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BGSIT BG Nagara
Department of civil engineering



COMPUTER AIDED DRAWING LABORATORY MANNUAL (18CVL56)

NAME:

USN:.....

SEM:.....

BRANCH:

ACADEMIC YEAR: 201 - 201

BATCH:.....

VISION OF THE DEPARTMENT

- Producing technically Competent and Environmental friendly Civil Engineering professionals to cope with societal challenges.

MISSION OF THE DEPARTMENT

- Imparting quality education and professional ethics by proficient faculty.
- Providing infrastructure to meet the requirements of curriculum, research and consultancy.
- Motivating towards higher education and entrepreneurship.
- Promoting interaction with design and construction industries.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO 1: Graduates will be pursuing successful career and higher education
- PEO 2: Graduates will be able to design safe, economical and sustainable civil engineering structures conforming to standards.
- PEO 3: Graduates will display professional ethics to work in a team and lead the team by effectively communicating the ideas
- PEO 4: Graduates will practice lifelong learning

PROGRAM SPECIFIC OUTCOMES (PSOs)

- PSO1: Graduates will be able to analyse, design, and execute the civil engineering structures effectively for the sustainable development
- PSO2: Graduates will acquire critical thinking abilities and technical skills for the usage of modern tools in development of civil engineering structures.
- PSO3: Graduates will be able to get opportunities for their professional growth, demonstrate communication and aptitude skills to face the challenges and needs of our society.

B. E. CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

18CVL56	Course Code	COMPUTER AIDED DRAWING-III	Course Title	V	Semester
2	Credits	1- 0 - 2 -3	L - T - P -TL*	40 Hours	Teaching Period
100 Marks	Total	60 Marks	SEE*	40 Marks	CIE*
*NOTE: L – Lecture; T – Tutorial; P – Practical; TL – Total; CIE – Continuous Internal Evaluation; SEE – Semester End Examination					

<p>Course Learning Objectives: This course will enable students</p> <ol style="list-style-type: none"> 1. Achieve skill sets to prepare computer aided engineering drawings 2. Understand the details of construction of different building elements. 3. Visualize the completed form of the building and the intricacies of construction based on the engineering drawings. 	<p>Number of Lecture Hours/Week</p>
<p>Module 1: Drawings Related to Different Building Elements: Following drawings are to be prepared for the data given using CAD Software</p> <ol style="list-style-type: none"> a) Different types of staircases – Dog legged, Open well. b) Lintel and Chejja. c) RCC slabs d) Beams. e) Cross section of a pavement. f) Septic Tank and sedimentation Tank. g) Cross sectional details of a road for a Residential area with provision for all services., <p>Note: Students should sketch to dimension the above in a sketch book before doing the computer drawing.</p> <p>Module 2: Use of EXCEL spread sheets:</p> <ol style="list-style-type: none"> a). Design of singly reinforced and doubly reinforced rectangular beams, b). Design of one way and two way slabs 	<p>03 Hours (1 Hour Instruction + 2 Hours Laboratory)</p>

Course outcomes:

After a successful completion of the course, the student will be able to:

1. Gain a broad understanding of planning and designing of buildings
2. Prepare, read and interpret the drawings in a professional set up.
3. Know the procedures of submission of drawings and Develop working and submission drawings for building
4. Prepare detailed working drawings

Question paper pattern:

1. Two questions shall be asked from each Module.
2. One full question should be answered from each Module.
3. Each question carries 40 marks.

Text Books:

1. N Krishna Raju, “Structural Design and Drawing of Reinforced Concrete and Steel”, University Press
2. Krishna Murthy, “Structural Design and Drawing – Concrete Structures”, CBS Publishers, New Delhi.

Reference Books:

1. SP 34: Handbook on Concrete Reinforcement and Detailing, Bureau of Indian Standards
2. IS 13920:2016, Ductile Design And Detailing Of Reinforced Concrete Structures Subjected To Seismic Forces - Code Of Practice, Bureau of Indian Standard.

MODULE-1

INTRODUCTION

The AutoCAD software is launched by Autodesk. This software is mainly developed initially for the drawing as before 1995 the drawings was done manually using mini-drafter , therefore was very time consuming and making modifications was very difficult. Its first version was developed in 1982 and was called Comdex.

In order to execute the drawings on the field, one must be able to read the drawings. AutoCAD makes it easier to draw and interpret the drawings. AutoCAD is a tool in which we can draw and modify any type of drawings using different commands such as line, rectangle, construction line etc. In AutoCAD we can do two dimensional as well as three dimensional drawings.

This AutoCAD tool is very user friendly because we can do modify very easily and copy the drawings 'n' number of times such that the original drawing can be retained as it is in the same working window, this helps in keeping both old and revised drawings.

The use of AutoCAD has spread widely all over the world because of its simple in user-friendly nature. AutoCAD has many versions such as AutoCAD 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007,2008,2009, 2010,2011,2014,2016, 2017 and the latest being 2019. The file format of AutoCAD is .dwg

APPLICATIONS OF AUTOCAD:

- AutoCAD improves the productivity of the designer to visualize the product and its component, parts and reduces the time required in synthesizing, analyzing and documenting the design.
- AutoCAD system permits a more detailed engineering analysis and a larger number of design alternatives can be investigated.
- The use of AutoCAD system provides better engineering drawings, more standardization in the drawing, and better documentation of the design, few drawing errors and legibility.
- AutoCAD serves as engineering drafting tool for designing various components, while minimizing human errors.

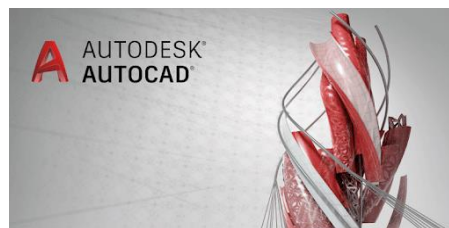
AutoCAD's innate features that enable its users to plan out architectural spaces map them out and can be used simultaneously with 3D Max, Maya and other design/animation tools when the need arises. AutoCAD supports the use of DWG and DXF files which can be exported from its interface to those of other advanced CAD applications to aid animation projects.

