ARCHITECTURAL DRAUGHTSMAN

NSQF LEVEL - 4

1st Year

TRADE PRACTICAL

SECTOR: CONSTRUCTION

(As per revised syllabus July 2022 - 1200 Hrs)

Directorate General of Training

DIRECTORATE GENERAL OF TRAINING
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
GOVERNMENT OF INDIA

NATIONAL INSTRUCTIONAL MEDIA INSTITUTE, CHENNAI

Post Box No. 3142, CTI Campus, Guindy, Chennai - 600 032

Sector : **Construction**

Duration : **2 - Years**

Trade : **Architectural Draughtsman 1st Year - Trade Practical - NSQF (LEVEL - 4) (Revised 2022)**

Developed & Published by

National Instructional Media Institute
Post Box No.3142
Guindy, Chennai - 600 032
INDIA
Email: chennai-nimi@nic.in
Website: www.nimi.gov.in

First Edition : December 2023 Copies :

Rs.305/-

FOREWORD

The Government of India has set an ambitious target of imparting skills to 30 crores people, one out of every four Indians, by 2020 to help them secure jobs as part of the National Skills Development Policy. Industrial Training Institutes (ITIs) play a vital role in this process especially in terms of providing skilled manpower. Keeping this in mind, and for providing the current industry relevant skill training to Trainees, ITI syllabus has been recently updated with the help of Mentor Councils comprising various stakeholder's viz. Industries, Entrepreneurs, Academicians and representatives from ITIs.

The National Instructional Media Institute (NIMI), Chennai, an autonomous body under Ministry of Skill Development & Entrepreneurship is entrusted with developing producing and disseminating Instructional Media Packages (IMPs) required for ITIs and other related institutions.

The institute has now come up with instructional material to suit the revised curriculum for **Architectural Draughtsman 1st year Trade Practical NSQF LEVEL - 4 (Revised 2022) in Construction Sector under yearly Pattern.** The NSQF LEVEL - 4 (Revised 2022) Trade Practical will help the trainees to get an international equivalency standard where their skill proficiency and competency will be duly recognized across the globe and this will also increase the scope of recognition of prior learning. NSQF LEVEL - 4 (Revised 2022) trainees will also get the opportunities to promote life long learning and skill development. I have no doubt that with NSQF LEVEL - 4 (Revised 2022) the trainers and trainees of ITIs, and all stakeholders will derive maximum benefits from these IMPs and that NIMI's effort will go a long way in improving the quality of Vocational training in the country.

The Executive Director & Staff of NIMI and members of Media Development Committee deserve appreciation for their contribution in bringing out this publication.

Jai Hind

ATUL KUMAR TIWARI., I.A.S.,
Director General/Addl. Secretary
Ministry of Skill Development & Entrepreneurship,
Government of India.

December 2023
New Delhi - 110 001

PREFACE

The National Instructional Media Institute (NIMI) was established in 1986 at Chennai by then Directorate General of Employment and Training (D.G.E & T), Ministry of Labour and Employment, (now under Ministry of Skill Development and Entrepreneurship) Government of India, with technical assistance from the Govt. of the Federal Republic of Germany. The prime objective of this institute is to develop and provide instructional materials for various trades as per the prescribed syllabi (NSQF) under the Craftsman and Apprenticeship Training Schemes.

The instructional materials are created keeping in mind, the main objective of Vocational Training under NCVT/NAC in India, which is to help an individual to master skills to do a job. The instructional materials are generated in the form of Instructional Media Packages (IMPs). An IMP consists of Theory book, Practical book, Test and Assignment book, Instructor Guide, Audio Visual Aid (Wall charts and Transparencies) and other support materials.

The trade practical book consists of series of exercises to be completed by the trainees in the workshop. These exercises are designed to ensure that all the skills in the prescribed syllabus are covered. The trade theory book provides related theoretical knowledge required to enable the trainee to do a job. The test and assignments will enable the instructor to give assignments for the evaluation of the performance of a trainee. The wall charts and transparencies are unique, as they not only help the instructor to effectively present a topic but also help him to assess the trainee's understanding. The instructor guide enables the instructor to plan his schedule of instruction, plan the raw material requirements, day to day lessons and demonstrations.

In order to perform the skills in a productive manner instructional videos are embedded in QR code of the exercise in this instructional material so as to integrate the skill learning with the procedural practical steps given in the exercise. The instructional videos will improve the quality of standard on practical training and will motivate the trainees to focus and perform the skill seamlessly.

IMPs also deals with the complex skills required to be developed for effective team work. Necessary care has also been taken to include important skill areas of allied trades as prescribed in the syllabus.

The availability of a complete Instructional Media Package in an institute helps both the trainer and management to impart effective training.

The IMPs are the outcome of collective efforts of the staff members of NIMI and the members of the Media Development Committees specially drawn from Public and Private sector industries, various training institutes under the Directorate General of Training (DGT), Government and Private ITIs.

NIMI would like to take this opportunity to convey sincere thanks to the Directors of Employment & Training of various State Governments, Training Departments of Industries both in the Public and Private sectors, Officers of DGT and DGT field institutes, proof readers, individual media developers and coordinators, but for whose active support NIMI would not have been able to bring out this materials.

Chennai - 600 032 **EXECUTIVE DIRECTOR**

ACKNOWLEDGEMENT

National Instructional Media Institute (NIMI) sincerely acknowledges with thanks for the co-operation and contribution extended by the following Media Developers and their sponsoring organisations to bring out this Instructional Material **(Trade Practical)** for the trade of **Architectural Draughtsman NSQF LEVEL - 4 (Revised 2022)** under **Construction** Sector for ITIs.

MEDIA DEVELOPMENT COMMITTEE MEMBERS

Smt. V. B. Sujatha	–	Assistant Training Officer, GOVT. I.T.I (W), Guindy, Chennai - 32.
Smt. S. Yasotha	–	Instructor (PPP), GOVT. I.T.I, Erode.
Shri. J. Cyril longton	–	Instructor (PPP), GOVT. I.T.I (W), Nagercoil.
Shri. S. Ram prathep	–	Instructor (PPP), GOVT. I.T.I (W), Cuddalore.

NIMI CO-ORDINATORS

Shri. Nirmalya Nath	–	Deputy Director, NIMI, Chennai - 32.
Shri. G. Michael johny	–	Assitant Manager, Co-ordinator, NIMI, Chennai - 32.

NIMI records its appreciation for the Data Entry, CAD, DTP operators for their excellent and devoted services in the process of development of this Instructional Material.

NIMI also acknowledges with thanks the invaluable efforts rendered by all other NIMI staff who have contributed towards the development of this Instructional Material.

NIMI is also grateful to everyone who has directly or indirectly helped in developing this Instructional Material.

INTRODUCTION

TRADE PRACTICAL

The trade practical manual is intended to be used in practical workshop. It consists of a series of practical exercises to be completed by the trainees during the course of the **Architectural Draughtsman** trade supplemented and supported by instructions/ informations to assist in performing the exercises. These exercises are designed to ensure that all the skills in compliance with NSQF LEVEL - 4 (Revised 2022) syllabus are covered.

The manual is divided into Ten modules.

Module 1	Safety & architectural symbols and sketches
Module 2	Plane geomentry and orthographic projection
Module 3	Masonry construction
Module 4	Carpentry works, lintel and arches
Module 5	Introduction to Auto CAD and design elements
Module 6	Model space view port and projection of solids
Module 7	Stairs and floors
Module 8	Introduction to Design and preliminary drawing
Module 9	DPC, History of Architecture - I and final design in Auto CAD
Module 10	History of Architecture - II and surface development

The skill training in the shop floor is planned through a series of practical exercises centered around some practical project. However, there are few instances where the individual exercise does not form a part of project.

While developing the practical manual a sincere effort was made to prepare each exercise which will be easy to understand and carry out even by below average trainee. However the development team accept that there is a scope for further improvement. NIMI, looks forward to the suggestions from the experienced training faculty for improving the manual.

TRADE THEORY

The manual of trade theory consists of theoretical information for the Course of the **Architectural Draughtsman** 1st Year Trade Practical NSQF Level - 4 (Revised 2022) in Construction. The contents are sequenced according to the practical exercise contained in NSQF LEVEL - 4 (Revised 2022) syllabus on Trade Theory attempt has been made to relate the theoretical aspects with the skill covered in each exercise to the extent possible. This correlation is maintained to help the trainees to develop the perceptional capabilities for performing the skills.

The trade theory has to be taught and learnt along with the corresponding exercise contained in the manual on trade practical. The indications about the corresponding practical exercises are given in every sheet of this manual.

It will be preferable to teach/learn trade theory connected to each exercise at least one class before performing the related skills in the shop floor. The trade theory is to be treated as an integrated part of each exercise.

The material is not for the purpose of self-learning and should be considered as supplementary to class room instruction.

CONTENTS

LEARNING / ASSESSABLE OUTCOME

On completion of this book you shall be able to

S.No.	Learning Outcome	Ref. Ex.No.
1	Draw different types of architectural symbols following safety precautions.	1.1.01 - 1.1.07
2	Draw different types free hand sketches and different type of letterings.	1.1.08 - 1.1.12
3	Draw different types of plane geometry.	1.2.13 - 1.2.17
4	Draw orthographic projections.	1.2.18 - 1.2.26
5	Draw different sizes of Bricks and Brick Masonry.	1.3.27 - 1.3.29
6	Draw different types of Stone Masonry.	1.3.30 - 1.3.34
7	Draw different types of Foundation.	1.3.35
8	Draw different Carpentry Joints.	1.4.36 - 1.4.41
9	Draw different types of Wooden Doors and Windows.	1.4.42 - 1.4.43
10	Draw different types of Lintels.	1.4.44
11	Draw different types of Arches.	1.4.45
12	Draft in CAD.	1.5.46 - 1.5.52
13	Draw plan, elevation and side view of Solids in inclined positions and Section of Solids.	1.6.53 - 1.6.54
14	Draw Plan, elevation and Construction Details of different types of stairs.	1.7.55 - 1.7.58
15	Draw different types of flooring details.	1.7.59 - 1.7.63
16	Illustrate design procedure of Residential Building.	1.8.64 - 1.6.65
17	Draw plan, elevation and section through toilet of the residential building and the site plan with landscape.	1.8.66 - 1.8.69
18	Draw details of Damp proof Course (DPC) and Water Proofing Treatment at different locations.	1.9.70 - 1.9.73
19	Draw typical vertical section of an external wall of two storied load bearing structure and RCC framed structure.	1.9.74 - 1.9.75
20	Produce final project work applying advance CAD commands and File management.	1.9.76 - 1.9.81
21	Surface Development of geometrical solids.	1.10.82

SYLLABUS

Duration	Reference Learning Outcome	Professional Skills (Trade Practical) With Indicative Hours	Professional Knowledge (Trade Theory)
Professional Skill 26 Hrs.; Professional Knowledge 06 Hrs.	Draw different types of architectural symbols following safety precautions. **(NOS:HCS/N0802)**	**Familiarization** 1 Importance of safety and general precautions observed in the institute and in the section. (1 hrs.) 2 Importance of the trade in the development of the country's infrastructure. (01 hrs.) 3 Recreational, medical facilities and other extracurricular activities of the institute. (01 hrs.) 4 All necessary guidance to be provided to the new comers to become familiar, with the working of training institute. (01 hrs.)	**Orientation** Familiarization with the institute Importance of trade training Introduction to the trade and professional prospects Orientation of subjects Familiarization with engineering drawing, tools and equipment. (03 hrs.)
		Architectural symbols 5 Architectural symbol for materials, doors, windows. (08 hrs.) 6 Architectural symbols for trees, plants, shrubs. (07 hrs.) 7 Architectural symbols for plumbing and electrical fittings and fixtures. (07 hrs.)	**Architectural Symbols** Architectural signs and symbols and their uses in the drawings (03 hrs.)
Professional Skill 28 Hrs.; Professional Knowledge 06 Hrs.	Draw different types free hand sketches and different type of letterings. **(NOS:HCS/N0802)**	**Sketching** 8 Free hand sketching of trees, plants and shrubs. (05 hrs.) 9 Free hand sketching of landscape and monuments. (05 hrs.) 10 Free hand sketching of objects. (05 hrs.) 11 Lettering – types of lettering, legibility, uniformity. (08 hrs.) 12 Purpose and uses of lines, curves, line weight, types of lines. (05 hrs.)	**Sketching techniques** Elements of drafting, readability, clarity, accuracy and neatness Pencil grades Method of pencil uses Uses of different brush strokes Various types of lines used for sketching (06 hrs.)
Professional Skill 17 Hrs.; Professional Knowledge 02 Hrs.	Draw different types of plane geometry. **(NOS:HCS/N0802)**	**Plane geometry** 13 Draw a line parallel to any given point. (01 hrs.) 14 Divide a line into any number of equal parts different methods. (01 hrs.) 15 Bisect a line, arc or angle. (01 hrs.) 16 Geometrical constructions using different method – square, pentagon, triangle, hexagon, heptagon, octagon, ellipse. (06 hrs.)	**Solids** Definition of solids – cube, square prism, hexagonal prism, triangular prism, square prism, triangular pyramid, hexagonal pyramid, pentagonal pyramid, cylinder, sphere, cone. (02 hrs.)

		Dimensioning 17 Basic system of measurement, dimensional control, location, dimensioning of different objects like lines, circle, curves and angles Scale and proportion. (08 hrs.)	
Professional Skill 92 Hrs.; Professional Knowledge 10 Hrs.	Draw orthographic projections. **(NOS:HCS/N0802)**	**Introduction to orthographic projections** 18 Types of projections. (02 hrs.) 19 Projection planes. (02 hrs.) 20 First angle projection. (02 hrs.) 21 Third angle projection. (02 hrs.) 22 Method of drawing orthographic projections. (02 hrs.) Projections of lines and lamina 23 Projections of lines in simple position. (12 hrs.) 24 Projection of lamina in simple position. (12hrs.) Projection of solids in simple positions 25 Drawing plan, elevation and side elevation of simple solids like cube, pyramid, prism, cone, cylinder in first angle projection. (30 hrs.) 26 Drawing projection of solids in third angle projection in simple positions. (28 hrs.)	**Types of projections** Types of projections Projection planes First angle projection Third angle projection **Isometric view** Isometric view of geometrical solids (10 hrs.)
Professional Skill 50 Hrs.; Professional Knowledge 12 Hrs.	Draw different sizes of Bricks and Brick Masonry. **(NOS:HCS/N0802)**	**Brick masonry** 27 Sizes of brick and brick bats. (04 hrs.) 28 English and Flemish bond for one brick thick and one and half brick thick wall. (18 hrs.) 29 Different types of bonds (zig zag bond, diagonal bond, stretcher bond, header bond, monk wall bond, herring bone bond, Dutch bond, garden wall bond). Brick laying with the help of tools / infrastructure. Setting out & measurement, cutting & construction, joint finishing & presentation. (28 hrs.)	**Brick masonry** Technical terms, Sizes of brick and brick tiles, Principle of brick masonry construction, English and Flemish bond for one brick thick and one and half brick thick wall, Different types of bonds and their uses in construction, Hollow brick masonry, AAC Block, Fly-ash brick . brick laying, understanding brick laying, pattern designs. Interpretation of drawings ,setting out and measurement, construction, joint finishing & presentation. (12 hrs.)
Professional Skill 22 Hrs.; Professional Knowledge 06 Hrs.	Draw different types of Stone Masonry. **(NOS:HCS/N0802)**	**Stone masonry, tile masonry** 30 Setting and measurement Cutting, preparations, fix, cleaning 31 Coursed and uncoursed rubble masonry. (04 hrs.) 32 Random rubble masonry. (06 hrs.) 33 Ashlar masonry. (04 hrs.)	**Stone masonry, tile masonry Wall & floor filing Produce and interpret drawing, setting out & measurement, preparations ,fix** Technical terms Principles of stone masonry Rubble masonry Ashlar masonry Composite masonry (06 hrs.)

		34 Composite masonry (stone facing with brick backing, stone facing with concrete backing, stone facing with rubble backing). (08 hrs.)	
Professional Skill 22 Hrs.; Professional Knowledge 10 Hrs.	Draw different types of Foundation. **(NOS:HCS/N0802)**	**Foundation with column** 35 Types of foundation – spread foundation, grillage foundation, pile foundation, raft or mat foundation. (22 hrs.)	**Foundation with column** Purpose of foundation Causes of failure of foundation Types of foundation – spread foundation, grillage foundation, pile foundation, raft or mat foundation (10 hrs.)
Professional Skill 22 Hrs.; Professional Knowledge 06 Hrs.	Draw different Carpentry Joints. **(NOS:HCS/N0802)**	**Carpentry Joints** 36 Lengthening spliced or longitudinal joints. (03hrs.) 37 Bearing joints. (03 hrs.) 38 Framing joints. (04hrs.) 39 Angle or corner joints. (04 hrs.) 40 Widening or side joints. (04 hrs.) 41 Oblique-shouldered joints. (04 hrs.)	**Carpentry Joints** Technical terms Lengthening joints and their uses Bearing joints and their uses Framing joints and their uses Angle or corner joints and their uses Widening or side joints and their uses Oblique-shouldered joints and their uses (06 hrs.)
Professional Skill 48 Hrs.; Professional Knowledge 12 Hrs.	Draw different types of Wooden Doors and Windows. **(NOS:HCS/N0802)**	**Doors** 42 Details of paneled door, flush door, batten and ledged door. (24 hrs.) **Windows** 43 Details of casement window, louvered window, ventilator. (24 hrs.)	**Doors** Standard Sizes of doors Types of doors - paneled door, flush door, batten and ledged door **Windows** Standard Sizes of windows Details of casement window, louvered window, ventilator Fixtures and fasteners Types of joints (used in doors and windows) (12 hrs.)
Professional Skill 10 Hrs.; Professional Knowledge 02 Hrs.	Draw different types of Lintels. **(NOS:HCS/N0802)**	**Lintels/slab lintels** 44 Details of Wooden lintel, stone lintel, brick lintel, steel lintel, RCC lintel, Chajjas. (10 hrs.)	**Lintels/ slab lintels** Purpose of lintel Types and uses of lintels – wooden lintel, stone lintel, brick lintel, steel lintel, RCC lintel, Chajjas (02 hrs.)
Professional Skill 17 Hrs.; Professional Knowledge 06 Hrs.	Draw different types of Arches. **(NOS:HCS/N0802)**	**Arches** 45 Details of semicircular arch, flat arch, segmental arch, pointed arch, two centered arch. (17 hrs.)	**Arches** Technical terms Materials used for construction of arches Types of arches and their uses – flat arch, semicircular arch, segmental arch, semi elliptical arch, two centered arch, three centered arch. (06 hrs.)
Professional Skill 84 Hrs.; Professional Knowledge 21 Hrs.	Draft in CAD. **(NOS:HCS/N05202)**	**CAD** 46 Introduction to CAD. (03hrs.) 47 Starting procedures of CAD – screen appearance, tool bar, menu bar, quick access tool bar, command tool bar, units, settings, dimensioning. (04 hrs.)	**Commands. (22hrsFactors considered in architectural design Introduction to CAD** Understanding the basic elements of design like point, line, plane, figure, form and space, light and color, texture. (21 hrs.)

		48 Basic CAD drafting commands - 1 – line, circle, arc, ellipse, copy, move, rotate, erase, undo, mirror, offset, fillet, polygon, trim, extend, explode. (05 hrs.) 49 Basic CAD commands 2 – rectangle, array, scale, stretch, break, join, chamfer, spline, colors, line type, line weight, properties, match properties, hatch. (05 hrs.) 50 Draft a plan and elevation of a sofa set, bed, chair, table, dining, TV unit etc using basic CAD Commands (30hrs) 51 Draft door/windows and ventilators in detailed section (frame panel fixing etc) (15 hrs) 52 Draft interiors of bed room/living room using basic CAD commands. (22 hrs)	
Professional Skill 46 Hrs.; Professional Knowledge 08 Hrs.	Draw plan, elevation and side view of Solids in inclined positions and Section of Solids. **(NOS:HCS/N9401)**	**Projection of Solids in inclined positions in AutoCAD** 53 Drawing plan, elevation and side elevation of inclined solids like cube, pyramid, prism, cone, cylinder in first angle projections. (18 hrs.) **Section of solids** 54 Drawing projection of solids in different section plane. (28 hrs.)	Introduction to model space view port in auto CAD (08 hrs)
Professional Skill 84 Hrs.; Professional Knowledge 18 Hrs.	Draw Plan, elevation and Construction Details of different types of stairs. **(NOS:HCS/N9402)**	**Stairs** 55 Plan and elevation of different types of stairs – straight stairs, quarter turn stairs, open well stairs, bifurcated stairs, circular stairs. (26 hrs.) 56 Construction Details of dog-legged stairs, baluster details, railing, nosing, tread and riser calculation. (26 hrs.) 57 Details of wooden stairs. (16 hrs.) 58 Details of MS spiral stairs. (16 hrs.)	**Stairs** Technical terms General dimensions and arrangements Requirements of good stairs Ashlar masonry Classification of stairs – straight flight stairs, dog legged stairs, newel stairs, open well stairs, geometrical stairs, circular stairs, bifurcated stairs, spiral stairs, stairs of different materials – wooden stairs, stone stairs, metal stairs, reinforced concrete stairs (18 hrs.)
Professional Skill 25 Hrs.; Professional Knowledge 08Hrs.	Draw different types of flooring details. **(NOS:HCS/N9403)**	**Floors and flooring** 59 Components of ground floor. (5 hrs.) 60 Details of cement flooring. (5 hrs.) 61 Details of stone / tile flooring. (5hrs.) 62 Details of wooden suspended flooring. (5 hrs.) 63 Details of wooden double floor. (5 hrs.)	**Floors and flooring** Components of floor – sub floor, floor covering, construction of ground floor, selection of floorings Suspended floors Floor coverings Ground and basement floor (08 hrs.)
Professional Skill (44 Hrs)	Illustrate design procedure of Residential Building. **(NOS:HCS/N9421)**	**Introduction to design** 64 Design topic – Residential. (18 hrs.) 65 Concept and visualization of design. (Students should be able to	Design principles – balance, proportion, perspective, movement, rhythm, harmony, unity, symmetry and contrast (06 hrs.)

Professional Knowledge (06 Hrs.)		understand the process of designing and the design project will go throughout the year) Initial sketches/ preliminary drawings manually. Sketches of the plan. (26 hrs.)	
Professional Skill 40 Hrs.; Professional Knowledge 12 Hrs.	Draw plan, elevation and section through toilet of the residential building and the site plan with landscape. **(NOS:HCS/N9422)**	**Preliminary drawing** 66 Drawing to be prepared by trainees in AUTOCAD based on single floor residential building after analyzing the requirement and area analysis. (12 hrs.) 67 Front elevation and one side elevation. (06 hrs.) 68 Section through staircase or toilet. (16 hrs.) 69 Site plan with landscaping. (06 hrs.)	Conceptual design ideas – site analysis, site planning, requirements, space designation, proportionately defined rooms, single line diagram, floor plan analysis, functional planning. (12 hrs.)
Professional Skill 34 Hrs.; Professional Knowledge 18 Hrs	Draw details of Damp proof Course (DPC) and Water Proofing Treatment at different locations. **(NOS:HCS/N9423)**	**Damp proof Course (DPC)** 70 Details at plinth level. (10 hrs.) 71 Details at terrace level (Water Proofing Treatment). (10 hrs.) 72 Details at basement level. (10hrs.) 73 Details of cavity wall. (04 hrs.)	**Damp proof Course (DPC)** Definition Sources of dampness Prevention methods of dampness – integral treatment, surface treatment, membrane damp proofing, cavity wall construction Materials used in DPC – mastic asphalt, hot laid bitumen, metal sheets, PCC etc. (06 hrs.) **Anti-termite treatment** Types of Anti termite treatment a)Treatment to basement in ordinary soil (06 hrs.) b)Treatment to basement in damp soil (06 hrs.)
Professional Skill 08 Hrs.; Professional Knowledge 02 Hrs.	Draw typical vertical section of an external wall of two storied load bearing structure and RCC framed structure. **(NOS:HCS/N9424)**	Draft in AutoCAD 74 Load bearing wall. (04hrs.) 75 RCC framed structure. (04hrs.)	Pre-fabricated panels RCC, GI Powder coated steel panels. (02 hrs.)
Professional Skill 111 Hrs.; Professional Knowledge 15 Hrs.	Produce final project work applying advance CAD commands and File management. **(NOS:HCS/N9425)**	**CAD** 76 Advance CAD commands – layers, block, insert, group, divide, measure, design center, text gradient, dimension style, leader, layouts, model space view ports, File management. (15 hrs.) **Final design** 77 Final floor plans showing living room, kitchen, bedrooms, toilet, logical order from the main entrance, basic area with furniture, garage and driveway, pedestrian ways, levels, north line, section line, scale, dwv schedule, statement of area etc. (30 hrs.) 78 Front elevation with all heights and levels mentioned. (17 hrs.)	**Indian architecture** Stupas and its characteristic features and typical examples Typical Buddhist column or order Northern Indian style elements and characteristic features (lingaraja temple at Orissa, sun temple at konark, temple of khajuraho (15 hrs.) **History of architecture (HOA) Egyptian architecture** Characteristic features of Egyptian architecture Tombs mastaba pyramid – the great pyramid at cheops at giza the great sphinx of chephren

		79 One side elevation with all heights and levels mentioned(17 Hrs.) 80 Detailed section through staircase/ toilet with all heights and levels mentioned. (All presentation drawing to be submitted as project spiral binding). (17 hrs.) 81 Final site plan with landscape elements. (15 hrs.) **Note**: design elements to keep in consideration while designing the elevations	**Greek architecture** Greek columns like doric order, ionic order, corianthan order Characteristic features of the temple of Parthenon at Athens, Olympia stadium at athens.
Professional Skill 10 Hrs.; Professional Knowledge 14 Hrs.	Surface Development of geometrical solids. **(NOS:HCS/N9426)**	**Surface Development** 82 Developing surface Development of solids. (10 hrs.) **Note**: subject of drawing, scale, date, job no, address, ph.no, north – south direction, sheet no. to be mentioned in all the sheets. Drawing produced should be well readable and self-explanatory.	**Roman architecture** Characteristic features of the temples of Saturn at rome, the pantheon at Athens, basilica of Trajan at rome. **Indian architecture** Stupas and its characteristic features and typical examples Typical Buddhist column or order Northern Indian style elements and characteristic features (Lingaraja temple at Orissa, sun temple at Konark, temple of Khajuraho) Central Hindu style elements and characteristic features (rock cut temples at Badami and Humpi, Hoysaleswar temple at halebid) South Hindu or Dravidian style elements and characteristic features (shore temple at Mahabalipuram, Brihadesvar temple at Tanjavur, temple of Madurai) (14 hrs.)

Importance of safety and general precautions observed in the institute and in the section

Objectives: At the end of this exercise you shall be able to
- **identify the places/machinery/equipments are to be cleaned**
- **collect the cleaning materials/devices required on cleaning**
- **clean the machines/equipment and devices installed in your section.**

Requirements

Tools/Equipments/Instruments

- Portable vacuum cleaner/blower - 1 No.
- Shovel - 1 No.
- Plastic or metal pan - 1 No.
- Trolley with wheels - 1 No.
- Basic safety sign chart - 1 No.
- Road safety signs and traffic signal chart - 1 No.
- Occupational hazards chart - 1 No.

Materials

- Emery sheet 'O' grade - 1 No.
- Dusting cloth - as reqd.
- Dust bin (labelled) - 3 Nos.
- Brush and gloves - 1 pair.

PROCEDURE

TASK 1: **Practice on cleanliness and procedure to maintain it**

Switch-off all the machinery and equipment before starting the cleaning. Use mask or cover the mouth and nose.

Instructor has to brief the Japanese 5S concept to the trainees before starting the work.

Sort
Set in order
Shine
Standardise
Sustabin

5S concept

1 Identify the areas/equipment machine have to be cleaned.

2 Keep the movable items at one place and group it.

3 Clean the dust carefully without damaging any part/ connection of the machine / equipment, by using clothes.

4 Use wet dusting cloth to shine the areas to be cleaned/ wired.

5 Remove the rust in any of the parts of equipment or devices by using emery sheet.

Do not remove any lubricants applied to the machine for its function while wiping/cleaning.

6 Use vacuum cleaner to suck the dust from the places where brush or cloth cannot be reached.

7 Collect the waste materials found in the lab and put it in the dustbin specified for it, as shown in Fig 1.

Dusting and cleaning can be arranged in groups of trainees under the supervision of instructor.

8 Clean the places where water or oil spill over the floor and dusting particles.

Note down any abnormal things you noticed in particular while doing cleaning and report to the instructor to take action to correct it.

9 Put back all the materials and equipment used for cleaning.

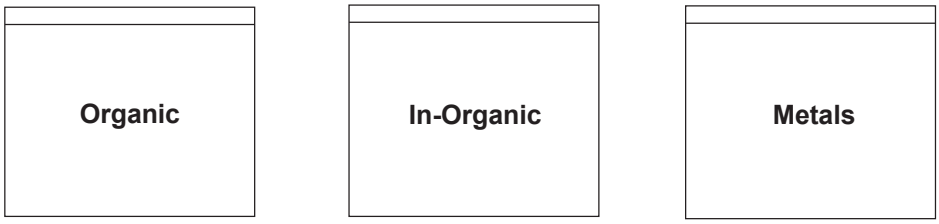
10 Inspect in the presence of instructor and ensure that all the machines are working after cleaning.

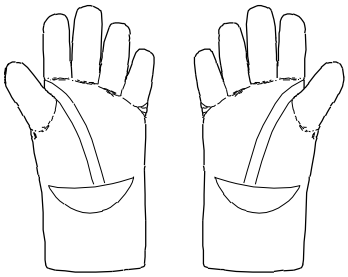
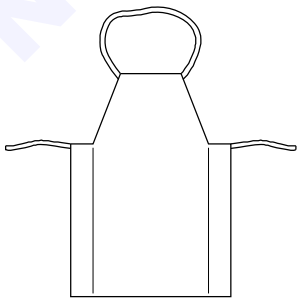
11 Discuss with instructor anything you noticed in particular and prepare a report if required to the instructor.

Assign the cleaning work in batchwise daily into the trainees by the instructor in an arranged manner. Dispose the waste as and when required through stores.

12 Get it checked by your instructor.

Fig 1



Sl. No.	Sketches	Name of PPE	Type of protection	Uses
1				
2				
3				

Disposal of waste materials

Objectives: At the end of this exercise you shall be able to
- **identify the waste material in different category**
- **segregate and arrange the waste materials in it's corresponding bins**
- **dispose non saleable and saleable material separately and maintain record.**

TASK 1: **Disposal of waste materials**

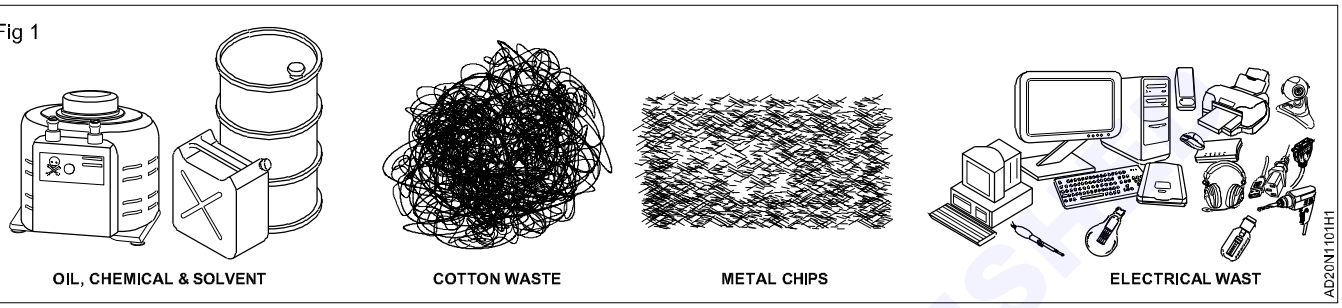
1 Collect all the waste materials in workshop.

2 Identify and Segregete the different waste like cotton waste. metal chips, all chemical waste and electrical waste etc. (Fig 1) separately and label them.

3 Segregate saleable, non saleable, organic and inorganic materials also.

4 Record the segreated wasre materal and fill the Table 1.

Fig 1



Table

Sl.No.	Name of the waste material	Quantity	Saleable or non Saleable
1			
2			
3			
4			
5			
6			

5 Arrange atleast 3 trollies with wheel for disposal and stick the lable an each trolly as "Cotton Waste", "Metalchips" and "others" (Fig 2)

6 Put the cotton waste in cotton trolly and similarly put the metal chips waste and others in corresponding trollys.

7 Keep another 4 bins to collect saleable scarp, non saleable scrap, organic waste and in-organic waste and lable them. (Fig 3)

Fig 2

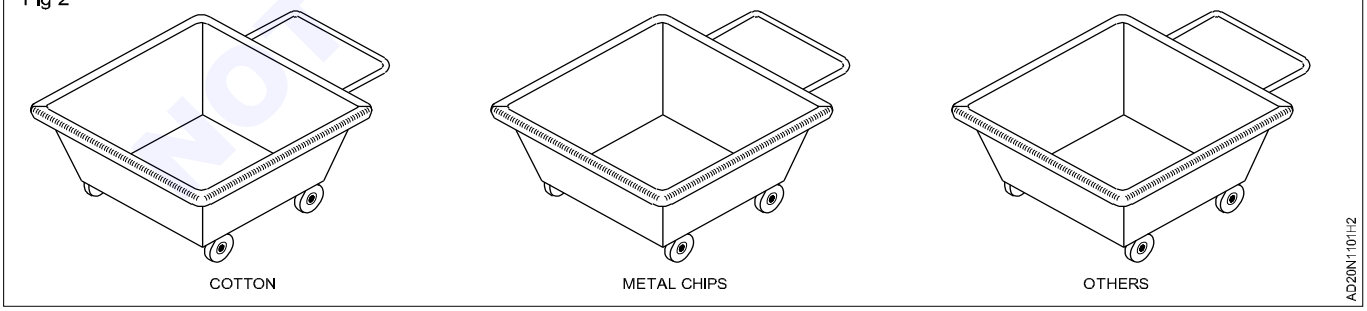
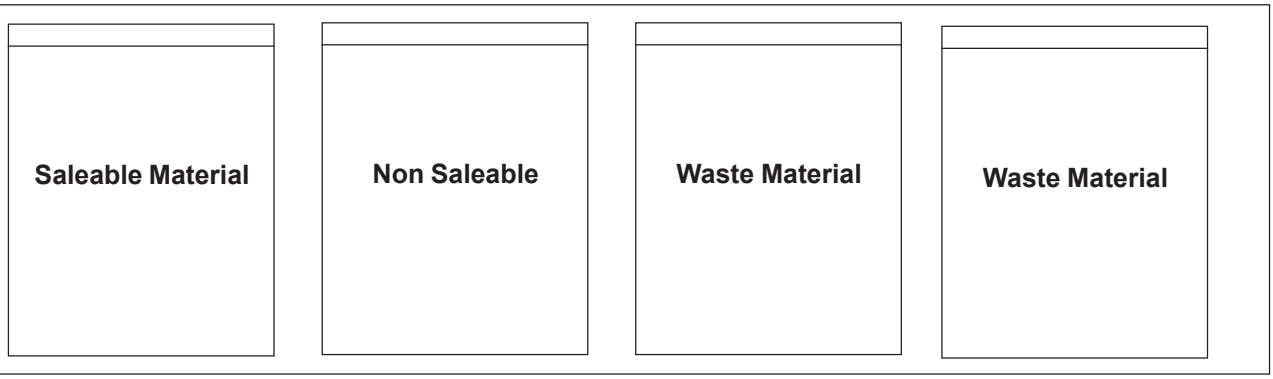


Fig 3



Separate the cotton waste and dispose it

Objective: At the end of this exercise you shall be able to
- **separate and dispose the cotton waste.**

1 Collect the chips by hand shavel with help of brush.

2 Clean the floor if oil is spill.

Do not handle the chip by bare hand there may be different metal chips. So separate the chip according to metal.

