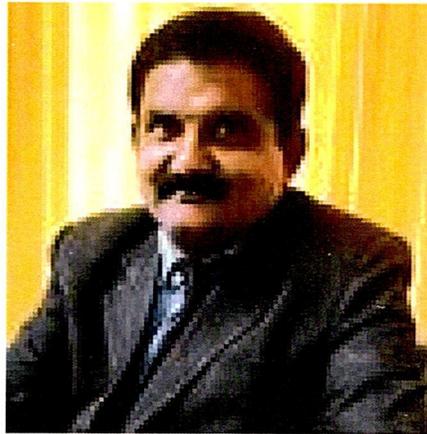## HOD MESSAGE

Dr.V.K.Naik

I am very happy to publish fourth issue of Departmental Technical Magazine for AY 2021-22. This issue is reflection of the efforts put by the students in research study and expertise they have achieved. The credit of compiling research articles in the form of detailed presentation goes to the editorial team of students. On behalf of my Department I am extremely grateful to this students' group and also thankful to our Executive Director, Hon.Shri Anil Baghane and the Principal Dr. S.A Khot, who are always keeping us motivated all the time. Last but not the least I am thankful to my departmental faculty members and supporting staff for doing each and everything that was assigned to them. They did their best to contribute the success of the Department.

CONTENT OF MAGAZINE

Department of Civil Engineering

Use of Coconut Shell Charcoal In Pavement as a Filler"

Mayuri S. Shingade[1], Muskan D. Bhaldar[2], Sabiha A. Matwal[3], Sangram A. Dopare[4]

[1,2,3]*B-Tech Student Dept. of Civil Engineering DBATU University, Maharashtra, India*

[4]*Assistant Professor, Dept. of Civil Engineering, DBTU University, Maharashtra, India*

ABSTRACT

Coconut shell is the byproduct of the agriculture can be used as an artificial source of coarse aggregate. In this study we are used coconut shell charcoal with replaced cement. Waste materials are used as an alternative to mineral filler, for reducing cost and increasing the efficiency of roads. Coconut shell charcoal is a waste material. waste materials are used as an alternative to mineral filler for reducing cost and increasing the efficiency of roads. Some of the waste material are coconut shell charcoal, plastic, waste material etc.... Among this coconut shell charcoal powder is referred as study .coconut shell charcoal powder is solid waste material. Coconut shells are locally available especially in southern India. In this coconut shell charcoal powder is replaced with cement. The performance of charcoal powder is tested by the compressive strength test. From the results we have observed that coconut shell charcoal powder can be used as filler in the pavement.

----

1. OBJECTIVES

- The main Objective is to check the suitability of Coconut shell charcoal as filler then comparing results with different fillers.

- Study of different material Properties using different fillers (Aggregate, Portland cement, Bitumen etc.) and then comparing the results with Coconut shell charcoal as filler.

- To find out optimum binder Content using compressive strength test.

2. MATERIAL USED

• **Slag** – Coarse aggregate

• **Stone** – Fine aggregate

• **Mineral filler** – stone dust, Portland cement, fly ash and Coconut shell charcoal.

• **Binder** – bitumen of penetration grade 60/70

3. METHODOLOGY

In this project we are going to use waste materials are used as an alternative to mineral filler for reducing cost and increasing the efficiency of road .Some of the waste materials like coconut shell charcoal ash , plastic waste and fly ash , stone dust among those coconut shell charcoal powder is referred as study. First we are collect the coconut shells and burn them . coconut shell charcoal possesses resistance to crushing , absorption , surface moisture , grading , freezing , lightweight and heating which are the most important features for the pavement . Thus the lifetime of the pavement is increased . Take bitumen of desired grade , coarse and fine aggregate . then we find the optimum content of Bitumen . for experimenting the compressive strength test method is used for obtaining better results .

4. Result

Observation Table

Material	Area	Load	Compressive Strength
Concrete Block	150*150	425	18.88
Concrete Block	150*150	422	18.75
Concrete Block	150*150	420	18.66
Charcoal Block	150*150	300	13.33
Charcoal Block	150*150	298	13.24
Charcoal Block	150*150	296	13.15

5.Conclusions

- In case of a coconut shell flow increases with increase in bitumen content in case of all fillers used in the sample.

- Air voids decreases with increase in bitumen content for all of the fillers used in the sample.

From in this experiment, it can be a concluded that coconut shell charcoal can be used as a substitute for a filler as it satisfies all the criteria to be used as a filler

Department of Civil Engineering

6. REFERENCES

[1] IRC:SP:79-2008-Tentative specifications for stone matrix asphalt , Published by Indian Roads Congress.

[2] Wikipedia - http://en.wikipedia.org/wiki/Stone_mastic_asphalt

[3] Shelke, A. S., et al. 2014. Coconut Shell as Partial Replacement for Coarse Aggregate: Review. International Journal of Civil Engineering Research. 5: 211-214.

[4] Aswathy, A, Soumya, S., Akhil, K. P., Rakesh, R., G, A. B., &Arya, C. A. (2016). Assessment of suitability of Coconut Shell charcoal as a Filler in Stone Mastic Asphalt. 7(4), 5–9.

[5] Dung Dung, S. (2014). Assessment of the Suitability of Coconut Shell Charcoal as Filler in Stone Matrix Asphalt.

[6] Lay Ting, T., Putra Jaya, R., Abdul Hassan, N., Yaacob, H., & Sri Jayanti, D. (2015). A review of utilization of coconut shell and coconut fibre in road construction. Jurnal Teknologi, 76(14), 121-125.

[7] Suraj, V., R, S. P., & Monika, T. (2017). Assessment of Suitability Coconut Shell as a Filler in Stone. 7(March), 304–309.

[8] JKR: Standard and specification for road works, Section 4-Flexible pavement (JKR/SPJ/2008- S4), Malaysia (2008).

[9] Bose S., Kamaraj C. and Nanda P.K. (2006), "Stone Mastic Asphalt (SMA) – A Long Life Pavement Surface", International Seminar on Innovations in Construction and Maintenance of Flexible Pavements, Agra, 2-4 September, Technical Papers, Volume 1, pp 169-17.

[10] T. Lay Ting, R. Putra Jaya, N. Abdul Hassan, H. Yaacob, D. Sri Jayanti, A review of utilization of coconut shell and coconut fiber in road construction. J. Teknologi 76 (2015) 121–125.

Department of Civil Engineering

"DESIGN AND MODELING OF COMMERCIAL CUM RESIDENTIAL BUILDING BY USING AUTODESK REVIT AND STAAD PRO."

Namrata S. Patil, Vaishinavi N. Ghodake, Rucha N Arali, Yogesh U Kulkarni

[1,2,3]*B-Tech Student Dept. of Civil Engineering DBATU University, Maharashtra, India*

[4]*Assistant Professor, Dept. of Civil Engineering, DBTU University, Maharashtra, India*
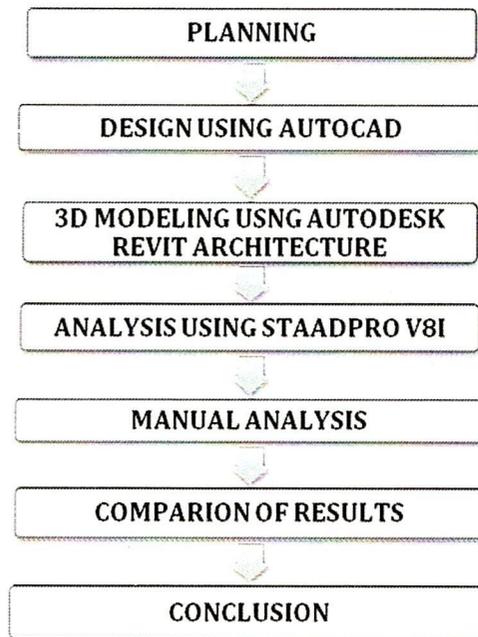

-

ABSTRACT:

It is not easy to design a huge building by manually it takes time and manpower too, but by using software it saves time and manpower. The commercial cum residential building has mixed stories, with the ground floor consisting of commercial shops and the first floor consisting of residential floor of 2BHK flat. In big cities, very limited land is available and it is of high cost. The primary goal of our project is to gain sufficient knowledge in planning, design, modeling, and analysis of a commercial cum residential building. In this project, planning and drafting are done by using Autodesk AutoCAD, 3D Modeling is done by using Autodesk Revit Architecture, and Analysis and Design are done by using STAAD Pro.V8i. Manual calculations of structural members like Slab, Beam, Column, and footing are done by the Limit State Method by using IS456:2000, IS875 and design aid SP16 code.

-

Introduction:

Our project is "Design and modeling of commercial and Residential Building by using Autodesk Revit Architecture and STAAD Pro." The main objective of our project is to gain sufficient Knowledge in planning, Design, Modeling and Analysis of a commercial cum residential building. It is a reinforced concrete framed structure consisting of G+1. All the structural members are designed by using National Building Code. IS 456:2000, IS 875, and design aid SP16. The structural components like Slab, Beam, Column and footing are manually designed by using Limit State Method.

Materials were used as specified by the National Building Code. For all the design, Concrete M20 grade and Fe 500 steel bars. Brick walls are in C.M 1:5 mix with wall external and internal wall thickness of 230 mm and 150 mm respectively. The total area of our building is 139 sq.m. The commercial shops had a glass wall for shops. Commercial space includes three shops, Two Store rooms, One Staffroom and two separate toilets for male as well as female and a staircase of 3 m wide. First floor is a residential floor (2BHK) with all the facilities.

2. Methodology


```
┌─────────────────────────────────┐
│           PLANNING              │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│      DESIGN USING AUTOCAD       │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│   3D MODELING USNG AUTODESK     │
│       REVIT ARCHITECTURE        │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│    ANALYSIS USING STAADPRO V8I  │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│        MANUAL ANALYSIS          │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│      COMPARION OF RESULTS       │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│          CONCLUSION             │
└─────────────────────────────────┘
```
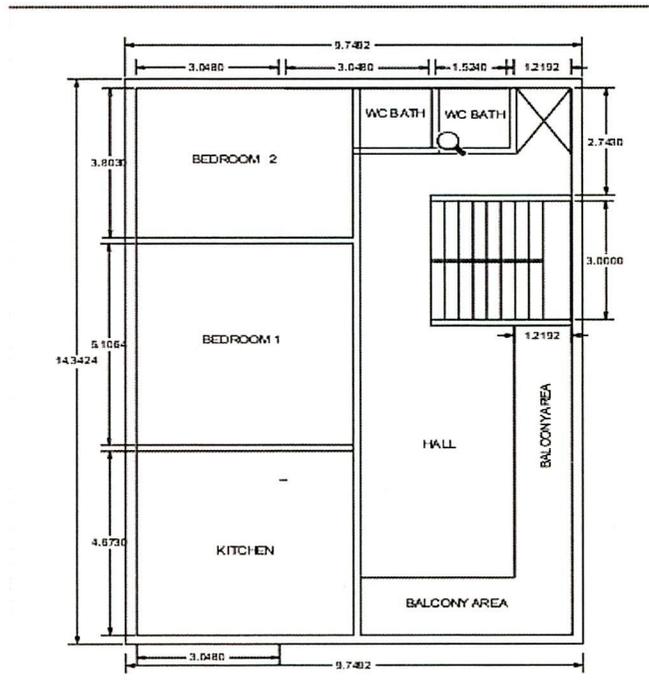
2.1 Design Using AUTOCAD

AutoCAD is a computer-aided design and drafting software application. AutoCAD is used to draft out plans, elevations, cross sections etc. of a building. The CAD drawing helps to identify the details such as balcony, kitchen, rooms, dining hall, thickness of wall, site details etc.

AUTOCAD plan
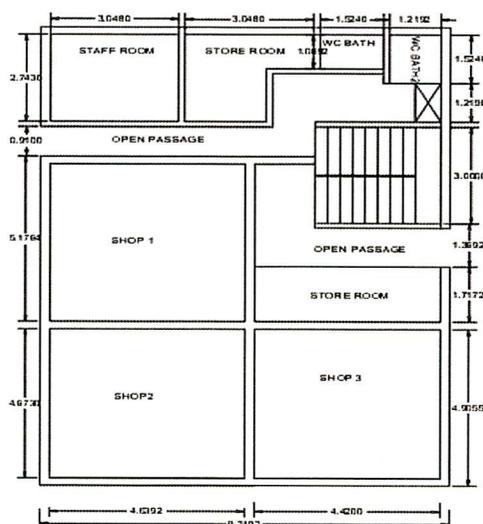
Ground Floor Plan

First Floor Plan

2.2 AUTODESK REVIT ARCHITECTURE 3D MODELING:

Nowadays, it is necessary to complete a project within a reasonable time and economically. Autodesk Revit is building information modeling softwares i.e., BIM software for architects, landscape architects, structural engineers, designers, and contractors. Autodesk Revit allows us to design and document a building by creating a three dimensional model that includes design and construction information, which is also known as building information modeling.