AUTOCAD vs MANUAL DRAWINGS

1. AutoCAD is easier to understand and is user- friendly.
2. AutoCAD is much faster than manual drawings. Hence, it's less time consuming.
3. It is more accurate, therefore, errors are reduced.
4. Creating backups easier, hence no problem of storage.
5. Etransmit option in AutoCAD enables the user to transfer his/her document easily to the client in any part of the world.
6. Updation and modification is much easier.

Launching AutoCAD

Choose the AutoCAD icon from the desktop and double click.



Graphical User Interface:

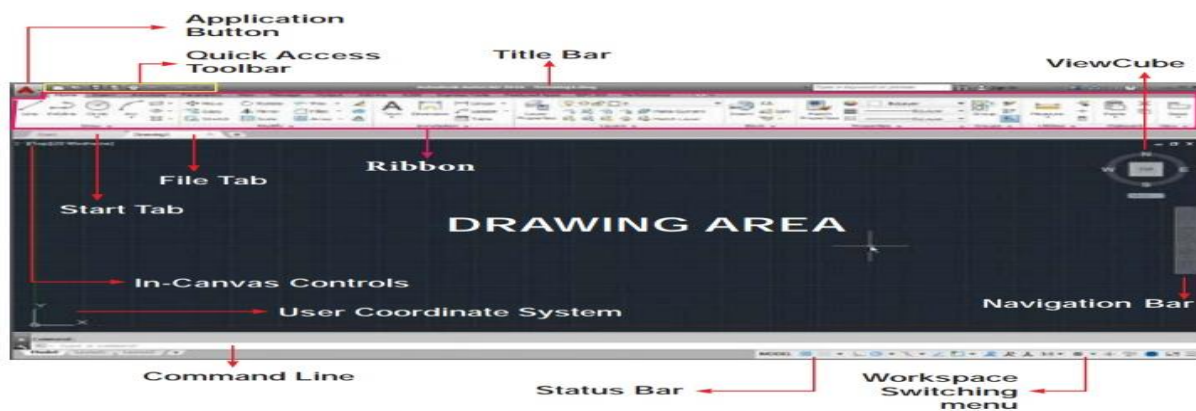


Fig. 6.5 AutoCAD 2016 screen components in AutoCAD Drafting & Annotation workspace

DIFFERENT TYPES OF STAIRCASES

1. DOG LEGGED STAIRCASE

AIM: - TO draw plan and sectional elevation of Dog legged staircase using AutoCAD software.

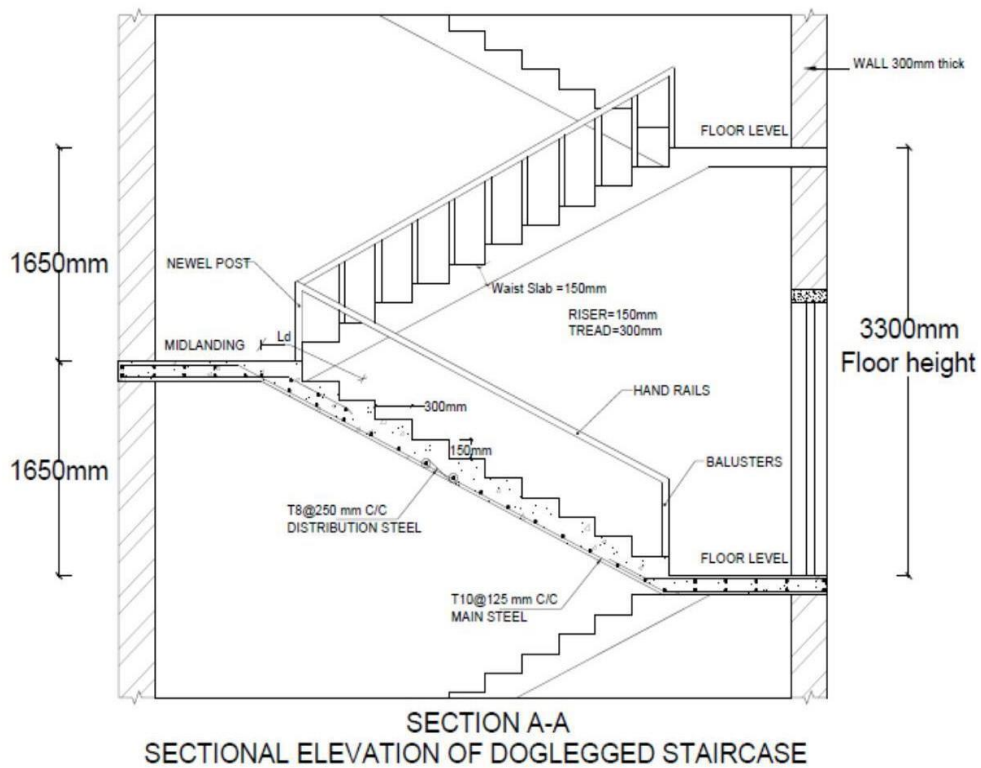
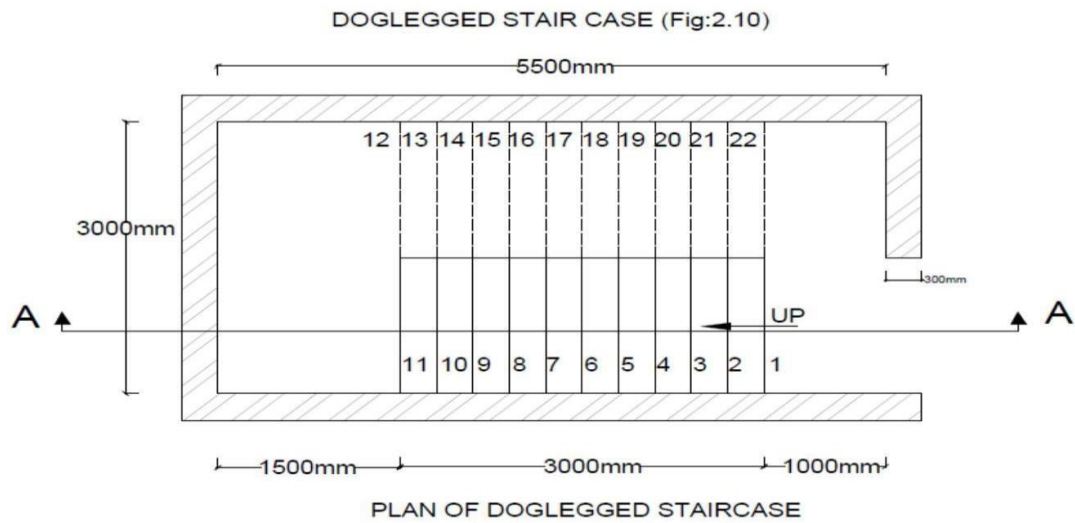
Draw plan and sectional elevation of RCC dog legged staircase for an office building which measures 3m x 5.5m. The vertical distance between the floors is 3.3m (including landing). Thickness of the floor slab is 150mm. Provide steps with tread of 300mm and rise of 150mm. Thickness of waist slab and landing slab is 150mm. Width of stair is 1.5m. Reinforcement details: main steel: 10ϕ @ 125 c/c spacing and distribution: 8ϕ @ 250 c/c spacing.