3 Separate the cotton waste material and store in the bin provided to store the waste cotton material.

4 Store the each category similarly of metal chip in separate bins.

Each bin have respective label.

5 Collect all the saleable material metal and non - metal seperately and keep it's respective bins.

6 Collect all the non - saleable materials like cotton waste, paper waste, wooden pieces etc. and keep it's respective bin as in Fig 3.

7 Check the non - saleable material work (organic) and send it for disposal by burning after getting approval.

8 Check the saleable material and segregate like Aluminium, Copper, Iron, Screws, nuts and other items separately and send to stores for disposal by auction (or) as per recommended procedure with approval.

Identify safety symbols and hazards

Objectives: At the end of this exercise you shall be able to
- **identify the safety symbols from the chart and their basic category**
- **write their meaning and description and the place of use**
- **identify the road safety sign with traffic signal from the chart**
- **read and interpret the different types of occupational hazards from the chart.**

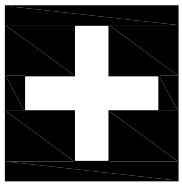
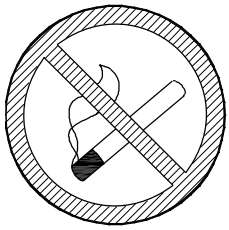
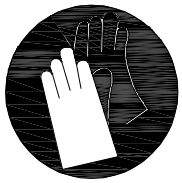
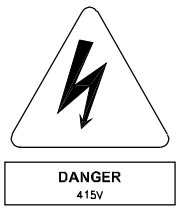
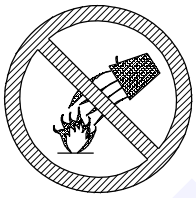
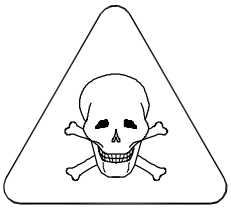
TASK 1 : **Identify the safety symbols and interpret their meaning and colour with shape**

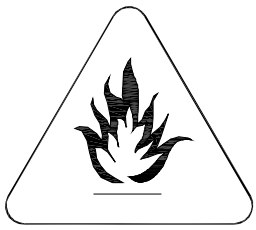
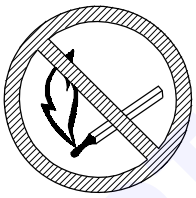
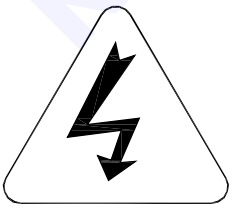
Instructor may provide various safety signs chart for basic categories and road safety with traffic signals. Then explain their categories meaning and colour. Ask the trainees to identify the sign and record in table 1.

1 Identify the basic category of each sign from the chart.

2 Write the categories name of the each sign meaning description and the place of use of that safety sign in Table 1.

Table 1

S. No.	Safety signs	Name of the basic category and sign	Place of use
1			
2			
3	 WEAR HAND PROTECTION		
4			
5	 DO NOT EXTINGUISH WITH WATER		
6	 WEAR HEAD		
7	 TOXIC HAZARD		

S. No.	Safety signs	Name of the basic category and sign	Place of us
8	 WEAR EYE PROTECTION		
9	 RISK OF FIRE		
10	 PEDESTRIANS PROHIBITED		
11	 WEAR HEARING PROTECTION		
12	 SMOKING AND NAKED FLAMES PROHIBITED		
13	 RISK OF ELECTRIC SHOCK		

— — — — — — — —

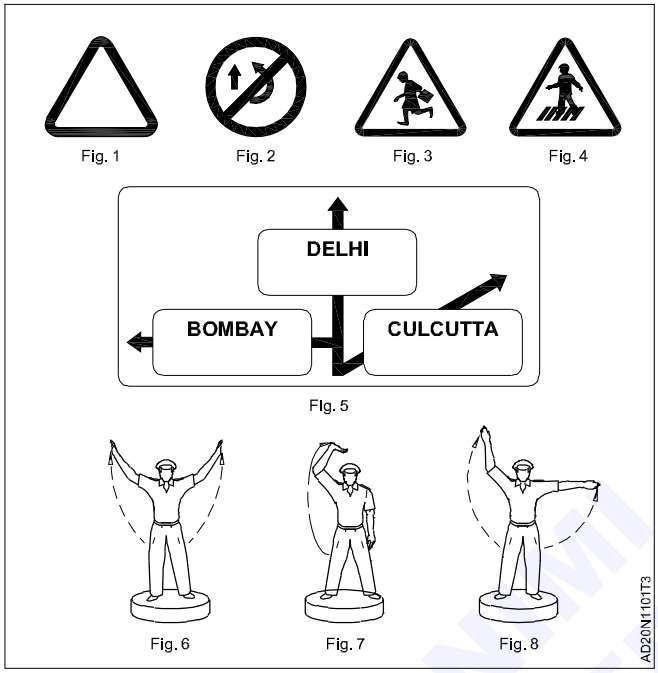
TASK 2 : **Identify the road safety sign and traffic signals**

Instructor will explain all the road safety sign and traffic police signals.

1 Read the sign given and mention their kinds and the meaning in the table 2.

2 Get it checked by the instructor.

Table 2

S. No.	Safety signs	Name of the basic category and sign	Place of use
			

— — — — — — — —

TASK 3 : **Read and interpret the different types of personal protective devices from the chart**

Instructor may brief the various types of occupational hazards and their causes.

1 Identify the occupational hazard to the corresponding situation with a potential harm given in table 3.

2 Fill up and get it checked by your instructor.

Table 3

Sl.No.	Source or potential harm	Type of occupational hazards
1	Noise	
2	Explosive	
3	Virus	
4	Sickness	
5	Smoking	
6	Non control device	
7	No earthing	
8	Poor house keeping	

— — — — — — — —

Importance of the trade in the development of the country's infrastructure

Objective: At the end of this exercise you shall be able to
- **identify the infrastructures for the development of the country.**

Requirements	
Material	
• Chart or PPT	- 1 No.

PROCEDURE

TASK 1: **Identification of different infrastructures**

Instructor should demonstrate the importance of Architectural Draughtsman trade in the development of India's infrastructure.

The following are the some important infrastructure in nations development

1 Physical infrastructure.

2 Roads, ports and airports.

3 Power and water supply.

4 Economic growth.

5 The instructor should show the above factors by means of chart or PPT.

6 The instructor should explain how the architectural draughtsman play his role in the above mentioned factors in the country's development.

7 The trainees should identify some of the infrastructure under each topic and instructor should guide them.

Recreational, medical facilities and other extra curricular activities

Objective: At the end of this exercise you shall be able to
- **trainees should identify the recreation - medical - other extra curriculam facilities available in the institute.**

Requirements	
Material	
• Notebook	- 1 No.

PROCEDURE

TASK 1: **The trainees should identify the facilities available in the institute**

Instructor should explain the facilities available in the institute

1 Recreation
  - i Indoor games
  - ii Outdoor games
  - iii Sports activities

2 Medical facilities
  - i Medical room
  - ii Natrue of treatment and first aid.

3 Extra curricular activities
  - i N.C.C
  - ii Creation of green belt around the institute
  - iii Creating landscape

— — — — — — — —

Familiarization with institute, administration setup of institute

Objectives : At the end of this exercise you shall be able to
- **identify the staff structure of the institute**
- **identify the available trades in the institute and their functions**
- **explain the necessary of adopting the safety rules**
- **list the safety rules and follow them.**

Requirements

Material

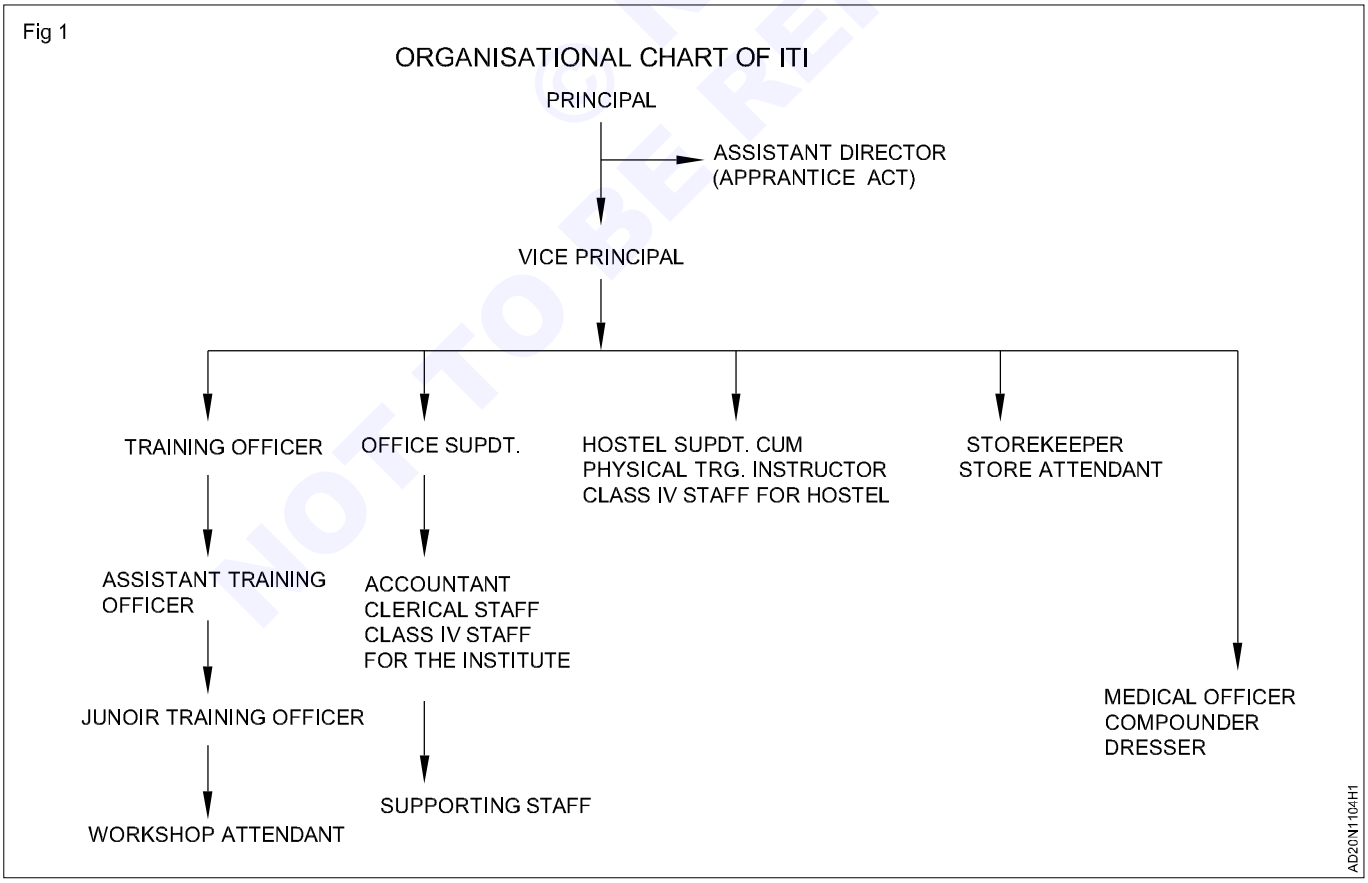
- Job sheet made by ex- trainee - 1 No.

1 The industrial training institutes throughout India follow the same syllabus pattern as given by the national Council for vocational Training (NCVT) Board. In India there are about 4000 Government. ITIs and 6000 private ITIs. The Government ITIs in each state work under the directorate of employment and training which is a department under the Labour ministry in most of the states.

2 The head of the industrial training institute is the principal, under whom there is one Vice-principal, Group instructor and a number of trade instructors as shown in the organization chart of ITI. (Fig 1)

3 Even though there are 132 trades selected for instructional training and identified for apprentice training, according to the requirement of industrial needs, area and finance a few selected trades are established under each ITI. The trainees are advised to make a list of the trades available in their ITI, the type of training and the scope of these trades in getting self or job employment in the rural and urban areas.

Fig 1



Awareness of the job sheet made by the Ex-trainees

Objectives: At the end of this exercise you shall be able to
- **identify the features of a pitched roof & building**
- **identify the details and construction features of a mangalore tiled residence**
- **identify details of single room building (Flat)**
- **study the line diagram for a residential building and its plan and section**
- **study a R.C.C sloped building.**

1 The instructor should explain the following job sheets (Fig 1 to 7) made by the extrainees to create the awareness among the trainees about the building drawing / job sheet which they are all going to execute in feature training activities.

i Offset the building outline and desired thickness of the exterior wall. Use the "Offset" command.

ii Draw all interior walls by using the same "Line" and "Offset" commands.

iii Use the "Trim" command to trim any messy intersections on the exterior or interior conditions. Left-click the "Trim" icon to activate the too. Select the "cutting edge" line followed by the line that you would like to trim off.

iv Cut openings for doors and windows by drawing lines and then trimming away the opening. If you want 100 cm door draw a line perpendicular to the wall, offset 100cm and trim away the exess lines.

v Draw the doors and windows where the new openings exist.

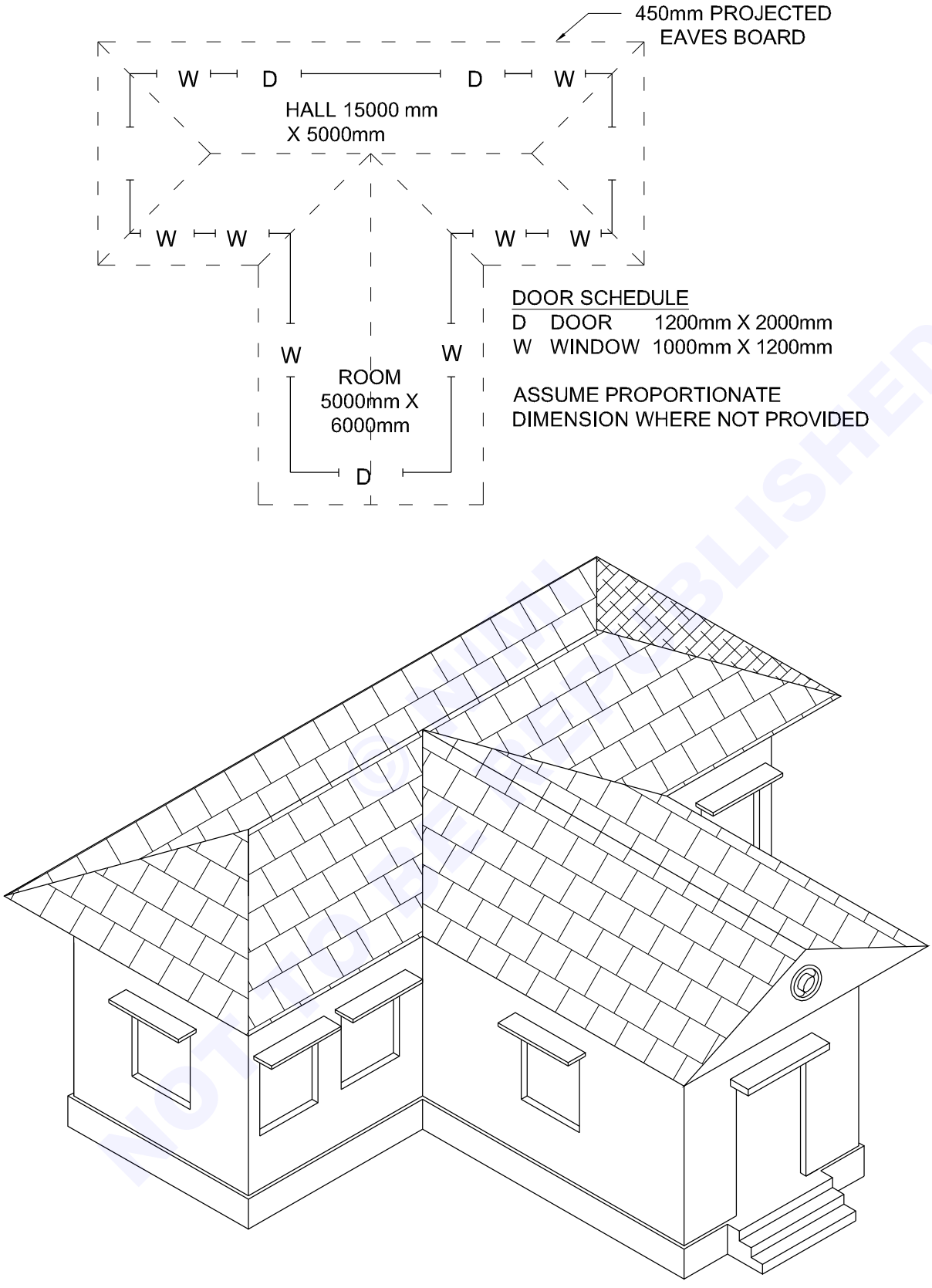
vi Activate the text command to enter the names of rooms and their sizes.

vii Activate the dimensions icon and click the edges of each wall that you would like to dimension too. This will give the drawing a more professional look and also gives people a sense of the space.

viii Insert the table and prepare the details of joinery.

ix Using area command find the area of the building

Fig 1

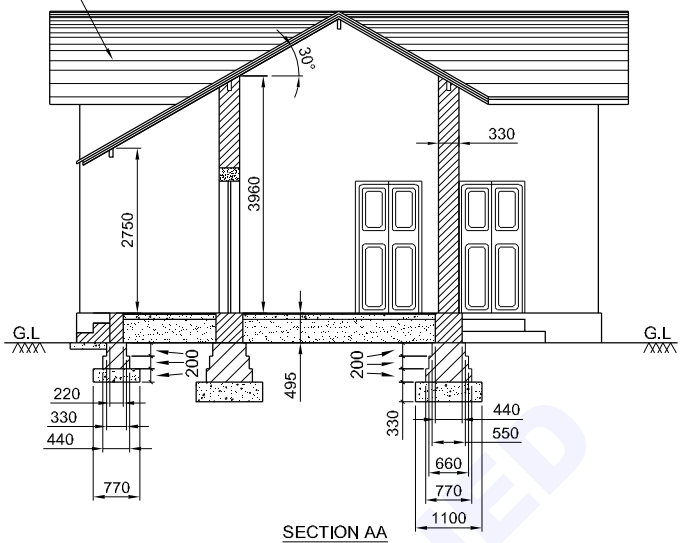


ISOMETRIC & ORTHOGRAPHIC PROJECTION

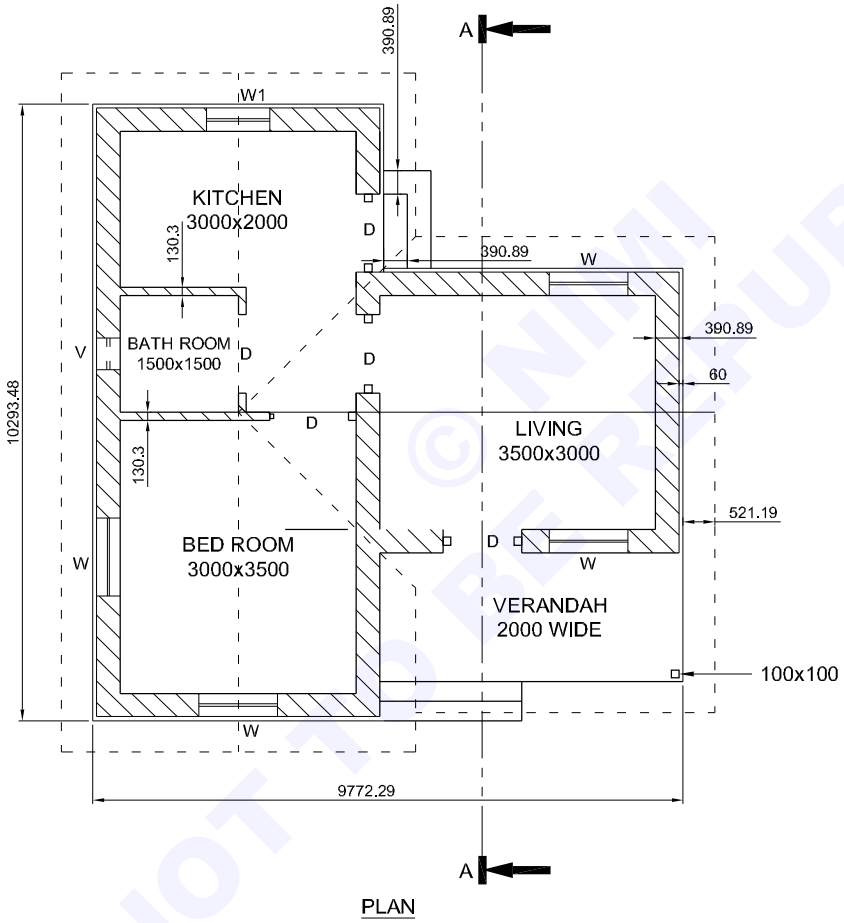
AD20N1104-J1

Fig 2

ELEVATION



SECTION AA



PLAN

REFERENCE:

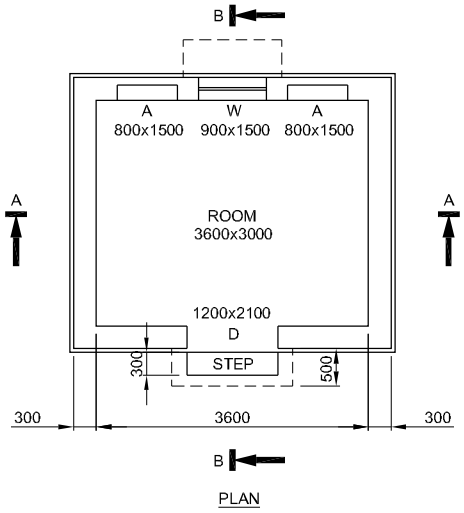
FOUNDATION IN C.C 1:5:10		
BASEMENT B.W IN C.M		
SAND FILLING	350mm	
FLOOR CONCRETE 1:4:10	100mm	
FLOOR FINISH	20mm	
R.C LINTEL	150mm	
WALL PLATE	75x100	
BRESUMMER	100x100	
COMMON RAFTER 100x125 AT 400C/C		
BATTENS 45x25 AT 350C/C		
RIDGE PIECE	50x150	
WOODEN POST	100x100	
D - DOOR PANELLED	1000x2000	5 NOS.
W - WINDOW PANELLED	1000x1200	4 NOS.
W1 - WINDOW PANELLED	800x1000	1 NO.
V - VENTILATOR GLAZED	300x400	1 NO.

ALL DIMENSIONS ARE IN MILLIMETRES

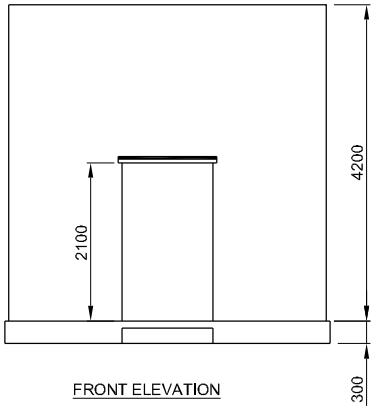
A MANGALORE TILED RESIDENCE

AD20N1104E2

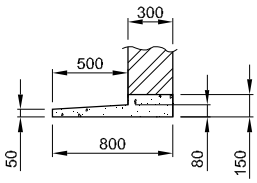
Fig 3



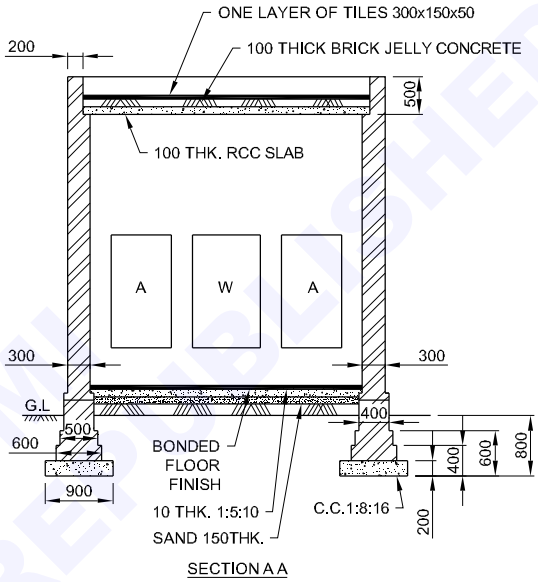
PLAN



FRONT ELEVATION

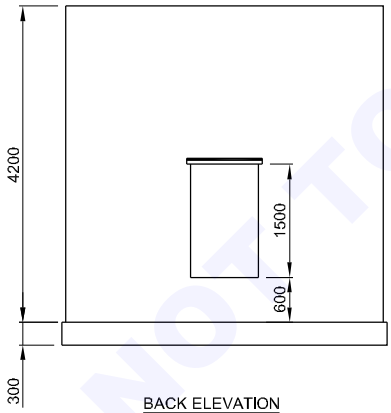


DETAIL OF SUNSHADE

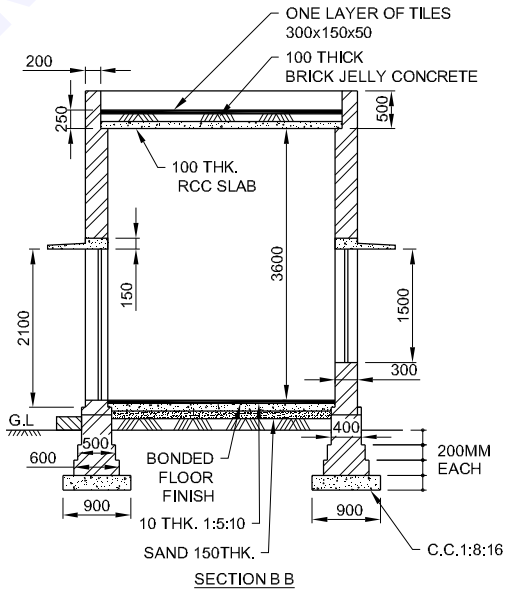


SECTION A A

Fig 4



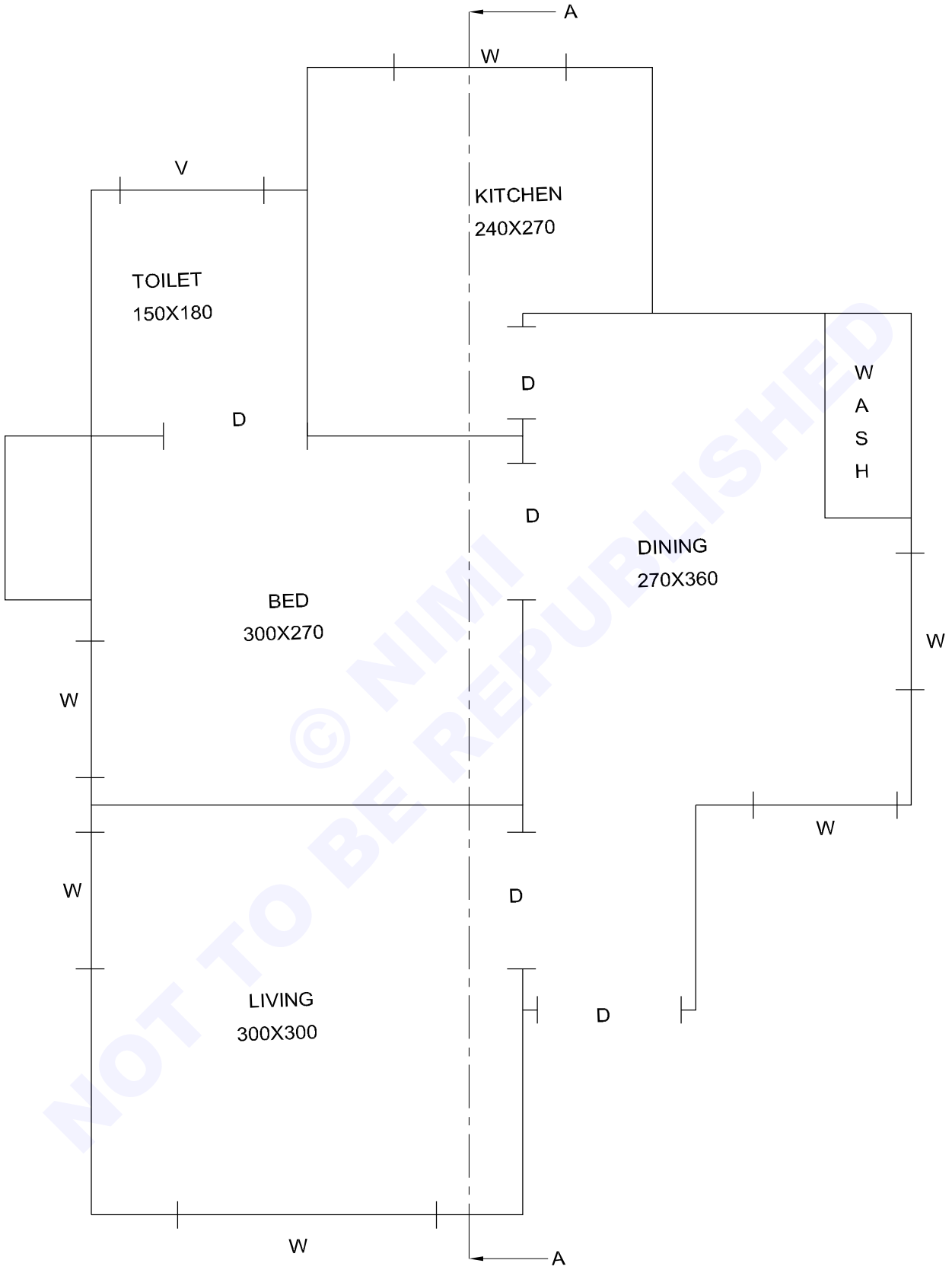
BACK ELEVATION



SECTION B B

					ALL DIMENSIONS ARE IN MILLIMETRES	
		–		–	–	1.1.04
NO.OFF	STOCK SIZE	SEMI-PRODUCT	MATERIAL	PROJECT NO.	PART NO.	EX. NO.
SCALE 1:100	**DRAWING DETAILS OF SINGLE ROOM BUILDING (FLAT)**					TIME 10h
					CODE NO. AD20N1104E3	

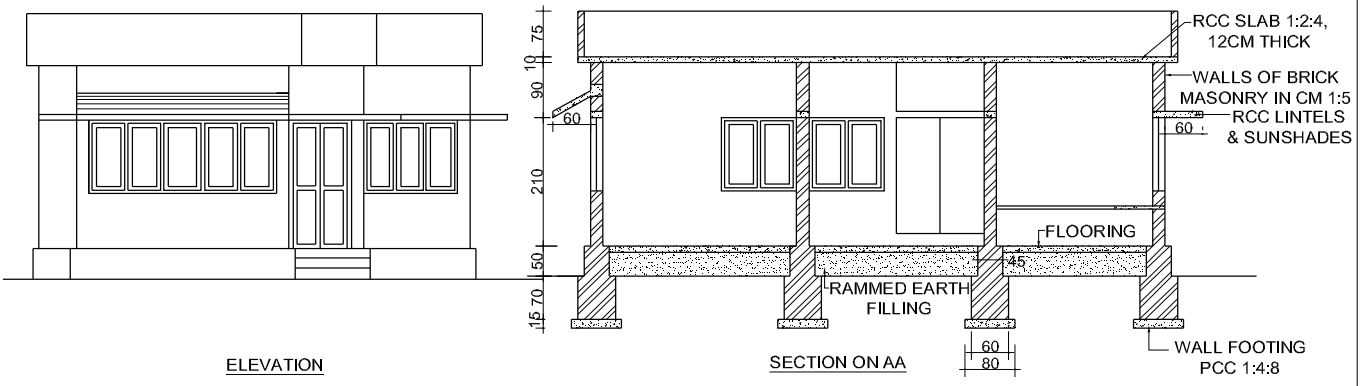
Fig 5



LINE DIAGRAM FOR A RESIDENCE

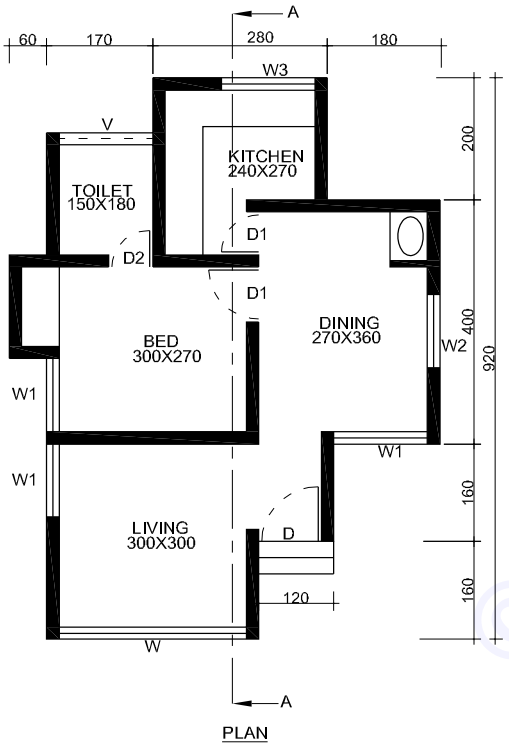
AD20N1104E5

Fig 6



ELEVATION

SECTION ON AA



PLAN

SCHEDULE OF JOINERY

MARK	ITEM	SIZE	TYPE	NOS.
D	DOOR	110X210	PANELLED	1
D1	DOOR	100X200	PANELLED	2
D2	DOOR	90X200	PANELLED	1
W1	WINDOW	300X150	GLAZED	1
W2	WINDOW	120X150	GLAZED	1
W3	WINDOW	150X120	GLAZED	1
V	VENTILATOR	150X60	GLAZED	1

SPECIFICATIONS

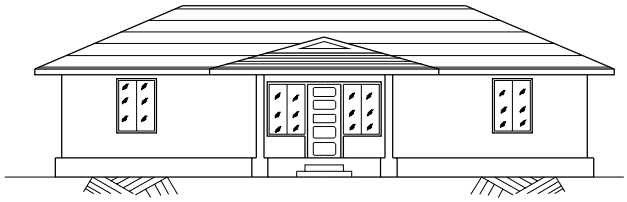
1) FOUNDATION:-
2) WALLS:-
3) LINTELS:-
4) ROOF SLAB:-
5) PLASTERING:-
6) FLOORING:-
7) PAINTING:-

Note:- Provide Foundation according to the condition of soil

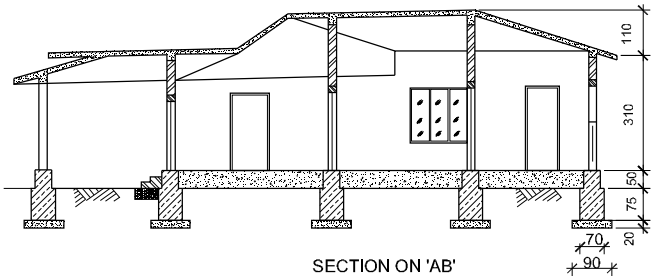
PLAN AND SECTION OF A BUILDING

AD20N1104E6

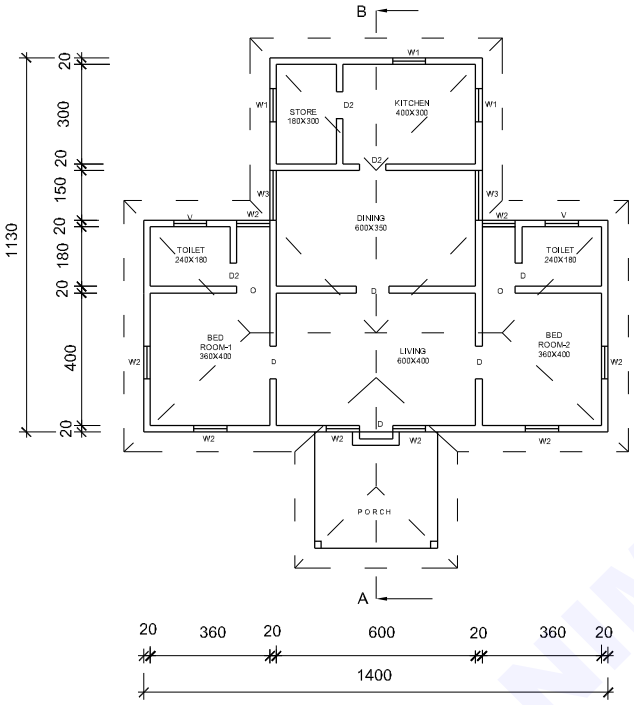
Fig 7



ELEVATION



SECTION ON 'AB'



REFERENCE:

FOUNDATION	:- R R MASONRY IN CM 1:6. 70CM WIDE 75CM DEEP OVERA LEVELLING COURSE OF PCC 1:4:8. 20CM THICK
BASEMENT	:- R R MASONRY IN CM 1:6. 50CM WIDE 50CM HEIGHT
SUPERSTRUCTURE:-	:- BRICK MASONRY IN 1:6 20CM THICK BOTH SIDE PLASTERED WITH CM 1:4 RCC LINTELS 15CM THICK ARE PROVIDED OVER ALL OPENEINGS
ROOF	:- RCC 1:11/2:3 SLAB , 12CM THICK

INDEX

MD	- MAIN DOOR WITH WINDOW (SINGLE SHUTTER NO EITHER SIDE) (110x210,60x180 CM
D	- DOOR (100x210CM)
D1	- DOOR (90x210CM)
W1	- WINDOW (100x100CM)
W2	- WINDOW (100x150CM)
W3	- WINDOW (150x150CM)
V	- VENTILATOR (100x60CM)

ASSUME SUITABLE DATA IF NECESSARY

A R.C.C SLOPED ROOF

AD20N1104E7

Draw the conventional signs and symbols used for architectural drawing

Objectives: At the end of this exercise you shall be able to
- **draw the conventional signs used for architectural drawing**
- **draw different material symbols used for architectural drawing.**

Requirements

Tools/Instruments/Equipments

- Drawing board - 1 No.
- Adjustable set square - 1 No.
- 30 cms metric scale - 1 No.
- 90cms parallel bar or 90 cms T.square - 1 No.