After creating the model we used Revit rendering tool to make the model more realistic.
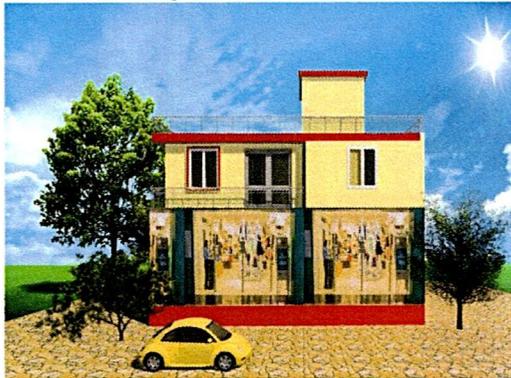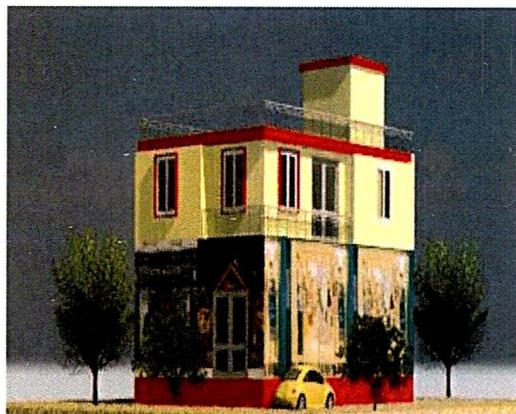
2.3 STAAD ANALYSIS AND MODELING

STAAD PRO is one of the most popular software that is used for analysis and designing towers, bridges, buildings etc. The first step in our process will be reading the plan that has been created. From this reading process, we will get all the information such as the number of storeys, number of bays, loadings, etc. The G+1 building is modelled using the Structure Wizard inside STAAD Pro according to the building.

Member Section	Dimensions (mm)
Beam	230 x 300
Column	230 x 300
Slab Thickness	100
Wall Thickness	External-230 ;Internal -150

Density of materials used:

MATERIAL	DENSITY
Plain concrete	24.0 KN/m
Reinforced	25.0 KN/m
Flooring material (cm)	20.0 KN/m

2.3.1 DEAD LOAD

Dead loads are the structural loads that include the self weight of the structural members such as walls, ceilings, floors, plaster etc. According to IS 875 part 2,
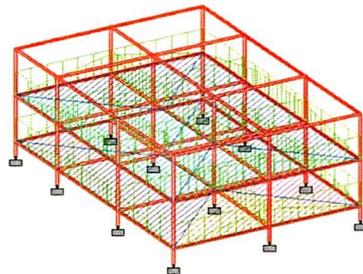
Dead load- 15KN/M
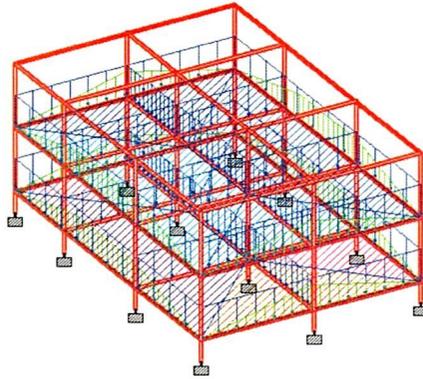
Self-weight is the body's own weight of body, due to the mass present in it. In STAAD Pro, we can directly add the self- weight by selecting the whole structure and simply specifying the direction of force. It is a dead load. According to IS 875 part 2,
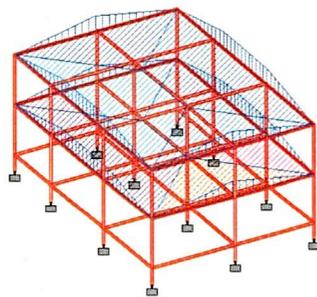
Self   weight – Factor = -1KN/M
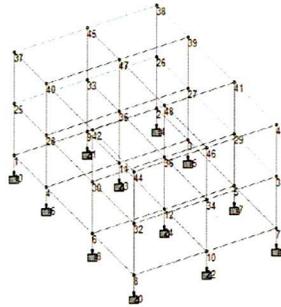
2.3.2 LIVE LOAD

Live loads are temporary loads that are applied to the structure on and off over the life of the structure. According to IS 875 part 2,

Live load- 2 KN/M

NODE NUMBER-

BEAM NO-
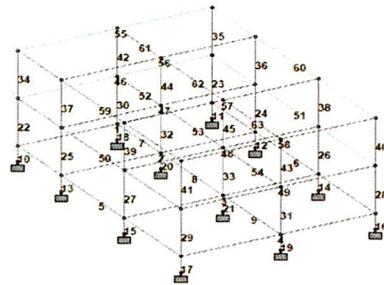
RENDERING-
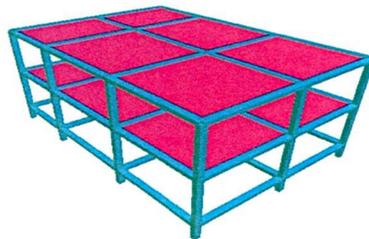
BENDING MOMENT-
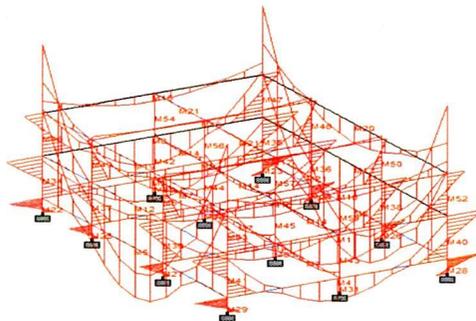
3.3.3 STAAD EDITER

SAMPLE RESULTS -

CONCRETE GRADE	M20
STEEL GRADE	Fe500
LENGTH	4863 mm
SIZE	300 mm x 230 mm
COVER	25mm
SHEAR REINFORCEMENT	8 mm Ø 2 legged vertical stirrups @145 mm c/c.
TOP REINFORCEMENT	8 bars of 12 mm dia.
BOTTEM REINFORCREMENT	4 bars of 16 mm dia.
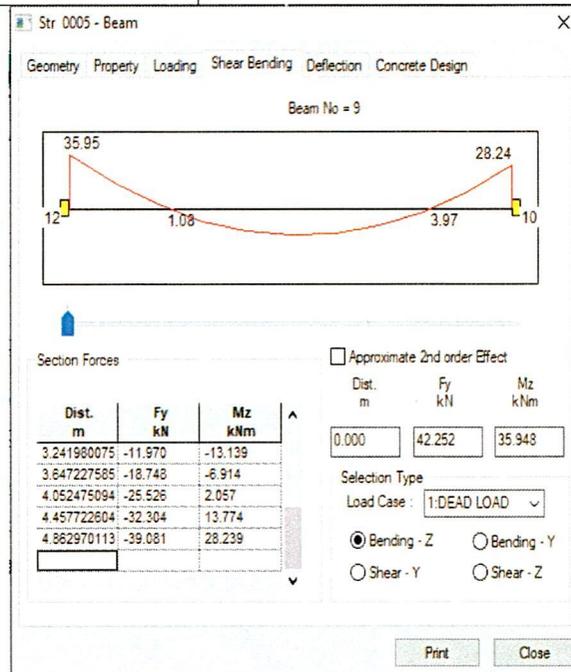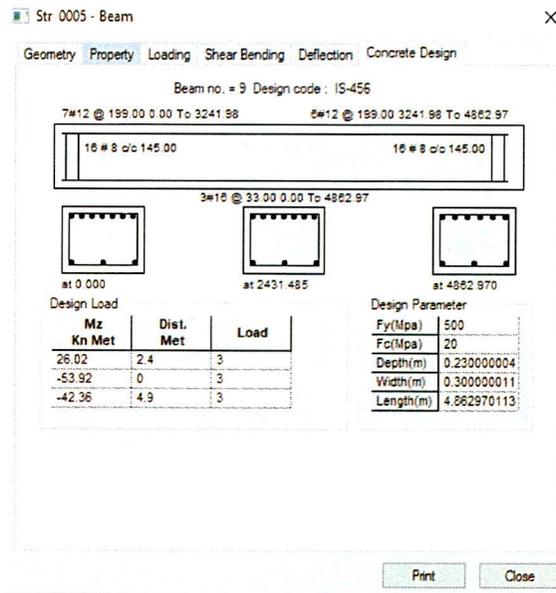
4. SAMPLE MANUAL CALCULATION-

4.1 Design of Beam

Beams shall normally be provided under the wall or under a heavy concentrated load. Beams transfer load from slabs to columns, beams are designed for bending. In general, we have two types of beam: single and double. Similar to columns, the geometry and perimeters of the beams are assigned.

There are three types of reinforced concrete beams

1. Single reinforced beams

2. Double reinforced concrete

3. Flanged beams

Step 1

Dimensions

AB = 4.83m

BC = 4.60m

Beam Size = 230mm *300mm

Cover = 50mm

Effective Depth = 250 mm

For M20 concrete and Fe 500 steel

Step 2

Load Calculation

- For span AB

Trapazoidal Area = ½ * (0.03+4.83) *2.415 = 5.86 m^2

i. Self weight = 0.23*0.30*1*25 = 1.725 KN/m

ii. Wall Load = 0.23*1*19 = 4.37 KN/m

iii. Slab Load = 12*5.86/4.83 = 14.55 KN/m

Total Working load = 20.645 KN/m

Factored Load = 30.96 KN/m

- For Spam BC

Trapezoidal area = ½ * (0.25+4.61)*2.30 = 5.59 m^2

i. Self weight = 1.725 KN/m

ii. Wall load = 4.37 KN/m

iii. Slab Load = 13.64 KN/m

Total working load = 19.74 KN/m

Factored load = 29.60 KN/m

Step 3

Calculation of FEMs

- Span AB

$M_{AB} = -wl^2/12 = -30.96*4.83^2/12 = -60.18$ KN

$M_{BA} = 60.18$ KN

- Span BC

$M_{BC} = -wl^2/12 = -29.60*4.61^2/12 = -52.42$ KN

$M_{CB} = 52.42$ KN

Step 4

Calculation of Distribution Factor

Joint	Member	Stiffness	Total Stiffness	DF
	BA	0.20		0.48
B			0.42	
	BC	0.22		0.52

Department of Civil Engineering

Step 5

Moment Distribution Table

Joint	A	B		C
	AB	BA	BC	CB
DF		0.48	0.52	
	-60.18	60.18	-52.42	52.42
		-3.72	-4.03	
	-1.86			-2.015
Final	-62.04	56.46	-56.46	50.405

RA = 76.76 + 1.15 = 88.27 KN

RB = 74.76 + 68.22-1.15+1.31 = 143.14 KN

RC = 68.22-1.31 = 66.91 KN

S.F. Calculation

SFAL= 0

SFAR= 88.27 KN

SFBL = 88.27 – (30.96*4.83) = -61.26 KN

SFBR = -61.26+143.14 = 81.88 KN

SFCL = 81.88- (29.60*4.61) = -66.91 KN

SFCR = 0

Calculation of Mu$_{lim}$

$=0.133Fckbd^2 = 0.133*20*230*250^2 = 38.24$ KN

Span AB = $Wl^2/8$ = .96*4.83^2/8 = 90.28 KN.m

Span BC = $Wl^2/8$ = 29.60* 4.61^2/8 = 78.63 KN. M

Calculation of Ast

Span AB

Ast=0.5*20/500*[1-4.6*59.25*10^6/20*230*250^2]

*230*250

$= 887.75$ mm^2

No. of Bars = 887.75/π/4*16^2 = 4.41≈6 Nos.

$Asc = 0.5 * 20/500 * [1 - 4.6 * 31.03 * 10^6/20 * 230 * 250^2] * 230 * 250$

$= 333.96 \ mm^2$

No. of Bars $= 333.96/\pi/4 * 12^2 = 2.95 \approx 4$ Nos.

Span BC

$Ast = 0.5 * 20/500 * [1 - 4.6 * 53.43 * 10^6/20 * 230 * 250^2] * 230 * 250$

$= 711.91 \ mm^2$

No. of Bars $= 711.91/\pi/4 * 16^2 = 3.50 \approx 4$ Nos.

$Asc = 0.5 * 20/500 * [1 - 4.6 * 25.2 * 10^6/20 * 230 * 250^2] * 230 * 250$

$= 261.59 \ mm^2$

No. of Bars $= 261.57/\pi/4 * 12^2 = 2.30 \approx 4$ Nos.

Check for shear

For span AB

$Vu = Wl/2 = 74.76$

$\tau c = 74.76 * 10^3/230 * 250 = 1.30$

$Pt = 887.75/230 * 250 * 100 = 1.54$

Pt	
1.50	0.72
1.54	X
1.75	0.75

$X = 0.75 - (0.75 - 0.72)/ (1.75 - 1.50) * (1.54 - 1.50)$

$X = 0.74$

$\tau v > \tau c$

Assume 8 mm 2 legged vertical stirrups.