PROCEDURE:-

1. Switch on the computer.
2. Load AutoCAD.
3. Set the unit as decimal and “mm”
4. Use line and circle commands, draw the section.
5. Use hatch command whenever necessary.

RESULT:-

The dog legged staircase is drawn using AutoCAD software.



2. OPEN WELL STAIRCASE

AIM:-To Draw the Plan and Sectional Elevation of Open Well Staircase for Residential Building with Following data:

Draw plan and sectional elevation of an open newel stair with a rectangular well for an office building with the following data:

Inside dimensions of staircase = 4.5m x 5.4m. Height between the floors is 3.6m.

Thickness of the floor slab and landing slab is 150mm. Width of landing=1.5m.

Width of stair = 1.5m. Tread=300mm, riser=150mm. Waist slab thickness = 150mm.

Reinforcement details: Main steel:12 ϕ @ 150 c/c spacing and Distribution: 8 ϕ @ 250 c/c spacing.

PROCEDURE:-

1. Switch on the computer.
2. Load AutoCAD.
3. Set the unit as decimal and “mm”
4. Use line and circle commands, draw the plan, elevation and section.
5. Use hatch command, whenever necessary.

RESULT:-

The open well staircase is drawn using Autocad software.

3. LINTEL AND CHEJJA

AIM:- To Draw the lintel beam with Chejja or sunshade using Autocad.

Draw the longitudinal section and cross section of RCC lintel monolithically cast with sunshade from following data:

- i) Projection of the sunshade from the face of the wall = 600mm
- ii) Thickness at fixed end = 150mm
- iii) Thickness at free end = 75mm
- iv) Main tensile bars: $8\phi @ 150$ c/c Distribution bars: $8\phi @ 200$ c/c
- v) For RCC lintel (200 x 200) mm with #4 - 12ϕ at tension zone and stirrups of 2L - $8\phi @ 150$ c/c. The sunshade provided over a 3m wide window.

PROCEDURE:-

1. Switch on the computer.
2. Load autocad.
3. Set the unit as decimal and “mm” (DD Units)
4. Use line and circle commands, draw the section.
5. Use hatch command, whenever necessary.

RESULT:-

The lintel with Chejja is drawn using Autocad.

4. ONE WAY SLAB

AIM:- To draw longitudinal section and cross section of one way slab using autocad software. Draw cross section and plan of one way roof slab showing the details of reinforcement for the following data:

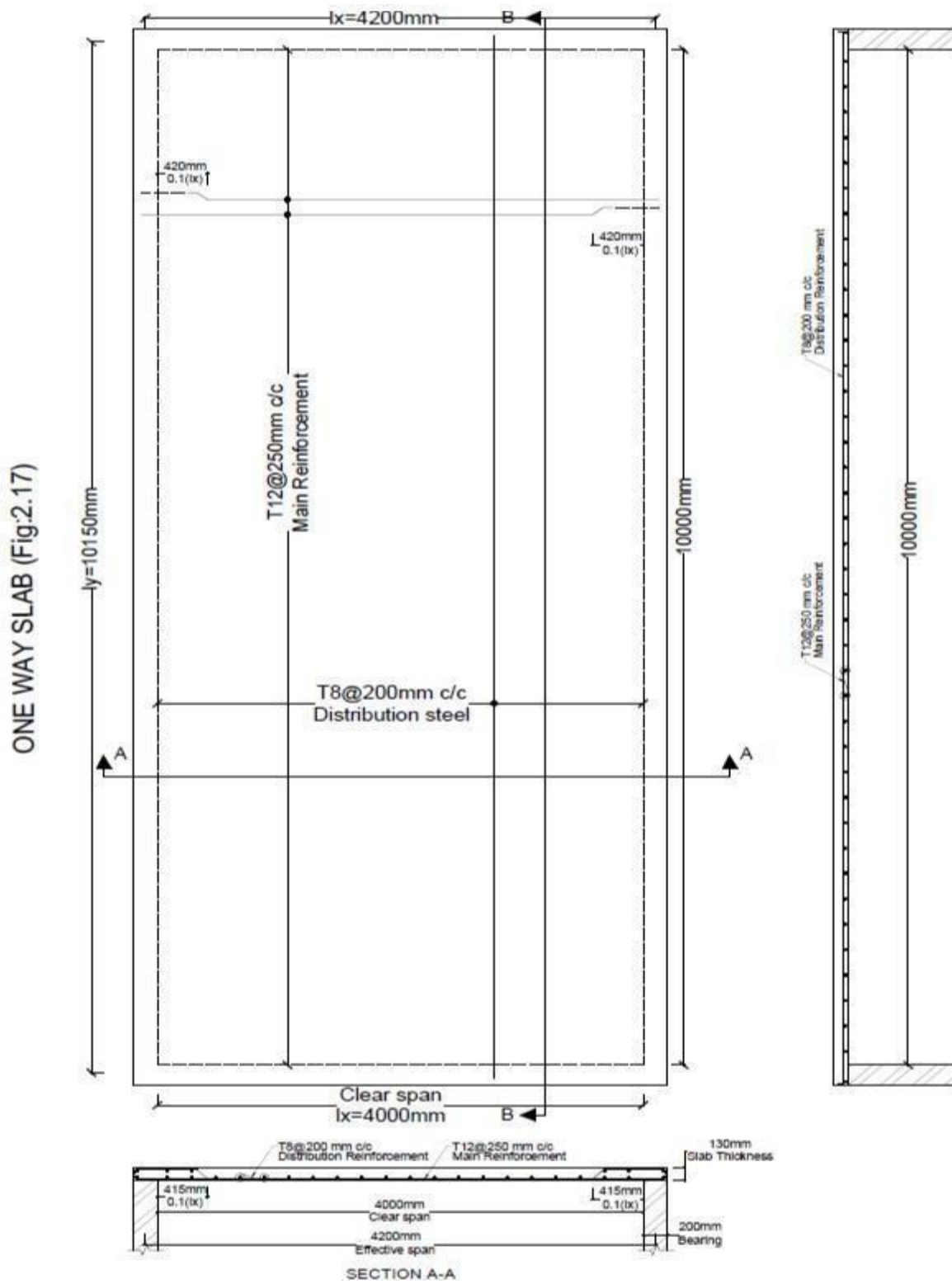
- i. Clear span = 4m Length of slab = 10m
- ii. Thickness of slab = 130mm Bearing wall = 200mm
- iii. Main reinforcement: $12\phi @ 250$ c/c with alternate bars bent up.
- iv. Distribution reinforcement: $8\phi @ 200$ c/c.

PROCEDURE:-

1. Switch on the computer.
2. Load the autocad software.
3. Set the unit as decimal and “mm”(DD Units)
4. Use line and circle commands, draw the longitudinal cross-section of beam.
5. Use hatch command, whenever necessary.
6. By using dimension command and text command, make the dimension and text of the beam.

RESULT:-

The one way slab are drawn using Autocad



5. TWO WAY SLAB

AIM:- To Draw longitudinal section and cross-section of the two way slab using Autocad software.

A simply supported two way slab is supported on all sides by using 230mm thick wall. The dimension of two-way slab is 3m x 4m (Clear).

Following are the reinforcement details:

- i. Along shorter span: $10\phi @ 125$ c/c.
- ii. Along longer span: $10\phi @ 150$ c/c.
- iii. Negative steel for shorter span: $10\phi @ 250$ c/c.
- iv. Negative steel for longer span: $10\phi @ 300$ c/c. Alternative bars are cranked.
- v. Corner mats are $8\phi @ 150$ c/c along shorter span and $8\phi @ 200$ c/c along long span.
- vi. Thickness of slab is 150mm.
- vii. Draw plan showing reinforcement and cross section along longer & shorter

COMMAND USED:-

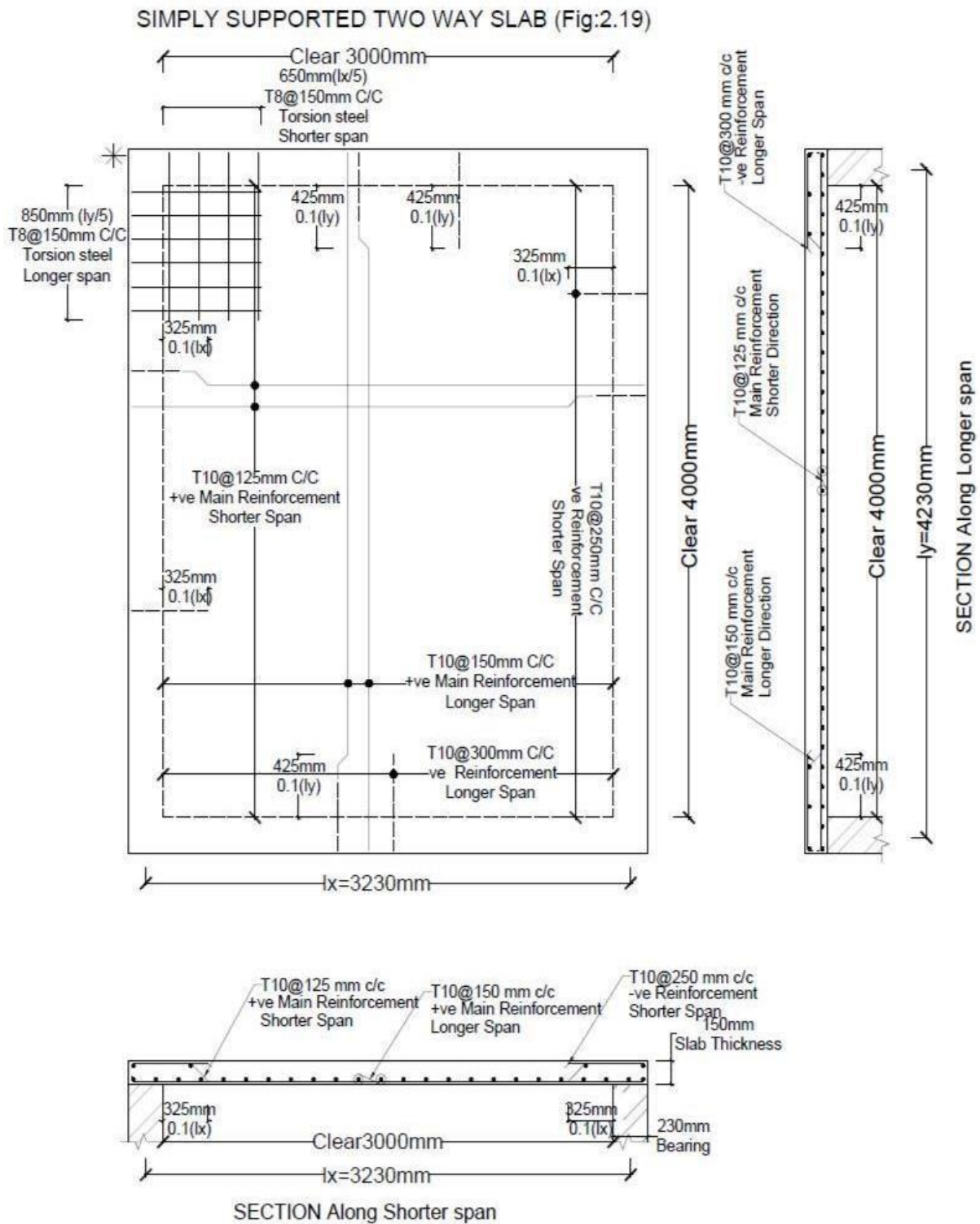
Limits, ortho, offset, line, move, trim, extend, hatch, dimension etc.