Materials

- A3 drawing sheet - 2 No.
- Pencil HB, B, 2B - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.

PROCEDURE

TASK 1: **Reproduce the symbols for different materials not to scale but, proportionate to the given diagrams (Fig 1)**

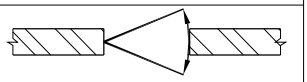
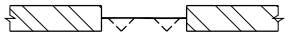
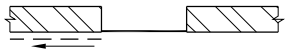
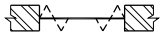
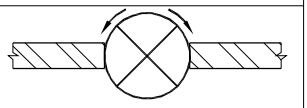
Fig 1

SL. NO.	OBJECT	SYMBOLS
01	BRICK	
02	CONCRETE	
03	STONE	
04	PARTITION BLOCK	
05	WOOD	
06	EARTH	
07	HARD WOOD	
08	PLASTER	
09	GLASS	
10	METAL SECTION	
11	FIBRE BUILDING BOARD AND INSULATION BOARD	

AD20N1105H1

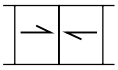
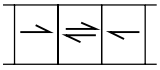
TASK 2 : **Reproduce the symbols for doors and windows not to scale but proportionate to the given diagrams (Fig 2)**

Fig 1

SL. NO.	OBJECT	SYMBOLS
01	SINGLE LEAF SINGLE SWING	
02	SINGLE LEAF DOUBLE SWING	
03	DOUBLE LEAF SINGLE SWING	
04	DOUBLE LEAF DOUBLE SWING	
05	FOLDING SIDE HUNG	
06	SLIDING DOORS	
07	FOLDING CENTRE HUNG	
08	REVOLVING DOOR	
09	ROLLING SHUTTER EXTERNAL	
10	ROLLING SHUTTER INTERNAL	

DOORS

AD20N1105J1

Sl.No.	Object	Symbols
1	Top hung	
2	Bottom hung	
3	Side hung Right hand	
4	Side hung Left hand	
5	Sliding window double shutters	
6	Sliding window 3 shutters	

Architectural symbols for trees, plants, shrubs

Objectives: At the end of this exercise you shall be able to
- **draw the architectural symbols for trees**
- **draw the architectural symbols for plants**
- **draw the srchitectural symbols for shrubs.**

Requirements

Tools/Instruments/Equipments

- Drafting board - 1 No.
- 'T' square, set square - 1 No.
- 30 cms metric scale - 1 No.
- Insrument box - 1 No.

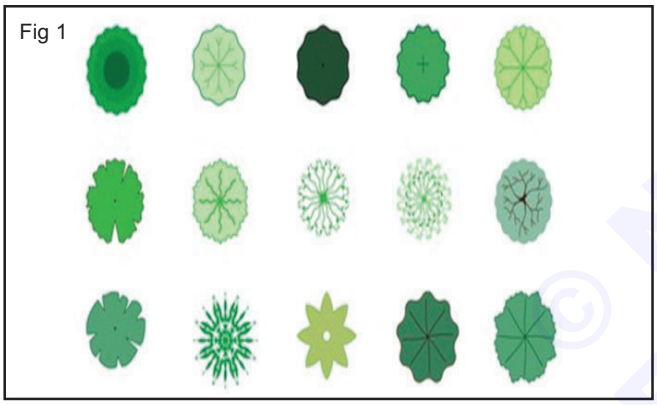
Materials

- A3 drawing sheet - 3 No.
- Pencil HB, B, 2B - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.

PROCEDURE

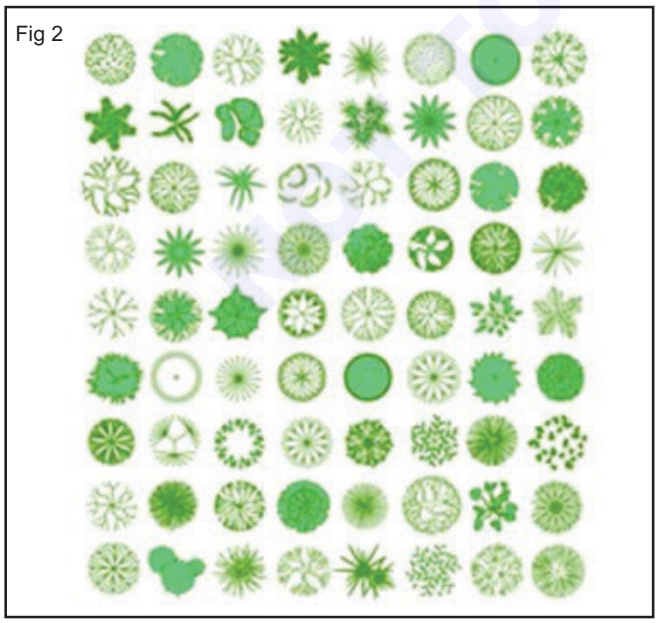
TASK 1: **Reproduce type symbol of architectural trees (Fig 1)**

Fig 1



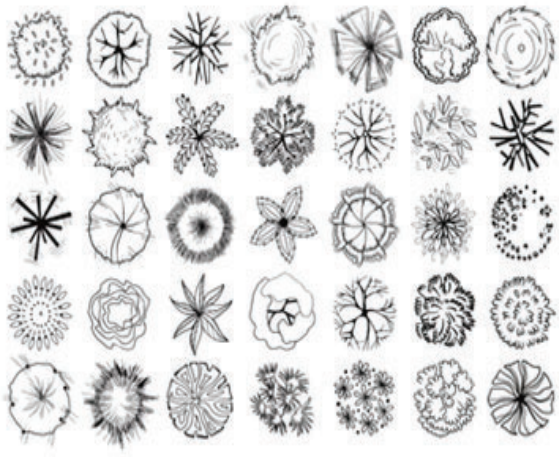
TASK 2: **Reproduce the symbol of architectural plant (Fig 1)**

Fig 2



TASK 3: **Reproduce tyhe symbol of architectural shrubs (Fig 1)**

Fig 3



Architectural symbols for plumbing and electrical fittings

Objectives: At the end of this exercise you shall be able to
- **identify the signs and symbols of various sanitary installations and fitment**
- **illustrate the signs and symbols of various sanitary installations and fitment**
- **use appropriate signs and symbols for showing sanitary installations and fitment used in drawing.**

Requirements

Tools/Instruments/Equipments

- Drafting board - 1 No.
- 'T' square, set square - 1 No.
- 30 cms metric scale - 1 No.
- Insrument box - 1 No.

Materials

- Drawing sheet A3 - 3 No.
- Pencil HB, B, 2B - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.

PROCEDURE

TASK 1: **Draw the symbols used for plumbing**

1 Layout on drawing area for showing signs and symbols of sanitary installations and fitment.

2 Illustrate signs and symbols of different types of sani tary installations and fitment.

3 Name the illustration drawn.

— — — — — — — —

Sanitary symbols and Electrical symbols

Objectives : At the end of this exercise you shall be able to
- **identify the electrical signs and symbols**
- **illustrate various electrical signs and symbols.**

TASK 1: **Draw the symbols used for sanitary**

1 Draw the sanitary symbols shown.

2 Illustrate signs and symbols used in sanitary.

3 Name the illustration drawn.

— — — — — — — —

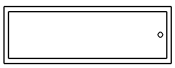
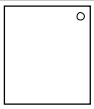
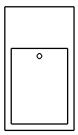
TASK 2: **Draw the symbols used for electrical**

1 Draw the electrical symbols shown.

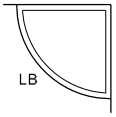
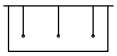
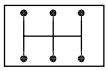
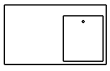
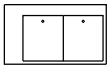
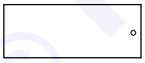
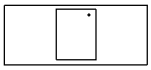
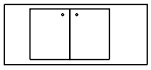
2 Illustrate signs and symbols used in electrical.

3 Name the illustration drawn.

— — — — — — — —

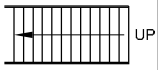
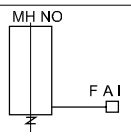
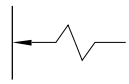
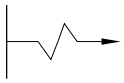
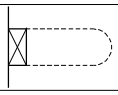
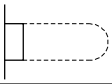
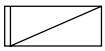
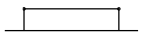
NAME	SYMBOL	NAME	SYMBOL
BATH		SHOWER TRAY	
BIDET		WASH BASIN	

SYMBOLS FOR SANITARY INSTALLATIONS-CONTD

NAME	SYMBOL	NAME	SYMBOL
CORNER LAVATORY BASIN		CLEANER'S SINK	
TROUGH LAVATORY, WALL TYPE		LAUNDRY SINK	
TROUGH LAVATORY, ISLAND TYPE		WC	
CIROULAR WASHING FOUNTAIN		URINAL BOWL	
SINGLE SINK, LEFT HAND DRAINER		URINALSTALLS	
DOUBLE SINK, LEFT HAND DRAINER		INDUSTRIAL WASHING TROUGH	
SINGLE SINK, WITH DOUBLE DRAIN BOARD		PEDESTAL DRINKING FOUNTAIN	
DOUBLE SINK, WITH DOUBLE DRAIN BOARD		DRINKING FOUNTAIN, WALL TYPE	
		FLOOR TRAP	

SYMBOLS FOR SANITARY INSTALLATIONS

AD20N1107T1

NAME	SYMBOL	NAME	SYMBOL
MANHOLE OR INSPECTION CHAMBER		STAIR	
COLD WATER CISTERN		COOKER	
INTERCEPTING TRAP AND FRESH AIR INLET		REFRIGERATOR	
VENT INLET		WASH BOILER, 'G'GAS, 'B' ELECTRIC	
VENT OUTLET		WASHING MACHINE, WRINGE TYPE	
RAIN-WATER OUTLET		WASHING MACHINE, AUTOMATIC	
RADIATOR		CENTRIFUGAL DRYER	
UNIT HEATER		CABINET DRYER	
CONVECTOR		RACK DRYER	
SURFACE PANEL, WALL TYPE		LAUNDRY TRAY, SINGLE	
SURFACE PANEL, WALL TYPE		LAUNDRY TRAY, DOUBLE	
EMBEDDED PANEL IN CAST-IN CEILING		IRONING MACHINE	
EMBEDDED PANEL IN SUSPENDED CEILING		BUILT-IN IRONING BOARD	
EMBEDDED PANEL IN CAST-IN FLOOR		SURFACING IRONING BOARD	
UNIT HEATER		BED	
TOWEL RAIL			

FITMENT SYMBOLS

AD20N1107T1

NAME	SYMBOL	NAME	SYMBOL
RELAY (AT 'N', INSERT THE NUMBER OF WAYS)		AERIAL	
		CEILING FAN	
SYNCHRONOUS CLOCK OUTLET		BRACKET FAN	
IMPULSE CLOCK OUTLET		EXHAUST FAN	
MASTER CLOCK		FAN REGULATOR	
FIRE ALARM PUSH		COOKER CONTROL UNIT	
AUTOMATIC CONTACT		EARTH POINT	
BELL CONNECTED TO FIRE ALARM		SURGE DIVERTER	
FIRE ALARM INDICATOR (AT 'N' INSERT NUMBER OF WAYS)		PILOT OR CORRIDOR LAMP	
AMPLIFIER		INDICATOR (BUZZER MAY BE ADDED, IF REQUIRED)	
CONTROL BOARD		RELAY	
MICROPHONE OUTLET		RESET POSITION	
LOUDSPEAKER OUTLET		HORN OR HOOTER	
RECEIVER OUTLET		SIREN	

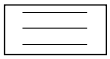
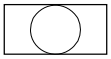
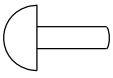
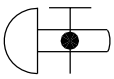
THIS GENERAL SYMBOL IS APPLICABLETO ANY SYSTEM BY THE ADDITION OFAN IDENTIFYING SYMBOL (APPROPRIATE TO A PARTICULAR SYSTEM) IN THE UPPER HALF.FOR EXAMPLE,BELL SYSTEM RELAY.

WHERE ITEMS OF OPERATIONS ARE COMBINED, THE SYMBOLS MAY BE COMBINED, FOR EXAMPLE,INDICATOR AND BELL.

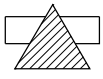
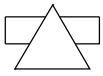
AD20N1107T2

NAME	SYMBOL	NAME	SYMBOL
MAIN FUSE- BOARD WITHOUT SWITCHES,LIGHTING		COUNTER WEIGHT PENDANT	C W
MAIN FUSE-BOARD WITH SWITCHES,LIGHTING		ROD PENDANT	R
MAIN FUSE- BOARD WITHOUT SWITCHES,POWER		CHAIN PENDANT	C
MAIN FUSE-BOARD WITH SWITCHES,POWER		LIGHT BRACKET	
LIGHT PLUGS		BATTEN LAMPHOLDER	BH
POWER PLUG		WATER-LIGHT LIGHT FITTING	W T
DISTRIBUTION FUSE-BOARD WITH OUT SWITCHES, LIGHTING		BULK-HEAD FITTING	
DISTRIBUTION FUSE-BOARD WITH SWITCHES, LIGHTING		POWER FACTOR CAPACITOR (WHEN INSTALLED REMOTE FROM THE LAMP UNIT)	
DISTRIBUTION FUSE-BOARD WITHOUT SWITCHES, POWER		FLUORESCENT LIGHT (SIGLE)	
DISTRIBUTION FUSE-BOARD WITH SWITCHES, POWER		FLUORESCENT LIGHT (DOUBLE)	
MAIN SWITCHES, LIGHTING		LIGHTING OUTLET CONNECTION TO AN EMERGENCY SYSTEM	
MAIN SWITCHES,POWER	P	CHOKE (WHEN INSTALLED REMOVE FROM THE LAMP UNIT)	
METER		ONE-WAY SWITCH	
SINGLE LIGHT PENDANT		TWO-WAY SWITCH	
PENDANT SWITCH	P	INTERMEDIATE SWITCH	
		PULL SWITCH	

AD20N1107T2

NAME	SYMBOL
SOCKET-OUTLET,2 PIN 5 AMP	
SOCKET-OUTLET,3 PIN 5 AMP	
SOCKET-OUTLET AND SWITCHCOMBINED, 2 PIN 5 AMP	
SOCKET-OUTLET AND SWITCH COMBINED, 3 PIN 5 AMP	
SOCKET-OUTLET,2 PIN 15 AMP	
SOCKET-OUTLET,3 PIN 15 AMP	
SOCKET-OUTLET AND SWITCH COMBINED, 2 PIN 15 AMP	
SOCKET-OUTLET AND SWITCH COMBINED, 3 PIN 15 AMP	
CONVECTION HEATER	
ELECTRIC UNIT HEATER	
IMMERSION HEATER	
THERMOSTAT	
IMMERSION HEATER WITH INCORPORATED THERMOSTAT	

AD20N1107T3

NAME	SYMBOL
SELF-CONTAINED ELECTRIC WATER HEATER	
HUMIDISTAT	
BELL PUSH	
BELL	
BUZZER	
INDICATOR (AT 'N' INSCRT NUMBER OF WAYS)	
TELEPHONE INSTRUMENT POINT PUBLIC SERVICE	
TELEPHONE INSTRUMENT POINT INTERNAL	
TELEPHONE CABLE DISTRIBUTION BOARD PUBLIC SERVICE	
TELEPHONE CABLE DISTRIBUTION BOARD INTERNAL	
TELEPHONE PRIVATE EXCHANGE PUBLIC SERVICE	
TELEPHONE PRIVATE EXCHANGE OR INTERNAL	

AD20N1107T3

Practice on drawing trees, plants ans shrubs

Objective: At the end of this exercise you shall be able to
- **draw by free hand trees, plants and shrubs.**

Requirements

Tools/Instruments/Equipments		Materials	
• Drafting board	- 1 No.	• A1 drawing sheet	- 1 No.
• 'T' square, set square	- 1 No.	• Pencil HB, B, 2B	- 1 No.
• 30 cms metric scale	- 1 No.	• Non dust eraser	- 1 No.
• Insrument box	- 1 No.	• Cello tape	- as reqd.
		• Sharpner	- 1 No.

PROCEDURE

TASK 1: **Drawing of trees, plants and shrubs by free hand**

Note: Instructor should guide the trainees to draw the above tasks by means of chart or PPT and explain them to draw by free hand.

— — — — — — — —

Free hand sketching of landscape and monuments

Objective: At the end of this exercise you shall be able to
- **sketch landscape or monuments.**

Requirements

Tools/Instruments/Equipments

- Drafting board - 1 No.
- Adjustable set square - 1 No.
- 30 cms metric scale - 1 No.
- 90cms parallel bar or 90 cms T.square - 1 No.

Materials

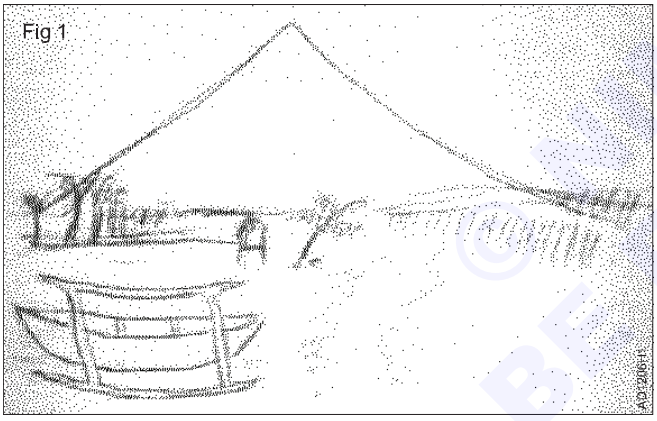
- A3 drawing sheet - 2 No.
- Pencil HB, B, 2B - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.

PROCEDURE

TASK 1: **Sketch landscape or monuments**

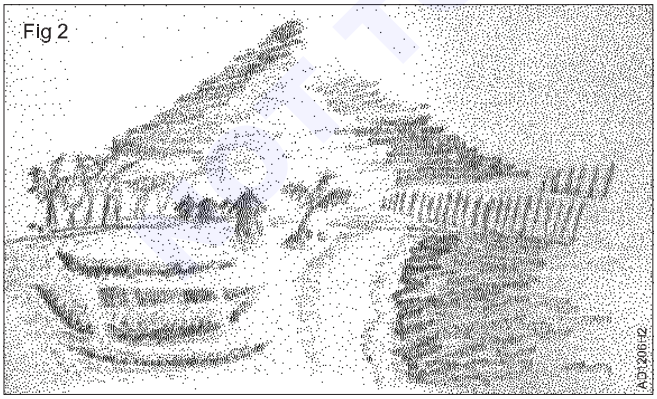
1 Draw the out line as shown in Fig 1 use HB pencil to draw the outline.

Fig 1



2 Render the landscape using 2B, 4B, 6B, pencils for various shades as shown in Fig 2.

Fig 2



3 The landscape can also be rendered using water colours or colour pencils.

4 Practice few more sketches as shown in Fig 3,4,5,6,7,8

Fig 3

Fig 4

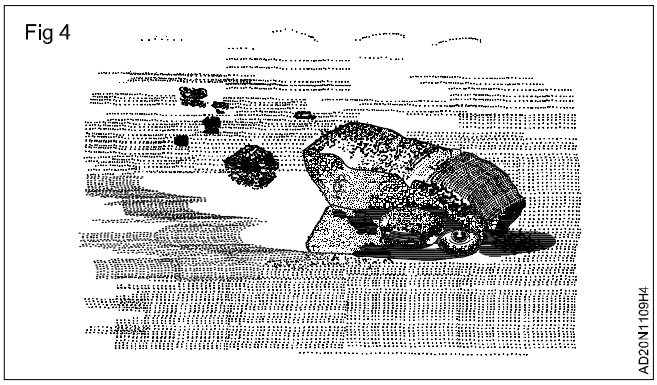
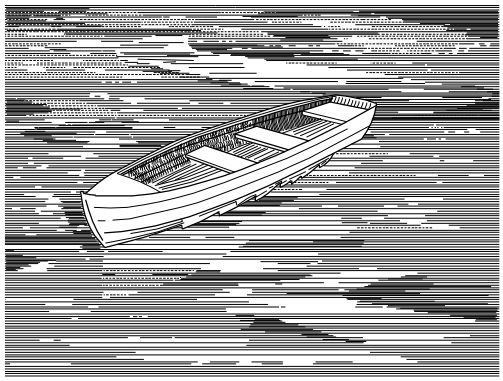
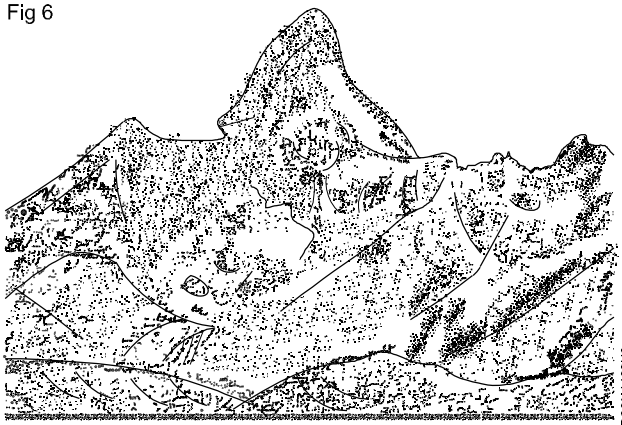


Fig 5



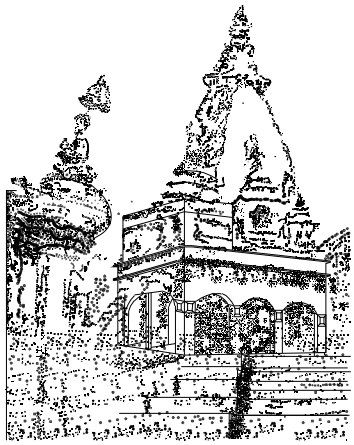
AD20N1109H5

Fig 6



AD20N1109H6

Fig 7



AD20N1109H7

Fig 8

AD20N1109H8

Note: Instruct should guide the trainees to visit any historical place nearby local areas and sketch any structure or landscape on the spot by freehand.

Skill Sequence

Types of grip

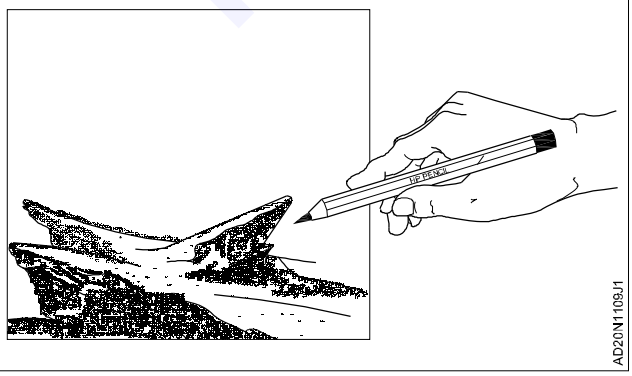
Objectives : This shall help you to

- **sketch the drawing using tripod grip**
- **sketch the drawing using extended grip**
- **sketch the drawing using overhand grip**
- **sketch the drawing using hand grip.**

Tripod Grip

1 Position the pencil applying equal pressure between the side of the middle finger, the tip of the index finger and the thumb as shown in Fig 1.

Fig 1

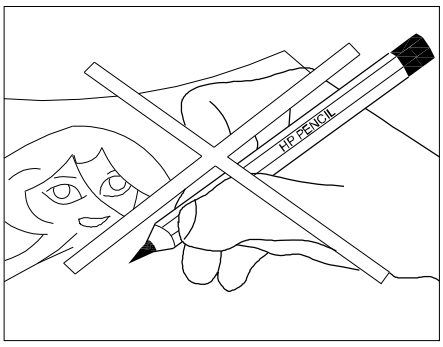


AD20N1109J1

2 Do not grip the pencil too firmly. Holding a pencil too tightly or too lightly will limit your flexibility in drawing.

3 Do not hold the pencil vertically as shown in Fig 2.

Fig 2



AD20N1109J2

check if the thumb and the underside of the forearm are in straight line.

Extended Grip

1 The tripod grip is still used, but you will hold the pencil a bit further at the end on near the tip that has the eraser. as shown in Fig 3.

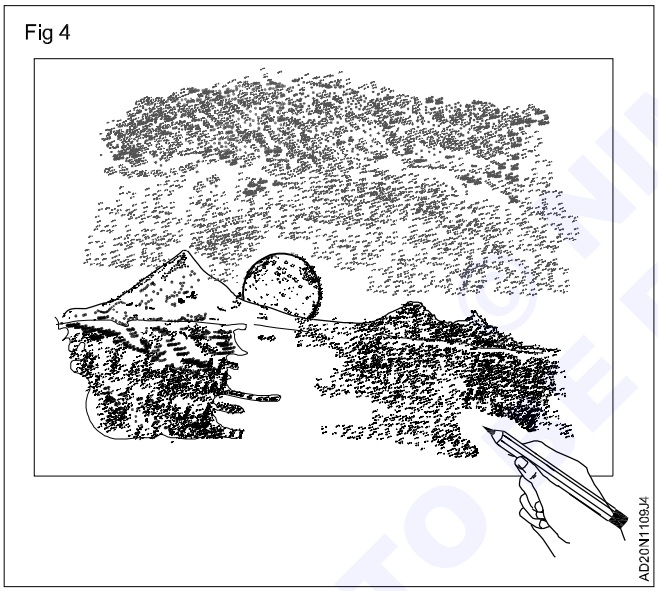
Fig 3

2 Small movements of your hand make larger effects on the other end.

Overhand Grip

1 Hold the pencil horizontally as shown in Fig 4

Fig 4



2 The overhand grip have a relaxed grip on the pencil but not too relaxed that the grip would not be secure.

3 You can draw sitting or standing, make sure that your arm has full range movement.

Under hand Grip

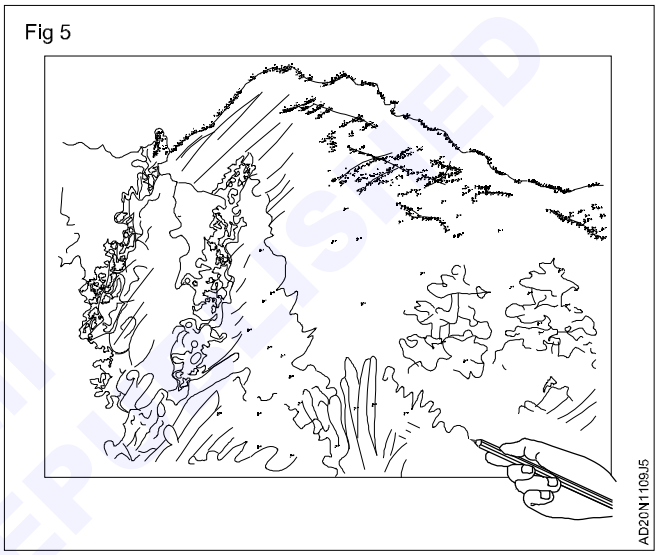
1 Hold the pencil in a relaxed way.

2 This grip is best suited for broad sketching.

3 The pencil is positioned in a ‘v’ with the middle and index finger controlling the movement as shown in Fig 5.

4 Using this type of grip will help you make from lines and small linear details.

Fig 5



Practice of an objects of different shapes

Objective: At the end of this exercise you shall be able to
- **draw geometrical solids and actual objects by free hand.**

Requirements

Tools/Instruments/Equipments

- Drawing board - 1 No.
- 'T' square, set square - 1 No.
- Instrument box - 1 No.
- 30 cms metric scale - 1 No.

Materials

- Drawing paper A2 size - 1 No.
- Pencil HB, B, 2B - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.

PROCEDURE

TASK 1: **The trainees should draw the following geometrical objects by free hand proportionally**

1 Cube
2 Rectangular block
3 Prisms (pentagonal, hexagonal, octagonal, triangular)
4 Cylinder
5 Cone
6 Pyramids (square, hexagonal, pyramid, triangular)
7 Sphere

— — — — — — — —

TASK 2: **The trainees should draw different types of object provided by the instructor**

Note: Instructor should provide actual models and guide the trainees to draw the objects by free hand.

— — — — — — — —

Types of lettering

Objectives: At the end of this exercise you shall be able to
- **select and calculate the size of letters**
- **draw the layout for printing a letters and numerals, as height and width of letter**
- **print single stroke letters and numerals**
- **print double stroke letters and numerals.**

Requirements

Tools/Instruments/Equipments

- Drafting board - 1 No.
- 'T' square, set square - 1 No.
- 30 cms metric scale - 1 No.
- Insrument box - 1 No.

Materials

- A2 drawing sheet - 2 No.
- Pencil HB, B, 2B - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.

PROCEDURE

TASK 1: **Print the letters and numerals of given size by free hand (Fig 1)**

1 Use the body proportion width/height :5/7

2 Draw three guidelines at top, middle and bottom.

3 Draw the vertical capital letters by gently touching the top & bottom guidelines.

4 Draw similar guide lines for inclined capital letters.

5 Draw the inclined letters at an angle 75° to the horizontals.

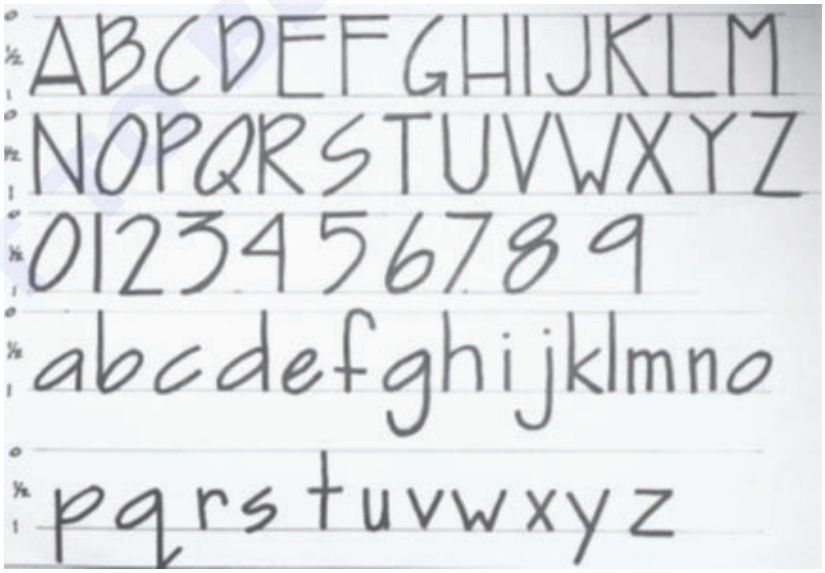
6 Complete the numericals.

7 Draw four guidelines for lower case (small) letters.

8 Draw and complete the lower case vertical and lower case inclined letters.

Fig 1

Print the alphabet A to Z and numerals 1 to 0 in the following sizes and styles



TASK 1: **Draw types of lettering (Fig 1)**

1 Select the size of letters and calculate the height & width of each letter.
2 Arrange and draw the guidelines for the required size.
3 Prepare the layout for printing of letters
4 Mark the width and spacing for each letters
5 Draw vertical guide lines
6 Print the letter by freehand, using H or HB pencil.

Fig 1

Purpose uses of lines

Objectives: At the end of this exercise you shall be able to
- **sketch and describe the illustration of the types of conventional lines**
- **apply illustrations of lines in the drawing.**

Requirements

Tools/Instruments/Equipments

- Drawing board - 1 No.
- 'T' square, set square - 1 No.
- 30 cms metric scale - 1 No.
- Instrument box - 1 No.

Materials

- A2 drawing sheet - 1 No.
- Pencil HB, B, 2B - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.

PROCEDURE

TASK 1: **Draw the following lines**

1 Write the descriptions and draw the illustration in the table.

Line	Description	General applications see figure and other relevant figure
A	Continuous thick	A1 Visible outlines A2 Visible edges
B	Continuous thin (straight or curved)	B1 Imaginary lines of intersection B2 Dimension lines B3 Projection lines or extension line B4 Leader lines B5 Hatching B6 Outline of revolved sections in place B7 Short centre lines B8 Thread lines B9 Diagonal line
C	Continuous thin free hand	C1 Limits of partial or interrupted views & sections, if the limit is not a chain thin
D	Continuous thin (straight) with zig-zags	D1 Line (see figure)
E	Dashed thick	E1 Hidden outlines E2 Hidden edges
F	Dashed thin	F1 Hidden outlines F2 Hidden edges
G	Chain thin	G1 Centre lines G2 Lines of symmetry G3 Trajectors
H	Chin thin, thick at ends & changes of direction	H1 Cutting planes
J	Chain thick	J1 Indication of lines or surfaces to which a special requirement applies
K	Chain thin double dashed	K1 Outlines of adacent parts K2 Alternative and extreme positions of movable parts K3 Centroidal lines K4 Initial outlines prior to forming K5 Parts situated in front of the cutting plane.

Draw parallel line to any given point

Objective: At the end of this exercise you shall be able to
- **draw parallel lines.**

Requirements

Tools/Equipments/Instruments		Materials	
• Drawing board	- 1 No.	• Pencil 2H, H & HB	- 1 No each.
• 'T' square, set square	- 1 No.	• Pencil eraser	- 1 No.
• Scale (Metric)	- 1 No.	• Emery sheet smooth	- a small piece.
• Divider	- 1 No.	• Clean cotton cloth	- as reqd.
• Compass	- 1 No.	• A3 drawing sheet	- 1 No.