$Vs = Vu - \tau c * b * d = 74.76 * 10^6 - 0.74 * 230 * 250$

16

$V_s = 32.21$ KN

Spacing $= 0.87*500*100.53*250/ 32.21*10^3$

$= 339.41$ mm

$S_v = 0.75d = 0.75*250 = 187.5$ mm

$S_v = 300$ mm

Provide 190 mm Spacing.

Check for shear Span BC

$V_u = Wl/2 = 68.22$

$\tau v = 68.22*10^3 /230*250 = 1.18$

$P_t = 711.91/230*250 *100 = 1.23$

Pt	
1.00	0.62
1.23	X
1.25	0.67

$X = 0.67- (0.67-0.62) / (1.25-1.00)* (1.23*1.00)$

$\tau c = 0.62$

$\tau v > \tau c$

Hence, shear reinforcement required.

Provide 8mm Ø 2 legged vertical stirrups

$V_s = V_u - \tau c *b*d = 68.22*10^3-0.62 * 230 *250 = 32.57$ KN

Spacing $= 0.87*500*100.53*250/ 32.57 *10^3$

$= 335.67$ mm

$S_v = 0.75d = 0.75*250 = 187.5$ mm

$S_v = 300$ mm

Provide 8 mm 2 legged vertical stirrups @190 mm Spacing.

5. CONCLUSION-

- The primary goal of the project has been met, which is to gain knowledge in design, modeling, drafting and analysis using software's.

- Getting familiar with structural software like AutoCAD, Autodesk Revit Architecture and STAAD Pro.

- STAAD Pro frame analysis of a building is done by STAAD Pro as per IS456-2000, IS875 and Design Aid SP-16. The shear and deflection are within the Is 456:2000.

- Software analysis was compared with manual analysis, and the results were almost the same.

- After comparison of the sample data for beam, the Ast requirement is the same in manual analysis as well as software analysis.

- The modeling of the building in Autodesk Revit software gives a beautiful, realistic view of the building.

6. REFERENCE-

1. Pranav Bhagwat, Rahul Shinde "Autodesk Revit: Implementation in practice", October–December 2003.

2. Analysis of Multistoried Building considering Hybrid Structure - Tanha B. Shah, International Journal of innovative research volume1 issue 2. (PP. 81-180)(May 2005)

3. Sergey P. Zotkina, "The Organization Of Autodesk Revit Software Interactions with Applications for Structural aqnalysis" In 2016.

4. Linomaia, "BIM Methodology, a new approach case study of structural elements creation" In 2015.

5. Rakesh Reddy "Design & modeling of G+5 commercial building by Autodesk Revit Architecture" In 2019.

6. Menglin Wang , "Building Information Modeling (BIM) Site building interperability method" In 2011

7. R. S. Bute, "Design & Detail of 3D model of building with comparison of Manual & Software estimate on Autodesk Revit" In 2018.

8. Xinan Jiang, "Development in cost estimating & scheduling in Autodesk Revit" In 2008.

9. Sreehna KS, "Structural Analysis & design of B+G+4 storied apartment building" In 2016.

10. Bandipati Anup, "Evaluate & Plan a Muiti Storeyed building adopting STAAD Pro" In 2016.

11. Amar Hugar, "The CADD Design of Residential building involves scruting of Building using STAAD Pro & Physical design of a structure" In 2016.

12. Sourav Saha, "Design & Analysis of multi storey (G+4) Residential building using STAAD Pro & Auto CADD" In 2021.

13. Falak Vats, "Review paper on design & analysis of Multi storey building bt the use of STAAD Pro" In 2019.

14. V. S. Nagasai, "Planning Analysis and Design of Residential Building (G+5) by using STAAD Pro" In 2019.

15. Dhanavath Seva, In 2017.

16. R. D. Deshpande, "Analysis Design & estimation of residential building".

Planning of Sustainable Town

, Hrutuj Mangalekar[1], Aditya Patil[2], Vinod Koli[3], Shridhar Mane[4] Gopika D. Ghadvir[5]

[1,2,3,4]B-Tech Student Dept. of Civil Engineering DBATU University, Maharashtra, India

[5]Assistant Professor, Dept. of Civil Engineering, DBTU University, Maharashtra, India

----

-

Abstract - *Sustainable township builds a Town for a healthy future. In general, development experts agree that sustainable cities should meet current needs without sacrificing the ability of future generations to meet their needs. That's why we adopt sustainable community ideas and concepts and design entirely new communities. We are adding various amenities and facilities using natural hot springs. Equipment such as rainwater harvesting that collects and stores rainwater. We are also adding solar panels to specific homes and local parking lots that generate electrowon. We are also adding sewage treatment plants to our town to collect and filter all liquid waste from all households. This water can be used for gardening and community water. Limit vehicle fuel consumption in the area and use electronic vehicles in the area to maintain a healthy environment in the area.*

-

1. INTRODUCTION

In today's vast world sustainable development, non-renewable energy, net zero energy concept and green energy concept and similar topics took all the interest to most of the researchers around the globe. We have many commercial buildings around us which uses more resources of the environment which comes or generate from non-renewable sources. Energy consumption in nearby buildings and cities are at a large scale comes from non-renewable sources of energy, which can be suitably shifted to renewable sources of energy. It is estimated that 50% of the world's population now live in cities. With this migration into large urban centres, the difficulty of meeting the basic needs of millions has become an ever-increasing problem. Overpopulation, overconsumption, pollution and resource depletion create environmental and health challenges in major cities.

Social sustainability revolves across the human element as a prerequisite for a sustainable town and a sustainable society. The government's sustainability method consequently denotes the belief that everybody ought to take part within side the social improvement and feature same possibilities, no matter the background. A targeted and sustained social sustainability paintings allows to make sure diversity, democracy and equality in cities. A sustainable town is socially related to the truth that there are democratic areas in which human beings can meet no matter social, monetary and cultural backgrounds and offer possibilities for deployment and accessibility for all of the residents of the town.

1.1 Solar Power Plant

Photovoltaic plants are based on the conversion of sunlight into electrowon, either directly through photovoltaics (PV) or indirectly through concentrating solar energy (CSP). Concentrated solar energy systems use lenses, mirrors, and tracking systems to focus a large area of sunlight into a small beam. Photovoltaics use the photoelectric effect to convert light into electrowon. The use of these products is increasing day by day after recognizing the importance of utilizing solar energy. The government is also taking the initiative to raise public awareness by introducing incentives for solar products. Installing a solar power plant is very beneficial in every way, not just in your pocket, but for the whole world. This solar system is being actively used to convert the energy of the sun into a usable format that can be used to power all types of devices. Concentrated solar energy systems use mirrors, lenses, and tracking systems to focus a large area of sunlight into a small beam. The photoelectric effect converts light into electrowon. All countries around the world have decided to use solar products widely. As we all know today, we are contributing to the protection of our environment with the help of solar energy. Apart from that, it's a one-time investment and you don't have to spend a lot of money on electrowon over and over again.

1.2 Waste Water Treatment Plant

Wastewater treatment is the process of removing pollutants from wastewater and turning it into wastewater that can be returned to the water cycle. After being returned to the water cycle, the wastewater has an acceptable impact on the environment or is reused for a variety of purposes called water regeneration. The treatment process takes place in a sewage treatment plant. There are different types of wastewater that are treated in the right type of wastewater treatment plant. In the case of domestic wastewater, also known as municipal waste or sewage, the treatment plant is called a sewage treatment plant. Industrial wastewater is usually treated after pre-treatment in either another industrial wastewater treatment plant or a wastewater treatment plant. Other types of sewage treatment plants include agricultural sewage treatment plants and leachate treatment plants. Commonly used methods are phase separations such as sedimentation and biological and chemical processes such as oxidation and polishing. The main by-product of wastewater treatment plants is a type of sludge, which is usually treated in the same or different wastewater treatment plants. Some wastewater can be treated in large quantities and reused as treated water.

1.3 Rain Water Harvesting

Rainwater harvesting (RWH) is the collection and storage of rain, rather than allowing it to run off. Rainwater is collected from a roof like surface and redirected to a tank, cistern, deep pit ,well, shaft, or borehole, aquifer, or a reservoir with percolation, so that it seeps down and restores the ground water. Dew and fog can also be collected with nets or other tools. Rainwater harvesting differs from stormwater harvesting as the runoff is typically collected from roofs and other surfaces for storage and subsequent reuse. Its uses include watering gardens, livestock, irrigation, domestic use with proper treatment, and domestic heating. The obtained water can also be used for long-term storage and groundwater concentration. Stormwater harvesting is one of the simplest and oldest methods of self-sufficiency in household water that has been used in India and other countries for thousands of years. The system can be designed for different sizes, such as residential, neighbourhood, and

community. It can also be designed for facilities such as schools, hospitals and other public facilities.

1.4 Town Planning

Town planning is the process of managing land resources. This includes managing existing and new developments and creating strategies to ensure that future requirements are met. This is a dynamic process that changes according to policies, development proposals, and local needs. Urban planners must strive to balance the needs of landowners and developers with the needs and concerns of the community and political environment. Successful planning can help protect the environment, promote and promote regeneration, help create and maintain communities, and create new and exciting places. Town planning preserves the best of the past while encouraging creativity and innovation in developing a sustainable future.

2. NECESSITY

Sustainable Township is defined as a livable place to meet the diverse needs of today's and future communities. It was also stated that the basis of the concept of sustainable development is a balanced approach to managing the environment. With rapid urbanization, people are attracted to cities and urban areas and want to get more and more facilities and equipment to survive in better living conditions. As a result of that trend, the limits of cities are increasing day by day.

For this reason, further development is underway to meet the needs of all sectors and plans, including residential, commercial, employment, facilities and medical facilities. Increased demand and development are ubiquitous and clearly not well managed. Therefore, there are papers on proper planning and proper management in urban areas.

3. METHODOLOGY

3.1 Data Collection

3.1.1 Sustainable Materials for Building

Precast concrete slabs -
slabs are formed on-site by the manufacturer and shipped to the site throughout the section. Some are made entirely of concrete, but there is a large hollow space like a burnt block. Precast concrete elements are used for walls and building façade because they can withstand all kinds of weather, while other elements can be used for floors and flat roofs.

Recycled Wood -
Using recycled wood is one of the most environmentally friendly ways to protect trees and reduce the amount of wood that can be landfilled. Recycled timber can be found in retired barns, excavators, home remodeling companies and contractors, junkyards, transport crates and pallets. Recycled wood is suitable for framing, cabinets and flooring.

Recycled Steel -
Steel is 100% recyclable, significantly reducing the environmental impact of new construction. Mining, heating and forming aluminum and steel products require a lot of energy, but by properly and efficiently reusing or recycling them into new products, we reduce energy consumption and make our materials more sustainable. Recycled metal is durable and does not need to be replaced frequently.

Rigid Vegetable Polyurethane Foam -
Rigid foam has long been used as insulation in construction. It is used in the manufacturing process of turbine blades and furniture. The material is rigid and relatively immobile, so it can be used as a heat insulating material. In addition, it provides protection against mold and pests. In addition, it is heat resistant, protects against mold and pests, and can fully function as soundproof.

Ferrock -
This is a relatively new material, using recycled materials such as steel powder from the steel industry and recycled materials such as iron rock that are left over from industrial processes and usually become landfills. It creates a concrete-like building material that is stronger than the concrete itself, and traps and absorbs carbon dioxide in the process of drying and hardening. This makes Ferrock CO2-neutral and emits much less CO2 than traditional concrete. A viable alternative to cement, it can be mixed and poured to form driveways, stairs, paths and other structures.

3.1.2 Planning And Designing In AutoCAD

AutoCAD is a commercial computer-aided design (CAD) and drafting software application. AutoCAD was developed and marketed by Autodesk and was first released in December 1982 as a desktop app that runs on a microcomputer with an internal graphics controller. Prior to the introduction of AutoCAD, most commercial CAD programs ran on mainframes or minicomputers, with each CAD operator (user) working on a separate graphics terminal. AutoCAD can also be used as a mobile and web app. AutoCAD is used in the industry by architects, project managers, engineers, graphic designers, urban planners and other professionals.