PROCEDURE:-

1. Switch on the computer.
2. Load the autocad software.
3. Set the unit as decimal and “mm”(DD Units)
4. Use line and circle commands, draw the longitudinal cross-section of beam.
5. Use hatch command, whenever necessary.
6. By using line, dimension and text command. Find dimensions and text of all given details.

RESULT:-

The given two way slabs are drawn using Autocad.



6. SINGLY REINFORCED BEAM

AIM:- To draw plan, longitudinal and cross-section along short span of singly reinforced beams for the following details using autocad.

Draw the longitudinal section and cross section of a rectangular RCC beam simply supported with the following data:

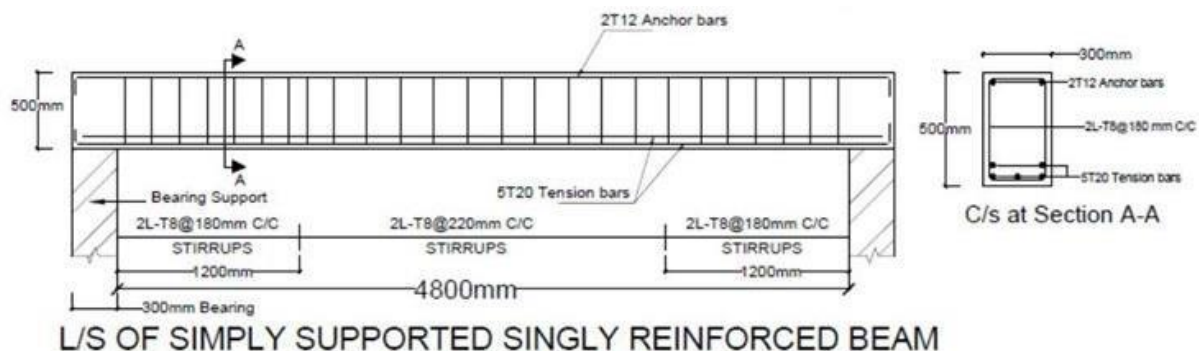
- i. Clear span = 4.8m
- ii. Bearing at the supports = 300mm
- iii. Width of beam = 300mm
- iv. Overall depth of beam = 500mm
- v. Main reinforcement consists of #5 - 20 ϕ bars in two layers.
- vi. Provide #2 - 12 ϕ as anchor bars.
- vii. Stirrups: 2L 8 ϕ @ 180 c/c near the supports up to 1.20m and @ 220 c/c in the remaining portion.

PROCEDURE:-

1. Switch on the computer.
2. Load the autocad software.
3. Set the unit as decimal and “mm” (DD Units)
4. Use line and commands, to draw the longitudinal and c/s of slab
5. Use hatch commands, whenever necessary.

RESULT:-

The given singly reinforced beam is drawn using Autocad



7. DOUBLY REINFORCED BEAM

AIM:- To draw plan, longitudinal and section along both spans for doubly reinforced beam using Autocad software.

Draw a detailed longitudinal section, a cross section near the supports and a section at the middle of the span of a simply supported doubly reinforced beam for the following data:

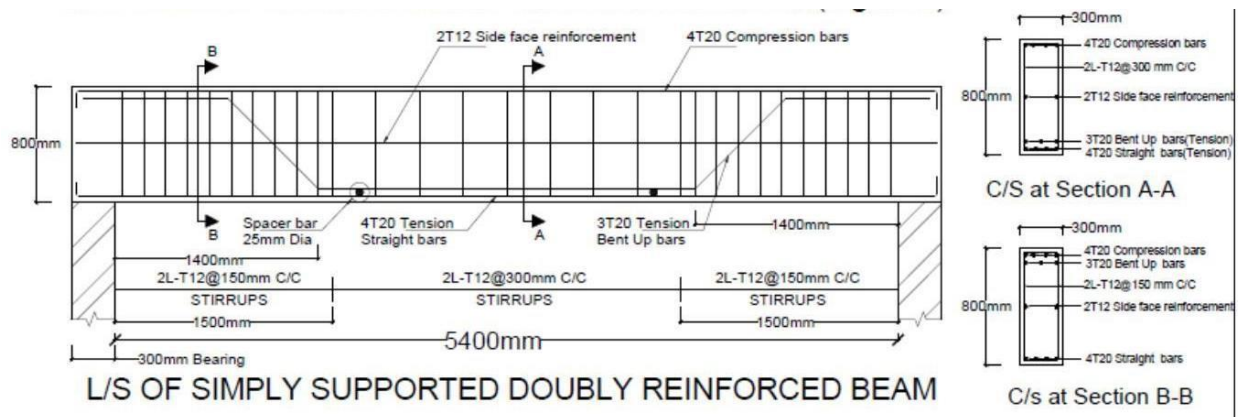
- Clear span = 5.4m
- Bearing over the supports = 300mm Size = 300 x 800 mm
- Main reinforcement tensile: #7 - 25 ϕ . 4 straight and 3 bent up @ 1400mm from support.
- Compression reinforcement: #4 – 25 ϕ . Spacer bars=25 ϕ
- Side face reinforcement=#2-12 ϕ
- Shear reinforcement: 2L - 12 ϕ @ 150 c/c for a distance of 1.5m from the support and 2L - 12 ϕ @ 300 c/c for remaining middle portion.