PROCEDURE

TASK 1: **Draw six horizontal parallel lines of 50mm long with 10mm intervals (Fig 1)**

Fig 1

Follow the procedure and draw the exercise in the work book practice sheet.

1 Draw a vertical line AB 50mm long, using setsquare on left side.

2 Mark points on the vertical line AB with 10mm intervals.

3 Butt a setsquare on the line AB.

4 Using another setsquare, draw parallel lines through the points marked.

Use sharpened conical point pencil.

Keep the pencil slightly inclined towards the direction of the movement.

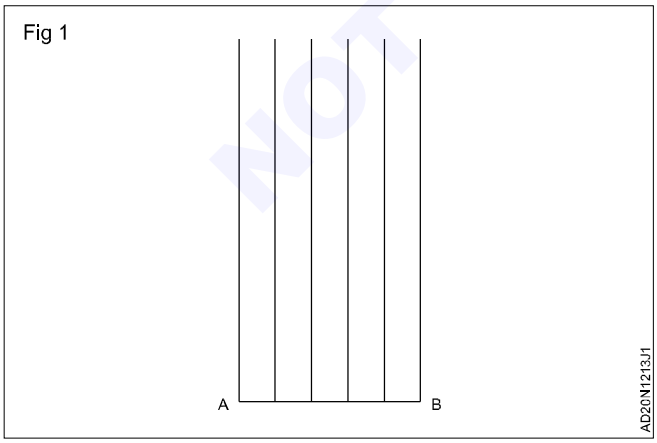
While drawing rotate the pencil to keep the constant thickness.

Maintain uniform pressure on the lead of the pencil.

— — — — — — — —

TASK 2: **Draw six vertical parallel lines of 50mm length with 10mm intervals (Fig 1)**

Fig 1



1 Draw a horizontal line AB 50mm long.

2 Mark the points with 10mm intervals.

3 Butt a setsquare on the line AB.

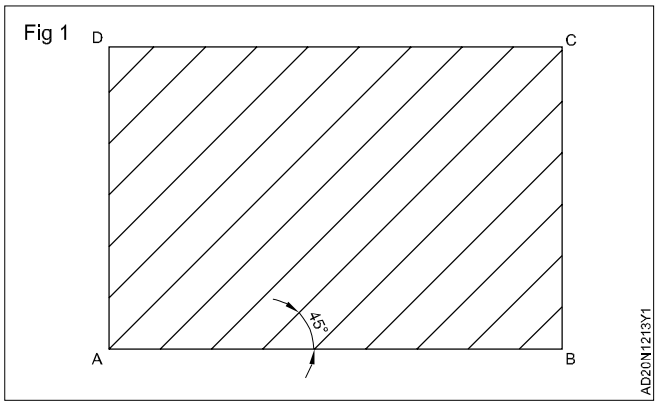
4 Using another setsquare draw vertical parallel lines from left to right.

Draw the vertical lines from bottom to top.

— — — — — — — —

TASK 3: **Draw 45° inclined lines (Fig 1)**

Fig 1



1 Draw a horizontal line AB 60mm long.

2 Butt a setsquare on the line AB, draw vertical lines from the points A and B using another setsquare.

3 Set off AD and BC equals to 40mm and complete the box.

4 On lines AB and DC mark 10mm points.

5 Butting the 60° setsquare on the line AB, using 45° setsquare draw inclined parallel lines through the marked points.

Draw lines from bottom to top.

Divide a line into any number of equal parts

Objective: At the end of this exercise you shall be able to
- **divide any number of equal parts in a given line.**

Requirements

Tools/Equipments/Instruments		Materials	
• Drawing board	- 1 No.	• A3 drawing sheet	- 1 No.
• 'T' square, set square	- 1 No.	• Pencil 2H, H & HB	- 1 No each.
• Metric scale	- 1 No.	• Pencil eraser	- 1 No.
		• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Divide a line into any number of equal parts (say 5)**

1 Draw a line AB to a convenient length (say 65mm) (Fig 1).

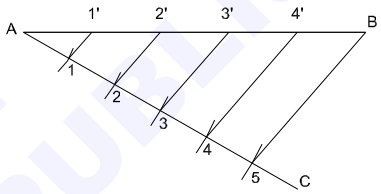
2 At 'A' draw a line AC to a required length, forming an angle BAC. (Always it is better to form an acute angle).

3 Set off 5 equal arcs on the line AC meeting at 1,2,3,4 & 5. (As many equal parts as required).

4 Join 5 & B.

5 From the points 4,3,2 & 1 draw lines parallel to 5-B meeting the line AB at 4',3',2' & 1'.

Fig 1



6 Now the line AB is divided into 5 equal parts.

Bisect a line, arc or angle

Objectives: At the end of this exercise you shall be able to
- **bisect a given line**
- **bisect a given angle.**

Requirements

Tools/Equipments/Instruments

• Drawing board	- 1 No.
• 'T' square, set square	- 1 No.
• Metric scale	- 1 No.
• Instrument box	- 1 No.

Materials

• A3 drawing sheet	- 1 No.
• Pencil 2H, H & HB	- 1 No each.
• Pencil eraser	- 1 No.
• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Bisect a given straight line (Fig 1)**

1 Draw a line AB of 70mm long.

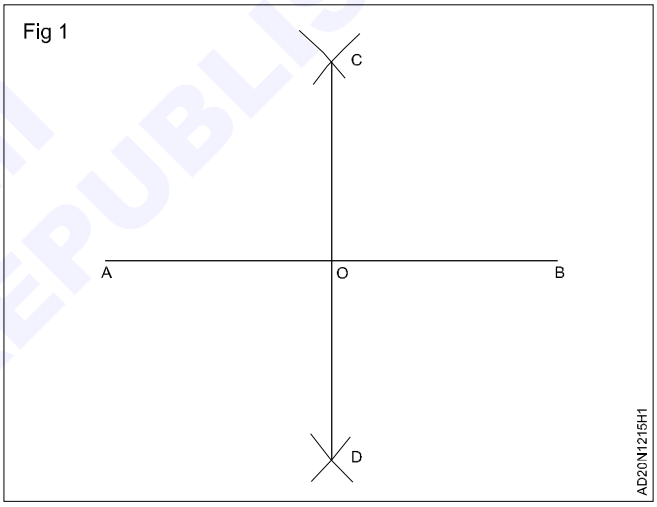
2 With A and B as centres, more than half of AB as radius describe arcs on either side of the line AB.

3 Draw arcs intersect at C&D.

4 Join CD, bisecting the line AB at 0.

5 CD is the bisector of the line AB and AO = OB.

Fig 1



TASK 2: **Draw a perpendicular to a given straight line from a given point in it (Fig 1)**

1 'C' is the point on the line.

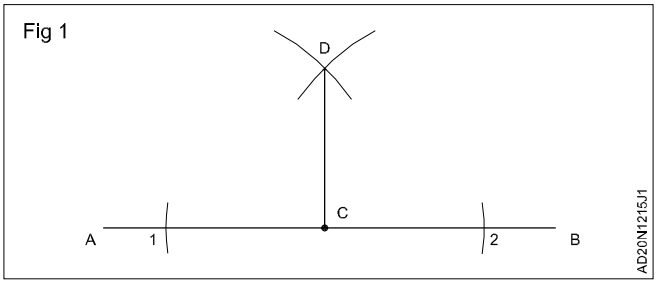
2 'C' as centre draw arcs on the line AB at 1 & 2.

3 Draw arcs above AB from center 1 & 2 to intersect at D.

4 Join DC.

5 CD is the perpendicular line from the point 'C'.

Fig 1



TASK 3: **Draw a perpendicular to a given straight line when the point is at the end of the line (Fig 1)**

1 Draw a line AB (say 75mm)

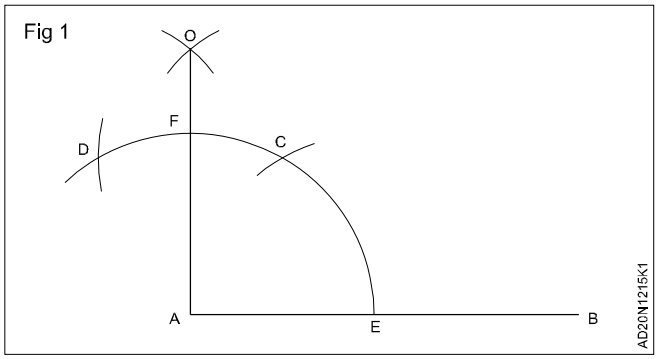
2 'A' as centre to a convenient radius draw an arc to meet AB at E.

3 'E' as centre AE as radius draw an arc to cut the previous arc at 'C'.

4 'C' as centre and with the same radius draw another arc to cut at 'D'.

5 Bisect the arc DC at O.

6 Join OA and AO is perpendicular to the line AB from the point 'A'.



TASK 4: **Trisect a given right angle (Fig 1)**

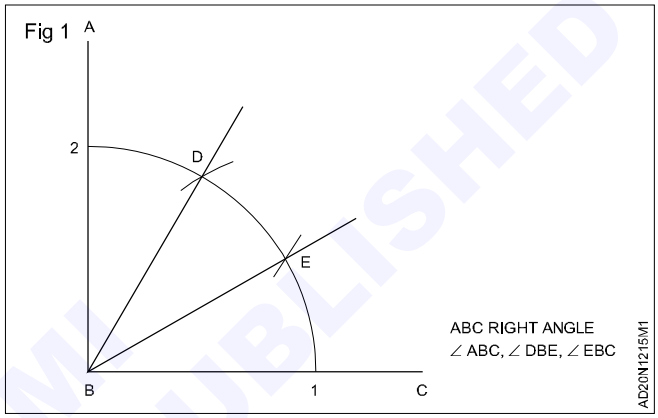
1 Draw a right angle ABC.

2 With 'B' as centre to convenient radius, draw an arc meeting the line BC and BA at 1 & 2 respectively.

3 With 1 & 2 as centres, B-1 as radius, draw arcs to cut the previous arc at D&E respectively.

4 Join BE & BD.

5 Now $\angle ABD = \angle DBE = \angle EBC$.



TASK 5: **Bisect a given angle (Fig 1)**

1 Construct an angle BAC (say 30°).

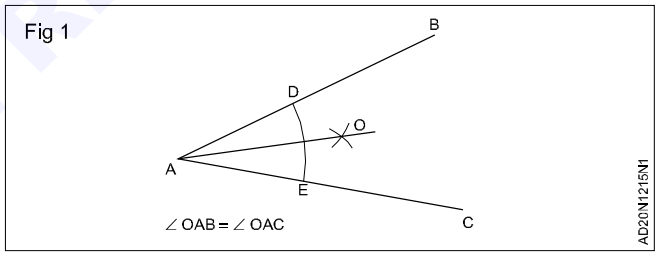
2 'A' as centre to a convenient radius draw an arc to cut line AC at 'E' and AB at 'D'.

3 Bisect the arc DE at 'O'.

4 Join AO.

5 AO is the bisector of the angle BAC.

6 Now $\angle OAB = \angle OAC$.



TASK 6: **Construct an angle equal to 75° (Fig 1)**

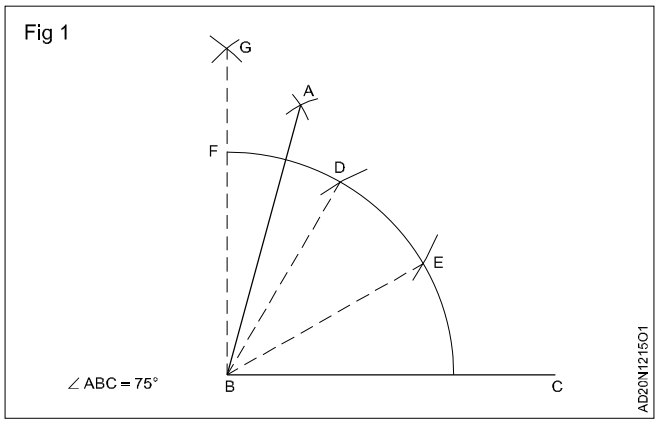
1 Draw a line BC (60mm long).

2 At 'B' erect a perpendicular GB and now $\angle GBC$ is a right angle.

3 Trisect the angle FBC at D&E.

4 Bisect the angle FBD at 'A'.

5 Now angle ABC = 75°.



TASK 7: **Construct an angle equal to $22\frac{1}{2}^{\circ}$ (Fig 1)**

1 Draw a line BC to a convenient length.

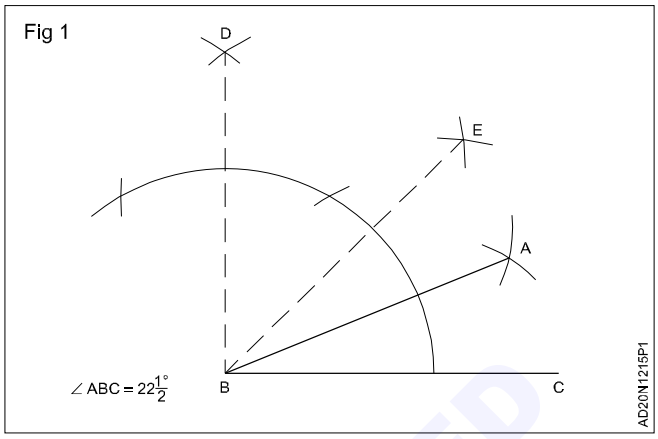
2 At 'B' erect a perpendicular BD and $\angle DBC$ is right angle.

3 Bisect the $\angle DBC$ at 'E'.

4 $\angle DBC = \angle EBC = 45°$

5 Bisect $\angle EBC$ at 'A'.

6 Now $\angle ABC = 22\frac{1}{2}^{\circ}$



Geometrical construction - Square, triangle, polygon and ellipse

Objectives: At the end of this exercise you shall be able to
- **draw a square**
- **draw the types of triangle**
- **draw the types of polygon**
- **constructing a ellipse by different methods.**

Requirements

Tools/Equipments/Instruments		Materials	
• Drawing board	- 1 No.	• Drawing sheet	- as reqd.
• 'T' square, set square	- 1 No.	• Pencil 2H, H & HB	- 1 No each.
• Metric scale	- 1 No.	• Pencil eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw a square (Fig 1)**

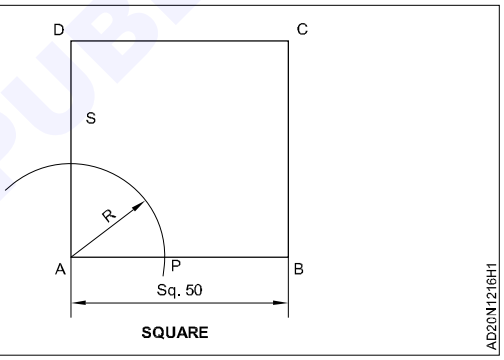
A square of side 50mm by erecting perpendicular

1 Draw a line AB 50mm long.

2 A as a centre, draw an arc of convenient radius 'r' touching the line AB at 'P'.

3 'P' as centre and radius 'r' draw another arc cutting the earlier draw arc at 'Q'.

Fig 1



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TASK 2: **Construct an equilateral triangle (Fig 1)**

1 Draw a horizontal line of length 70mm and name AB.

2 From A, draw an arc as radius of length of line AB,

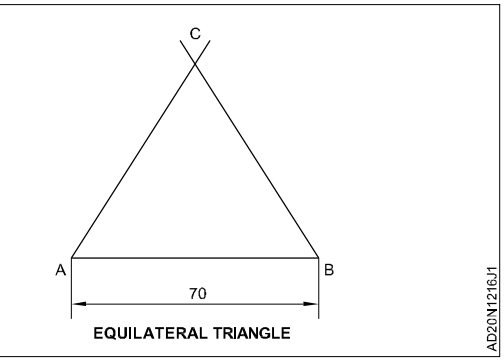
3 Similarly, from B draw an arc as radius of length of line AB to intersect the first arc.

4 Name the intersect point C.

5 Joined AC and BC points with a line to form a triangle.

6 Construct triangle is an equilateral triangle.

Fig 1



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TASK 3: **Construct a scalene triangle (Fig 1)**

Length of all three sides are given, AB = 35mm, AC = 60mm & BC = 40mm.

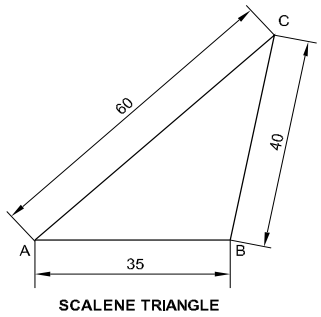
1 Draw base line AB = 35mm.

2 'A' as centre draw an arc of radius 60mm.

3 'B' as centre draw an arc of 40mm, cutting tjhe prevoius arc at 'C'.

4 Join CA & CB, ABC is the required scalene triangle.

Fig 1



SCALENE TRIANGLE

AD20N1216K1

TASK 4: **Construct a right angled triangle (Fig 1)**

AB = 80mm, BC = 60mm.

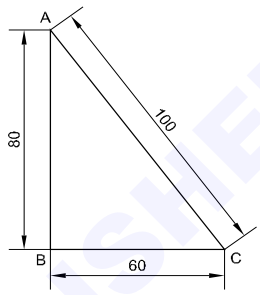
1 Draw the horizontal line BC to length 60mm.

2 Erect a perpendicular to length 80mm at B.

3 Join AC.

4 ABC is the required right angled triangle.

Fig 1



RIGHT ANGLE TRIANGLE

AD20N1216M1

TASK 5: **Construct an isosceles triangle (Fig 1)**

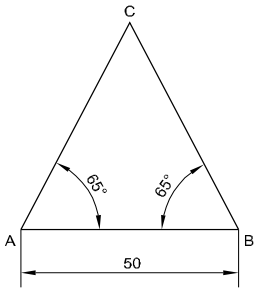
AB = 50mm and $\angle CAB = \angle ABC = 65°$

1 Draw line AB = 50mm.

2 Set an angle 65° at A and B.

3 Extent the line meeting at C, ABC is the required an isosceles triangle.

Fig 1



ISOSCELES TRIANGLE

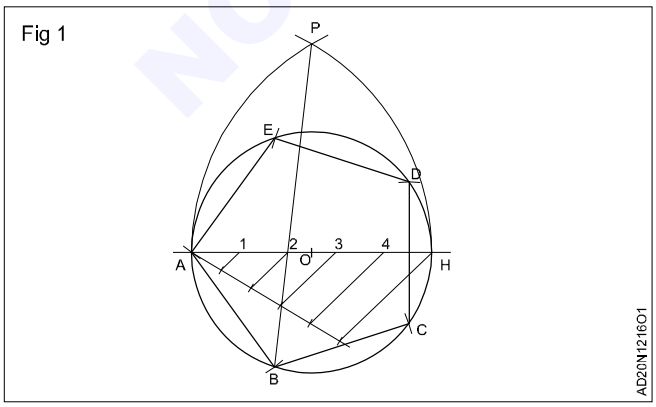
AD20N1216N1

To construct polygons

Objective: At the end of this exercise you shall be able to
- **construct a regular polygon from given data.**

TASK 1: **Pentagon inside a circle of diameter 80 mm (Fig 1)**

Fig 1



AD20N1216G1

1 Draw the line AH equals to 80 mm. (Diameter of circle)

2 `O' as centre OA as radius describe a circle.

3 Divide AH into 5 equal parts (as many equal parts as the sides).

4 A and H as centres, AH as radius describe arcs intersecting at P.

5 Join P2 and extend it to meet the circle at B.

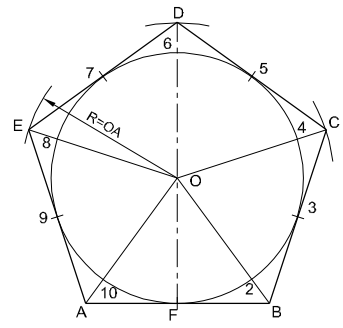
6 Set off BC, CD, DE, EF equals to AB on the circle.

7 Join the points

8 ABCDEF is the required pentagon.

TASK 2: **Pentagon outside a circle of diameter 80 mm (Fig 1)**

Fig 1



1 O as centre and OF as radius describe a circle of dia 80 mm.

2 Draw the line DF vertically beyond the top of the circle.

3 Divide the circle into 10 equal parts. (Twice as many equal parts as the number of sides)

4 Points 1,3,5,7 and 9 are the tangent points of the pentagon.

5 Join 02, 04, 06, 08, 010 and extend to a convenient length.

6 Draw a tangent to the circle through point 1 (F).

7 The tangent cuts the lines 0-2 and 0-10 lines at A & B.

8 Draw tangents on points 3,5,7,9 & locate C,D & E in the same manner.

9 Join BC, CD, DE, EA

10 ABCDE is the required pentagon.

— — — — — — — —

TASK 3: **Three circle method (Fig 1)**

Pentagon of 38 mm side

1 Draw the line AB equal to side of pentagon 38 mm.

2 Draw two circles of radius equal and AB, with center A and B, cutting at two points F and G.

3 Join G and F extend upwards.

4 AB as radius, G as centre, draw a circle passing through A and B cutting both the circles at H and J, and also cutting the line FG at K.

5 Join HK and extend to cut the circle (b) at C.

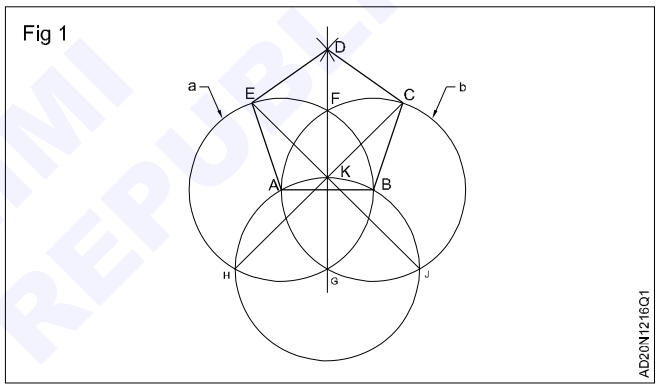
6 Join JK and extend to cut circle (a) at E.

7 Join AE and BC.

8 E and C as centers, AB as radius, draw arcs to cut at D.

9 Join ED and CD. ABCDE is the regular pentagon.

Fig 1



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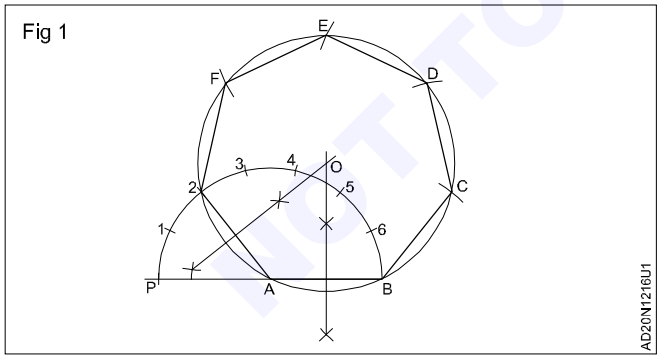
TASK 4: **Regular heptagon of side 30 mm**

Semi-circular method - Type A (Fig 1)

Fig 1



1 Draw a line AB equal to 30 mm.

2 Extend BA to a convenient length.

3 A as centre and radius AB describe a semi-circle.

4 Divide the semi-circle into seven equal parts (number of sides) using divider.

5 Number the points as 1,2,3,4,5,6 starting from P.

6 Draw the perpendicular bisectors from 2A and AB intersecting at 0.

7 0 as centre and OA or OB as radius describe a circle.

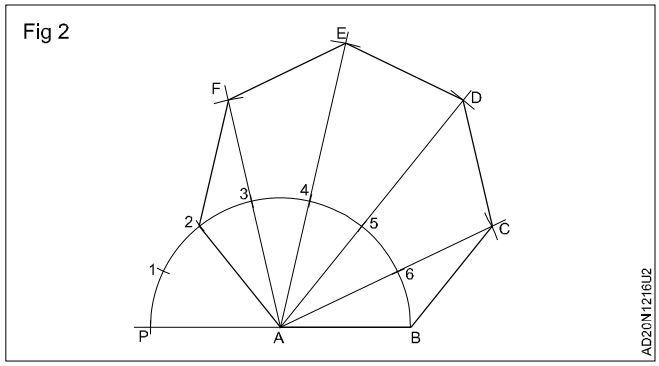
8 Mark the points C,D,E,F and 2 on the circle such that BC = CD = DE = EF = F2 = AB = 2A.

9 Join the line BC, CD, DE, EF and F2.

10 ABCDEF2 is required heptagon.

Semi-circle method - Type B (Fig 2)

Fig 2



Follow the procedure of Type A upto dividing the semi-circle into number of equal parts.

1 Join A2

2 Join A3, A4, A5 and A6 and extend to a convenient length.

3 With centre B and radius AB draw an arc cutting A6 extended line at C.

4 C as centre and same radius, draw an arc cutting the line A5 at D.

5 Locate the points E & F in the same manner.

6 Join BC, CD, DE, EF and F2.

7 ABCDEF2 is the required heptagon.

Perpendicular bisector method - Type A (Fig 3)

1 Draw a line AB equal to 30 mm.

2 At B, draw a line BP perpendicular AB and equal to AB.

3 Join AP

4 B as centre BA as radius, draw an arc AP.

5 Bisect AB and draw the bisector cutting the line AP and the arc AP at 4 & 6 respectively.

6 Mark 5 the mid point of 4-6.

7 Set off 6-7, 7-8, 8-9, 9-10 equals to 4-5.

8 7 as centre, 7A as radius, draw a circle on AB.

9 On the circumference set off BC, CD, DE, EF, FG equals to AB.

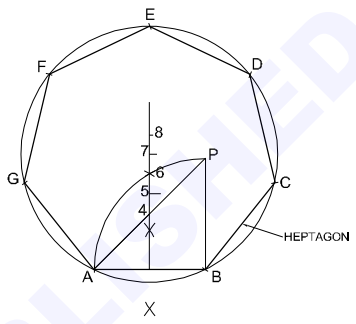
10 Join BC, CD, DE, EF, FG and GA.

11 ABCDEFG is the required heptagon.

12 Mark point 5 at the mid-point of 4 and 6 and complete the heptogon.

In this method also any regular polygon of different sides can be constructed.

Fig 3



TASK 5: **Hexagon of side 32 mm (Fig 1)**

Protractor method

1 Draw AB equal to 32 mm.

2 Set angle 120° at A and B.

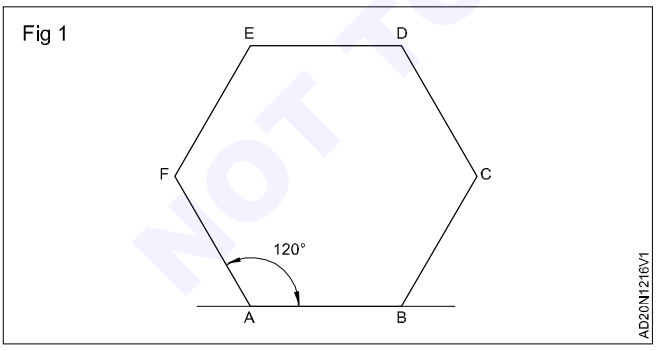
3 Mark off AF & BC equal to 32 mm with divider.

4 Draw FE and CD equal to 32 mm parallel to BC and AF respectively.

5 Join ED

ABCDEF is the required hexagon.

Fig 1



Using Tee square and 30°-60° setsquare (Fig 2)

1 Hexagon of side 32 mm, draw a line 32 mm long using T square, mark it as AB.

2 Using 30°-60° setsquare draw lines A-1 , B - 2 , A - 3 and B - 4 lines, A - 3 and B - 2 intersect at 0.

3 Draw a horizontal line passing through 0, cutting the lines A-1 and B-4 at points 1 and 4.

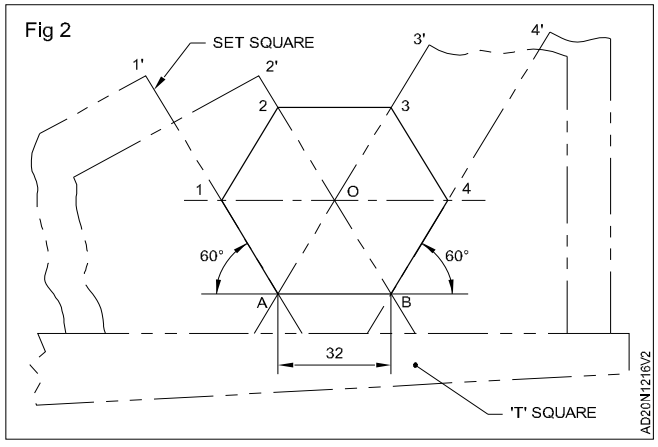
4 Join points 1-A and 4-B.

5 From point 1, draw a parallel to B-4, cutting the line B02 at 2.

6 From point 4, draw a parallel to A-1, cutting the line A03 at 3.

7 Join the points 2 and 3.

Fig 2



Arc method

Hexagon of side 32 mm (Fig 3)

1 Draw a horizontal line.

2 Draw a circle of radius 32 mm.

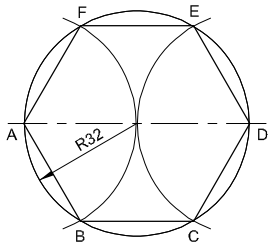
3 Mark the diameter AD

4 With same radius, A and D as centres. draw two arcs cutting the circle at points B,F,E & C respectively.

5 Join AB, BC, CD, DE, EF and FA.

ABCDE is the required hexagon.

Fig 3



Arc method (Fig 4)

Hexagon inside a circle of diameter 78 mm (inscribing)

1 Draw a line FC equal to 78 mm (Diameter of circle).

2 'O' as centre describe a circle on the diameter FC.

3 F as centre FO as radius draw an arc at A.

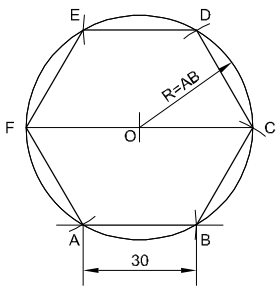
4 'A' as centre, same radius draw an arc at B.

5 In the same manner set the points D,E.

6 Join AB, BC, CD, DE, EF on FA.

ABCDEF is the required hexagon

Fig 4



Setsquare on Tee square method (Fig 5)

1 Draw a horizontal line length 78 mm.

2 With radius 39 mm draw a circle cutting the line. Mark them as A and D.

3 Place the 60° - 30° setsquare keeping 60° corner at A.

4 Mark point C on the circle along the setsquare.

5 Move the setsquare/'T' square and align with D.

6 Mark point F on the circle along the setsquare.

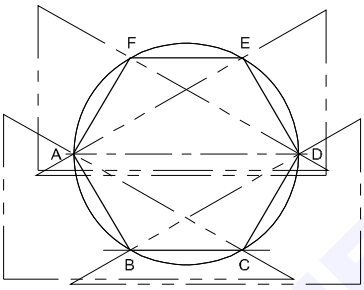
7 Reverse the setsquare by placing 60° angle at D.

8 Mark point B on the circle along the setsquare.

9 Align the setsquare with point A and mark E on the circle.

10 Join the points A,B,C,D,E,F and A and form the hexagon.

Fig 5



Across flats method (Fig 6)

Hexagon, distance across flat of 45 mm

1 Draw a circle of ϕ 45. (45 mm is the size across flat)

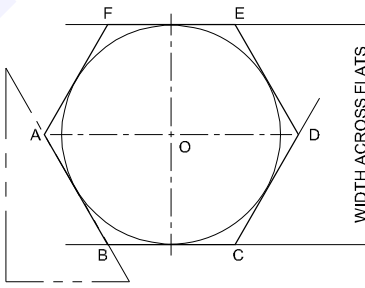
2 Draw two horizontal tangents BC and FE.

3 With 60° setsquare draw four tangents, touching the horizontal tangents.

4 Mark the corners A,B,C,D,E and F.

ABCDEF is the required hexagon.

Fig 6



TASK 6: **Special method (Fig 1)**

Heptagon inside a circle of diameter 80 mm

1 Draw a line AH equal to 80 mm.

2 Describe a circle on AH with 0 as centre.

3 A as centre AO as radius draw an arc 5-0-1.

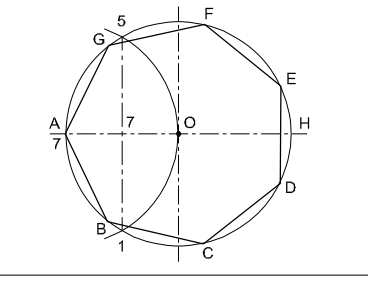
4 Join 5-1 cutting AH at 7.

5 1-7 as radius divide the circle starting from A marking 7 equal parts at B,C,D,E,F and G.

6 Join AB, BC, CD, DE, EF, FG and GA.

7 ABCDEFG is the required heptagon.

Fig 1



TASK 7: **Octagon of side 36 mm (Fig 1)**

1 Draw a horizontal line AB equals to 36 mm.

2 Set an angle of 135° (or 45°) at A and B.

3 A and B as centres, with radius AB, draw arcs, cutting the lines at H and C.

4 Draw vertical lines from H and C upwards.

5 Mark length HG and CD equal to AB.

6 From point G draw a line GF parallel and equal to BC.

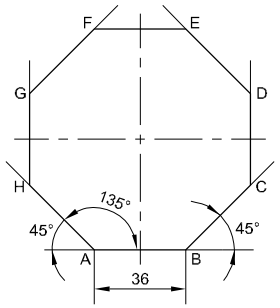
7 From point D draw a line DE parallel and equal to AH.

8 Join FE

9 All the sides are equal and interior angles are equal.

ABCDEFGH is the octagon required.

Fig 1



AD20N1216W1

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Constructing of ellipse by different methods

Objective: At the end of this exercise you shall be able to
- **construct ellipse with the given conditions.**

TASK 1: **Rectangle/Oblong method (Fig 1A)**

Construct an ellipse of major axis 100mm and minor axis 60mm.

1 Draw a rectangle EFGH of sides 100mm and 60mm.

2 Draw a major axis AB and minor axis CD and mark the intersection as 'O'.

3 Divide AO and OB into 5 equal parts each and name them as shown.

4 Divide AE, AG, BF and BH into 5 equal parts and each number of them as shown.

5 Draw lines and form C1, C2, C3, C4, D1, D2, D3, and D4.

6 Draw lines such as Ca, Cb, Da, and Db, etc to meet the corresponding lines drawn from C and D at points P1, P2 etc.

7 Join A, P1, P2 etc with a smooth curve and form the ellipse.

— — — — — — — —

TASK 2: **Concentric circle method (Fig 1B)**

Major axis = 100mm, Minor axis = 60mm

1 Draw the major axis AB (100mm) and minor axis CD (60mm), bisecting at right angle at O.

2 'O' as centre OA and OC as radius, draw two concetric circles.

3 Draw a number of radial lines through 'O' say 4 cutting the two circles.

4 Mark the point on the outer circle as a, b, c.

5 Similarly mark the intersecting points on inner circles as a1, b1, c1.

6 From points such as a, b, c… draw lines parallel to minor axis.

7 From points such as a1, b1…..draw lines parallel to the major axis to intersect with the corresponding vertical lines at point's p1, p2.....etc.

8 Join all these points with a smooth curve using "French curve" and form the ellipse.

9 To find the 'foci'- with half the major axis (a) as radius and with 'c' on the minor axis as centre. Draw an arc cutting the major axis, at two points; mark them as F1, F2, and the focus points of the ellipse.

Check

Mark any point P on the curve and measure its distance from X axis and Y axis.

You will observe that X2/a2 + Y2/b2 = 1

Where a = 50mm and b =30mm.