Plans
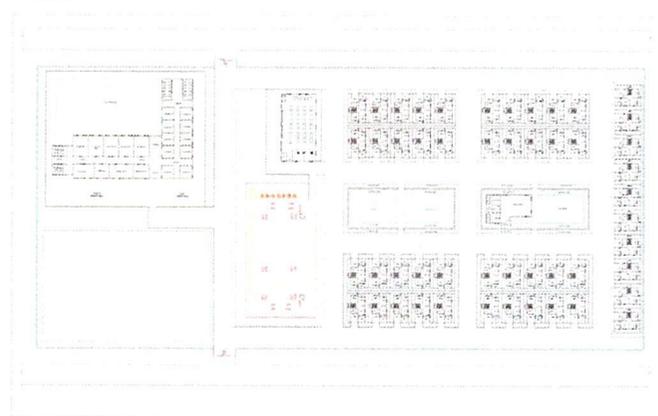
Fig -1: 2D Design of Town Plan
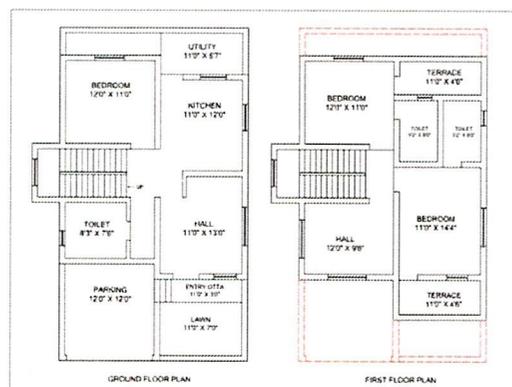
Fig -2: 2D Design of House
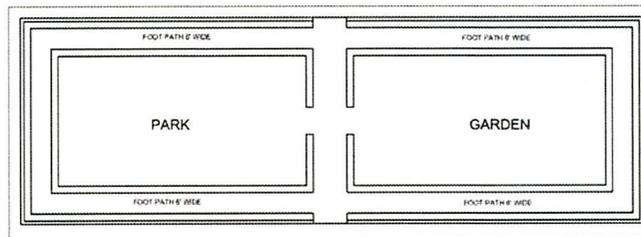
Fig -3: 2D Design of Park and Garden
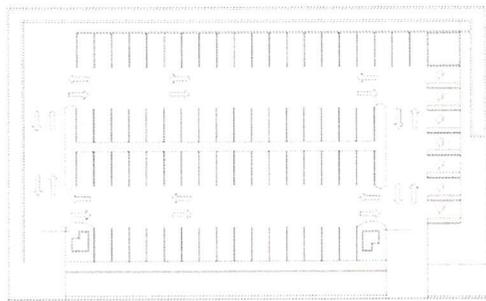
Fig -4: 2D Design of Solar Parking
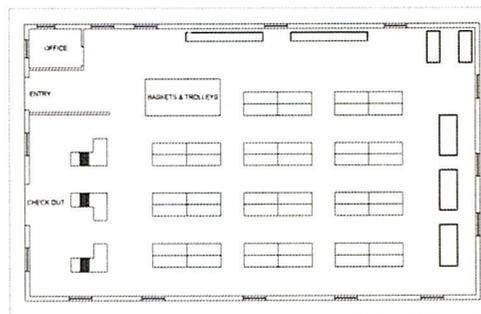
Fig -5: 2D Design of Super Market
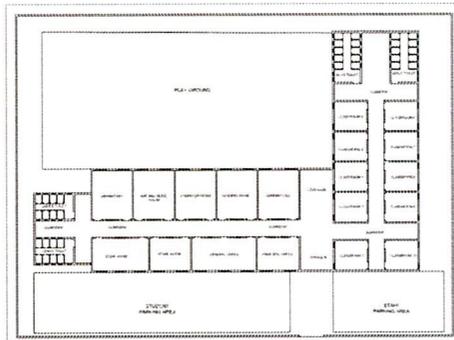
Fig -6: 2D Design of School

3.1.3 3D MODELING

We create 3D models of some of the buildings in our city. Create a 3D model using the SketchUp software.

SketchUp –
Sketchup (formerly Google Sketchup) is an easy-to-use 3D modeling software with an extensive database of custom models for download. You can use it to sketch (or import) your model for all kinds of projects.

3D Design

of House
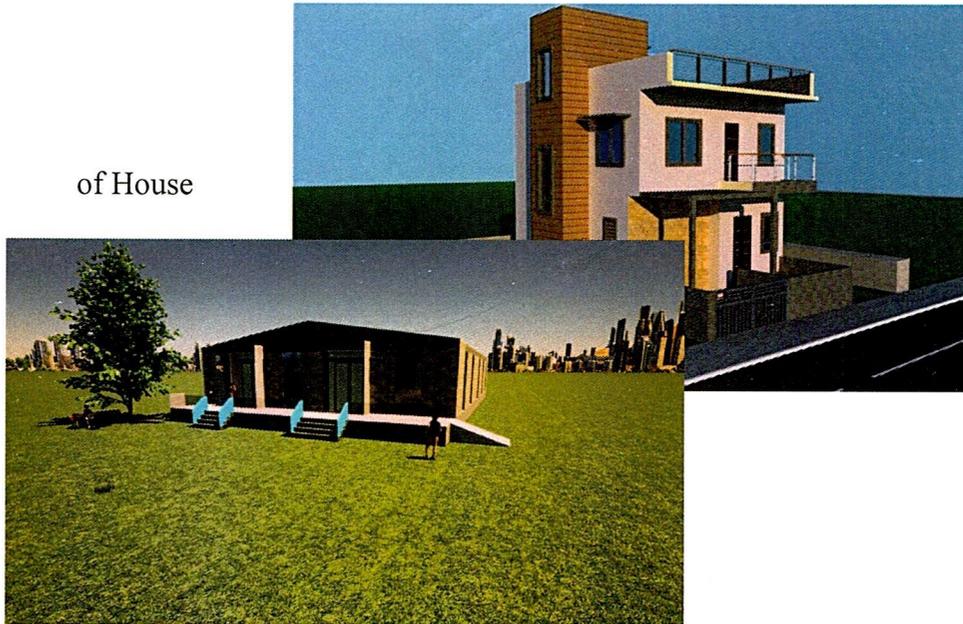
Fig -8: 3D Design of Super Market
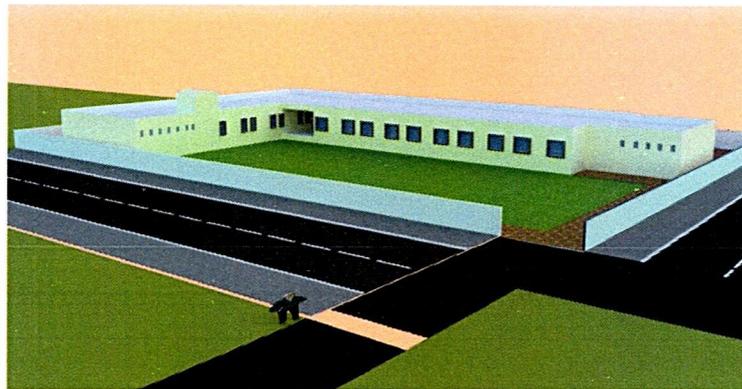
Fig -9: 3D Design of School
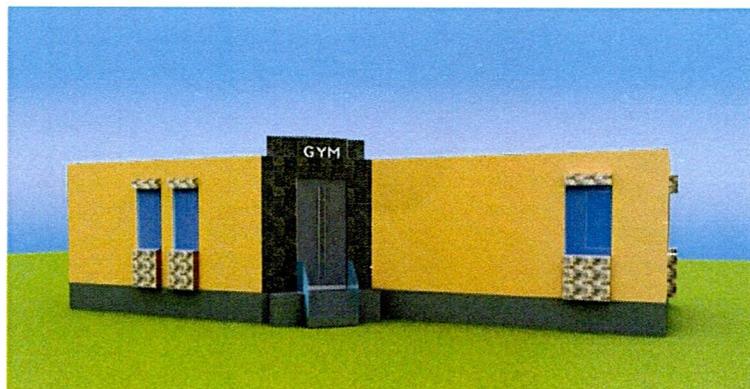
Fig -10: 3D Design of Gym
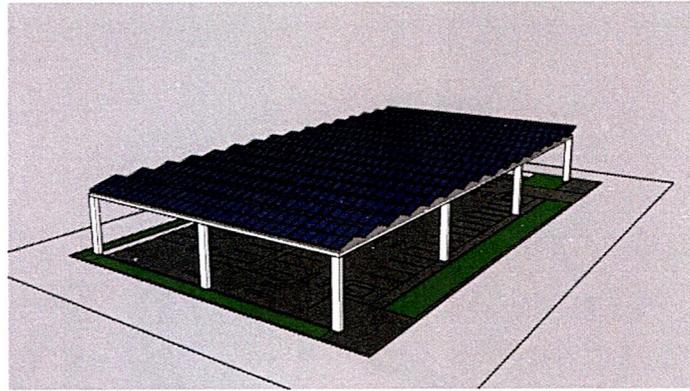
Fig -11: 3D Design of Solar Parking

3.1.4 PREPARE MODEL

We making physical model of the town which we design in AutoCAD. We using hard foam to making the buildings and compound walls. First we print the design of town plan on A1 size paper and fix on same size foam. Then we cutting the small pieces of foam of size is the printed plan and joint together. Then we coloring that pieces as we want. After coloring, draw windows, doors and solar panels. Finally, fix the foam building to the plan.
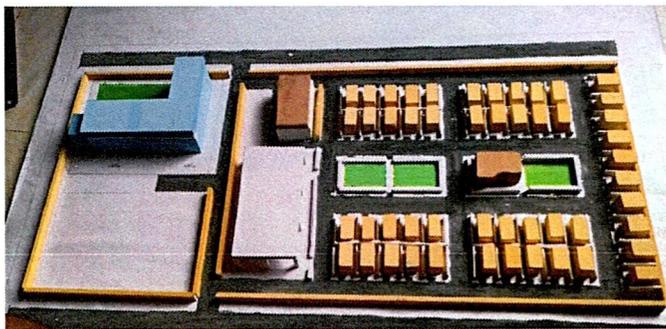
Fig -12: Model of Town

4. CONCLUSIONS

We are doing this project for future and we think that it will help us. So basically it is helpful for environment. But as per human tendency no one is thinking about environment and cleanliness. So apart from environment it is also economical friendly also,due to this project we can save some ammount of money. And also we are using natural resources to produce energy so no harm for our environment. And it is lifetime investment just we have to take maintenance of those machines or equipment. So these are the things we are presenting from our project.

5. ACKNOWLEDGEMENT

6. REFERENCES

[1] Yigitcanlar, T., Dur, D., & Dizdaroglu, D. (2015). "Towards prosperous sustainable cities: A multiscale urban sustainability assessment approach. Habitat International", 45(1), 36–46.

[2] Kondepudi, S. N. (2014). "Smart sustainable cities analysis of definitions. The ITU-T focus Group for Smart Sustainable Cities, United Nations, Washington".

[3] Wheeler, S., "Planning for sustainability: Creating Liveable, Equitable and Ecological Communities, Routledge": London, 2013.

[4] Graham, P., P. B., "Guidlines on education policy for sustainable built environment, UNEP": Nairobi, Kenya, 2010

[5] Roy, M. (2009). "Planning for sustainable urbanisation in fast growing cities": Mitigation and adaptation issues addressed in Dhaka, Bangladesh. Habitat International, 33(3), 276–286.

Department of Civil Engineering

Environmental Impact Analysis of Water and Soil Near Sugar Factory Area

[1,2,3,4]B-Tech Student Dept. of Civil Engineering DBATU University, Maharashtra, India

[5]Assistant Professor, Dept. of Civil Engineering, DBTU University, Maharashtra, India

----
-

Abstract :

Sugar industries are the largest agro-based industries after textile industries in Western Maharashtra in India and have its big share in economic development. It not only generates huge employment opportunity to the rural and urban population but also contributes in various ways to the economy. In nature sugar industries may be also considered as multiproduct industry, the byproducts are bagases, molasses, press mud ,etc. Having their multiple uses. In a way the variety of by products that sugar industries have their direct or indirect on our day-to-day life. Despite of benefits sugar industries have some social cost that is environmental problems. Basically the by products of sugar industries are the solid waste and without filtration if they are dumped into water bodies or to the open atmosphere they are hazardous and impact environment adverally. In wake of environmentral degradation, the corporate or the owners of the industries have some legal, ethical and social obligation and they need to adhere upon to the norm. The whole idea of these paper revolves around the environmental problem related to the sugar industries special reference to Sugar Industries near to us.

-

Objectives

The aim of this study is to investigate the effects and to analyse the waste water and waste products releases from Sugar Factory.

1) The aim of this study to investigation or analyses the effect of sugar industry effluent in the nearby areas where agriculture is practiced in large scale.

2) To know the effect of these industrial effluents which are outletted in environment.

Methodology

Based on the previous year studies of subject "Waste Water Treatment", which we have learnt in the Third year, and the new draft of EIA launched by Ministry of Environment, Forest and Climate change. We decided to do this project because we all group members are belong to the newly developing industrial Centre of our state i.e., MIDC and Sugar Industry whose problems are going to face by us. For these project we are going to collect the samples and test them in in two phases *i.e.* before the sugar season start and another phase i.e, after the season start   For these project we are first going to collect the 6 samples of water around the sugar industry before the season start. The collected samples testing is going to be done in our chemistry lab which test's we have studied in third year. But for the

soil we are going to test for once only because the soil never changes its property like water because it's stability and can't travel from one place to another. After the testing we will get the result that testing results will be noted down with detailed. Further these same procedure will be done for to calculate the results after when sugar season starts. And then we will calibrate all the results between these two season's with reference to the standard results for both water and soil.