PROCEDURE:-

- Switch on the computer.
- Load the autocad software.
- Set the unit as decimal and “mm”(DD Units)
- Use line commands; draw the roof slab according to given direction shown all the dimensions.
- Insert text and hatch commands, whenever necessary.

RESULT:-

The Doubly reinforced beams are drawn using Autocad.



8. CROSS-SECTION OF FLEXIBLE PAVEMENT

AIM:- To Draw cross-section of the flexible pavement using Autocad software

Sketch the cross section of a flexible pavement having the following particulars:

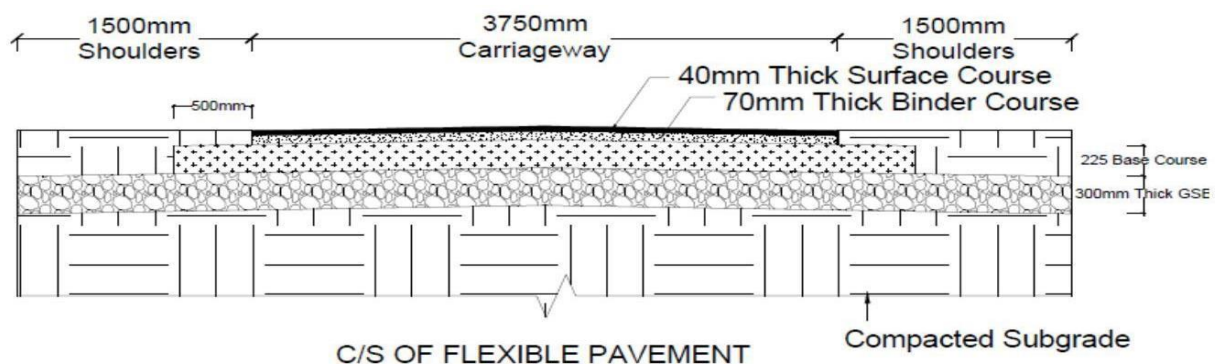
- i. Width of carriage way = 3.75m
- ii. Camber (@ 2%) = 38mm
- iii. Width of Shoulder = 1.5m
- iv. Granular sub-base (GSB) thickness = 300mm
- v. Base course thickness = 225mm
- vi. Thickness of Binder course = 70mm
- vii. Thickness of Surface course = 40mm
- viii. Total thickness of the pavement = 635mm.

PROCEDURE:-

1. Switch on the computer.
2. Load the autocad software.
3. Set the unit as decimal and “mm”(DD Units)
4. Use line and circle commands, draw the longitudinal cross-section of beam.
5. Use hatch command, whenever necessary.
6. By using line, dimension and text command. Find dimensions and text of all given details.

RESULT:-

The given flexible pavement is drawn using Autocad.



9. CROSS-SECTION OF RIGID PAVEMENT

AIM:- To Draw cross-section of the rigid pavement using Autocad software

Sketch the cross section of a rigid pavement in heavy rainfall area having the following particulars:

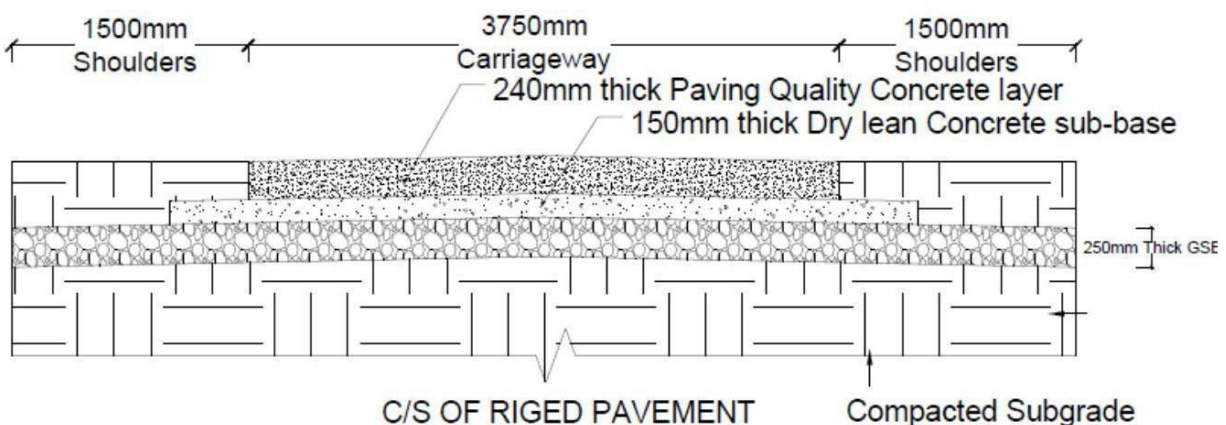
- i. Width of carriage way = 3.75m
- ii. Camber (@ 2%) = 38mm
- iii. Width of Shoulder = 1.5m
- iv. Granular sub-base (GSB) = 250mm thick
- v. Dry lean concrete sub-base = 150mm
- vi. thick Paving Quality Concrete layer = 240mm
- vii. thick Total thickness of the pavement = 640mm.