— — — — — — — —

TASK 3: **Intersecting arc method (Fig 1C)**

1 Draw AB (100mm) and CD (55mm) bisecting at right angles represent major and minor axis.

2 C as centre, half major axis as radius, draws an arc on AB cutting F1 and F2.

3 Mark any number of parts between on F1. F2 as 1, 2, 3 etc.

4 F1 and F2 as centers and A-1 as radius, draw arcs on either side of AB.

5 F1 and F2 as centers. B-1 as radius and draw arcs cutting the previous corresponding arcs at P1.

6 Repeat previous two steps and obtain points such as P2, P3 etc.

7 Join all the P1& P2etc with a smooth curve passing through vertex A and B to complete the ellipse.

Fig 1

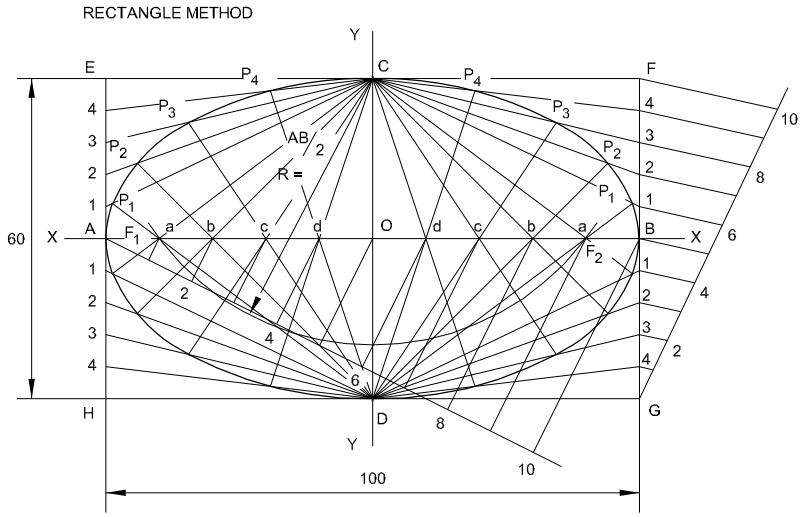


Fig 1A

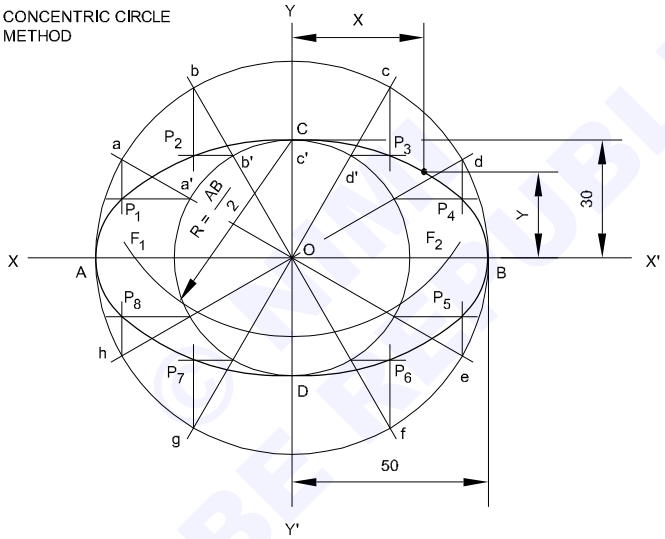


Fig 1B

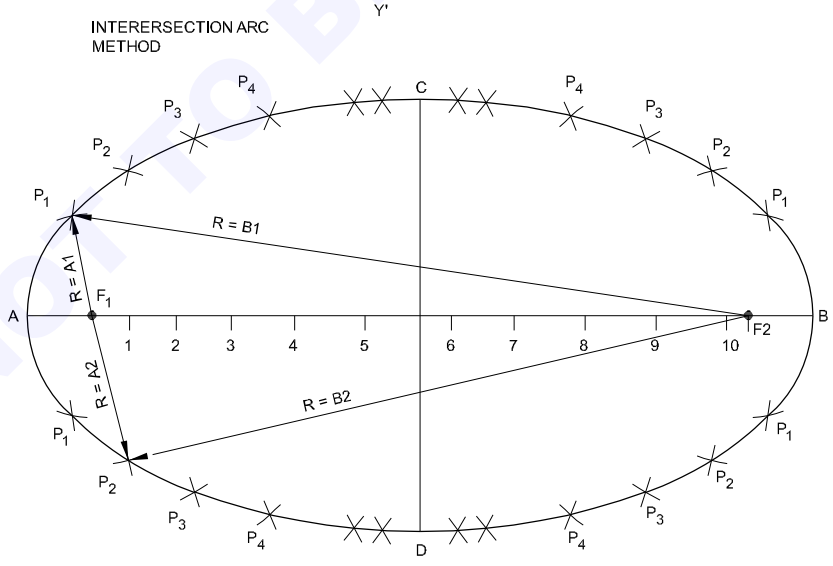


Fig 1C

AD20N1216X1

Dimensioning techniques

Objectives: At the end of this exercise you shall be able to
- **draw different systems of dimensioning**
- **dimension the drawings by aligned system and unidirectional system**
- **follow the standard of system of dimensioning with different arrangements of dimensional values.**

Requirements

Tools/Equipments/Instruments

- Drawing board - 1 No.
- 'T' square - 1 No.
- Set square - 1 No.
- Metric scale - 1 No.
- Instrument box - 1 No.

Materials

- A3 drawing sheet - 3 Nos.
- Pencil 2H, H & HB - 1 No each.
- Pencil eraser - 1 No.
- Cello tape - as reqd.

PROCEDURE

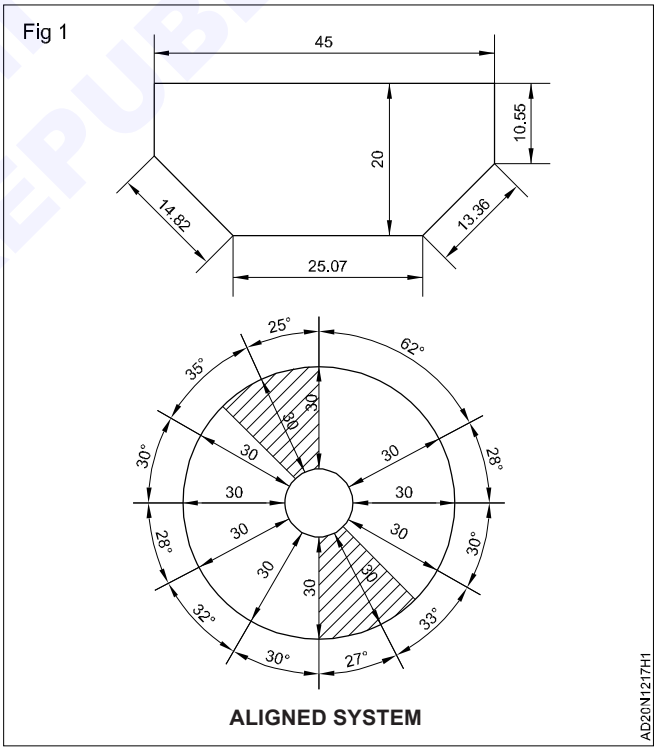
TASK 1: **To show aligned system of dimensioning**

1 Draw the figures as shown (Fig 1).

2 Show the dimension lines in the figures.

3 Place the dimension value above the dimension line centrally as direction.

Fig 1

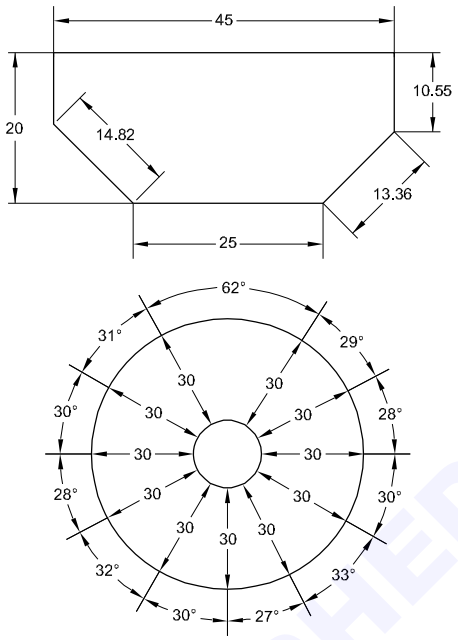


ALIGNED SYSTEM

TASK 2: **To show unidirectional system of dimensioning**

- Draw the figures as shown (Fig 1).
- Show the dimension lines in the figures.
- Cut the dimension line at center to place the dimension value horizontally.

Fig 1



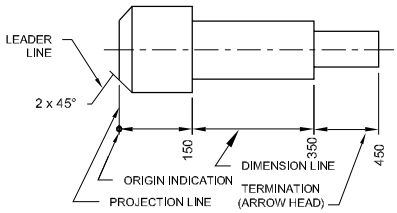
UNIDIRECTIONAL SYSTEM

AD20N1217J1

TASK 3: **To show various notations used in dimensioning (Figs 1 to 7)**

Arrangements of Dimensional Values

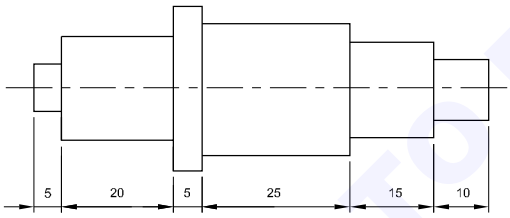
Fig 1



ELEMENTS OF DIMENSIONING

AD20N1217X1

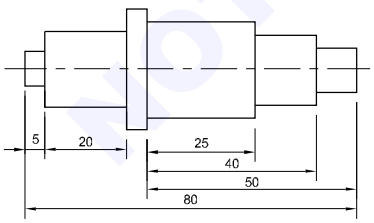
Fig 2



CHAIN DIMENSION

AD20N1217X2

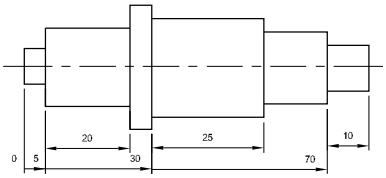
Fig 3



COMBINED DIMENSIONING (CHAIN AND PARALLEL)

AD20N1217X3

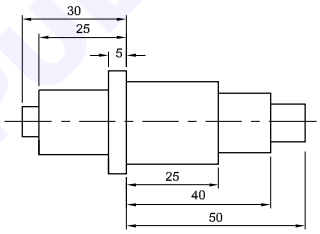
Fig 4



COMBINED DIMENSIONING (CHAIN AND SUPERIMPOSED RUNNING)

AD20N1217X4

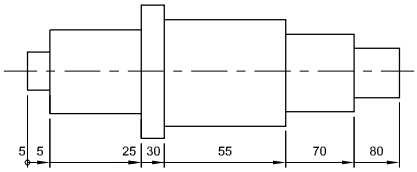
Fig 5



PARALLEL DIMENSIONING

AD20N1217X5

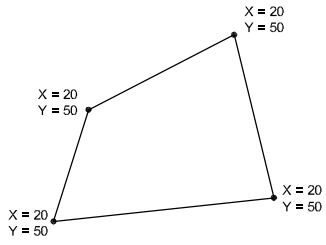
Fig 6



SUPERIMPOSING RUNNING DIMENSIONING IN ONE DIRECTION

AD20N1217X6

Fig 7



DIMENSIONING BY CO-ORDINATES

AD20N1217X7

Types of projection

Objectives: At the end of this exercise you shall be able to
- **draw the types of projection.**

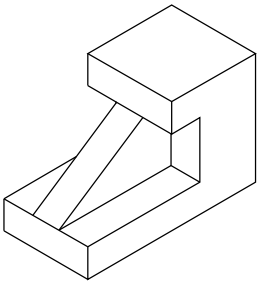
Requirements

Tools/Equipments/Instruments		Materials	
• Drawing board	- 1 No.	• A3 drawing sheet	- 5 Nos.
• Scale 30 cm length	- 1 No.	• Pencil 2H, H & HB	- 1 No each.
• Instrument box	- 1 No.	• Pencil eraser	- 1 No.
• Set of set square (45° & 60°)	- 1 No each.	• Cello tape	- as reqd.

PROCEDURE

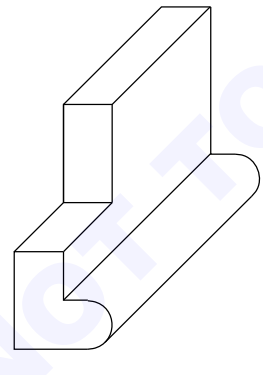
TASK 1: **Draw the given isometric views of the object in proportionate dimensions (Fig 1)**

Fig 1



TASK 2: **Draw the given oblique views of the object in proportionate dimensions (Fig 1)**

Fig 1

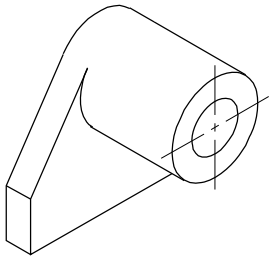


TASK 3: **Draw the given views of the object shown in isometric view as positined in cabinet and cavelier method (Fig 1&2)**

1 Refer Fig 1 for drawing the oblique views as positioned in Fig 2.

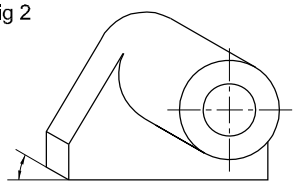
Note: If the length of the receding line is marked half of full length, it is called as cabinet method.

Fig 1



AD20N1218M1

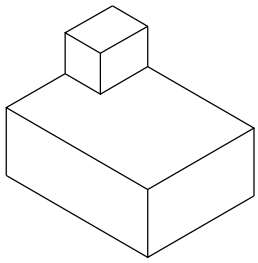
Fig 2



AD20N1218M2

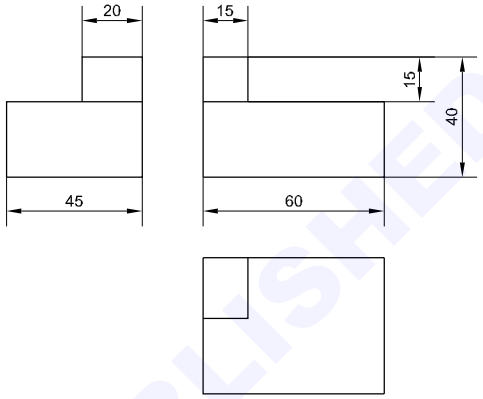
TASK 4: **Draw the orthographic views of the given object in first angle projection (Fig 1 & 2)**

Fig 1



AD20N1218X1

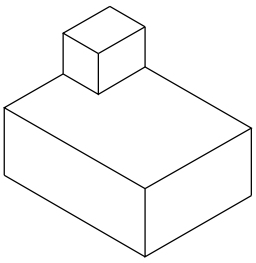
Fig 2



AD20N1218X2

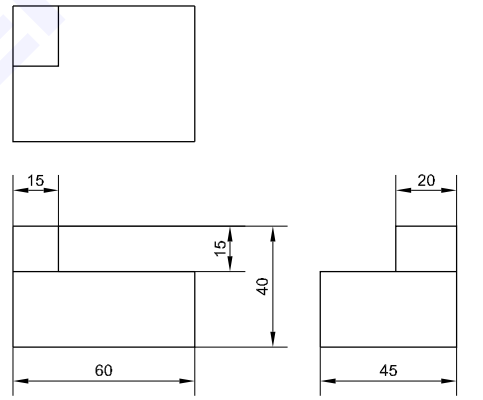
TASK 5: **Draw the orthographic views of the given object in 3rd angle projection (Fig 1& 2)**

Fig 1



AD20N1218Y1

Fig 2

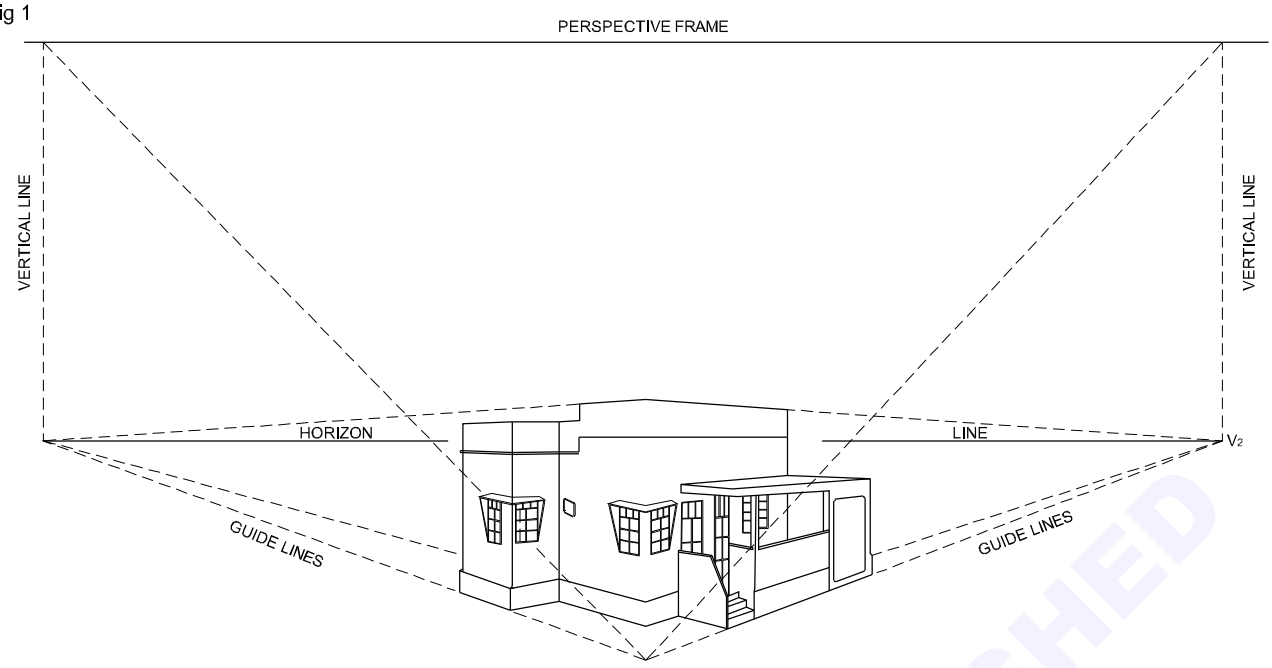


AD20N1218Y2

TASK 6: **Draw the given perspective view of the building (Fig 1)**

Note: Instructor to guide the trainees in drawing the perspective views.

Fig 1



TWO POINTS PERSPECTIVE OF A BUILDING

Projection planes

Objectives: At the end of this exercise you shall be able to
- **identify the projection of planes and draw the planes**
- **draw the projection of views in planes - first angle**
- **draw the projection of views in planes - 3rd angle**
- **draw the multiview orthographic projection.**

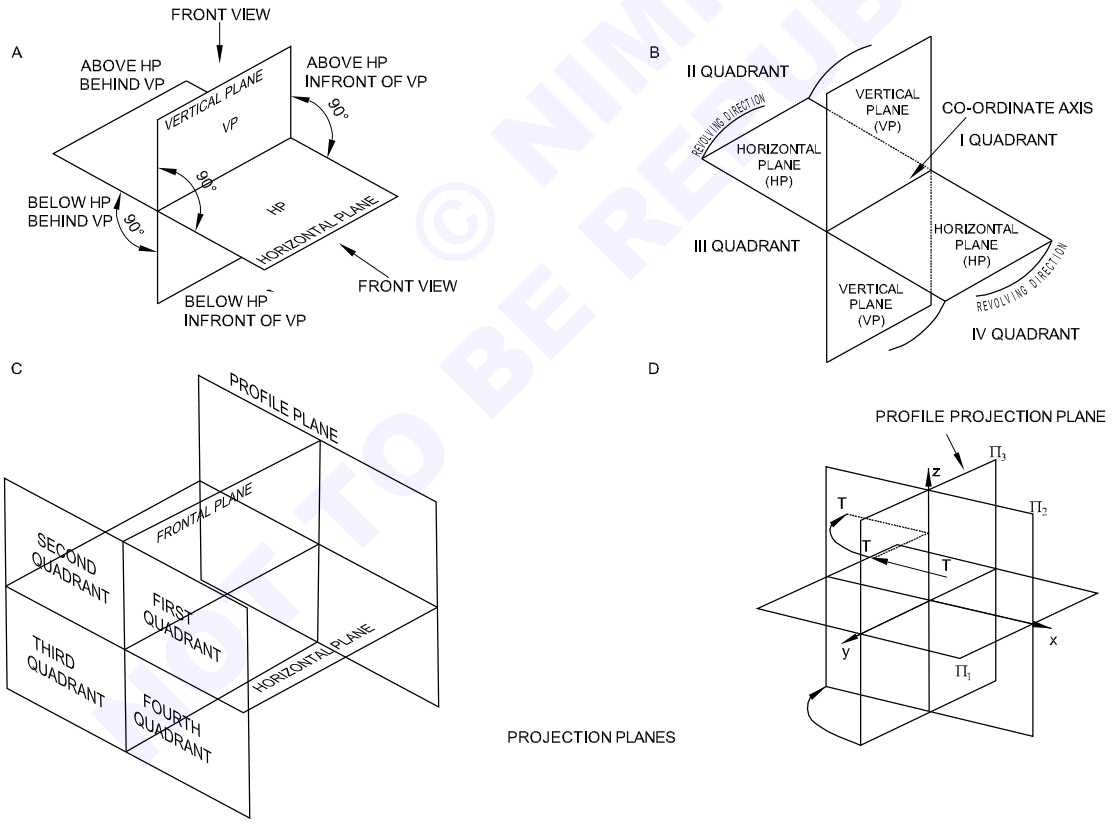
Requirements

Tools/Equipments/Instruments		Materials	
• Drawing board	- 1 No.	• Drawing sheet	- as reqd.
• Scale 30 cm length	- 1 No.	• Pencil 2H, H & HB	- 1 No each.
• Instrument box	- 1 No.	• Pencil eraser	- 1 No.
• Set of set square (45° & 60°)	- 1 No each.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Identify the projection planes and draw the given planes (Fig 1a, 1b, 1c and 1d)**

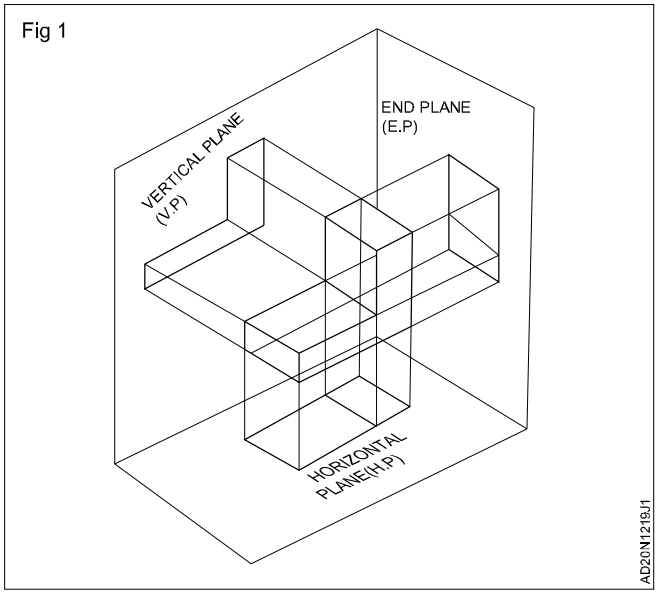
Fig 1



PROJECTION PLANES

TASK 2: **Draw the projection of views in plane in first angle (Fig 1)**

Fig 1



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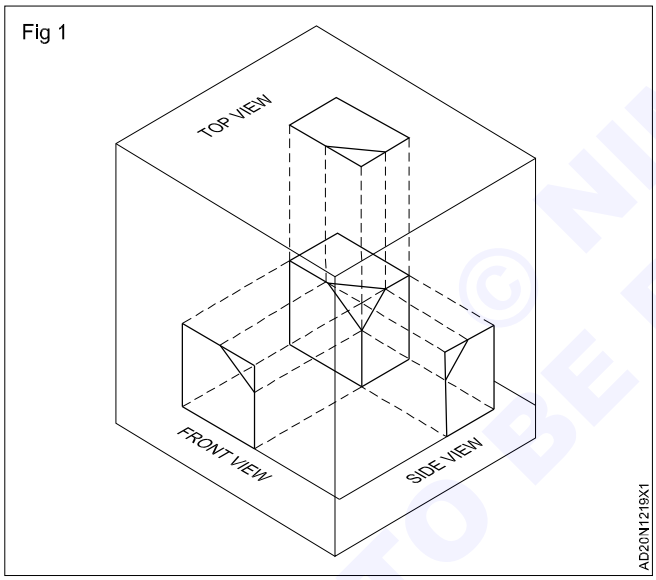
TASK 3: **Draw the projection of views in plane in 3rd angle (Fig 1)**

Fig 1



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TASK 4: **Draw the first angle projection of views by viewing multi view orthographic projection shown in Fig 1**

1 Draw the views with reference to the front directions indicated.

2 The view from top is placed underneath.

3 The view from bottom is placed above.

4 The view from the left is placed on the right.

5 The view from the right is placed on the left.

6 The view from the rear may be placed on the left or on the right as may be found convenient.

— — — — — — — —

TASK 5: **Draw the 3rd angle projection of views by viewing multi view orthographic projection shown in Fig 1**

1 Draw the views with reference to the front directions indicated.

2 The view from top is placed above.

3 The view from the left is placed on the left.

4 The view from the right is placed on the right.

5 The view from the rear may be placed on the left or on the right as may be found convenient.

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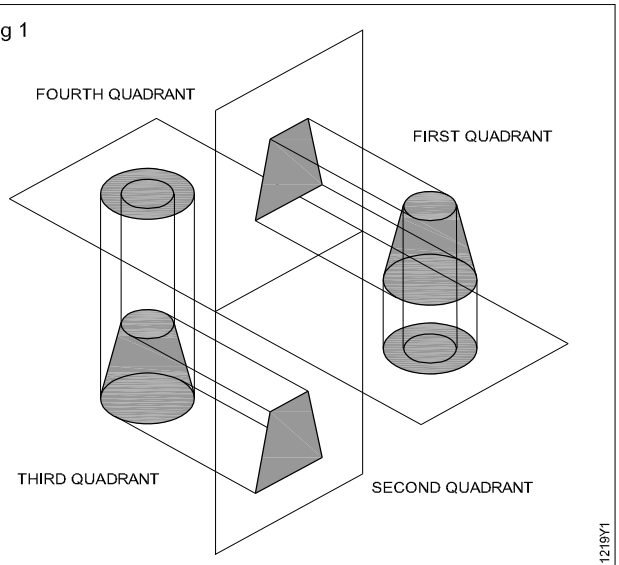
Fig 1



MULTI VIEW ORTHOGRAPHIC PROJECTION

First angle projection

Objectives: At the end of this exercise you shall be able to
- **draw the object in first angle with opening of planes**
- **draw the views of the object in first angle projection and symbol representing first angle.**

Requirements

Tools/Equipments/Instruments

- Drawing board - 1 No.
- Scale 30 cm length - 1 No.
- Instrument box - 1 No.
- Set of set square (45° & 60°) - 1 No each.

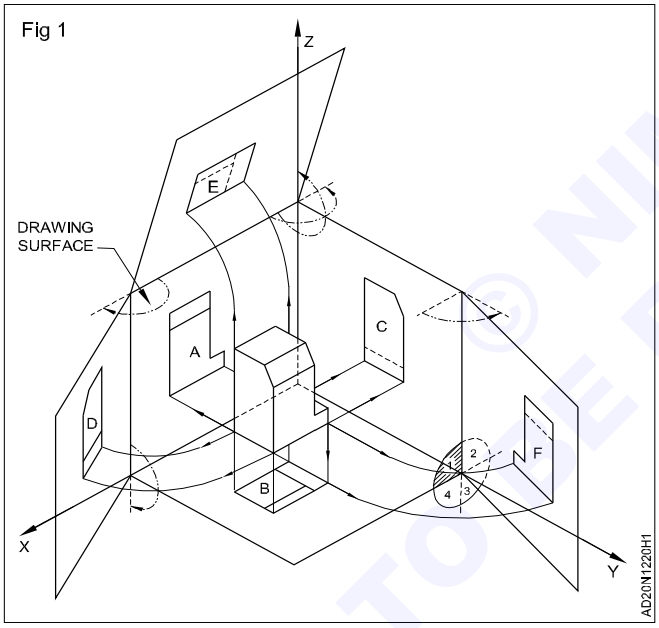
Materials

- Drawing sheet A2 size - as reqd.
- Pencil 2H, H & HB - 1 No each.
- Pencil eraser - 1 No.
- Cello tape - as reqd.

PROCEDURE

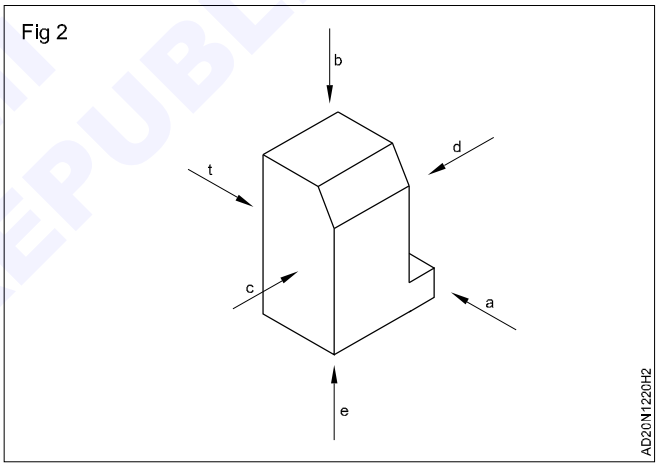
TASK 1: **Draw the given opening of planes in first angle projection and placement of the views in the respective planes as shown in Fig 1& 2**

Fig 1



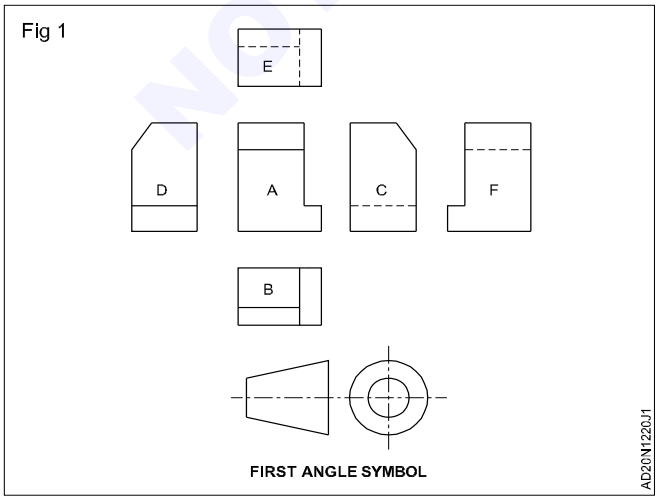
Given Object

Fig 2



TASK 2: **Draw the given object in first angle projection and draw the first angle symbol (Fig 1)**

Fig 1



Third angle projection

Objectives: At the end of this exercise you shall be able to
- **draw the object in third angle with opening of planes**
- **draw the views of the object in third angle projection and symbol representing third angle.**

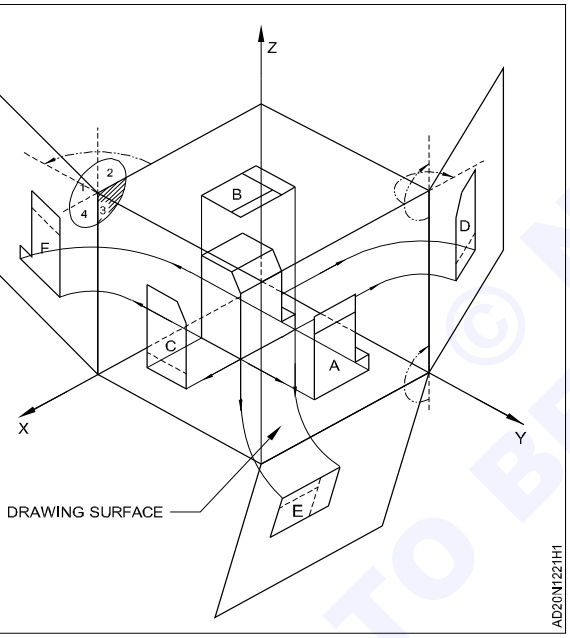
Requirements

Tools/Equipments/Instruments		Materials	
• Drawing board	- 1 No.	• Drawing sheet A2 size	- as reqd.
• Scale 30 cm length	- 1 No.	• Pencil 2H, H & HB	- 1 No each.
• Instrument box	- 1 No.	• Pencil eraser	- 1 No.
• Set of set square (45° & 60°)	- 1 No each.	• Cello tape	- as reqd.