Site Information and Sample Collection

For to study this project we have collected the altogether total 6 number of samples of water around the sugar industry, were the MIDC is closer to it. Whose waste water is somehow released in the nalas which meets to the river near to it. To know better about our project you can refer the figure shown below. As we have discussed earlier about the methodology in short but now here discuss in brief. The things that we have studied form literature review that will help us the do these test and for analyzing the results.

For these we have done the following tests; 1)pH 2)Total Hardness 3)DO 4)Chlorine Content 5)Permanent hardness 6)Alkalinity 7)Turbidity

Significance of pH

• The acceptable value of pH for potable water is 6.5 to 8.5

• Higher value of pH accelerates the scale information in water heating apparatus and boilers.

• Higher values of pH reduces the garmicidal potential of chlorine .

• pH value below 6.5 starts corroision in pipes thereby releasing toxic metals like zinc.

Significance OF Hardness

• Hardness of water is important consideration in determining the suitability of water for domestic and industrial uses.

• The environmental engineer uses this value as a basis for recommending the need for softening processes.

• Determination of hardness serves as basis for routine checkup of softening process.

• Hardness imparts taste of water upto certain limit. The calcium salts are useful for the growth of children.

• Absolutely soft waters are corrosive but the hard water forms scales on the pipeline inner surface and the boilers etc.

• Hard water causes excessive consumption of soap

The hardness of water affects the working of dyeing process.

Significance of Chloride

• The chloride determination of water gives the idea about the salinity of water.

• Saline water is not fit for drinking and irrigation purpose.

• Chloride is used as pollution indicator.

Department of Civil Engineering

• Chloride above 250 ppm gives salty taste to water which is objectionable.

• High chloride concentration results in decreasing dissolved oxygen content

Significance of alkalinity

1)Higher alkalinity levels in surface water will buffer acid rain and other acidwastes, prerventing pH changes that are harmful to aquatic life.

2)Alkalinity is also in important considering the treatment of waste water and drinking water because it influences cleaning processes such as anerobic digestion.

3)Water with low levels of alkalinity less than 150 mg/l is more likely to be corrosive. High alkalinity water greater than 150mg/l may contribute to scaling.

4) Water may also be unsuitable for use in irrigation. If the alkalinity level in the water is higher than the natural level of the alkalinity in the soil.

5)High alkalinity is good to have in our drinking water because it keeps the water safe for us to drink.

Significance of DO

• The DO determination is done to find out quality of water.

• It is also use for the BOD determination of waste water .

• A minimum DO of 4 ppm is necessary for aquatic life .

• The DO increases the taste and freshness of drinking water.

Significance OF TURBIDITY

1)Turbidity in drinking water is directly associated to its possible pollution and health hazard.

2)The consumer are not accepting the turbid water due to unacceptable appearance.

3)Generally in case of high turbid water filtration is difficult. Frequent chocking and backwashing are observed.

4)Due to high turbidity, efficiency of treatment is considerly reduced and the cost of maintenance increases.

Effect on soil parameter

The pH of a natural soil depends on the mineral composition of the parent material of the soil, and the weathering reactions undergone by that parent material. In warm, humid environments, soil acidification occurs over time as the products of weathering are leached by water moving laterally or downwards through the soil. In dry climates, however, soil weathering and leaching are less intense and soil pH is often neutral or alkaline.

Phosphorous-

It is a constituent of the cell nucleus, essential for cell division and the development of meristematic tissues at the growing points. It makes 0.1 to 0.5% of dry weight of the plant. Therefore, plants which cannot absorb adequate quantities of phosphorus from the soil have small root system and leaves, and their growth is stunted. In cereals tillering is reduced and maturity is delayed. Phosphorus is particularly helpful in the production of legumes, as it increases the activity of nodular bacteria which fix nitrogen in the soil. It aids the formation of seeds and fruits, particularly in the legumes. It stimulates early root growth and development. Optimum quantity of phosphorus available to the crop in combination with nitrogen balances their shoot and root growth.

Potassium-

Unlike nitrogen and phosphorus, potassium is not a constituent of the carbohydrates, oils, fats and proteins, the substances which form the fabric of the plants. But it plays a vital role in the formation or synthesis of amino acids and proteins from ammonium ions which are absorbed from the soil. It is also considered essential in the photosynthetic activity of the leaves. When potassium is in short supply the carbon dioxide is synthesized into sugars more slowly than when it is available in optimum quantity. The relative concentration of sodium and calcium also influences the activity of potassium in the plant. It helps in moving manufactured food, viz., carbohydrates (sugars) and proteins (amino acids), from leaves to roots. It favours the growth of legumes in competition with other plants. The stalks and stems (of plants) are more stiff when an adequate supply is available than otherwise. In consequence the lodging in cereals is reduced. It increases the plumpness of the grains. In general it imparts vigour and resistance to diseases. Some crops, such as potato, tomato, clovers, Lucerne and beans, are more responsive to potassium than other crops. As larger quantities of carbohydrates and proteins are stored, it increases winter hardiness of some plants, such as Lucerne. It constitutes 0.8to3.0% of dry matter in cereals.

CONCLUSION

From the above project we have got the positive results about the tests which we have done. On the basis of above analysis we may conclude that the region surrounded by the sugar factory get polluted. And further it will get more polluted Because to support these the new growing industries will help it. The results of every test which we have tested states that the samples which we have collected are being polluting. The results of the test before beginning of the sugar factory were quite good but results of the samples after the starting of the sugar factory are awful. So it is necessary to take care of water and soil which are affecting due to sugar industry effluents on ecosystem

Department of Civil Engineering

REFERENCE

1. ☐ IS:10500(2012) ☐ Environmental Engineering by S.K.Garg
2. ☐ Environmental Engineeringby B.C.Punmia
3. ☐ Environmental Engineering by N.N.Basak
4. ☐ Environmental Management by I.V.Murli ☐ Powar,Pondhe,Patil(1998) Ground Water pollution due to sugar mill effluent at sonai ,Maharashtra, india
5. ☐ Ahmed,Haroun,etla (2017)Environmental Impacts of the liquid waste from Assalaya Sugar Factory in RabekLocality, White Nile State, Sudan.
6. ☐ Upma Singh, ShikhaSingh,etla (2018)Water Pollution due to Discharge of Industrial Effluents with special reference to Uttar Pradesh, India
7. ☐ Daulta, Rani, Yadav,(2014) Effect of Sugar Mill Effluent on Physio-Chemical Properties of soil at Panipat City, India
8. ☐ Bhadja,poonam,A.K.Vaghela,Assessment Physio-Chemical Parameter and Water Quality Index of reservior water. Int.J.plant,Animal and Environmental Science,3(3),2013,8995
9. ☐ Sandeep kaur and Anjali Singh(2021)Environmental Problems Related to Sugar Industries:A Case Study of Govind Sugar Mill Ltd,Aira,Lakhimpur Kheri
10. ☐ Jaydeep Kumbhar and Shirkant Bhosale(2019)Study on Environmental Impact Assessment of the Sugar Industry
11. ☐ ICMR,Manual of Standards of quality for drinking water supplies. Indian Council of Medical Research,1975,Spe.Rep.No.44:27 ☐ BIS,Analysis of water, Bureau of Indian Standards, New Delhi,1993
12. ☐ APHA, Standards method for examination of water.21st Eds.Washington D.C,2005
13. ☐ Solomon, S.K. (2005). Environmental pollution and its management in sugar industry in India: an appraisal. Sugar Tech. 7, 77–81.
14. ☐ Saranraj, P., D. Stella. (2014). Impact of sugar mill effluent to the environment: A Review. World Applied Science Journal, 30(3): 299-316.
15. ☐ Latha, A., Vardhini, M.V., Monisha, R., Shobika,B. (2018).Environmental Impacts of Sugarcane Industry - A Case Study on Kurungulam Mills in Thanjavur ☐ Researchgate ☐ Science Direct

WASTE WATER TREATMENT BY USING INNOVATIVE FILTRATION TECHNIQUE

Abhishek.y.koli[1],Atharv.b.tashildar[2],Rohit.p.jadhav[3],Pranav.d.belkude[4], A.D.Ware[5]

[1,2,3,4]*B-TechStudent,Dept. of CivilEngineering,DBATUUniversity,Maharashtra,India*

[5]*AssistantProfessor,Dept.of CivilEngineering,DBTUUniversity,Maharashtra,India*

ABSTRACT

Water is life to us and all living organism and this water is polluting and scarcity of water is increasing due to large amount of unnecessary use of water. The reuse of domestic wastewater for non-potable water application is a potential solution for water deprived region world-wide. In recent days many developing nations cannot afford to construct and maintain costly wastewater treatment plants. They need more options for wastewater treatment at low cost. In both developed and developing nations, centralized waste water treatment system may not fulfill sustainable wastewater management requirements in future due to ever-increasing demand. Also the increase of the rate of building construction besides increasing also construction waste so that need of best solution on the treat of waste water and reuse of construction waste. Especially in rural area no awareness about water and effluent water directly discharged into water bodies, due to improper system disturbed our ecosystem. Solution in that problem we design a filter media and utilized construction waste as an ingredient of filter media. So we used Aerobic Brickbat Gravel Sand filter (ABGS) filtration technique and we designed 3 units. After the passing of waste water we seen very excellent results. And the treatment of waste water reuse the treated water for different purposes like horticulture, toilet flushing, car wash, and floor wash etc. also used in construction site for as a curing purpose. In case of grey water the performance of filtration showed overall efficiency are : Biochemical Oxygen Demand (BOD3) - 74.89 %, Chemical Oxygen Demand (COD) - 81.85 % , Total Dissolved Solids (TDS) - 100%, Hardness - 25.13% , Permanent hardness - 47.22% .And increased the value of DO and pH.

1. INTRODUCTION

Water is becoming limited resource in the world. International Water Management Institute (IWMI) predicts that per capita domestic water demand in India is likely to increase from the estimated 31 m3/person/year in 2000 to about 46 and 62 m3/person/year by 2025 and 2050.Water scarcity and waste water disposal has become a worrying issue in India. Treatment of wastewater using a simple, decentralized, environment friendly method using minimum energy which is applicable to rural as well as urban areas at a low cost is need of the present. Increase of human population and urbanization growth results in producing huge amount of wastewaters which creates the most challenging environmental safe and economic problems in today's world civilization (Alireza et al, 2014). More than 70 % of our fresh water bodies are polluted today. Groundwater table is depleting rapidly and the country is facing a major problem of groundwater contamination affecting as many as 19 states. Wastewater management has attained significant importance with growing period. Around 80% of water utilized produces domestic wastewater. The problem of water scarcity can be mitigated if treated domestic wastewater utilized for non-portable application. In source-separation based wastewater treatment concepts wastewater streams are separated according to their degree, type of pollution and reuse potential of resources. Generally three types of wastewater streams are distinguished: black water, grey water and rain water.The reuse of waste water for non-potable water application is a potential solution for water deprived region world-wide. Due to rapid industrialization and development, there is an increased opportunity for waste water reuse in developing countries such as India. Also the world is growing fastly and the population is increasing. Due to increasing population the demand of building construction is increasing. So that the construction industry is increasing fastly resulting a large amount of construction waste is producing such as demolished buildings waste, and demolition materials mostly used as a land filling. So to reduce this waste and to reuse it, we used this constructional waste materials in our experimental model as a filter media. So we can treat the waste water from construction waste and also we can reduce the building construction waste and Reuse the treated water

2. METHODOLOGY

The primary focus of this study was to check the applicability of Innovative filtration technique, ABGS method reactor to low strength domestic wastewater and to check the removal efficiencies of wastewater contamination parameters In order to test the effluent

characteristics, it was essential to design a lab scale model of the reactor and successfully implement its startup process. We had visited to STP plant located at Goa, and met to environment consultant Mr. Mahesh Bakal sir. He explained to us working process of treatment process. The first step was to design the approximate lab scale model which would provide a representative effluent sample of an onsite ABGS reactor. After this stage, fabrication of the lab scale model was done as per the treatment capacity and design. After the fabrication process was completed, the filtration media used construction waste that is brickbat, pebbles, waste aggregate, pieces of AAC blocks, hardcoke, coal, cinder aggregate (industrial waste) and waste ceramics converted into crush and checked basic properties of ingredients and were washed properly to remove any dirt or impurities on them,and soaked for 24 hours, and then the material is placed as the coarser particle at beginning and finer particle at end.After the completing design of reactor waste water collected from at SIT Hostel campus. Then checked of the physiochemical parameters of influent, the tests like BOD, COD, DO, PH, PH conductivity, hardness, permanent hardness etc. Then collected grey water was directly kept to a settling tank/storing tank for Proper mixing and settled suspended solid parts. And then the sample was slowly discharged through unit-1 under gravity zig-zag flow and checking different parameters and then same procedure carried out for second and third units and each unit took 2 to 3 hours of retention time, and accumulate the water some hours. Then it is ready to use some purposes, after the completion of treatment Process treat water collected in collection tank. Treated water can be used as per our need for some different purposes like horticulture, car wash, floor wash, toilet flushing, curing etc. After the experimental run the entire model was cleaned and washed with clean water. The material media were saturated with clean water for about 24 hrs.