PROCEDURE:-

1. Switch on the computer.
2. Load the autocad software.
3. Set the unit as decimal and “mm”(DD Units)
4. Use line and circle commands, draw the longitudinal cross-section of beam.
5. Use hatch command, whenever necessary.
6. By using line, dimension and text command. Find dimensions and text of all given details.

RESULT:-

The given flexible pavement are drawn using Autocad



10. SEPTIC TANK

AIM:- To Draw plan and cross-section of septic tank using Autocad software

Draw plan and cross section of the septic tank for 25 users. The details are given below:

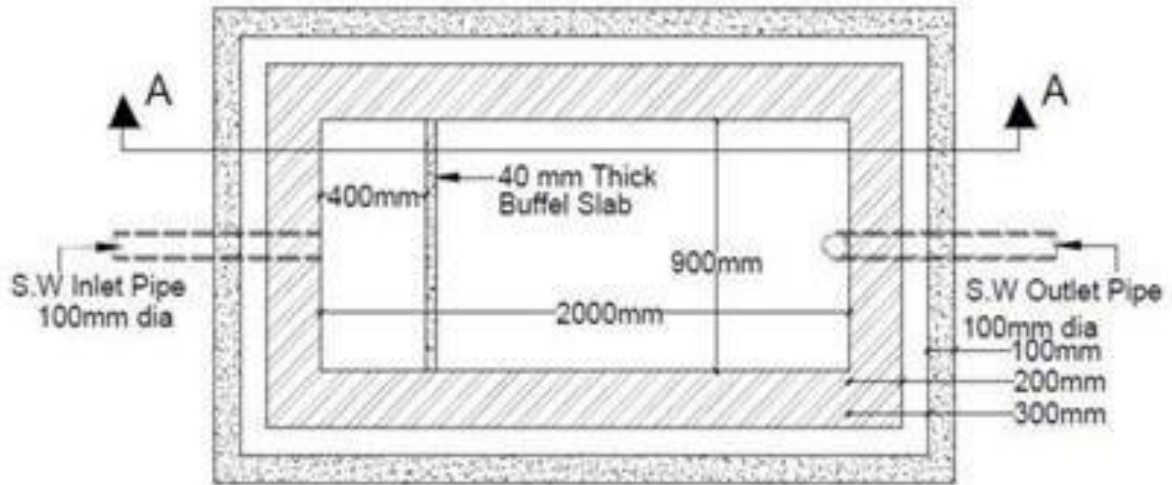
- i. Size (clear) of the septic tank (L x B) = (2m x 0.9m)
- ii. Depth of liquid = 1.4m
- iii. Free board = 0.3m
- iv. Thickness of PCC bed in 1:3:6 = 0.2m
- v. Inlet and outlet pipe: 100mm diameter S. W. pipe
- vi. Thickness of brick wall up to 0.6m height is 300mm and for remaining height it is 200mm.
- vii. Thickness of RCC Baffle slab = 40mm
- viii. RCC slab of 75mm thick is provided with 50mm diameter C. I. ventilating pipe Bed slope: 1 in 20

PROCEDURE:-

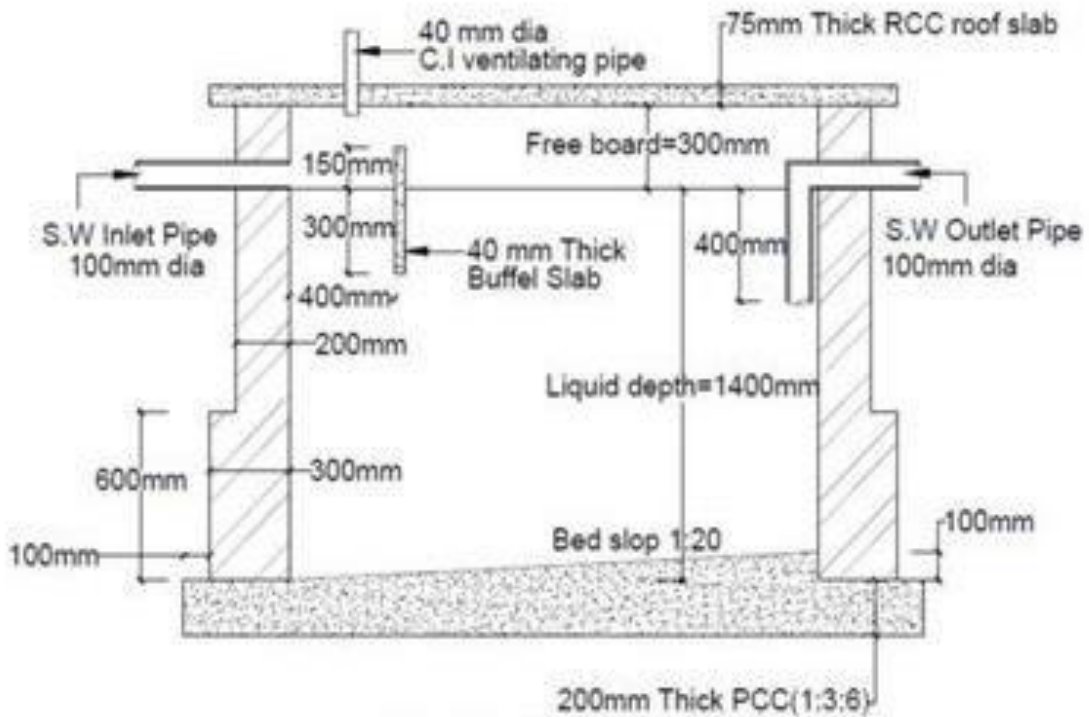
1. Switch on the computer.
- 2 Load the autocad software.
3. Set the unit as decimal and “mm”(DD Units)
4. Use line and circle commands, draw the longitudinal cross-section of beam.
5. Use hatch command, whenever necessary.
6. By using line, dimension and text command. Find dimensions and text of all given details.