PROCEDURE

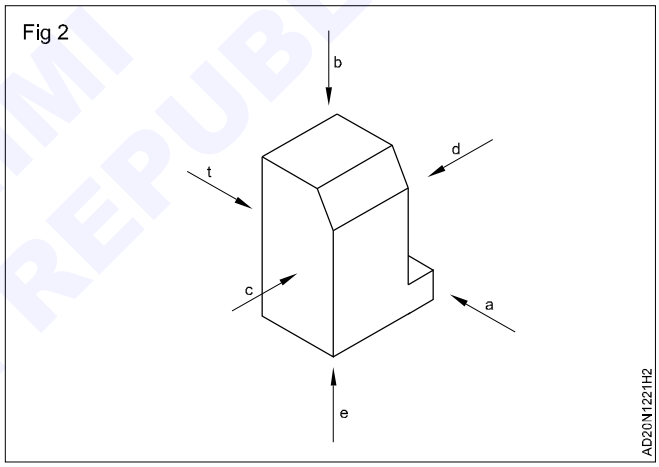
TASK 1: **Draw the given opening of planes in third angle projection and placement of the views in the respective planes as shown in Fig 1 & 2**

Fig 1



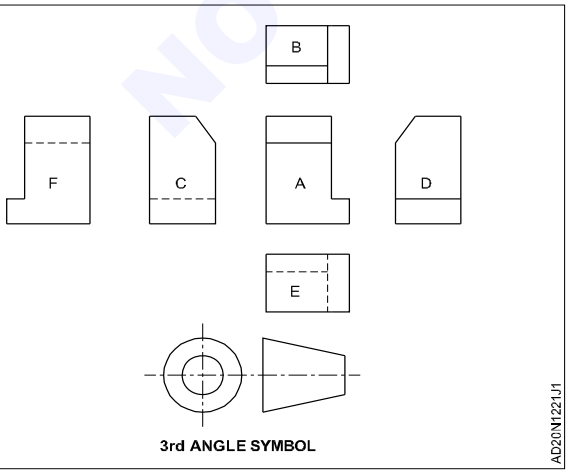
Given object

Fig 2



TASK 2: **Draw the given object in 3rd angle projection and also draw the 3rd angle symbol (Fig 1)**

Fig 1



Method of drawing orthographic projections

Objectives: At the end of this exercise you shall be able to
- **draw the plan, elevation and side views in first angle projection**
- **draw the plan, elevation and side views in third angle projection**
- **draw the combination of first and third angle projection of the object.**

Requirements

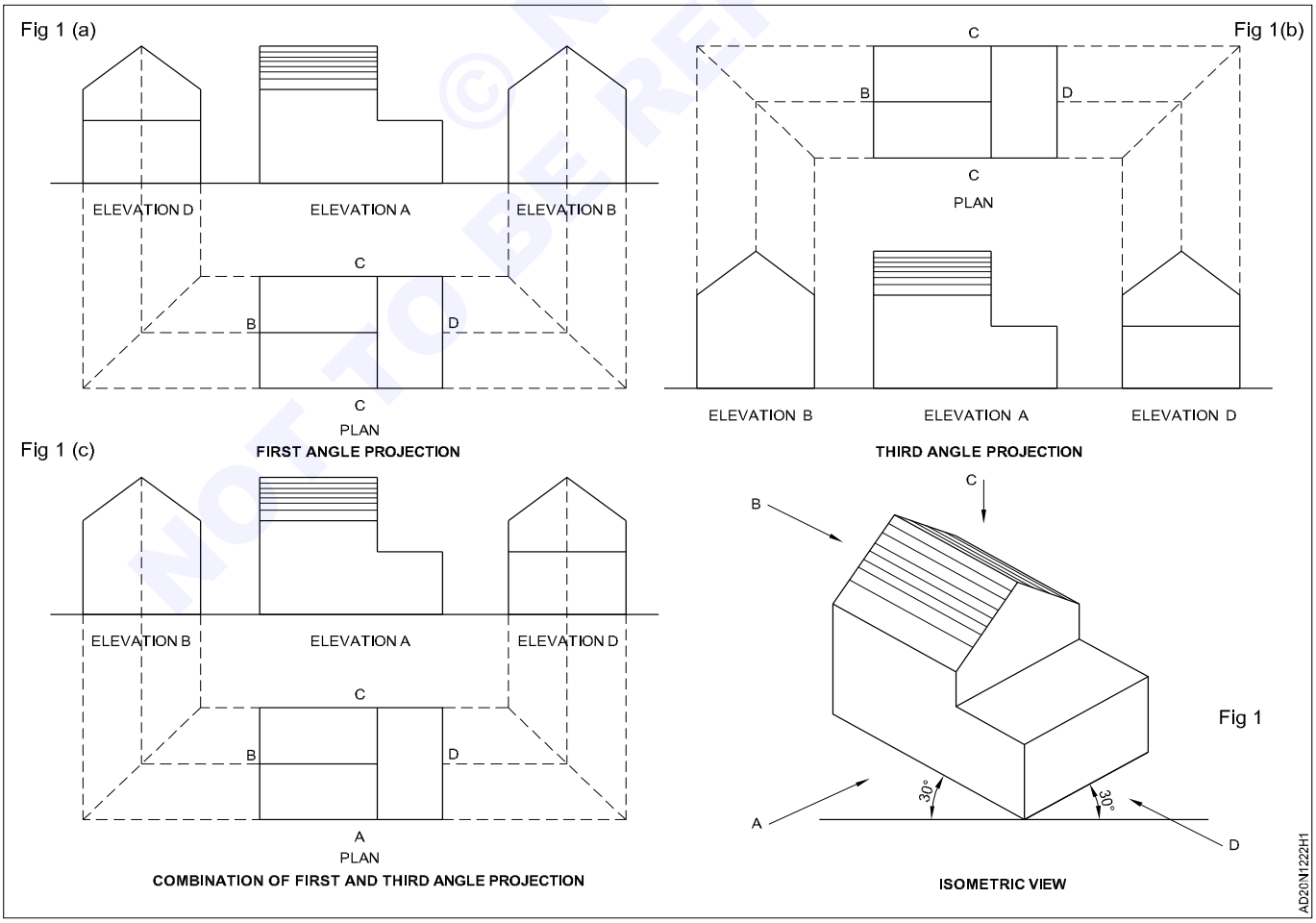
Tools/Equipments/Instruments		Materials	
• Drawing board	- 1 No.	• Drawing sheet A2 size	- as reqd.
• Scale 30 cm length	- 1 No.	• Pencil 2H, H & HB	- 1 Noeach.
• Instrument box	- 1 No.	• Pencil eraser	- 1 No.
• Set of set square (45° & 60°)	- 1 No each.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw the plan, elevation and side views in first angle projection for the given object (Fig 1) (1a)**

TASK 2: **Draw the plan, elevation and side views in third angle projection for the given object (Fig 1) (1b)**

TASK 3: **Draw the combination of first and third angle projection of the given object (Fig 1) (1c)**



Projection of lines in simple position

Objective: At the end of this exercise you shall be able to
- **draw the projection of lines.**

Requirements

Tools/Equipments/Instruments		Materials	
• Drawing board	- 1 No.	• Drawing sheet A2 size	- as reqd.
• Scale 30 cm length	- 1 No.	• Pencil 2H, H & HB	- 1 Noeach.
• Instrument box	- 1 No.	• Pencil eraser	- 1 No.
• Set of set square (45° & 60°)	- 1 No each.	• Cello tape	- as reqd.

PROCEDURE

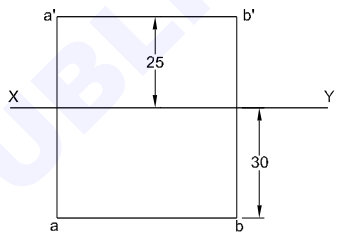
TASK 1: **Draw the projections of a line AB of 50mm long, parallel to both HP and VP, situated 25mm above HP and 30mm in front of VP (Fig 1)**

1 Draw XY line.

2 Draw ab (plan) 50mm long such that 30mm below XY.

3 Draw a'b' (elevation) 50mm long 25mm above XY line.

Fig 1



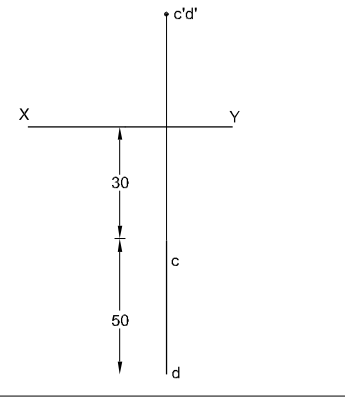
TASK 2: **Draw the projections of line CD of 50mm long, parallel to HP and perpendicular to VP,situated 25mm above HP and the nearest end to VP 30mm front of VP (Fig 1).**

1 Draw XY line.

2 Draw cd (plan) 50mm long below XY line such that line cd is perpendicular to XY line and oc = 30mm.

3 Project cd vertical upwards and mark c'd' (elevation), 25mm above XY line.

Fig 1



TASK 3: **Draw the projections of a line PQ of 60mm long, situated in such a way that the P is 10mm above HP, 25mm in front of VP.The line PQ is inclined at 30° to HP and parallel to VP (Fig 1).**

In this case as the line is inclined to HP, the elevation shows the actual length.

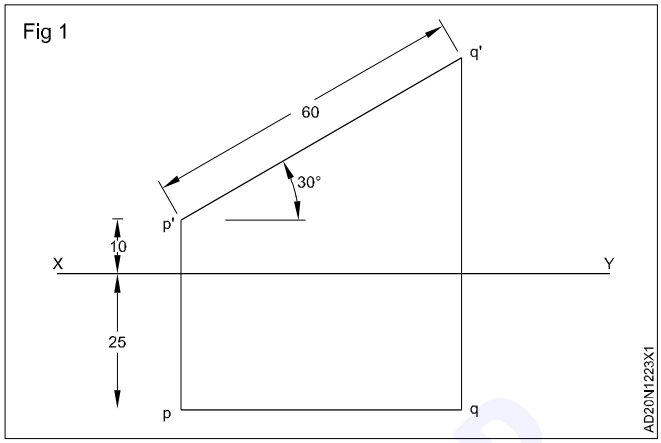
1 Draw XY line.

2 Draw p' q', such that p is 10mm above XY line and p' q' = 60mm and inclined 30° to the XY line.

3 Project p'q' vertical downwards and mark pq, 25mm below XY line.

Solve more problem at different quadrants and various positions.

Fig 1



Drawing the projection of plane figures (Lamina)

Objectives: At the end of this exercise you shall be able to
- **draw projections of surface, when they are parallel to one plane, but perpendicular to the other plane**
- **draw projections of surface when they are inclined to one plane, but perpendicular to the other plane**
- **draw the projections of surface when they are perpendicular to both the planes**
- **draw the projections of surface when they are inclined to both the planes.**

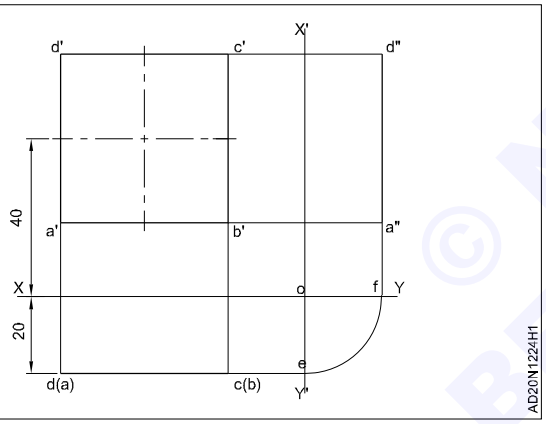
Requirements

Tools/Equipments/Instruments		Materials	
• Drawing board	- 1 No.	• Drawing sheet A2 size	- as reqd.
• Scale 30 cm length	- 1 No.	• Pencil 2H, H & HB	- 1 Noeach.
• Instrument box	- 1 No.	• Pencil eraser	- 1 No.
• Set of set square (45° & 60°)	- 1 No each.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw the projections (elevation, plan and side view) of the square having its position defined under as (Square of 60 mm side) (Fig 1)**

Fig 1



1 Surface parallel to VP.

2 Surface perpendicular to HP.

3 One of its edges parallel to HP.

4 Centre point 40mm above HP and 20mm in front of VP.

- Draw the xy line.
- Draw the square with its centre 40 mm above the xy line and one edge parallel to xy line.
- Mark the corners of the figure a', b', c' & d'. This will be the elevation of the square.
- Draw the vertical projectors from a'b' downward beyond the xy line.
- Draw a horizontal line dc at a distance of 20 mm below the xy line. Line dc will be the plan.
- Draw a X'Y' line at a convenient distance from b'c', intersecting the xy line at 'O'.
- Project the plan to the X,Y, line meeting at e.
- By arc method transfer Oe to xy and mark the point 'f'.
- Project 'f' upwards.
- Projct b' and c' to meet the the projected line from 'f' at a" and d" respectively. Now the line a"d" is the side view.

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TASK 2: **Draw the projections (elevation, plan and side view of a rectangle having the position defined as (Rectangle of 40 mm x 80 mm) (Fig 1)**

1 Surface parallel to HP

2 Surface perpendicular to VP

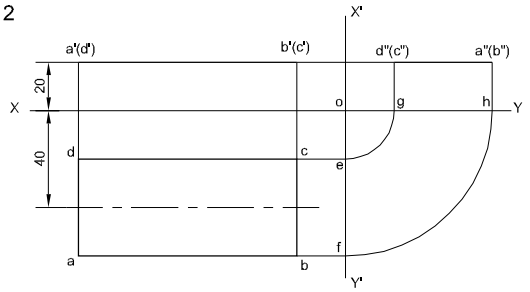
3 One of its edges parallel to VP

4 Centre point 20mm above HP and 40mm in front of VP

- Longer side parallel to xy.
- Draw the xy line.
- Draw the rectangle with its centre 40 mm below xy line and its longer side parallel to xy. Mark the corners as a,b,c & d and join them.
- Figure a,b,c,d will be the plan.
- Draw the vertical projectors from d and c upwards beyond xy line.
- Draw a horizontal line a'b' at a distance of 20 mm above xy line.

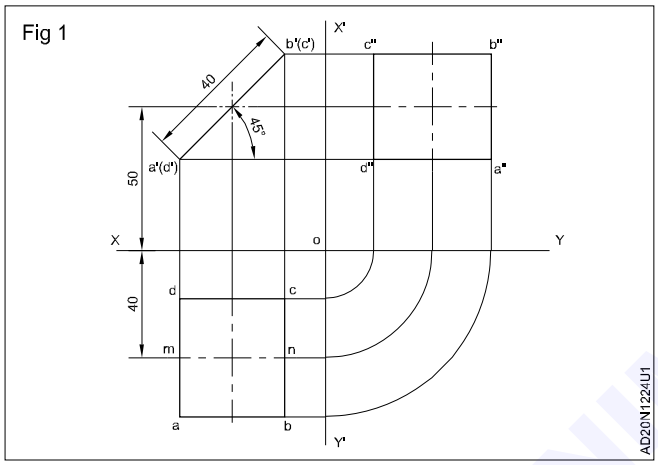
- Now the line a'b' will be the elevation.
- Draw a vertical line x'y' line at a convenient distance from b'.
- Project c and b, meeting x'y' line at ef.
- By arc method transfer the point e & f to xy line and mark g & h respectively.
- Project the points g & h upward beyond xy line.
- Project a horizontal projectors from the point b' intersecting the vertical projectors, projected from g & h at d" & a" respectively.
- Now the line d "a" is the side view.

Fig 2



TASK 3: **Draw the projection (elevation, plan and side view) of the square having its position defined as (Square of 40 mm side) (Fig 1)**

Fig 1



1 Surface inclined to HP at on given angle 45°.

2 Surface perpendicular to VP.

3 One of the edges perpendicular to VP.

4 Axis major on it perpendicular to VP.

5 Centre point 50mm above HP and 40mm in front of VP.

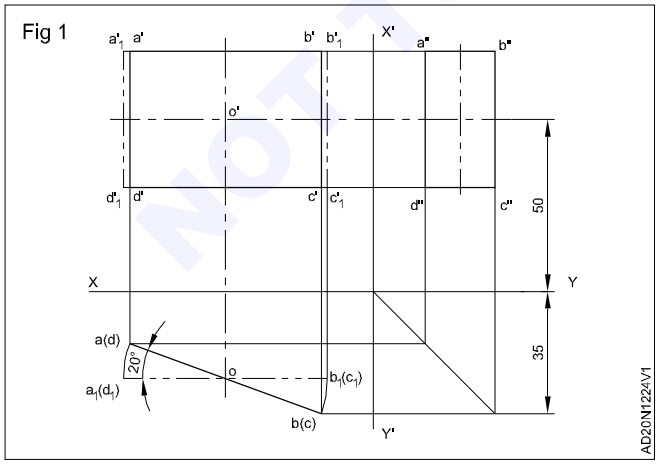
- Draw xy, X',Y' axis.
- Draw a'b' equal to the side of the square (40) at 45° and its centre point 50 mm above xy.
- Now a'b' is the elevation.
- Project a'b' downwards beyond xy line.
- Draw centre line mn at a distance of 40 mm below xy.
- Mark points a,b,c & d at a distance of 20 mm above and below and project a'b' down and complete the rectangle a,b,c,d and this will be the plan.
- Draw the projectors from elevation and plan.

In this exercise we have started with the elevation as the true length of the side will be available in the elevation.

The plan and side view are rectangles one side is equal to 40 mm and another side is fore-shortened and complete the side view d",a", b" & c" as shown in Fig 1.

TASK 4: **Draw the projection (plan, elevation and side view) of a rectangle given its position as (Rectangle of 60 mm x 40 mm) (Fig 1)**

Fig 1



1 Inclined to VP at a given angle 20^0.

2 Surface perpendicular to HP.

3 One of its edges perpendicular to HP.

4 Centre point 50mm above HP and 35mm in front of VP.

Surface perpendicular to HP, standing on its longer edge and also rotated about the vertical centre line to an angle. (say 20°)

1 Since the surface is perpendicular to HP and inclined to VP the true length of the rectangle will be shown in the plan.

2 Draw xy and X',Y',' lines.

3 Draw the plan and elevation as if the rectangle is parallel to VP and perpendicular to HP.

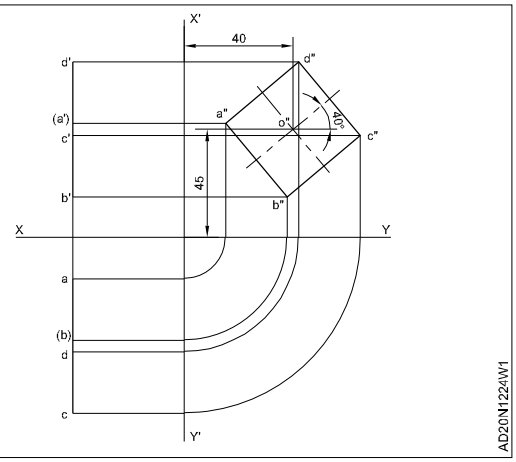
4 Mark the centre point `0' and draw the plan ab in the rotated position. (i.e. 20°)

5 Project the point a & b and complete the elevation a'b'c'd'.

6 Complete the side view a"b"c"d" by drawing the projectors from plan and elevation.

TASK 5: **Draw the plan, elevation and side view of a rectangle given its position as Square of side 40mm (Fig 1)**

Fig 1



1 Surface parallel to HP

2 Surface perpendicular to VP

3 One of its edge axis 40° to the HP

4 Centre point 45mm above HP and 40mm in front of VP

- Surface is perpendicular to both HP and VP.
- One of its edges is 40° to HP. Centre point is 45 mm above HP 40 mm in front of VP.
- According to the conditions listed above, true shape of the square can be seen only in side view. Draw the side view first.
- Draw xy line and draw parallel line 45 mm above xy.
- Mark point 0" the centre point of the square.
- Draw a line 40° with xy passing through the point 0".
- Mark of 20 mm both sides of point 0" and draw perpendiculars to 40° line from the points marked.
- Draw two lines parallel to 40° line at distances of 20 mm both sides.
- These lines cut the earlier lines at points a",b",c",d".
- a"b"c"d" is the side view.
- Draw X,'Y,' line 40 mm from the centre point of the square.
- Project the side view and draw plan and front view.

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TASK 6: **Draw the plan, elevation and side view of a square given its position as below (Square of side 60 mm) (Fig 1)**

1 Corner `a' is on HP diagonal. ac makes 30° to HP and the diagonal bd makes 45° to VP, but parallel to HP

This is a case when the surface is inclined to both VP and HP. As the diagonal BD is parallel to HP its projection on HP will have its true length.

The procedure has three stages.

2 In the first stage, draw a plan a_1, b_1, c_1, d_1 assuming the diagonal ac is parallel to HP and the diagonal bd is perpendicular to VP. Plan is a true square.

3 In the second stage, assume corner a_2 (A) of the square is on HP and the diagonal ac makes 30° to HP and diagonal b_2d_2 is parallel to HP.

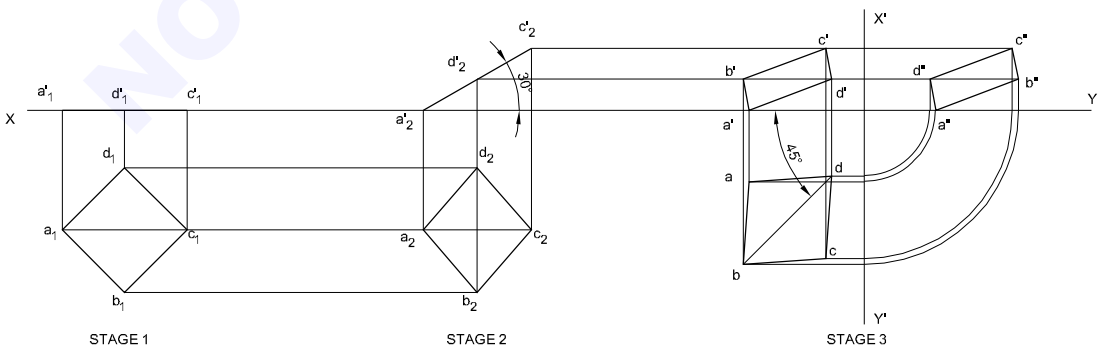
4 Draw the line $a'_2b'_2c'_2$ the elevation of the second stage.

5 Draw the plan a_2, b_2, c_2 d_2 by projecting from the first stage plan and the second stage elevation. The diagonal b_2d_2 will be of true length and the diagonal a_2c_2 will be fore-shortened. In the third stage the diagonal b_2d_2 is to be tilted to an angle of 45° to VP and parallel HP.

6 Even though the diagonal bd makes 45° to VP, the plan will be same as that of the plan of second stage, but rotated through 45°.

7 Draw the plan abcd as shown in Fig $a_2b_2c_2d_2$ making bd at 45° to xy line.

Fig 1



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Projection of simple solids in first angle

Objectives: At the end of this exercise you shall be able to
- **draw orthographic view of rectangular prism**
- **draw orthographic views of hexagonal and pentagonal prism**
- **draw orthographic views of cylinder**
- **draw orthographic views of cone**
- **draw orthographic views of a hexagonal pyramid.**

Requirements

Tools/Equipments/Instruments		Materials	
• Drawing board	- 1 No.	• Drawing sheet A2 size	- as reqd.
• 'T' square, set square	- 1 No.	• Pencil 2H, H & HB	- 1 Noeach.
• 30cm metric scale	- 1 No.	• Pencil eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw the plan, elevation and side view of a rectangular prism of size base 50 x 30 and height 80 mm given its position as below (Fig 1)**

1 The base 50 x 30 is resting on HP.

2 The vertical face 80 x 50 nearest to VP is 20 mm in front of it.

Note: In this problem the face of prism are parallel to the planes of projection. Therefore the plan, elevation and side view will be rectangles.

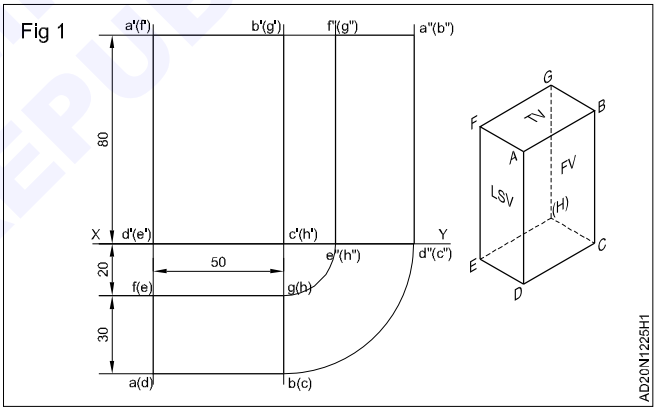
3 The prism is shown pictorially in the figure and its eight corners are marked as abcd-efgh.

4 Draw the plan (50 x 30) 20 mm below XY line.

5 Project from plan and draw elevation (80 x 50)

6 Draw the side view by drawing projection from elevation and plan. (Fig 1)

Fig 1



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TASK 2 **: Draw the plan, elevation and side view of an hexagonal prism whose side is 25 mm and length 60 mm given its position as below: (Fig 1)**

1 One of its lateral surfaces lying on HP

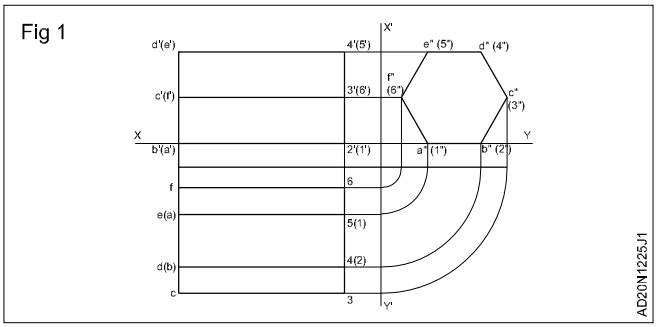
2 The axis is parallel to vertical plane.

From the position described above, it is clear that the hexagonal face of the prism is parallel to AVP. Therefore the end view is a true hexagon and hence this view should be drawn first.

3 Draw the end view (hexagon of side 25 mm) with one side on HP line. (Fig 1)

4 Draw horizontal projectors from side view and complete the elevation. (In the elevation two lateral faces are visible, but they are fore-shortened)

Fig 1



5 Draw projectors from elevation and side view and complete the plan.

(Three lateral faces are visible, of which one is of true shape and the other two are fore-shortened).

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TASK 3: **Draw the plan, elevation and side view of a pentagonal prism of side 30 mm and length 70 mm given its position as below**: **(Fig 1)**

1 One of its lateral surfaces rests on HP

2 The axis makes 30° with HP.

In this exercise none of the three views required will confirm to the true shape. Therefore the final views cannot be drawn straight away. The views have to be arrived at by first drawing some views using given data. Therefore we first draw plan and elevation as if it is lying on HP and axis perpendicular to VP.

3 As stated above, start by drawing the elevation (Pentagon of side 30 mm) and mark corners as a',b',c',d', and e',. (Fig 1)

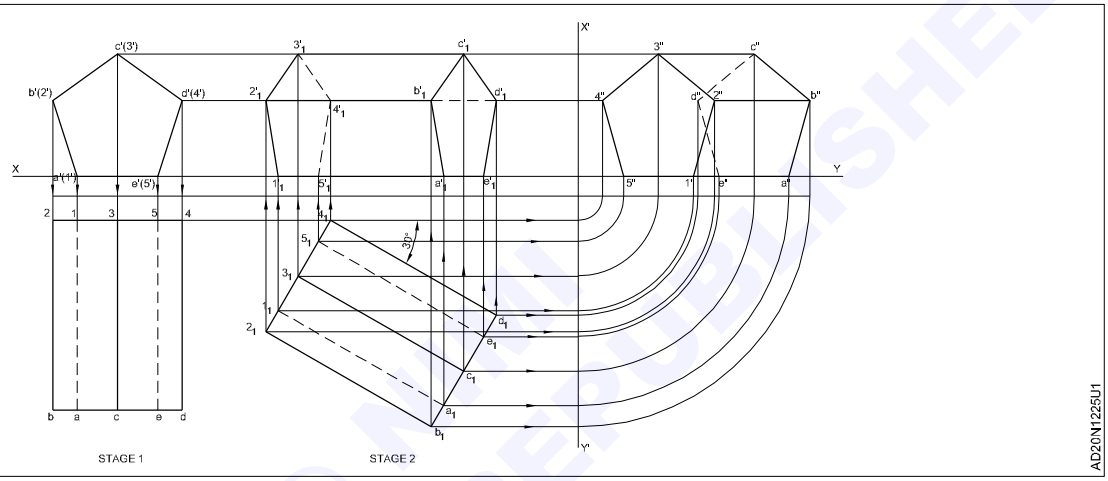
4 Draw the plan projecting from the above elevation.

5 Reproduce this plan with the axis making 30° with XY line as shown in figure. This is required plan.

6 Draw the horizontal projectors from the elevation of first stage and vertical projectors from plan of second stage and complete the required elevation as shown.

7 Complete the side view by drawing horizontal projectors from the elevation and by transfering the distances from plan of the second stage.

Fig 1



TASK 4: **Draw the plan, elevation and side view of a cylinder of diameter 40 mm and length 80 mm given its position as below: (Fig 1)**

1 Cylinder resting on the HP with its axis perpendicular to VP.

2 Face farthest from VP is 100 mm away from VP.

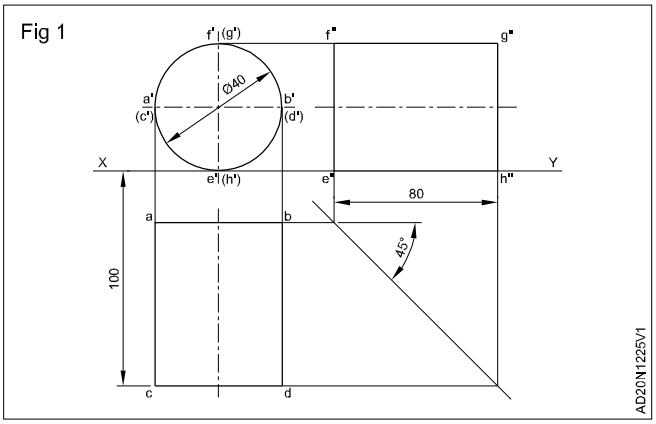
In this problem the circular faces are parallel to VP. Therefore the elevation is a circle resting on XY line. Plan an end views are rectangles of size 80 mm x 40 mm.

3 Draw the circle of diameter 40 mm touching XY line. (Fig 1)

4 Draw the plan projecting it from the elevation.

5 Draw the end view by drawing projection on it, from the plan and elevation.

Fig 1



TASK 5: **Draw the projections of a cone of base diameter 60 mm and height 80 mm when its position is as under (Fig 1)**

1 Its circular base touching HP and making an angle of 45° with HP.

2 Axis parallel to VP.

The elevation of a cone, which is standing vertical is a triangle. The base of the cone will be elliptical in both the plan and side view.

3 Draw the plan and elevation of cone as if it is standing vertically on HP. (Stage 1) (Fig 1)

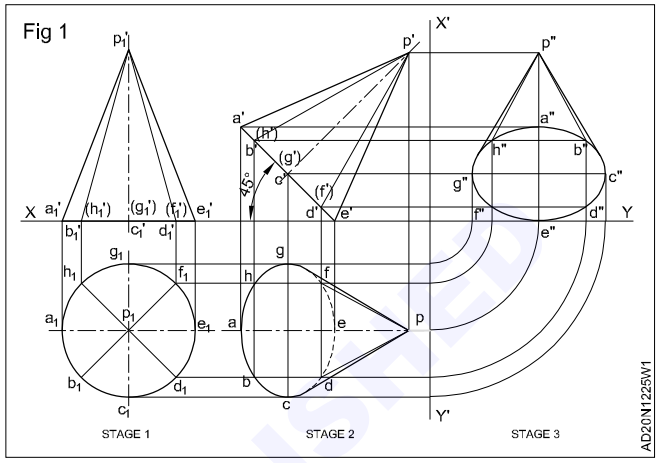
4 Divide the circumference of the plan into number of equal parts. (say 8) and mark them. From these points draw projectors to XY line and mark the intersection is a',b' (h') c' etc.

5 Draw the required elevation, same as in stage 1, but with the axis 45° to XY line and mark the points as a'b'(h') c'(g') etc.

6 Draw the ellipse through the intersection of the corresponding points of the vertical and horizontal projectors and complete the required plan.

7 From the final plan and elevation, draw projectors and complete the required end view.

Solve more problems by changing the position of solids.



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TASK 6 : **Standing vertically with its base on HP with one side of the hexagonal base parallel to VP**

The pyramid has 6 triangular faces and one hexagonal base. The plan will show the true shape of the base and other six triangular faces are foreshortened.

In this elevation, three triangular faces are seen and all of them are fore-shortened.

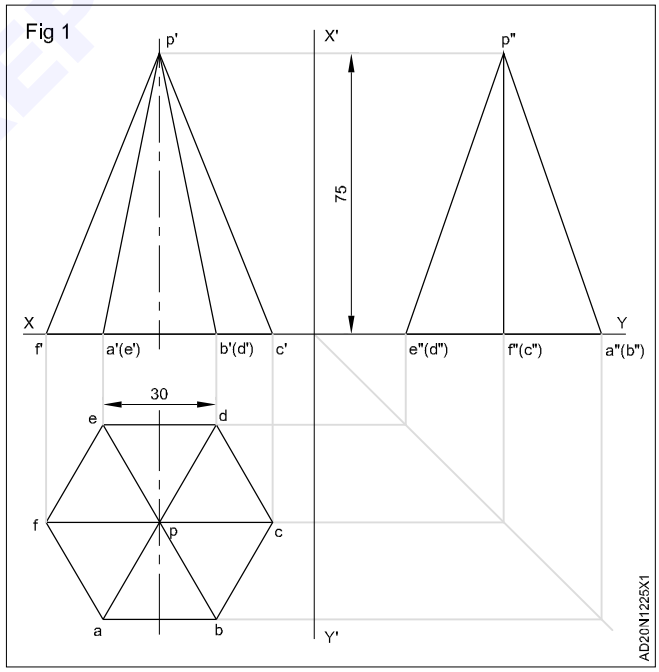
1 Mark the centre of hexagon (Point P) and draw lines from P to the six corners of the hexagon. Now this is the required plan. (Fig 1)

2 Project this P from plan upwards and mark P' at a distance of 75 mm from XY line.

3 Mark the points f', a'b'c' etc... on XY line by projecting the corresponding points from plan.

4 Join the P' with f',a',b',c' etc and complete the required elevation.

5 Draw projectors from elevation and plan to complete the required side view.



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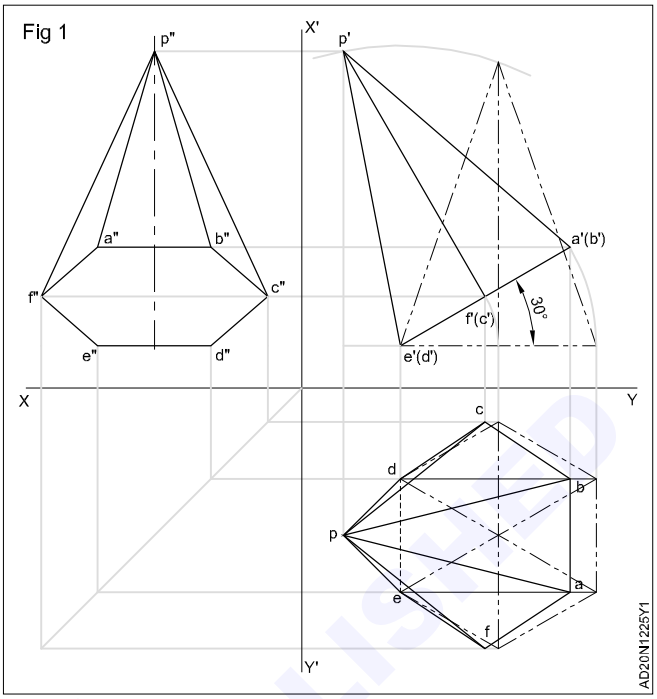
TASK 7: **A hexagonal pyramid of side 30 mm and height 60 mm is resting with its base on HP. Draw its projections when one of the base edges is at right angle to VP and the base makes 30° with the HP**

This is similar to the previous example with the only difference that is base makes 30° to HP. Therefore elevation will be same as in the previous exercise, but tilted to 30°.

1 Draw the front view and top view of the pyramid as in the previous example. (Fig 1)



Projection of simple solids in third angle

Objective: At the end of this exercise you shall be able to
- **draw orthographic projection of the simple solids in third angle projection.**

Requirements

Tools/Equipments/Instruments		Materials	
• Drawing board	- 1 No.	• Drawing sheet A2 size	- as reqd.
• Scale 30 cm length	- 1 No.	• Pencil 2H, H & HB	- 1 Noeach.
• Instrument box	- 1 No.	• Pencil eraser	- 1 No.
• Set of set square (45° & 60°)	- 1 No each.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw the plan, elevation and side view of a rectangular prism in 3rd angle projection (Refer ex 1.2.25)**

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TASK 2: **Draw the plan, elevation and side view of a hexagonal prism in 3rd angle projection (Refer ex 1.2.25)**

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TASK 3: **Draw the plan, elevation and side view of a pentagonal prism in 3rd angle projection (Refer ex 1.2.25)**

— — — — — — — —

TASK 4: **Draw the plan, elevation and side view of a cylinder in 3rd angle projection (Refer ex 1.2.25)**

— — — — — — — —

TASK 5: **Draw the plan, elevation and side view of a cone in 3rd angle projection (Refer ex 1.2.25)**

— — — — — — — —

TASK 6: **Draw the plan, elevation and side view of a hexagonal pyramid in 3rd angle projection (Refer ex 1.2.25)**

Note: Instructor should guide the trainees to draw the views of the solids in 3rd angle projection refering ex.1.2.25

— — — — — — — —

Drawing of sizes brick and brick bats masonry

Objectives: At the end of this exercise you shall be able to
- **draw isometric view of standard bricks**
- **draw isometric view of ¾ bats,half bat and bevelled bat**
- **draw isometric view of bevelled closer, king closer, queen closer and squint brick.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- Adjustable set square - 1 No.
- 30 cms Metric scale - 1 No.
- 90 cms parallel bar or 90 cms T-square - 1 No.

Materials

- A1 drawing sheet - 1 No.
- HB pencil - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.
- Hand cloth - as reqd.