3. CONCLUSION

It has been observed that it is the need of future to adopt cost effective decentralized treatment processes for the treatment of low strength domestic wastewaters. The study focuses on this factor and as a result suggests the use of Innovative Filtration technique (ABGS) method reactor for grey wastewater treatment.

Following conclusions are drawn from the present study:

1. It can be observed from the above results that, greywater can be efficiently treated by adopting a simplified technique of horizontal gravity roughing filtration system using Construction waste.

2. All the parameters tested of the resulting effluent were well within the prescribed limits put forth by the Central Pollution Control Board (CPCB) of India.

3. As for the removal of BOD Unit second (waste aggregates and AAC block pieces) and Unit third (hardcoke, coal, cinder aggregate and waste ceramic crush) have contributed the most in removal efficiency.

4. As for the value of DO (dissolved oxygen), unit first (brickbats and pebbles) contributed the most, hence can be concluded that brickbats and pebbles facilitated the aeration process in wastewater.

5. As for the removal of COD (chemical oxygen demand) all units are contributed in the removal efficiency.

6. As for the removal of TDS (total dissolved solid), unit third (hardcoke, coal, cinder aggregate and waste ceramic crush) contributed the most, hence can be concluded that hardcoke, coal, cinder aggregate and waste ceramic crush facilitated the totally removal solid concentration in wastewater.

7. From the experimental results it can be concluded that unit first (brickbats and pebbles) and unit second (waste aggregates and AAC block pieces) and unit third (hardcoke, coal, cinder aggregate and waste ceramic crush) had good removal efficiency.

8. In this present study, hardcoke and coal both was used at a time it gave good results and can be taken into consideration for wastewater treatment as it is cost effective also.

9. The present study opens up a new dimension on utilization of all the construction waste eco-friendly and locally available materials. This decentralized approach can reduce environmental burden by acquiring minimum land and electric power and no need for costly mechanical equipment's, hence can be mostly suitable for rural areas.

Department of Civil Engineering

4. **REFERENCES**

[1] PriyanandAgale and ParagSadgir. "Grey water treatment using novel technique of Aerobic Brickbat Grit Sand (ABGS) purifier system." Eco. Env. & Cons. 24 (3): 2018; pp. (1293-1299)

[2] MedhaKhangal, Dr.P.K.Agale, DrParagSadgir "Treatment of sewage and greywater using Aerobic Brickbat Gravel Sand (ABGS) Filtration method." International Journal of Interdisciplinary Innovative Research & Development (IJIIRD) (2020)

[3] Ahmed M., Al Sidari, S., Prathapar, A. and Al Adwai, S., Evaluation of custom made and commercial greywater treatment system: a case study From Oman, Bio-resource technology, 65, 33-40, (2008)

[4] Albalawneh, A; Chang T., Alshawabkeh H., "Greywater treatment by granular filtration system using volcanic tuff and gravel media." Water Science & Technology, 2017, 2331.

[5] Damodhar J Garkal, J V Mapara and MandarPrabhune. "Domestic waste water treatment by bio-filtration: a case study." International Journal of Science, Environment and Technology, Vol. 4, No 1, 2015, 140 – 145.

[6] Gazala Sayed. "Treatibility Study of Wastewater Using Activated Carbon, Sand Filter and Dual Media Filter." National Conference on Biodiversity: Status and Challenges in Conservation- 'FAVEO' (2013). ISBN: 978-81-923628-1-6.

[7] Jabbar H. Al-Baidhani and Zaid H. AL- Khafajy. "Treatment of Water and Wastewater by using Roughing Filter Technology of Local Materials."International Journal of Current Engineering and Technology,Vol.6, No.6 (Dec 2016),E-ISSN 2277 – 4106, P-ISSN 2347 – 5161.

[8] MangeshGulhane and AnujaCharpe. "Multimedia filter for domestic wastewater treatment." Journal of Environment Research and Development, Volume 9 No. 3A, March (2015)

[9] Martinez S. G., Barcelo O. G., Flores-Torres C. A., "Wastewater treatment in an anaerobic filter using small lava stones as filter media without temperature control", Water Science & Technology 2011, 1188.

Department of Civil Engineering

[10] OnyekaNkwonta and George Ochieng. "Roughing filter for water pre-treatment technology in developing countries: A review."International Journal of Physical Sciences Vol. 4 (9), pp. 455-463, September, 2009.

[11] PrayongKeeratiurai. "Wastewater treatment with aerobic filtration process by rock layer." ARPN Journal of Agricultural and Biological Science, Vol. 9, no.4, april 2014.

Utilization of Mask, PPE kit waste and Textile waste in Brick Manufacturing"

[1,2,3,4]*B-TechStudent,Dept. of Civil Engineering, DBATU University,Maharashtra,India*

[5]*AssistantProfessor,Dept.of Civil Engineering, DBTU University, Maharashtra,India*

ABSTRACT

There has been a considerable imbalance between the availability of conventional building material and there demand in the recent past. On the other hand the mask waste and textile waste is abundantly available and the disposal of this waste is a biggest challenge, as repeated recycling of this waste pose a potential danger and only a small proportion of mask waste are being recycled.In this work an attempt has been made to manufacture the brick by using the waste in range of 75 to 90 % of mask and textile waste and 43 grade OPC cement was added in range of 2 to 5% by weight.The brick was manufactured by mask and PPE kit and also by textile waste by proper proportion. The Brick manufactured possess the properties such as neat and even finishing with satisfactory compressive strength to satisfy the increasing demand of brick. This project reviews the effective and sustainable method of reuse of waste

----

METHODOLOGY

- **Material Used for casting of Brick:**
  1. Face Mask.
  2. PPE Kit.
  3. Textile waste. (Cotton)
  4. Paper Waste.
  5. Binder. (Cement- OPC)
  6. Portable Water.

Mask Waste & PPE Kit:

The source of biomedical waste is from hospitals, schools, clinics and other public places by placing "Eco Bins". These are meant to collect non-woven PPE

waste. The bins will have an indication mark to show that it is full. Once it reaches that mark, the waste is left untouched for the next 72 hours.

Textile Waste:

As the ichalkaranji is famous for cloth industries, many factories of cloths are available in inchalkaranji. Hence, the in ichalkaranji textile waste (Cotton) is generated in huge amount. So for the further work the textile waste is collected from the factories situated in shahapur, kabnur, ichalkaranji etc. places.

- **Waste Collection –**

- **Sanitation Protocol –**
  For the safety measures, after collection of mask and PPE kit waste it is kept in isolation for 72 hours. Then waste is disinfected by spreading sanitizer over it twice before touching it.

- **Proportioning of Material –**
  After Sanitation of mask, PPE kit and paper, all the waste are kept in water for 3-4 hours. After this the following proportion is adopted.
  For the Mask Waste brick -
        No. of mask – 50 nos.
        No. PPE kit – 1 Piece.
        No. of paper – 3 Nos.
        Cement – 300 gm.

  For the Textile waste brick -
        Textile waste – 500 gm.
        Cement – 450 gm.

- **Shredding of Material –**

After complete disinfection of all waste, the mask, PPE Kit, paper waste and cottons are cut into small pieces for proper binding. Thereafter all waste is kept in water for 3-4 hours. Then the all material is taken for mixing.

- **Preparation of formwork –**
  For casting of bricks we used the steel mould as per required dimension(Size of mould taken-4"x 3" x 9"). The oil was applied on internal surface of mould to prevent the sticking to mould.

- **Mixing of material –**
  All the material (Mask, PPE kit, Paper and cottons etc.) which was thoroughly weighed, batched was transported by us to mixing area. Cement and all waste was dry Mixed thoroughly. Then the waterwas added slowly while mixing. All waste was mixed with help of shovel. The mask and PPE kit waste brick and textile waste brick was made separately.

- **Placing of mix –**
  For placing the mixed material, first the grease is applied to the mould. Finally we placed the prepared mixture of waste into the mould as per required thickness. The mould was filled in three layers with help of tamping rod.
  After placing mould was checked w.r.t. all the edged its smoothness andits roughness.

- **Curing –**

Finally the casted section was removed from the mould after 24 hours and was kept for curing tank for 3 days for completion of the hydration reaction. After curing the bricks are taken for testing process.

Meth

Result:

Types of brick	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Regular (Mud) Brick	22.50 %	22.50 %	22.50%	20.75%	21.30%
Mask & PPE kit & Textile waste brick	42.04 %	45.40 %	43.75 %	47.83%	47.21%

Result

Estimation of Each brick made from Textile waste

Sr. No.	Item	Quantity	Unit	Unit Rate Rs-ps	Total Amount (Rs)
1.	Waste collection and transportation	0.51	Kg	1.5	0.80
2.	Cement	0.40	Kg	8	3.2
				Total	Rs. 4.00

Conclusion:

As the above result shows that the water absorption of the both waste material is more than the regular mud brick. So it is not suitable for construction. But if we use some water repellant admixture in it then the brick will give more suitable results in water absorption. So that it is conventional to use the admixture it the manufacturing of the brick.

References

[1] Lourenço PB, Vasconcelos G, Medeiros P, Gouveia J. Vertically perforated clay brick masonry for loadbearing and non-loadbearing masonry walls, Construction and Building Materials, 2010; 24 (11):2317-2330.

[2] Mendonca P, Macieira M, Lightweight Dividing Walls: Adaptation to Temperate Climates, International Journal of Environmental, Cultural, Economic and Social Sustainability, 7 (2011) 2:11-26.

[3] Mendonça P, Living under a second skin – Strategies for Environmental Impact Reduction of Solar Passive Constructions in Temperate Climates, Doctorate Thesis in Civil Engineering, University of Minho, Guimarães, 2005 (in Portuguese).

[4] Gerra I, Vivar I, Llamas B, Juan A, Moran J, Eco-efficient concretes: The effects of using recycled ceramic material from sanitary installations on the mechanical properties of concrete, Waste Management, 2009; 29:643-646.

[5] Corinaldesi V, Moriconi G, Behavior of cementitious mortars containing different kinds of recycled aggregate, Construction and Building Materials. (2009) 3:289-294.

[6] M. Garg, N. Jain, Waste gypsum from intermediate dye industries for production of building materials, Construction and Building Materials. 24 (2010) 1632-1637.

[7] F. Hernadez-Olivares, M.R. Bollati, M. del Rio, B. Parga-Landa, Development of cork-gypsum composites for building applications, Construction and Building Materials. 13 (1999) 179-186.

[8] M. Rio Merino, J. Santa Cruz Astorqui, F. Hernadez-Olivares, New prefabricated elements of lightened plaster used for partitions and extrados, and Building Materials

WATER QUALITY ANALYSIS AND REMEDIAL MEASURES FOR THE LAKE AT MALGAON

Dr. V. K. Naik[1], Ms. Manali Nirmale[2], Ms. Rasika Todkar[3], Ms. Pratiksha Patil[4],

[1]Professer and head of Civil Engineering Department, DBATU University, Maharashtra, India

[2,3,4]UG Student Dept. Of Civil Engineering, DBATU University, Maharashtra, India

----

Introduction

Impact of human activities on the global environment is so much that even the hydrological cycle is affected, and humanity needs to be prepared for such changes that are being imposed on the Earth. The anthropogenic impact of the last decades on our aquatic environment has shown that a responsible use of our natural resources is mandatory to guarantee sustainable conditions. Many lakes modified to the extent that they changed their appearance, besides creating lot of benthic deposition due to the negligence in preserving the environment. This also resulted in their stratification alteration due to the human impact or due to climatic change. The first step in forecasting such evolutions is to understand the environmental processes. A good understanding of stratification is required not only to prognosticate the future of our lakes but also to better interpret the past from lacustrine sediment cores. Such interpretations and studies not only record the lake history but also to conclude on the climate in the past by relating variations of the lake sediments to circulation patterns in lakes and finally climatic conditions triggering these changes. Deep lakes generally show the complete stratification and some already undergone permanent stratification. Many medium and small depth lakes do not generally circulate completely in vertical direction; as a result do not show a homogenized, overturning water body at any time during the annual cycle. The permanent stratification has decisive impact on the redistribution of dissolved substances, such as nutrients or oxygen, and hence determines the biocenosis that can form in the lake. An important role is played by the chemical transformations that undergoes due to nutrient inflow and climatic variations, in lake stratification. Great variations in salinity and chemical composition of dissolved substances were found in lakes. As a consequence, fresh water assumptions may be acceptable for some considerations, while for many lakes, or more detailed investigations, these assumptions fail. Separate approaches may be required to satisfactorily reflect given conditions under such cases. This study on lake stratification is intended to be useful in understanding the water quality status and its variation during any time of annual cycle.

Study Area:

Malgaon lake is situated in Malegaon village which is located in Miraj tahsil of Sangli district in the state of Maharashtra. It is situated at latitude of 16.867 N, and longitude 74.717 E with total population of 26917. The lake is almost at the center and attracted many human and animals' activities resulting in the contamination of water. Map of the study area is as in Fig.1. Agriculture is the main occupation in the area with only around

38% of the population under the earning category. It experiences hot and dry weather during the period of February to June with temperature as high as 42 ^{0}C and winter temperature as low as 15 ^{0}C.