RESULT:-

The given septic tank are drawn using Autocad



PLAN OF SEPTIC TANK



SECTION A-A

11. SEDIMENTATION TANK

AIM:- To Draw plan and cross-section of sedimentation tank using Autocad software

Draw the cross section of the peripheral feed circular sedimentation tank mechanical sludge removal equipment for given data.

- i. Diameter of the tank = 17.5m Depth of the tank = 3.0m
- ii. RCC wall & slab thickness = 200mm
- iii. Diameter of influent pipe, effluent pipe and sludge pipe = 200mm.
- iv. Bed slope=8%.
- v. Thickness of RCC Baffle slab = 40mm.

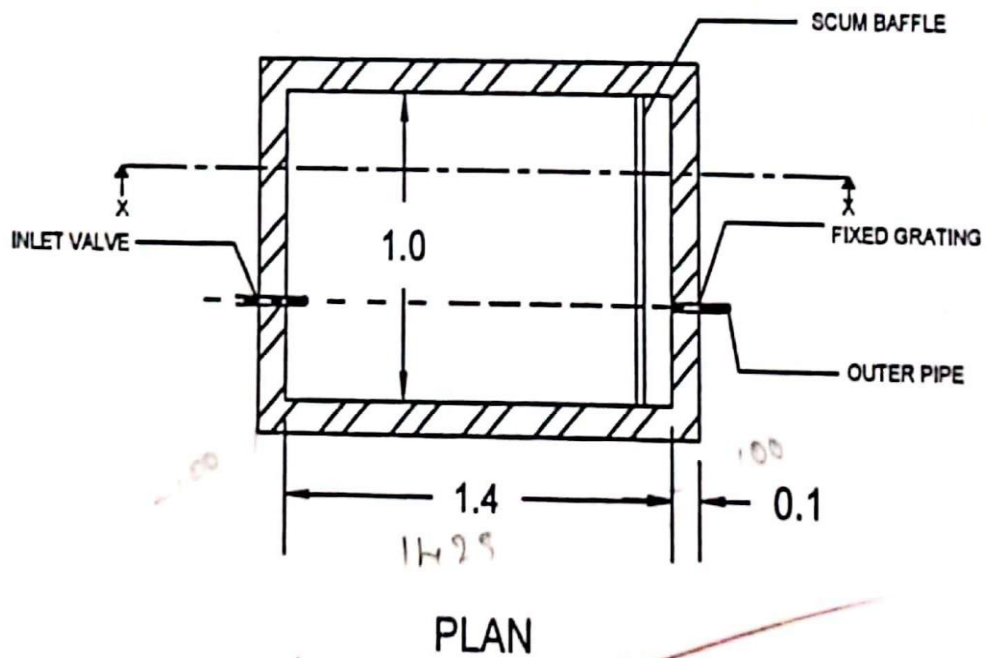
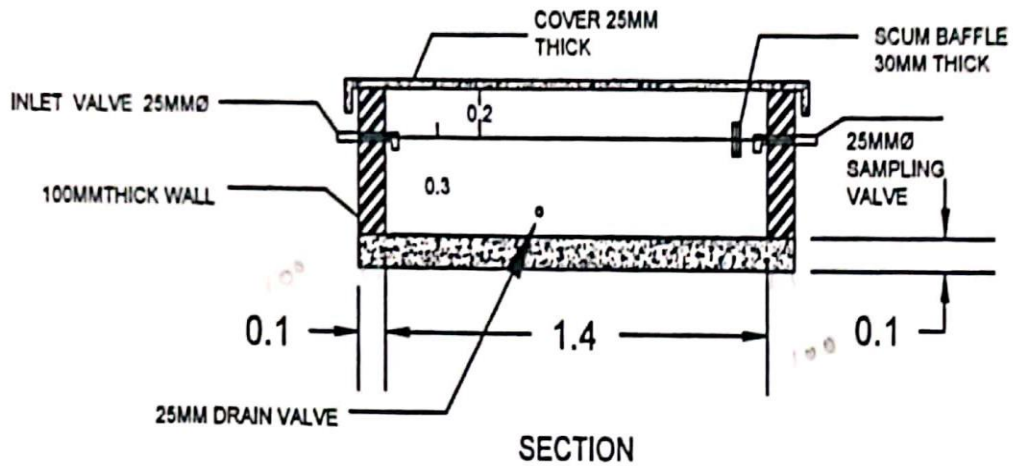
PROCEDURE:-

1. Switch on the computer.
2. Load the autocad software.
3. Set the unit as decimal and “mm”(DD Units)
4. Use line and circle commands, draw the longitudinal cross-section of beam.
5. Use hatch command, whenever necessary.
6. By using line, dimension and text command. Find dimensions and text of all given details.

RESULT:-

The given sedimentation tank are drawn using Autocad

SEDIMENTATION TANK



12. CROSS SECTIONAL DETAILS OF A ROAD FOR A RESIDENTIAL AREA

AIM:- To Draw plan and cross-section of details of road for a residential area using Autocad software

Draw the cross sectional details of a road for a residential area with provision for all services

PROCEDURE:-

1. Switch on the computer.
2. Load the autocad software.
3. Set the unit as decimal and “mm”(DD Units)
4. Use line and circle commands, draw the longitudinal cross-section of beam.
5. Use hatch command, whenever necessary.
6. By using line, dimension and text command. Find dimensions and text of all given details.

RESULT:-

The given cross sectional details of a road for residential area are drawn using Autocad

Cross sectional details of a Road for a Residential area
with provision for all Services (Fig:2.25)