DATA

Size of modular brick (including mortar)= 200 x 100 x 100 mm

PROCEDURE

TASK 1: **Draw the isometric projection of the standard bricks (Fig 1a)**

TASK 2: **Draw ¾ in brick bat**

1 Draw the isometric view of the brick with 3/4 portion of the brick in solid.

2 Indicate the remaining 1/4 portion of the brick in dotted lines.

3 Hatch the cut portion of the brick as shown in Fig 1b.

TASK 3: **Draw bevelled bat of brick**

1 Draw the isometric view of the brick with 3/4 L on one side and 1/4 L on other side and bevel the edges in solid.

2 Indicate the remaining portion of the brick in dotted lines.

3 Hatch the cut portion of the brick as shown in Fig 1c.

TASK 4: **Draw half bat of brick**

1 Draw the isometric view of the brick with 1/2 L portion of the brick in solid.

2 Indicate the remaining 1/4 portion of the brick in dotted lines.

3 Hatch the cut portion of the brick as shown in Fig 1d.

TASK 5: **Draw bevelled closer of brick**

1 Draw the isometric view of the brick with b/2 on one side and b on other side and bevel the closer.

2 Indicate the remaining bevelled portion in dotted lines.

3 Hatch the cut portion of the brick as shown in Fig 1e.

TASK 6: **Draw king closer brick**

1 Draw the isometric view of the brick with L/2 and b/2 on one side and bevel the edges as shown in Fig 1f.

2 Indicate the remaining bevelled edge in dotted lines.

3 Hatch the cut portion of the brick.

— — — — — — — —

TASK 7: **Draw queen closer brick**

1 Draw the isometric view of the brick with b/2 for the entire length of the brick as shown in Fig 1g.

2 Indicate the remaining 1/2 closer of the brick in dotled liner.

3 Hatch the cut portion of the brick.

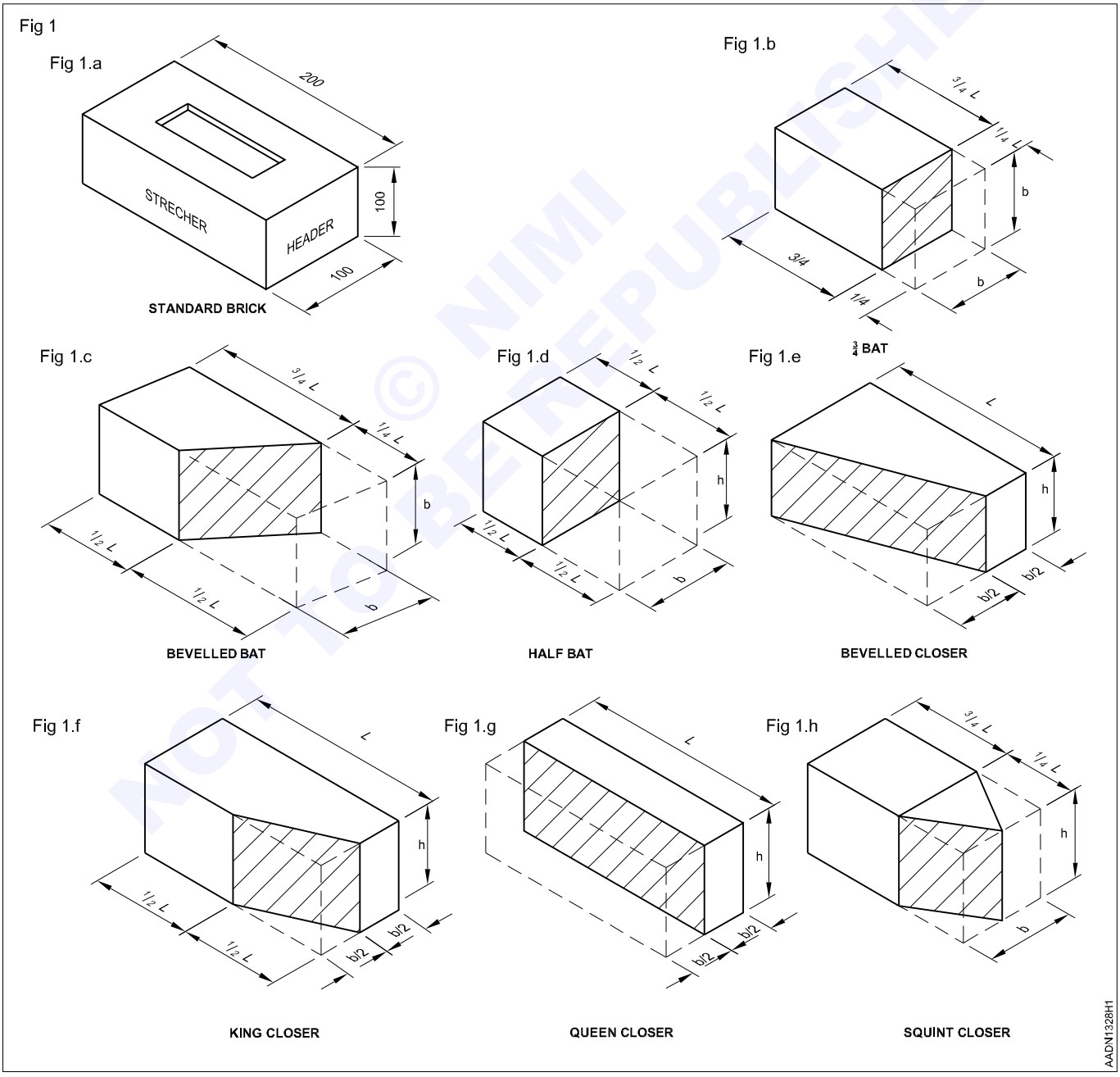
— — — — — — — —

TASK 8: **Draw squint closer brick**

1 Draw the isometric view of the brick with 1/4L and bevelled equally from b as shown in Fig 1h.

2 Indicate the remaining portion of the brick in dotted lines

3 Hatch the cut portion of the brick.



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Drawing of english bond in walls

Objectives: At the end of this exercise you shall be able to
- **draw the plans of english bond of 1 brick and 1½ brick thick wall**
- **project elevation view of english bond of 1 brick thick wall**
- **develop the isometric view of english bond of 1½ brick thick wall.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- Adjustable set square - 1 No.
- 30 cms Metric scale - 1 No.
- 90 cms parallel bar or 90 cms T-square - 1 No.

Materials

- A1 drawing sheet - as reqd.
- HB pencil - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.
- Hand cloth - as reqd.

DATA

Size of brick = 200 x 100 x 100 mm.

Size of Queen closer = 200 x 50 x 100 mm

Height of each course = 100 mm

PROCEDURE

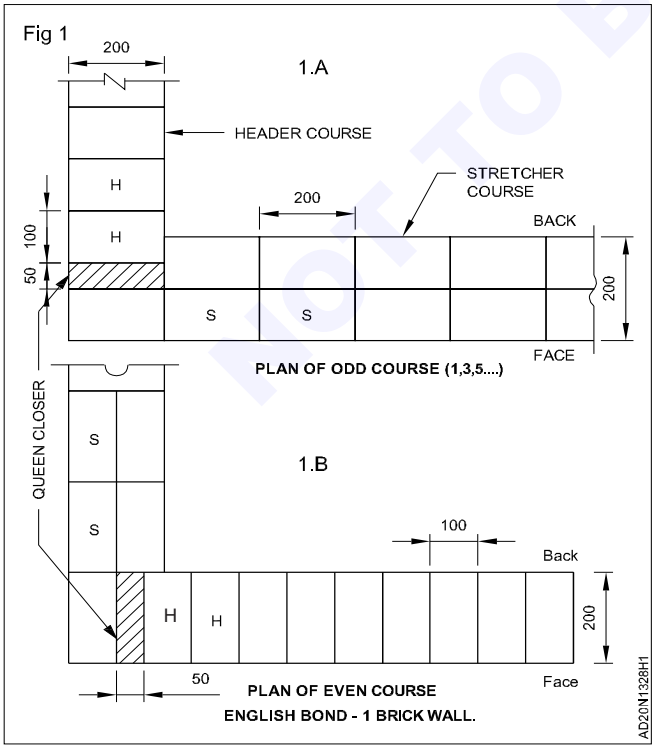
TASK 1: **English bond 1 brick thick**

1 Draw horizontal and vertical lines to form 'L' Shape to a required length.

2 Draw parallel line to 'L' shape at an offset of 200mm.

3 Draw quoin stretcher and queen closer as shown in Figure 1A for courses.

Fig 1



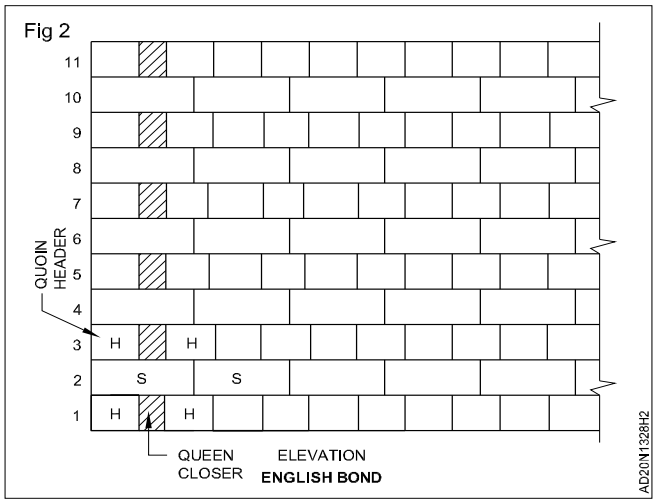
4 Draw headers side by side between the vertical lines.

5 Draw stretchers between the horizonl lines at an offset of 200mm.

6 Follow the same proceducers for even course as shown in Fig 1B.

7 Draw projections from plans of odd and even courses and develop the elevation. (Fig 2).

Fig 2



8 Develop the isometric view for the plans shown in Fig 1a & 1b as show in Fig 3.

TASK 2: **English bond 1½ brick wall (Fig 1)**

1 Draw the 'L' shape, 300mm wide

2 Complete the plan views as per the Fig 1a and 1b.

Fig 1

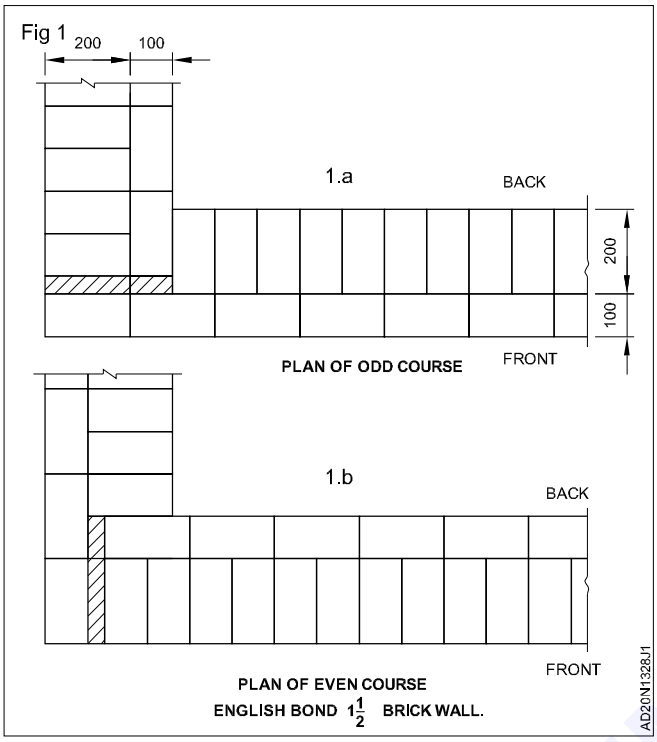


Fig 2

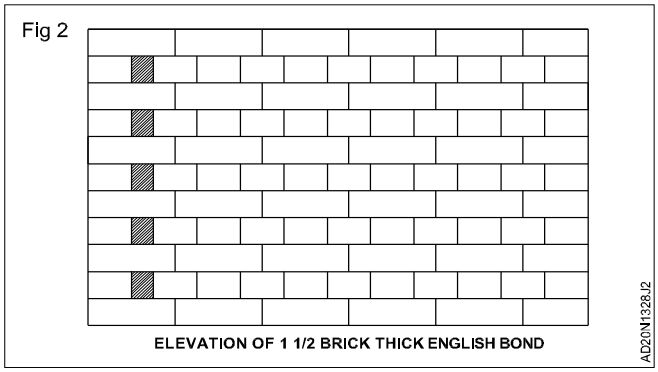
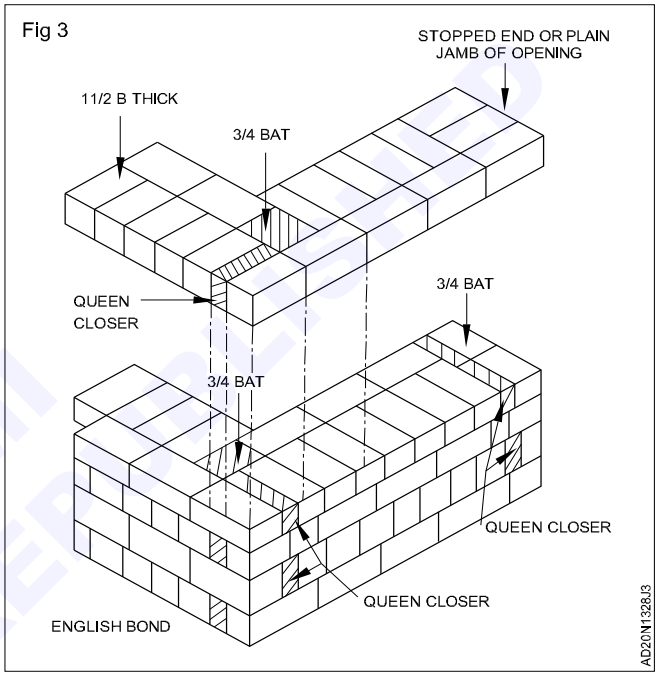


Fig 3



3 Draw projections from plans of odd and even courses and develop the elevation (Fig 2)

4 Develop the isometric view for the plans shown in Fig 3.

5 Arrange odd course and even course alternately and complete the drawing.

Drawing of flemish bond in walls

Objectives: At the end of this exercise you shall able to
- **draw the plans of flemish bond of 1 brick and 1½ brick wall**
- **develop the isometric view of flemish bond.**

DATA

Size of brick =200 mm x 100mm x 100 mm

Size of queen closer = 200mm x 50mm x 100

Height of each course = 100 mm

TASK 1: **Double flemish bond one brick thick (ODD courses)**

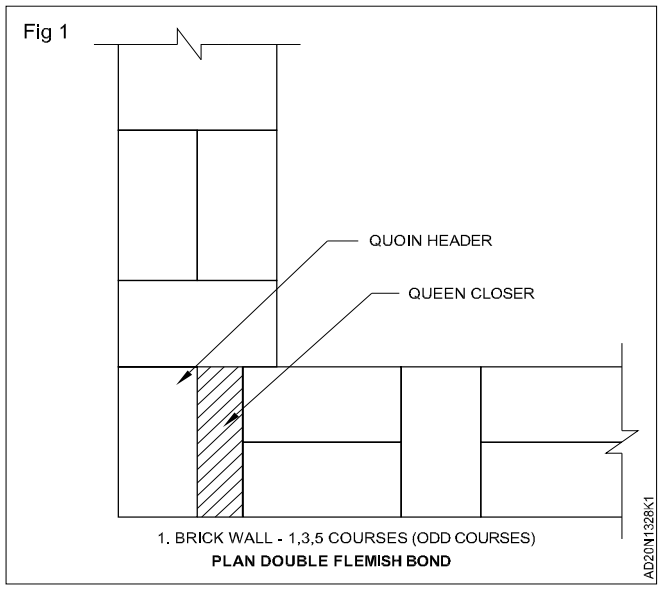
1 Draw plan view of odd course of one brick wall in Double flemish bond (Fig 1)

2 Draw 200mm thick corner wall as per exercise English Bond.

3 Similarly draw quoin header and queen closer.

4 Draw headers and stretchers alternately in both directions (Fig 1) and complete the drawing.

Fig 1



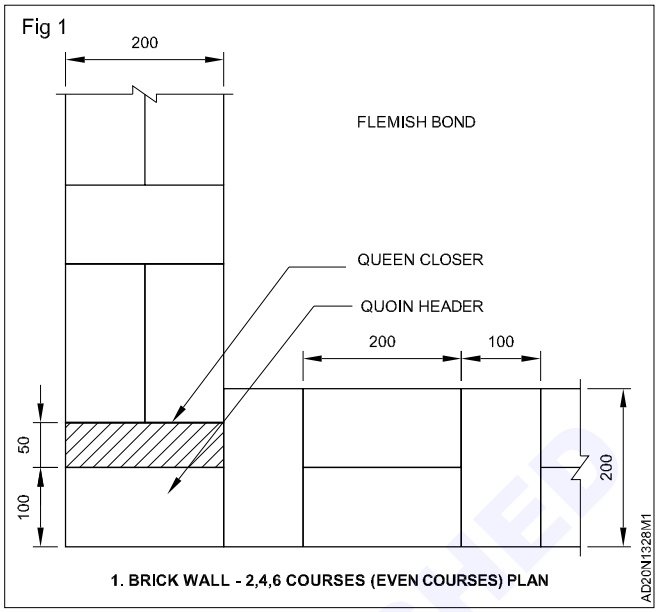
TASK 2: **Double flemish bond one brick thick (Even courses)**

1 Draw plan view of even course of one brick wall in Double Flemish bond. (Fig 1)

2 Draw the corner wall for even course as mentioned in exercise 1.3.28.

3 Complete the drawing as per Fig 1.

4 Develop the isometric view of double flemish bond.



1. BRICK WALL - 2,4,6 COURSES (EVEN COURSES) PLAN

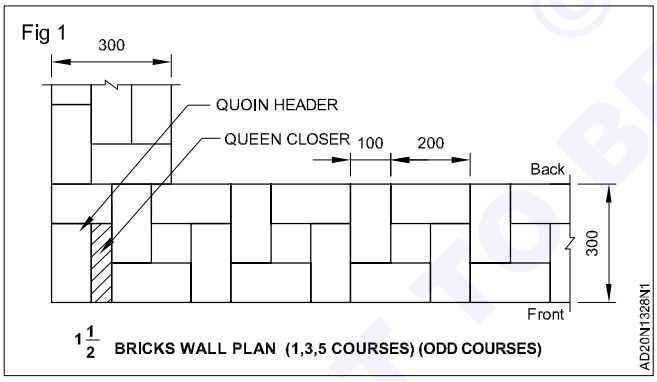
TASK 3: **Double flemish bond one and half brick thick wall**

Draw plan views of double flemish bond for one and half brick thick wall at right angled corner.

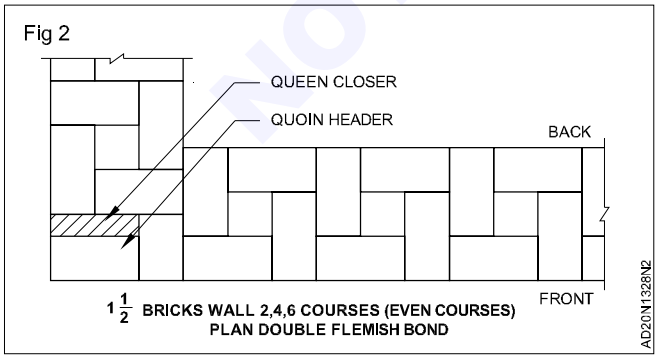
1 Draw the 'L' shape, 300mm wide.

2 Follow the procedures mentioned in TASK 1 and TASK 2.

3 Complete the plan views as per Fig 1 and Fig 2.

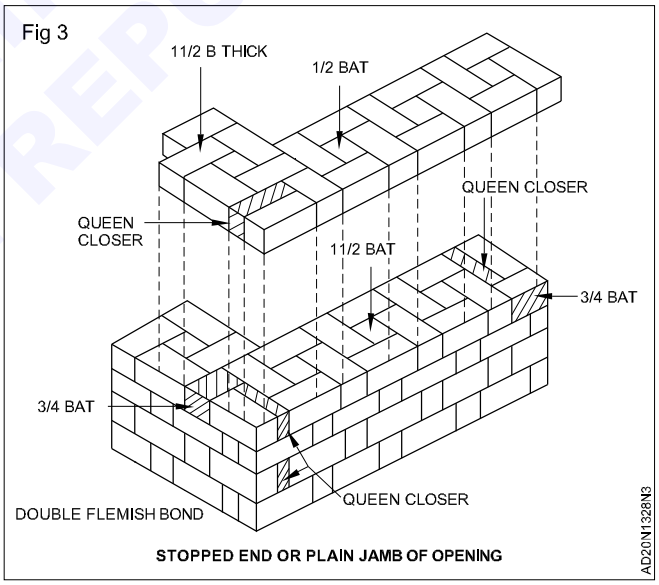


$1\frac{1}{2}$ BRICKS WALL PLAN (1,3,5 COURSES) (ODD COURSES)



$1\frac{1}{2}$ BRICKS WALL 2,4,6 COURSES (EVEN COURSES) PLAN DOUBLE FLEMISH BOND

4 Develop the isometric view of double flemish bond for one and half brick thick wall at right angled corner. (Fig 3)



STOPPED END OR PLAIN JAMB OF OPENING

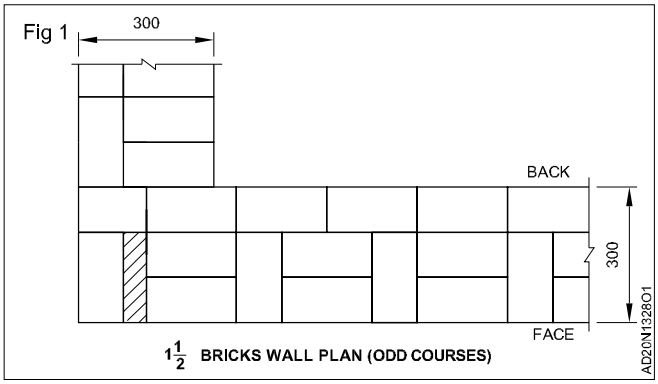
TASK 4: **Single flemish bond one and half brick thick wall**

Draw plan view of odd and even courses of single Flemish bond for one and half brick wall at right angled corner.

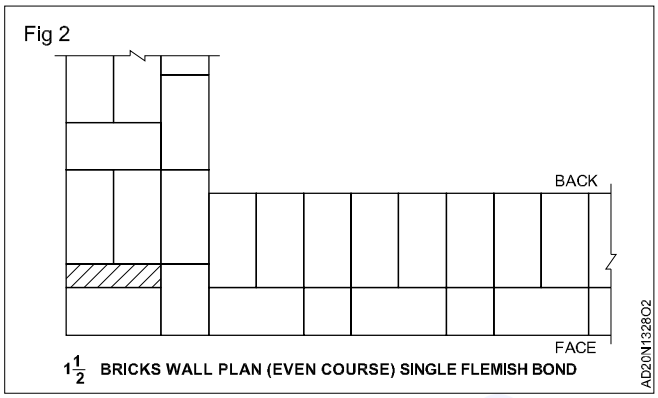
1 Draw the 'L' shape, 300mm wide

2 Draw the arrangement of bricks as flemish bond in face and as English bond in back.

3 Complete the plan as per Fig 1 and 2.



1½ BRICKS WALL PLAN (ODD COURSES)



1½ BRICKS WALL PLAN (EVEN COURSE) SINGLE FLEMISH BOND

Drawing of other types of bond in walls

Objectives: At the end of this exercise you shall be able to
- **draw plan elevation/isometric views for**
  - **header bond**
  - **stretcher bond**
  - **english garden wall bond**
  - **flemish garden wall bond**
  - **diagonal bond**
  - **zig-zag bond**
  - **herring bone bond.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- Adjustable set square - 1 No.
- 30 cms Metric scale - 1 No.
- 90 cms parallel bar or 90 cms T-square - 1 No.

Materials

- A1 drawing sheet - as reqd.
- HB pencil - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.
- Hand cloth - as reqd.

PROCEDURE

TASK 1: **Draw a header bond (Fig 1)**

1 Draw 200mm thick horizontal line, required length.

2 Draw 100m thick vertical line to horizontal line as header bond.

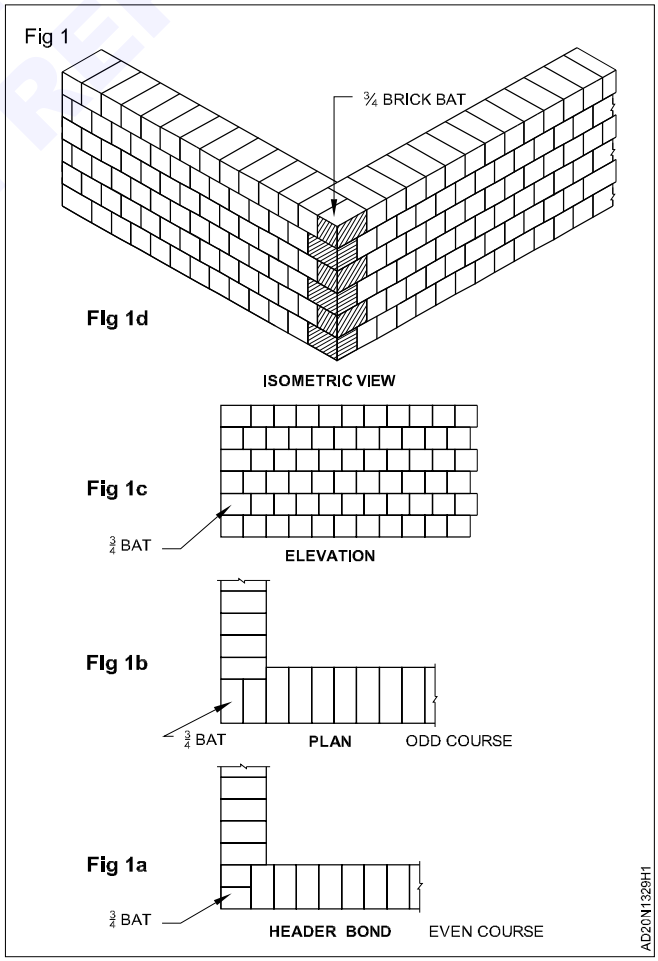
3 Draw two corner brick 3/4 size of a brick in odd course. (Fig 1a)

4 Draw similarly left side of corner wall.

5 Draw similarly even course Fig 1b.

6 Draw the elevation of heading course by projecting the plan. (Fig 1c)

7 Develop isometric view of Header Bond. (Fig 1d)



TASK 2: **Draw stretcher bond (Fig 1)**

1 Draw 100 mm wide two Horizontal lines 1200 mm long in odd course. (Fig 1a)

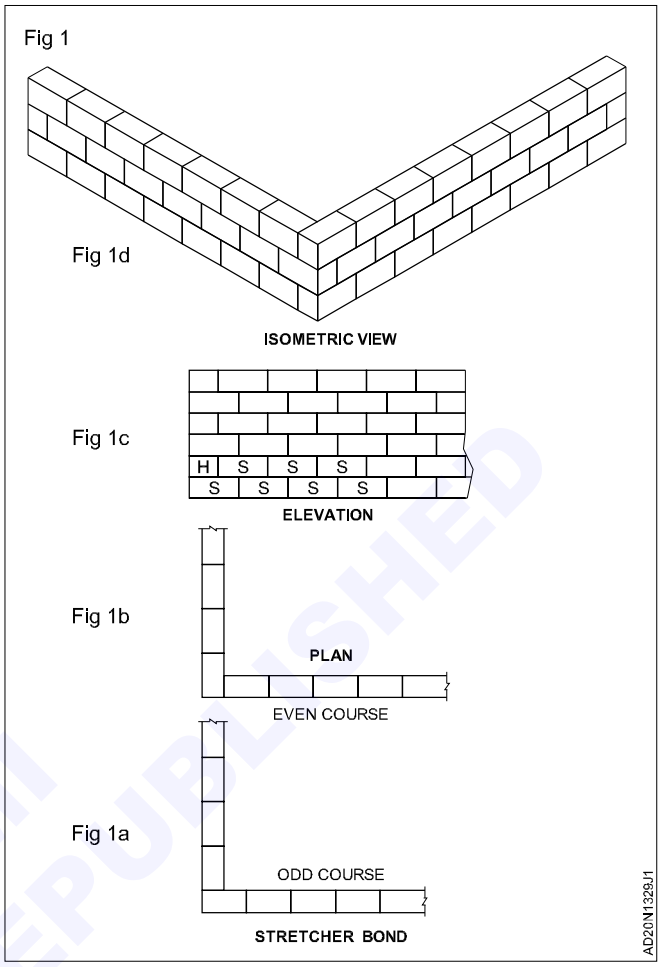
2 Draw at left side 100 mm wide two vertical lines, 1200mm long.

3 Draw 200mm length in plan on both sides. (Fig 1a)

4 Draw similarly even course (Fig 1b).

5 Draw the elevation by projecting the plans. (Fig 1c)

6 Develop the isometric view. (Fig 1d)



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TASK 3: **Draw english garden wall bond (Fig 1)**

1 Draw one course of headers 100mm thick.

2 Draw the first brick as header

3 Draw queen closer (50mm width) next to Quioin brick

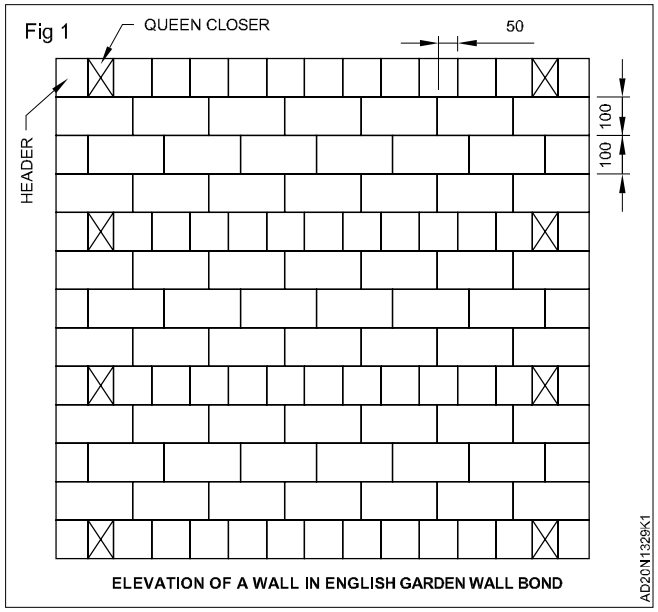
4 Draw the remaining bricks as headers

5 Draw the length of wall upto required length.

6 Draw the successive three or five courses, all as stretcher course.

7 Draw and repeat the courses alternately upto twelve courses (Fig 1)

8 Complete the drawing of English Garden wall Bond as per the figure.



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TASK 4: **Draw flemish Garden wall bond (Fig 1)**

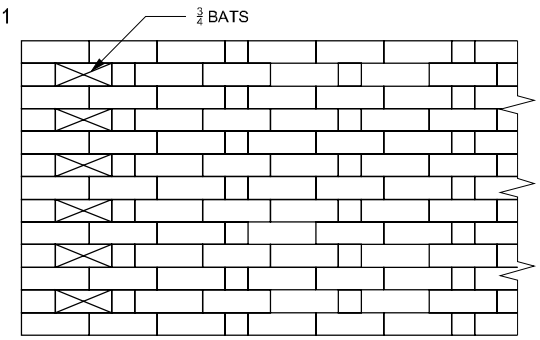
1 Draw alternatively stretchers three to five bricks and then one header in the same course.

2 Draw ¾ bats to avoid vertical joints next to quoin header.

3 Draw and repeat twelve courses in Flemish Garden wall bond as shown in Fig 1.

4 Complete the Elevation.

Fig 1



ELEVATION OF A WALL IN FLEMISH GARDEN WALL BOND

AD20N1329M1

TASK 5: **Draw diagonal bond (Fig 1)**

1 Draw Four brick wall width (800mm).

2 Draw front and back wall as stretcher bond as shown in Fig 1.

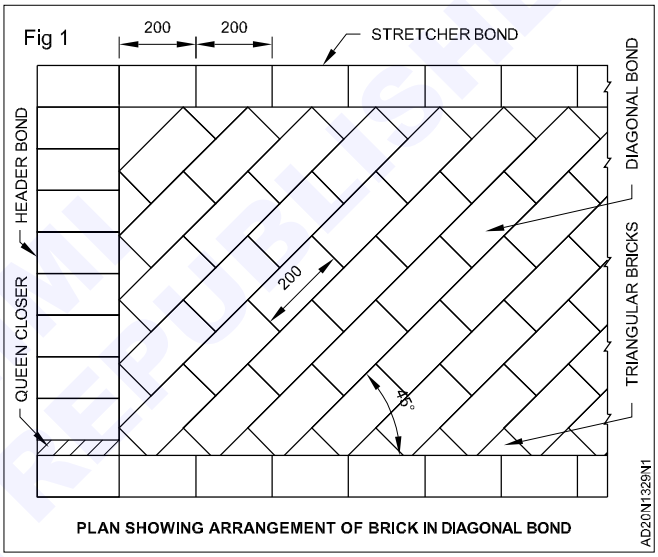
3 Draw the connecting and ending wall as header bond.

4 Draw Queen closer at header bond.

5 Draw 45^0 inclined line in the middle of wall and draw the bricks as shown in the Fig 1.

6 Draw the triangular pieces of brick on the sides (Fig 1) and Complete the plan of Diagonal bond.

Fig 1



PLAN SHOWING ARRANGEMENT OF BRICK IN DIAGONAL BOND

AD20N1329N1

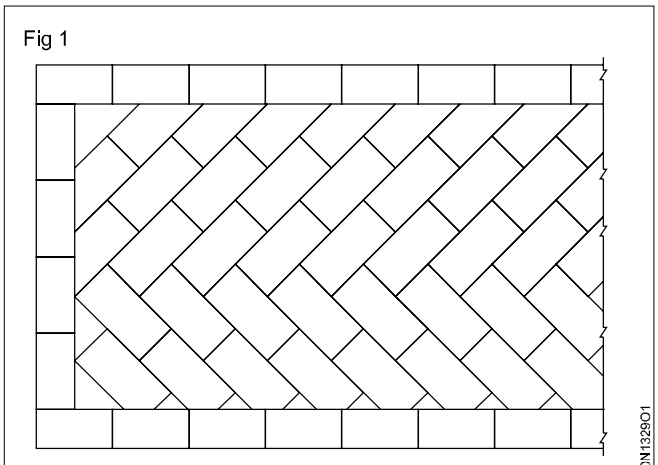
TASK 6: **Draw herring bone bond (Fig 1)**

1 Draw face wall similar to diagonal bond.

2 Draw the lines at an angle of 45^0 from centre in both directions. (Fig 1)

3 Complete the plan of Herring-Bone bond.

Fig 1



PLAN SHOWING ARRANGEMENT BRICKS IN HERRING BONE BOND

AD20N1329O1

TASK 7: **Draw zig - zag bond (Fig 1)**

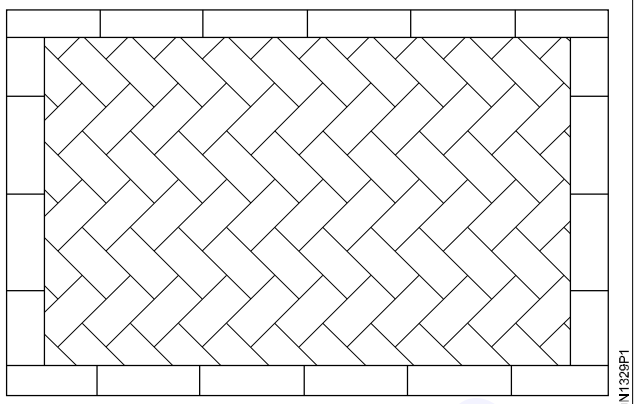
1 Draw a face wall similar to diagonal bond.