Lake stratification:

Temperature difference at different levels in the lake water leads to density difference. This is the main cause for the lake stratification which is also helped by the wind force. Thermal stratification holds for a longer period, i.e. from summer to autumn and winter, for deeper lakes. However, the present study is limited only to a 3 m deep lake where such a long period stratification is ruled out. But temperature difference does occur as the depth increases. The warm surface water layer, which generally occurs during summer, is called epilimnion, while the warmer water beneath the surface, which does not mix with epilimnion during stratification, is the hypolimnion. These layers are separated by the temperature gradient, thermocline, which is formed between the two contact layers. Generally atmosphere and epilimnion exchange heat and volatile substances, like gases. Besides, the epilimnion is overturned episodically by wind force or during the periods of lower temperature during the stratification period. In most of the lakes, it is the wind factor which is decisive for the epilimnion depth. But some exceptions also exist where wind may be weak and other factors can contribute to the epilimnion thickness.

Present Malgoan Lake is one such where wind factor is negligible and other factors evolve to be the most dominant. Thickness of epilimnion is not constant over the stratification period. A thin layer is formed in spring and gradually gains thickness due to wind action till autumn when colder water from the surface can erode the stratification. Thermocline can form a special habitat due to its high gradient. Organisms that can regulate their density can position themselves in the strong density gradient. Further, inanimate particles can accumulate on a level representing their density. Apart from this motile organisms can settle in the thermocline, with the advantage of layers, epilimnion and hypolimnion. This results in the formation of a separate layer, called metalmnion, due to its own characteristics. Decomposition of organic matter, especially in nutrient rich lakes, can cause oxygen depletion, resulting in a so-called metalimnetic oxygen minimum. In contrast to this if photosynthesis can overcome the oxygen uptake in this zone, due to penetration of light; a metalimnetic oxygen maximum can be encountered. In the present study, no clear distinction of metalmnion was observed. This might be due to the fact that the depth of the lake under study was shallow.

Department of Civil Engineering

Utilization of solid waste in manufacturing of brick

Ms. G.D. Ghadvir[1], Narendra R Belekar[2], Sammed S Danole[3], Harichandra R Shinde[4]

[1] *Assistant professor, Dept. of Civil Engineering, DBATU University, Maharashtra, India*
[2,3,4] *UG Student Dept. of Civil Engineering, DBATU University, Maharashtra, India*

Abstract -Solid waste is developing every day emerges as an eyesore. Plastic waste is nonbiodegradable waste that can not decompose and this creates water, land, and air pollution. Also, it is predicted that plastic waste will double after a decade as we use loads of grades of plastic in our each day life. We can recycle, and reuse plastic waste. Basically, in bricks, we used earth-based clay. Excessive use of the clay, suggests the quit result of useful resource depletion and environmental degradation. Hence at the manner to reduce the quantity of strong waste it could be used as the selection of the severa introduction materials. This venture evaluation the effective and sustainable approach to reuse of strong waste.

----

1. Introduction

Solid waste manage is one of the pinnacle environmental issues worldwide. It is expected that greater than fifty-5 million heaps of family waste are generated in India annually; annual boom of round5percentage is anticipated. Heavy waste generated in small, medium, and bigtowns in India is anticipated to be 0.1kg, 0.3 – 0.0kg. 4 kg or 0.five kg, in keeping with capita and day. Conventional manufacturing substances inclusive of concrete, brick, hole block, sturdy block, paver, and tile are crafted from contemporary-day grass reassets. This harms the surroundings because of the non-prevent exploration and depletion of natural reassets. Environmental problems are of growing hobby to decision-makers in politics, business, and society. As a result, predominant modifications are taking area in our tactics to lifestyles and paintings in phrases of keeping reassets and recycling waste via right manage. The use of sturdy wastes with inside the manufacture of fabric is one such cutting-edge effort. The cost of the manufacturing substances will increase day by day because of immoderate demands, shortage of uncooked substances, and immoderate strength consumption. From the angle of saving strength and keeping plant reassets, the usage of possibility additives in cloth manufacturing is now a worldwide concern. This calls for vital research and development paintings withinside the course of studies into new substances for the manufacturing of environmentally pleasant and sustainable manufacturing substances. The gift observe examines the viable makes use of diversestrong residues withinside the manufacture of bricks.

1.1 Objectives
To prepare bricks from solid waste.
Determine the structural properties of bricks with solid waste like compressiv strength.
Compare the properties of solid waste bricks with conventional bricks.
To determine durability of solid waste bricks.

Department of Civil Engineering

1.2 Material Used In Brick
Ordinary Portland cement (O.P.C.) (43 GRADE)
Water (Portable water)
Solid Waste (rubber, plastic, etc)

2.0 Methodology

Initially we decided the material to be used for casting of bricks/blocks and accordingly we decided the proportion. The cement concrete ratio was decided as 1: 1.5: 3. Then the size of bricks/blocks was decided according to mould size.

M_{20} Proportion (1:1.5:3) 1 is Cement, 1.5 is sand, 3 is Aggregate Density of Cement = 1440 kg/m^3 Density of Sand = 1660 kg/m^3 Density of Aggregate = 1400 kg/m^3 Density of Water = 1000 kg/m^3 Density $= \frac{Weight}{Volume}$ Volume $= \frac{Weight}{Density}$ Volume of Cement = $\frac{50}{1440}$ = 0.0347 m^3 Volume of Sand = 0.0347 x 1.5 = 0.052 m^3 Volume of Aggregate = 0.0347 x 3 = 0.104 m^3 Volume of Water =0.0347 x 0.030 m^3 Weight of Cement = Volume x Density = 0.0347 x 1440 = 49.96 kg Weight of Sand = 0.052 x 1600 = 83.2 kg Weight of Aggregate = 0.104 x 14.00 = 145.6 kg Weight of Water = 0.010 x 1000 = 10 lit.   For 1 mould = Cement 2.5 Kg Sand 3.75 Kg Aggregate 7.5 Kg

Table -1: Proportion

Size of Cube	Cement	Aggregate	Sand
0.0018 m^3	0.26 kg	2.95 kg	1.11 kg
0.002016 m^3	0.338 kg	3.81 kg	1.44 kg

3. Result and Discussion

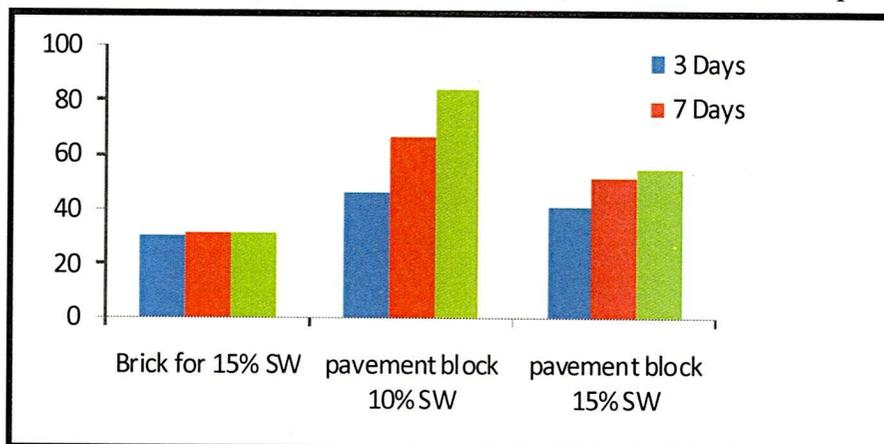**Test carried on solid waste specimen are** Visual inspection test and Compressive strength test on UTM.

Fig -1: Compressive Strength on UTM on 3-7-28 Days

2.2 Rate Analysis:

Sr. No	Item	Quantity	Unit s	Unit rate Rs - ps	Amount Rs - ps
1	Solid Waste (Collection & Transportation)	1	Kg	0.80	9.5
2	Cement	0.3	Kg	10.5	3
3	Labour	lump-sum	-	-	10
TOTAL				Rs.23.5	

Table-2: Estimation of each Solid Waste Paving Block

Therefore for each Solid Waste paving Block = Rs. 23.5

Table-3: Estimation of each Concrete Brick

Sr. No	Item	Quantity	Unit s	Unit rate Rs - ps	Amount Rs - ps
1	Solid Waste (Collection & Transportation)	1	Kg	0.80	9.5
2	Cement	0.3	Kg	10.5	3
3	Labour	lump-sum	-	-	3
Total				Rs.15.5	

Therefore for each Concrete brick = Rs. 15.5

As the cost of concrete block and paving block is more the use of **solid waste block can provide to be economical.**

3. Conclusions

According to the discussion of results the following conclusions are derived by this study:

1. The solid waste brick consist of waste materials and therefore cost is very low compared to conventional bricks.

2. Since, the waste materials are used; it reduces landfills and pollution problems. And Good amount of cement and artificial sand can be saved which will result in reduction in carbon footprints and lead to preservation of natural resources.

3. The compressive strength of brick is more than that of conventional brick.
4. The brick has a lesser water absorption than conventional brick. So it can be a better alternative building material.
5. Using the solid waste brick in a building, the total cost will be reduced from 20% to 25%.
6. As we know that the cost of a conventional brick is 8 Rs/brick. The manufacturing cost of a solid waste brick is less than the cost of a conventional brick of the same size. So this brick is more economical than conventional brick.

7. The use of innovative technology not only strengthened construction but also increased the life of the building as properly as will assist to enhance the surroundings and additionally create a supply of income.

8. Lastly, we are able to finish that using Recycled stable waste in creation fabric that's the exceptional alternative for the disposal of stable waste &in the long run reduces the pollutants of the Environment.

9. It is was hoping that during close to destiny we can have strong, durable, and green homes with a purpose to relieve the earth of all varieties of waste fabric.

Department of Civil Engineering

"SEISMIC EVALUATION OF TALL BUILDINGS USING ASCE 41-17 & IS:16700 USING REALISTIC DESIGN"

Akshay Mr. Kamble Swapnil Prakash ; Mr. Koli Prathmesh Shahaji ;Mr. Gaikwad Abhishesk Baban; Mr. Bhonge Abhishek Ramesh

[1] Assistant professor, Dept. of Civil Engineering, DBATU University, Maharashtra, India
[2,3,4] UG Student Dept. of Civil Engineering, DBATU University, Maharashtra, India

----

ABSTRACT

A research work entitled "Seismic Evaluation of Tall Buildings Using ASCE 41-17 & IS: 16700 using Realistic Design Approach" deals with assessment of the existing structure as well as for the proposed structures. In this research to begin with the existing building is selected in the pune region for the analysis of the existing as well as proposed structures. It is found that the existing building con- tain certain irregularities in the form of concrete grades and due to those change in grades. The impact of change in grade which is mainly on the safety of the structure causes more deformation as per the limiting values prescribed by codes. The nonlinear static analysis has been carried out to find failure patterns of the building to overcome the loss of life as well as structural loss. The nonlinear static analysis has been carried out with deformation controlled method to know the lo- cation of the various plastic hinges at various floors. Which can give us the exact information of failure of the structural members. The existing building fails on fif- teenth story a two intermediate column. The loss of column is against the seismic design methodology. Hence the large girders have been provided at the bottom of those columns. The progressive collapse analysis has been very important for the evaluation of the seismic demands which can be further satisfied by forming the retrofitting or changing the member sizes. The realistic design approach has been used to analyses the existing building which can be further met with the proposed structures. The check according IS16700-2016 been taken for the evaluation of the building like story drift, displacements , torsional irregularity which have also been checked by the ASCE41-17 for above said parameters. Hence the pushover and progressive collapse analysis is useful for studying the failure patterns of the existing as well as proposed building.

METHODOLOGY

Modeling in Etabs

Etabs is software used for the design & analysis of different structural members. Following are some of the points considered in the design of RC structure Following are some of the points considered in the design of RC structure.

In the present study structure is assumed to be located in seismic zone III, at hard soil. A existing 36 storied reinforced concrete structure was analyzed using ETAB software. The plan dimension of the structure is 35.46 x 14.75 m,
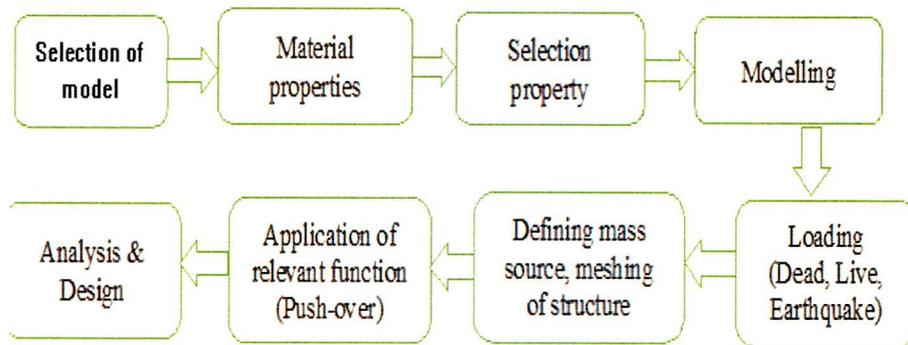

Figure 4.1: Flow chart for procedure in ETABS

typical story height is 3.3 m, overall structure height is 142.350 m. Structure was analyzed under wind and earthquake loads as per the recommendation of IS: 875 (Part 3) - 1987 and IS: 1893 (Part 1) - 2002 respectively. After performing the wind and seismic analysis on structural model deflection and drift result where evaluated.

In this study, the two nonlinear procedures used for Performance Based Plastic Design and the nonlinear static procedure (pushover). The pushover static method is nothing but the model analysis at the failure of the structure. The structure is modeled and checked up to its failure limit or failure of structural members. The process of all modeling parameters are discussed in this chapters. The processes includes the application of plastic hinges in non linear states of structures.

Adaptability of computer programs

It is well known fact the distribution of mass and rigidity is one of the major considerations in the seismic design of moderate to high rise buildings. Invariably these factors introduce coupling effects and non-linearity in the system, hence it is imperative to use non-linear static analysis approach by using specialized programs viz.ETABS, IDARC, NISA-CIVIL, SAP2000, STAADPRO2005 etc. In

this study we are going to use ETABS software.

Non-linear Static Push-over Analysis

The static pushover analysis is becoming a popular tool for seismic erfor- mance evaluation of existing and new structures. This analysis of a structure is a static non-linear analysis under permanent vertical loads and gradually increasing lateral loads. The equivalent static lateral loads approximately represent earth- quake induced forces. A plot of the total base shear versus top displacement in a structure is obtained by this analysis that would indicate any premature failure or weakness. The analysis is carried out up to failure, thus it enables determination of collapse load and ductility capacity. On a building frame, and plastic rotation is monitored, and lateral inelastic forces versus displacement response for the com- plete structure is analytically computed. This type of analysis enables weakness in the structure to be identified.

Objectives

The objectives of research are as follows -

1. Seismic Assessment of tall building under the code of ASCE 41-17 & IS 16700 for proposed and existing buildings.

2. Performing linear static and linear dynamic analysis for Performance basedanalysis & for Displacement Based Design for existing tall building.

3. To analyse the existing tall building for progressive collapse for intermediatestories due to the changed grades of concrete.

4. To investigate alternative load path for tall and normal buildings prior toretrofitting.

5. To provide the guidelines and checklists for existing and proposed structures

Conclusions

The following conclusions are drawn from the study -

1. The Existing Structure violates the major norms of IS: 16700-2017 and ASCE41-17 in the form of drift at 15th storey by 46 % of limiting value of drift in wind and torsional irregularity by 8.86 % at the top of building.

2. The existing building shows failures in linear static and dynamic at 15th storey.

3. The realistic design approch of existing building shows failure of middle two column shows the progressive collapse leads to sudden failure of building.

4. The proposed building shows no collapse due to increased influential column sizes by 48.14 % from 15th storey to the base.The proposed building satisfiesall the results as per IS16700 and ASCE47-17 norms.

5. The alternative load path prior to retrofitting is allocated to its adjacent columns by using R.C.C girder of size 0.8 m x 3.3 m for C_9, C_{10}, C_{20} and C_{21} due to failure of C_{13} and C_{14} columns

6. Following are the guidelines for existing buildings.

    (a) Changing the frame element to a shear wall, infilled frame, or braced frame element by adding new material.

    (b) Connections between new and existing materials should be designed to transfer the anticipated forces based on the design–load combinations. Where the existing concrete frame columns and beams act as boundary components and collectors for the new structural wall or braced frame, these should be checked for adequacy, considering strength, reinforcement development, and deformability.

    (c) Diaphragms, including ties and collectors, should be evaluated and if necessary, rehabilitated to ensure a complete load path to the new structural wall or braced frame element.

REFERENCES

[1] Schachter, A.M and R. Smilowitz. 2015, "Challenges and Considerations For The Retrofit Of Existing Structures For Progressive Collapse." American Society Of Civil Engineers.8(10), 512-518.

[2] Yasaman, B. et al. 2017. "Seismic evaluation of a steel braced frame using NBCC and asce-4." Journal of Constructional Steel Research. 18(3), 110–124.

[3] Amirahmad, F. and M. Oya. 2016. "Seismic Evaluation of Modular Steel Buildings." Engineering Structures.45(3), 83–92.

[4] Hart, G.C. et al. 2012. "An Alternative Procedure For Seismic Evaluation And Strengthening Of Tall Buildings". The Structural Design of Tall and Special Buildings 21(11), 53–61.

[5] John, H. and S Matthew. 2018. "Assessment of Performance-Based Seismic Design Methods in ASCE 41 For New Steel." Engineering Structures. 12(9), 215-220.

[6] Jain, A.K. 2014. "The State of Codes on Structural Engineering in India." The Bridge and Structural Engineer. 44(1), 1-7.

[7] Jain, A.K. 2016. "Dynamics of Structures with MATLAB Applications.".

Pearson Education (India). 11(6), 113-123.

[8] Jain, A.K. 2016. "Challenges Posed by Tall Buildings to Indian Codes." The Master builder. 36(12), 636-648.

[9] Jain, A.K. 2017. "A Critical Review of IS13920:2016.". Indian Concrete Journal. 91(9), 18-24.

Department of Civil Engineering

DESIGN OF BEAM AND SLAB BY USING C PROGRAMMING

Kutwade Rutuja S.[1], Kutwade Rutvik S.[2], Kharade Monesh A[3].

[1,2,3]*UG Student Dept. of Civil Engineering, DBATU University, Maharashtra, India*

ABSTRACT

Beam and Slab design is done mainly by manual method or using design and analysis software. In this project, a C coding has been done for the design of a simply supported reinforced concrete beam and design of a simply supported reinforced concrete slab . Computer is very useful tool in the engineering works but sometimes computer software has some limitations. The solution could be an appropriate use of computer programming. Knowledge of programming allows to solve various civil engineering difficulties.The design criteria will change with the grade of concrete and grade of steel used. Indian standard design procedure has been followed, and the clauses in the IS 456:2000, has been followed during the coding. This coding has done to overcome the delay in the manual calculations, to obtain the accuracy in the result calculations. Also the unit conversion is not allowed in the coding, and all the dimensions are to be submitted in millimeters only.

----

1. METHODOLOGY

This project is to develop a C program for design of RCCbeam. In that the major part of this project is based on C language. To develop this program " Turbo C " Software is essential. Important knowledge for this project that is divided into four parts: (1) Literature Review (2) Study of C language (3) Theory of Design of Reinforced concrete beam and (4) Develop a program.The literature review is a search for keywords about research in applied computer language for   civil engineering such C/C++ ,computer program. One of the literature reviews is developing program for Analysis of standard beam conditions by C programming. Whereas, someone did Analysis by STAAD-PRO and Design of Structural Elements by MATLAB. But in this project we will design RCC beam by developing C Program. In this project, We refer to IS-456:2000 standard. Besides, we learn about the fundamentals of C language to be used to develop the program.

2. DESIGN CONSIDERATIONS

There are some certain steps and procedures to be followed to design the beam.

a) For singly reinforced beam

1) Calculation of depth
Required depth (dreq)= $\sqrt{Mu/Rumax*b}$
OverallRequireddepth (Dreq)= dreq+dia/2+clear cover

Provided depth (dprov)= D-dia/2-clear cover.

2) Calculation of Ast
Ast=0.5*fck/fy(1-√1-(4.6*Mu/fck*b*dprov))*b*dprov
Number of bars = Ast/π/4*dia2

3) Calculation of Shear Reinforcement
Nominal shear stress i.e. Tv is calculated by IS 456:2000(Clause no.40.1)
Ptlim= Ast/b*1/dprov*100
Design shear strength of concrete i.e. Tc is calculated from Table no.19 in IS 456:2000.
Tcmax has taken from Table no.20 in IS 456:2000.
Comparing Shear stresses -
Tv<Tv/2 - No need of shear reinforcement
Tv<Tc - Nominal shear reinforcement is required
Tcmax>Tv>Tv - Shear reinforcement is required
Calculation of spacing in shear reinforcement
Minimum of -
Sv1= 0.75*dprov
Sv2= Sv2=0.87*fy*Asv*1/0.4*1/b
Sv3=300

b) For Doubly reinforced beam

1) Calculation of Mulim
For Fe250 - Mulim=0.149*fck*b*dprov*dprov
For Fe415 - Mulim= 0.138*fck*b*dprov*dprov
For Fe500 - Mulim=0.133*fck*b*dprov*dprov

2) Check for Singly or Doubly reinforced section
If Mulim is less than Mugiven then it is Doubly reinforced section. And if Mulim is greater than Mugiven then it is Singly reinforced section.

3) Calculation of Ast
Ast1 is calculated by following formula
Mulim = 0.87*fy*Ast1*(dprov-0.42*xumax)
Ast2 is calculated by, Mu1= Mugiven- Mulim
Mu1= 0.87*fy*Ast2*(dprov- cc- dia/2)
Now, Ast= Ast1+Ast2

4) Calculation of Asc
Asc is calculated by following formula
Mu1= fsc*Asc*(dprov- cc- dia/2)

5) Calculation of shear reinforcement
Nominal shear stress i.e. Tv is calculated by IS 456:2000(Clause no.40.1)
Ptlim= Ast/b*1/dprov*100
Design shear strength of concrete i.e. Tc is calculated from Table no.19 in IS 456:2000.
Tcmax has taken from Table no.20 in IS 456:2000.
Comparing Shear stresses -

Tv<Tv/2 - No need of shear reinforcement.
Tv<Tc - Nominal shear reinforcement is required.
Tcmax>Tv>Tv - Shear reinforcement is required.

6) Calculation of spacing in shear reinforcement
Minimum of -
Sv1= 0.75*dprov
Sv2= 0.87*fy*Asv*1/0.4*1/b
Sv3=300

2. RESULTS

```
 Select grade of concrete
1.M20
2.M25
3.M30
 Select option =1

Select grade of steel
1.Fe250
2.Fe415
3.Fe500
 Select option =2

 Enter value of width of beam = 230

 Enter value of clear cover = 20

 Assume diameter of bar =16

 Enter value of ultimate moment =175000000

 Enter value of shear force=60000_
```

Fig.- Input

```
Required Depth=525.12
Provided ( Effective) depth = 572.00
Area of steel = 1008.00
Number of Bar = 6.00
Tv =0.456066            .....IS 456:2000( Clause 40.1)
ptlim=0.766250
Tc= 0.574550           .....IS 456:2000( Clause 40.2.1)
Nominal shear reinforcement is required
Provide 6mm diameter 2 legged vertical stirrups
Spacing for vertical stirrups=220.711441_
```

Fig.-Output

3. CONCLUSION

❖ C programming helps to reduce lengthy calculations. Values obtained very accurately with minimum time by using C programming.

❖ The program run successfully with reasonable speed and reliability, thus achieving the basic aim of carrying out this work.

❖ The C coding is sufficient for design of RCC Simply supported Slab and Beam.

❖ As engineer, our knowledge about programming will develop, which prove to be value addition for us. Now a day world is getting faster day by day, to survive in competitive world programming skill is very useful.

❖ Satisfied results are obtained for this programming when compared to manual calculations.

❖ With the help of basic knowledge of C language, new software can be invented by user. The programming environment selected in the project work, is found quite user friendly due to manual errors are avoided.

4. ACKNOWLEDGEMENT

We would like to express our gratefulness and sincere gratitude to my guide Mr.Y.S.Patil and Mr. R.A.Chougule, for guiding us to accomplish this project work. It was our privilege and pleasure to work under his able guidance, we are indeed grateful to him for providing helpful suggestion, from time to time. Due to his constant encouragement and inspiration we are able to present this project. We are thankful to our parents for their moral as well as financial support.

Department of Civil Engineering

5. <u>REFERENCES</u>

- ❖ Jitendra M. Joshi, Aakash S. Pawar,"Analysis of standard beam conditions by C programming", Cikitusi Journal For Multidisciplinary Research, Volume 6, Issue 4, April 2019.
- ❖ Shrikant M. Harle,"Analysis by STAAD-PRO and Design of Structural Elements by MATLAB", Asian Journal of Scientific Research, January 2017.
- ❖ Computational analysis of RCC slab (simply supported) using c software language, International Journal Of Recent Technology And Engineering,Volume 8, Issue 4, November 2019.
- ❖ Analysis of standard beam conditions by c programming, Cikitusi Journal For Multidisciplinary Research, Volume 6, Issue 4, April 2019.
- ❖ IS: 456-2000 Bureau of Indian Standards, New Delhi.
- ❖ Karve and Shah, " Limit State Theory & Design", Structures Publications, Pune.
- ❖ Punmia B.C. "Reinforced Concrete Design, Vol. I, II", Laxmi Publications.
    - ❖ E. Balagurusamy, "Programming In ANSI C", Tata McGraw-Hill Publication.