2 Divide the face wall 3 equal parts.

3 Draw the lines at an angle of 45° from centre in both direction (Fig 1).

4 Complete the plan of zig-zag bond.

Fig 1



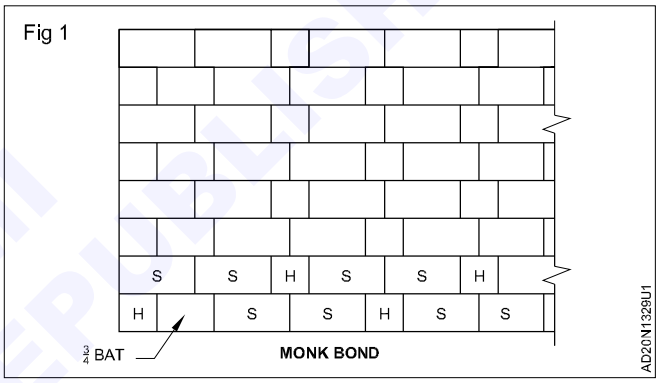
TASK 8: **Draw monk bond (Fig 1)**

1 Draw a header is placed centrally over each middle stretcher.

2 Draw each course contain one header to two stretchers.

3 Draw the header rest on the joint be tweenty two headers.

Fig 1

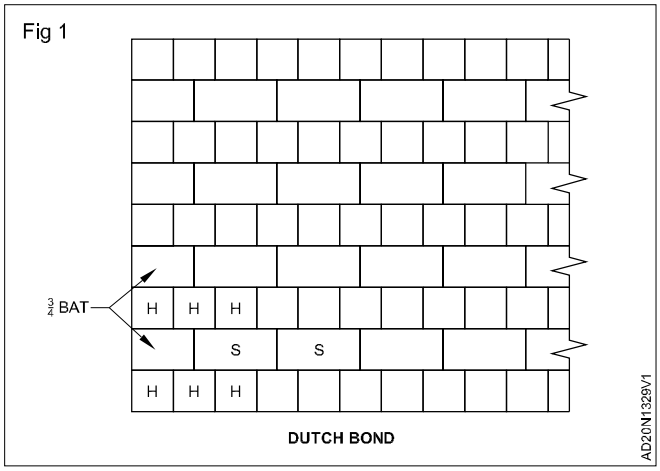


TASK 9: **Draw dutch bond (Fig 1)**

1 Draw a alternate courses of headers and stretchers. (Fig 1)

2 Draw the quoin of stretcher course is ¾ bat.

Fig 1



TASK 10: **Make model (English bond 1 Bricks thick wall)**

Instructor should be provide actual models (miniature bricks) and guide the trainees to make the model for English bond 1 Brick thick wall.

Note: Instructor should be arrange a site visit or presentation to show the actual brick laying process by mason with help of tools. Understanding setting out & measurement, cutting, joint finishing and presentation of masonry construction.

Setting, measurement, cutting, preparation for stone masonry

Objectives: At the end of this exercise you shall be able to
- **to setting up stone for masonry**
- **to measure stone**
- **how to cut stone**
- **to make stone masonry model.**

Requirements

Tools/Instruments/Machines		Materials	
• Trawel	- 1 No.	• Cement	- 5 Kg.
• Pan	- 1 No.	• Sand	- 10 Kg.
		• Water	- as reqd.

PROCEDURE

TASK 1: **Make model in stone masonry 300mm thk wall**

Instructor should guide to make small stone model with cement mortar of size 30 x 45 x 30 mm and also guide trainees to make the model of stone masonry.

Stone Setting: Construction using stone (natural rocks) is called stone setting. This construction techniques uses a combination of stones and mortar to build arches, columns, floors, foundations, and retaining walls.

masonry the stones are roughly dressed to an irregular polygonal shape. The stones should be so arranged as to avoid long vertical joints in face work and to break joints as much as possible. Small stone chips should not be used to support the stones on the facing. To cut the stone, you'll need a chisel and an electric grinder fitted with a diamond-coated cutting blade. What you need is a hammer fit for a stone mason (these are similar to small sledge hammers). You must also have protective equipment. You should use safety glasses, a full face shield, and earplugs

Note: Instructor should guide the trainees to make model of the above task.

Drawing types of coursed and uncoursed rubble masonry

Objectives: At the end of this exercise you shall be able to
- **draw the section and view of coursed rubble masonry**
- **draw the section and view of uncoursed rubble masonry.**

Requirements

Tools/Instruments/Machines

- drawing board - 1 No.
- Adjustable set square - 1 No.
- 30 cms Metric scale - 1 No.
- 90 cms parallel bar or 90 cms T-square - 1 No.

Materials

- A1 drawing sheet - 1 No.
- HB pencil - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.
- Hand cloth - as reqd.

DATA

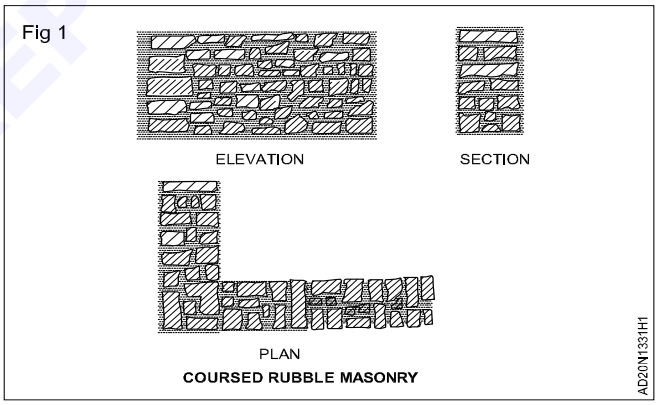
The height each course = 150mm to 200mm

PROCEDURE

TASK 1: **Draw coursed rubble masonry (Fig 1)**

1 Draw each course in free hand and complete the drawing as per given sketch (Fig 1).

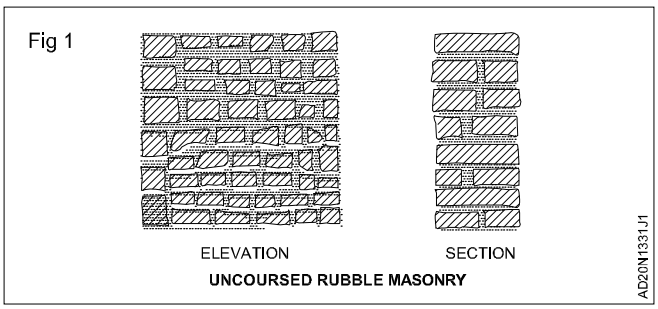
Fig 1



TASK 2: **Draw uncoursed rubble masonry**

Draw the uncoursed rubble masonry in freehand and complete the drawing as per the given sketch (Fig 1).

Fig 1



Draw random rubble masonry

Objectives: At the end of this exercise you shall be able to
- **draw the plan, elevation and section of coursed & uncoursed squared rubble masonry**
- **draw the elevation of polygonal rubble masonry**
- **draw the elevation of flint & dry rubble masonry.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- Adjustable set square - 1 No.
- 30 cms Metric scale - 1 No.
- 90 cms parallel bar or 90 cms T-square - 1 No.

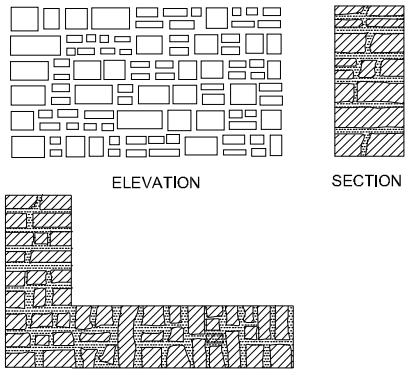
Materials

- A1 drawing sheet - 1 No.
- HB pencil - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.
- Hand cloth - as reqd.

PROCEDURE

TASK 1 : **Draw the plan, elevation, section of coursed square rubble masonry (Fig 1)**

Fig 1



COURSED SQUARE RUBBLE MASONRY

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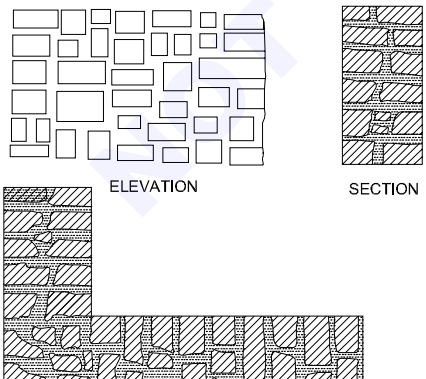
TASK 2 : **Draw the plan, elevation section of uncoursed squared rubble masonry (Fig 1)**

Fig 1



UNCOURSED SQUARED RUBBLE

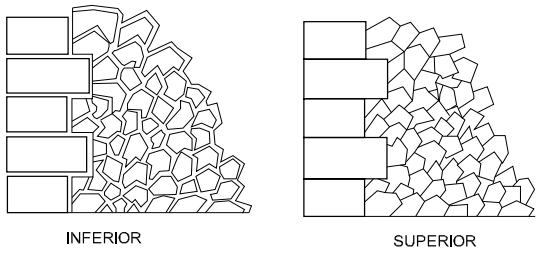
— — — — — — — —

TASK 3: **Draw the elevation of polygonal rubble masonry**

Data: The height of stone between 150 mm to 300mm.

- Draw the masonry in free hand and complete the elevation as shown in figure. (Fig 1)

Fig 1

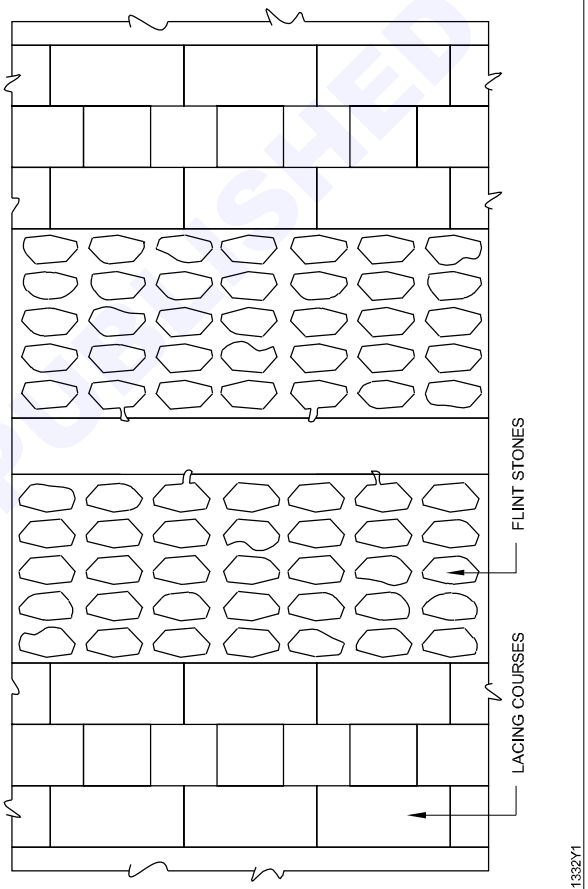


POLYGON RUBBLE MASONRY

TASK 4: **Draw the elevation of flint rubble masonry**

- Draw lacing courses as shown in figure (atleast 3 course)
- Sketch the cousrse with flint stone over the lacing courses.
- Draw the remaining height of wall with lacing courses and flint courses alternatively
- Complete the drawing. (Fig 1)

Fig 1

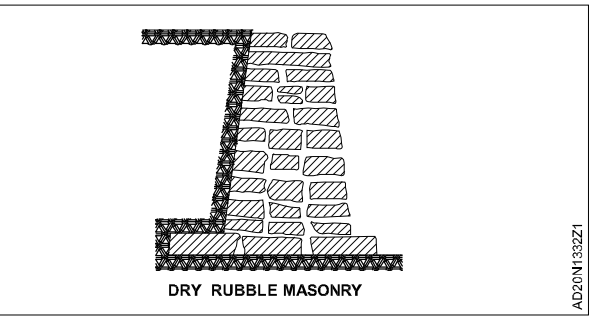


ELEVATION OF FLINT RUBBLE MASONRY

TASK 5 : **Draw the elevation of dry rubble masonry as shown in Fig 1**

Data: Maximum stone should not exceed 300 mm.

Fig 1



DRY RUBBLE MASONRY

Draw the different types of ashlar masonry

Objectives: At the end of this exercise you shall able to
- **draw the elevation of**
  - **ashlar fine masonry**
  - **ashlar rough tooled masonry**
  - **ashlar chamfered masonry**
  - **ashlar quarry faced masonry.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- Adjustable set square - 1 No.
- 30 cms Metric scale - 1 No.
- 90 cms parallel bar or 90 cms T-square - 1 No.

Materials

- A1 drawing sheet - 1 No.
- HB pencil - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.
- Hand cloth - as reqd.

PROCEDURE

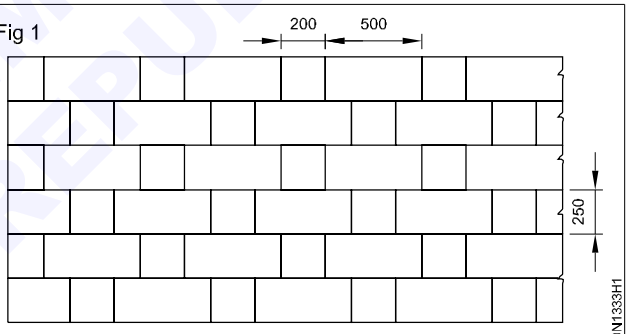
TASK 1: **Draw ashlar fine masonry (Fig 1)**

1 Draw a vertical line to a height of 1500mm and horizontal line of 3000mm.

2 Draw horizontal lines 250mm apart to represent courses. (Fig 1)

3 Complete the drawing as shown in Fig 1.

Fig 1



TASK 2: **Draw ashlar rough tooled masonry (Fig 1)**

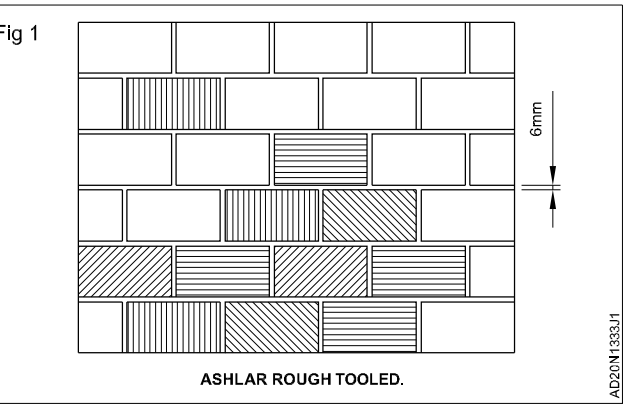
1 Draw the vertical & horizontal Lines as described in TASK 1.

2 Show the mortar thickness (6mm) between stones.

3 Hatch the stone for Rough Tooled finish. (Fig 1)

4 Complete the drawing.

Fig 1



TASK 3: **Draw ashlar chamfered Masonry**

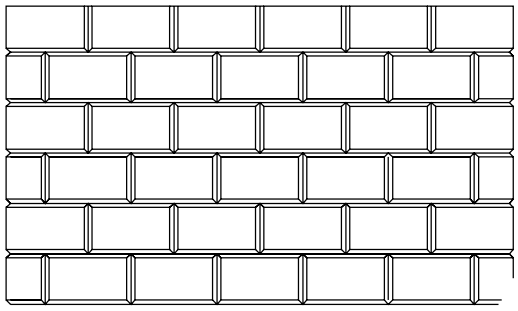
1 Draw the vertical & horizontal lines as described in TASK 1.

2 Draw tripple lines at the joints to represent 45^0 chamfering on stones (Fig 1)

3 Complete the drawing.

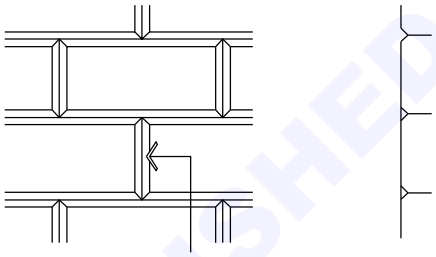
Fig 1

Fig A

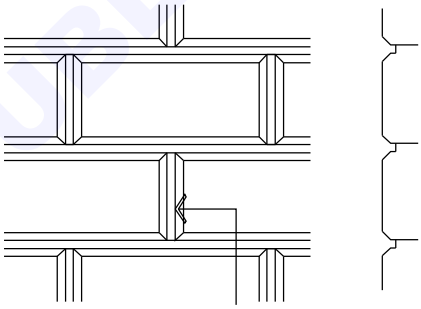


ASHALAR CHAMFERED MASONRY

Fig B



VEE-JOINTSFORMED BY CUTTING EDGES OF STONES AT 45° DEGREES



VEE AND CHANNELLED JOINTS FORMED BY CUTTING REBATE ON EDGE OF STONES

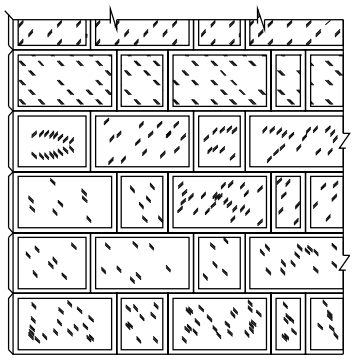
AD20N1333X1

TASK 4: **Draw ashlar quarry faced masonry (Fig 1)**

1 Draw the vertical & horizontal lines as described in Fig 1.

2 Show the Quarry face symbol as shown in Fig 1.

Fig 1



ROCK OR QUARRY FACED

AD20N1333Y1

Composite masonry

Objectives: At the end of this exercise you shall be able to
- **draw stone and brick composite masonry**
- **draw brick and concrete composite masonry**
- **draw rubble and ashlar fine composite masonry.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- Adjustable set square - 1 No.
- 30 cms Metric scale - 1 No.
- 90 cms parallel bar or 90 cms T-square - 1 No.

Materials

- A1 drawing sheet - 1 No.
- HB pencil - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.
- Hand cloth - as reqd.

DATA

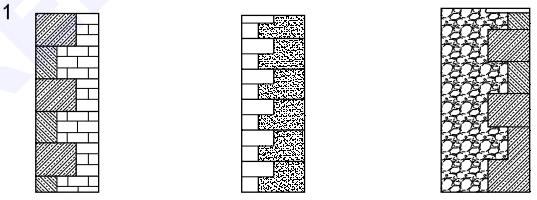
300mm height stone 200 x 200 x 100 mm thick.

PROCEDURE

TASK 1: **Draw the section of stone and brick composite masonry**

1 Draw and arrange the stones and bricks as shown in Fig 1A.

Fig 1



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TASK 2: **Draw the section of brick and concrete composite masonry**

1 Draw and arrange the stone and concrete as shown in (Fig 1B).

— — — — — — — —

TASK 3: **Draw the section of rubble and ashlar fine composite masonry.**

1 Draw and arrange the rubble and ashlar as shown in (Fig 1C).

— — — — — — — —

Drawing of types of foundation

Objectives: At the end of this exercise you shall be able to
- **draw footing for walls (brick/stone)**
- **draw footing for R.C.C. column.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- Adjustable set square - 1 No.
- 30 cms Metric scale - 1 No.
- 90 cms parallel bar or 90 cms T-square - 1 No.

Materials

- A1 drawing sheet - as reqd.
- HB pencil - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.
- Hand cloth - as reqd.

PROCEDURE

TASK 1 **: Draw the sectional elevation of a Spread footing for wall (Fig 1)**

Data:

Wall thickness-300 mm

D- Depth of foundation from ground level-90 mm

a - offset of concrete -150 mm

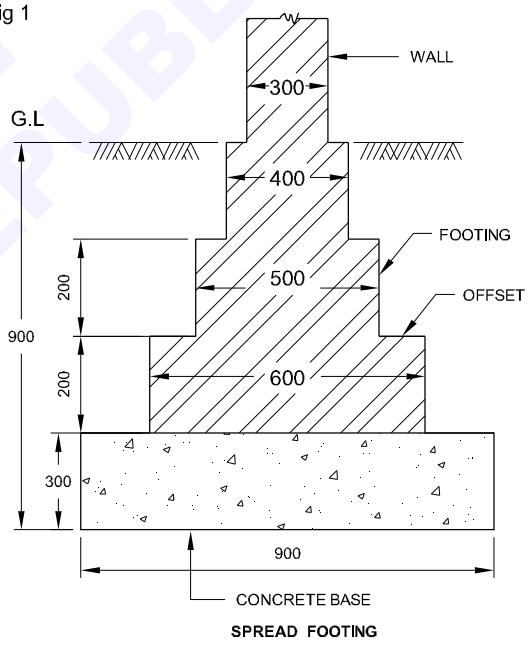
Offset of brickwork- 50 mm

Thickness of footing-200 mm

d-Depth of concrete base -300 mm

B-Breadth of concrete base-900 mm

Fig 1



TASK 2: **Draw R.C.C footing**

DATA

Size of column = 300 x 300 mm

Height of column from G.L. = 3000 mm

Size of concrete footing = 600 x 600 mm

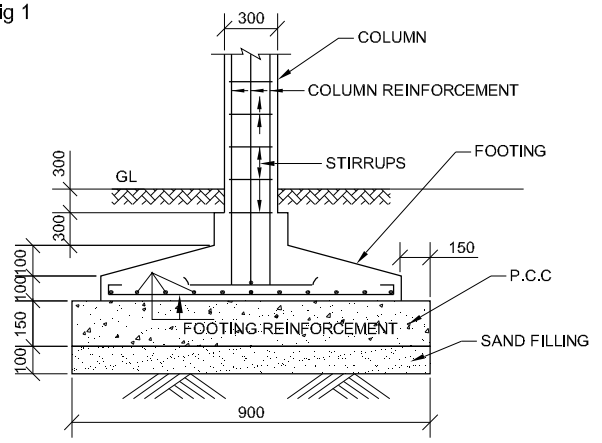
Depth of concrete footing = 200 mm

Depth of foundation = 1050 mm

Thickness of PCC = 150 mm

Thickness of sand filling = 100mm

Fig 1



1 Draw the section of R.C.C. footing

2 Mark the dimension as in Fig 1.

3 Complete the section.

— — — — — — — —

Drawing details of grillage, mat (or) raft and pile foundation

Objectives: At the end of this exercise you shall able to
- **draw the top view and draw cross section of grillage foundation**
- **draw the isometric view of grillage foundation**
- **draw the details of pre cast piles.**

TASK 1: **Plan of grillage foundation**

Draw the plan view to show the arrangement of (Rolled steel joist) R.S.Js in a grillage foundation to support a steel stancheon.

First layer of RSJ

No. of R.S.J in first tier(layer) = 11 Nos.

C.S size of R.S.J = 100 mm x 125 mm

c/c distance between each RSJ = 200 mm

Dia of bolt=16mm.

No of bolts=3.

Second layer of RSJ

No. of R.S.J in the second layer = 4 Nos.

C.S size of R.S.J = 125mm x 300mm

c/c distance between each R.S.J = 200 mm

Bolt details similar to 1st layer

Steel Stancheon

R.S.J Column = 200 x 350 mm

Angle cleat size = 100 x 130 x 12 mm thick

Thickness of gusset plate = 16mm

1 Calculate the size of 1st layer based on the size of R.SJ and c/c distance between each RSJ.

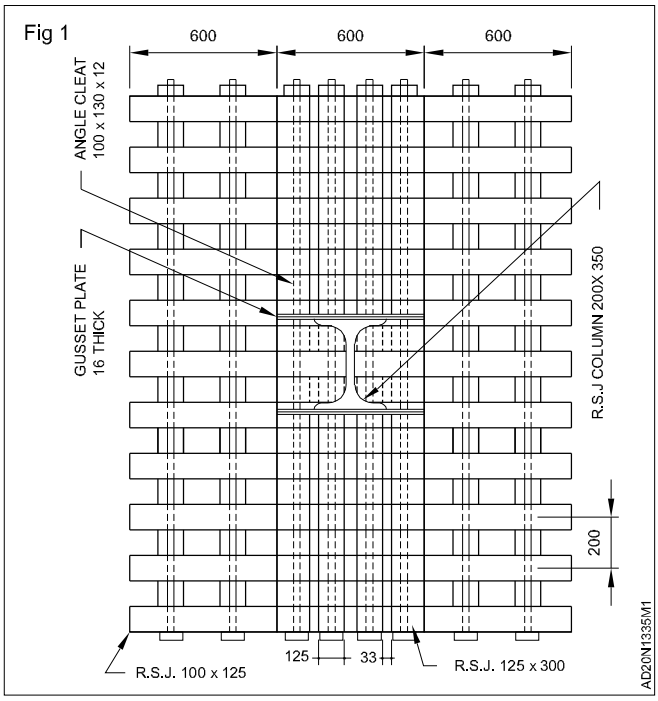
2 Draw the isometric planes and arrange the first tier of R.S.Js as shown in Fig 1.

3 Similarly calculate the size of second layer and draw as detailed in Fig(1).

4 Draw the RSJ column angle cleat and gusset plate as shown in Fig 1.

5 Draw the bolt and nut arrangement and complete the drawing as shown in Fig 1.

Fig 1

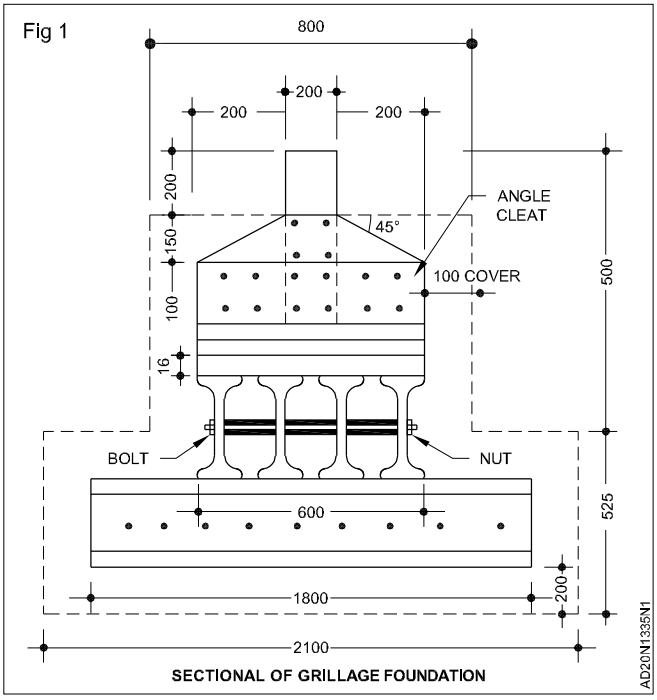


— — — — — — — —

TASK 2: **Section and isometric view of grillage foundation**

1 Draw the R.S.Js in I[st] layer and second layer, and the gusset plate as shown in Fig 1.

Fig 1

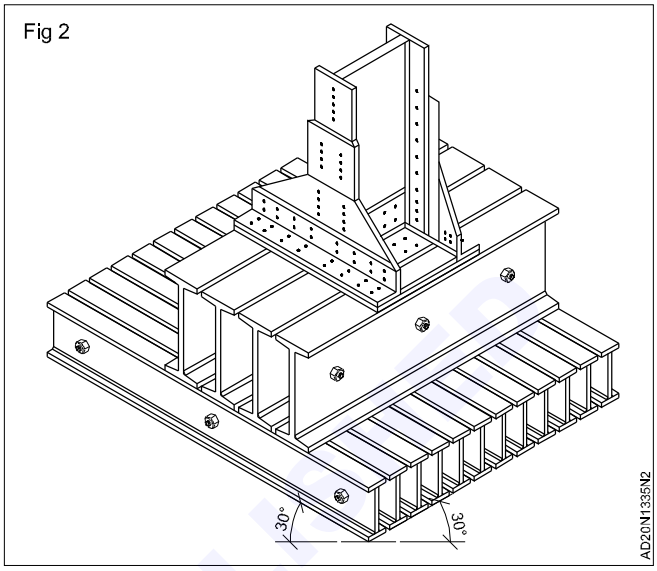


SECTIONAL OF GRILLAGE FOUNDATION

2 Draw the outline of concrete embedding as hidden line and complete the drawing as shown in Fig 1.

3 Develop the isometric view of the grillage foundation as shown in Fig 2.

Fig 2



TASK 3: **Section of R.C.C. raft foundation**

Draw the cross section of raft foundation with slab only.

Thickness of pier = 300 mm

Span between piers = 3000 mm

Thickness of bedding concrete = 150mm

Thickness of R.C.C slab = 300 mm

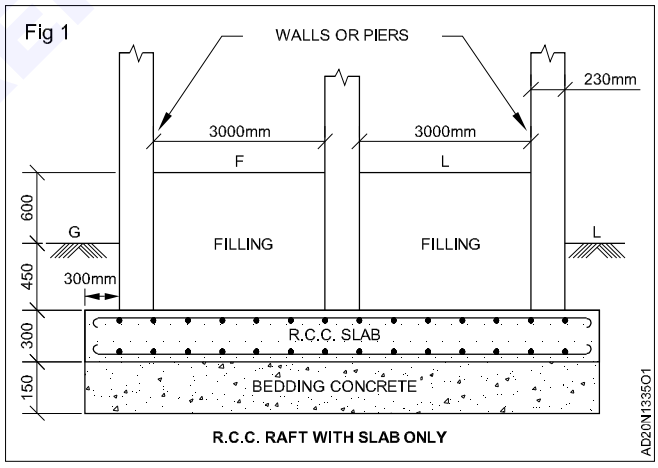
Pillar offset = 300mm.

Depth of sand filling =1350mm.

1 Draw the rectangles for Bedding concrete and R.C.C slab as shown in Fig 1.

2 Draw the supports as per the span and bearings and complete the cross section as detailed in Fig 1.

Fig 1



R.C.C. RAFT WITH SLAB ONLY

TASK 4: **Vertical and cross section of piles**

Draw the cross and vertical section of precast piles.

The size of the pile 300mm x 300mm

Length of the pile 8000 mm

Clear cover = 40mm

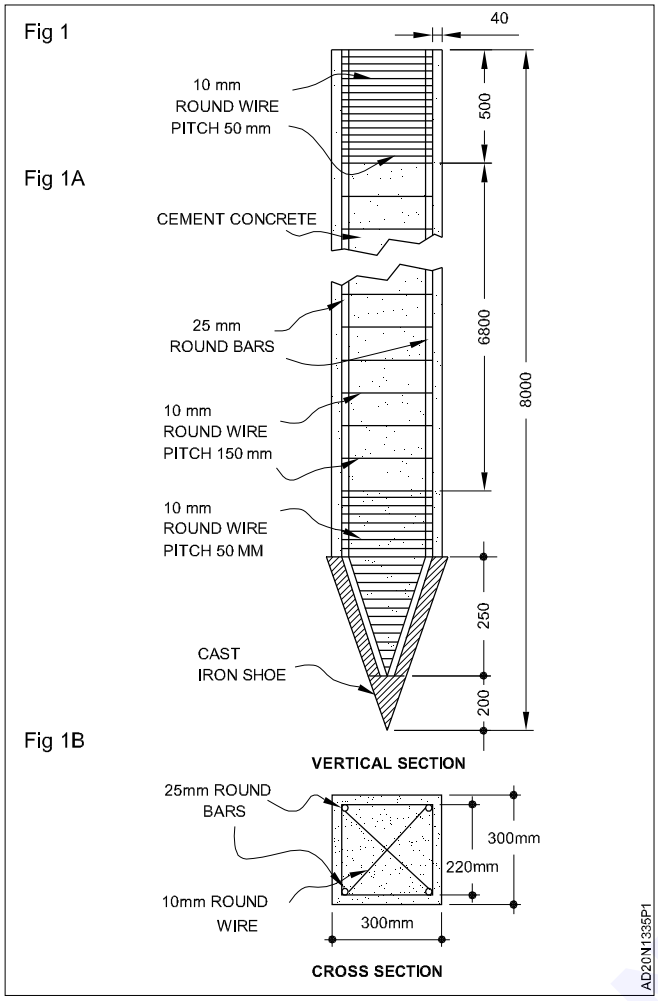
Depth of cast iron shoe = 200mm.

Main bars 25mm ϕ 4Nos. stirrups 10 mm dia spacing as shown in Fig 1.

1 Draw cross section of pile as shown in Fig 1A.

2 Project the vertical section of pile.

3 Draw the bars as per Fig shown 1B and complete the drawing.



TASK 5: **Cross section of precast piles**

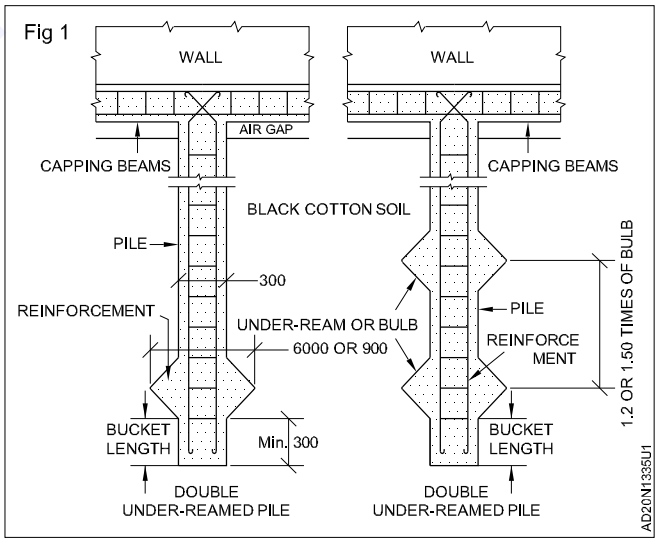
1 Draw the vertical section of precast piles (Fig 1).

2 From the bottom of the pile bucket length is minimum 300 mm.

3 Diameter of under reamed or bulb 2 to 3 times of dia of pile.

4 The vertical spacing between two bulbs varies from 1.25 to 1.50 times dia of bulb.

5 Draw the bars and complete the same.



Carpentry joint - Lengthening joint

Objective: At the end of this exercise you shall be able to
- **draw the views of lengthening joints.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3	- 1 No.
• 'T' square, set square	- 1 No.	• HB pencil	- 1 No.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw the plan and elevation of different types of lengthening joints (Fig 1)**

DATA

Width of the member = 300mm.

Thickness of the member = 200mm.

Length of the member = can be assumed.

1 Draw the plan and elevation of lapped joints using member size 300x200mm. (Fig 1a,b)

2 Draw the elevation of finished joints with single fish plates, double fish plates and intented fish plates. (Fig 2a,b,c)

3 Draw the elevation of scarfed or spliced joints. (Fig 3a,b,c)

4 Draw the elevation of table joints. (Fig 4a,b,c)

Fig 1

Fig 1

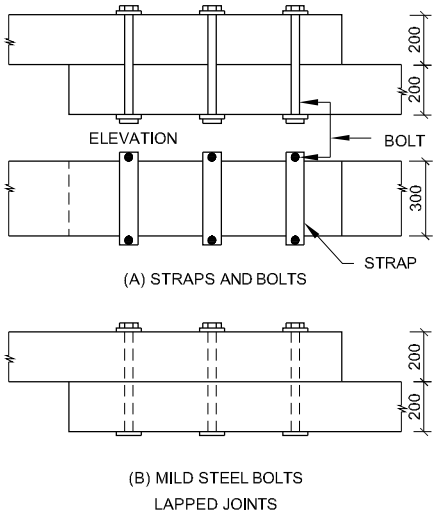
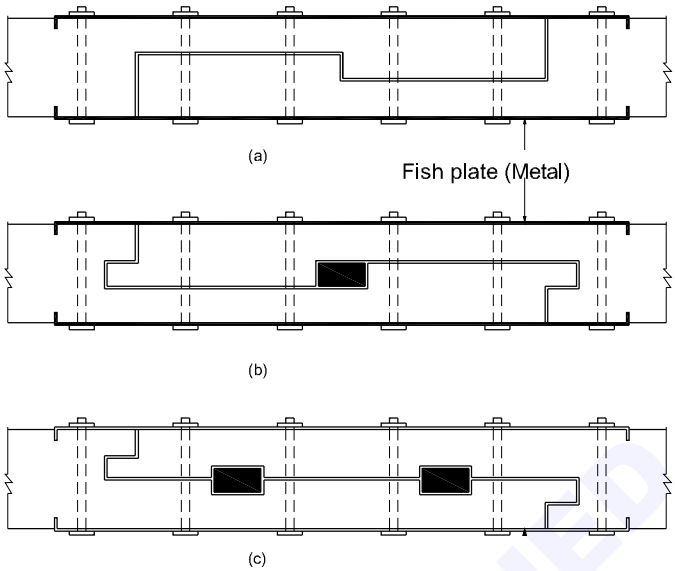
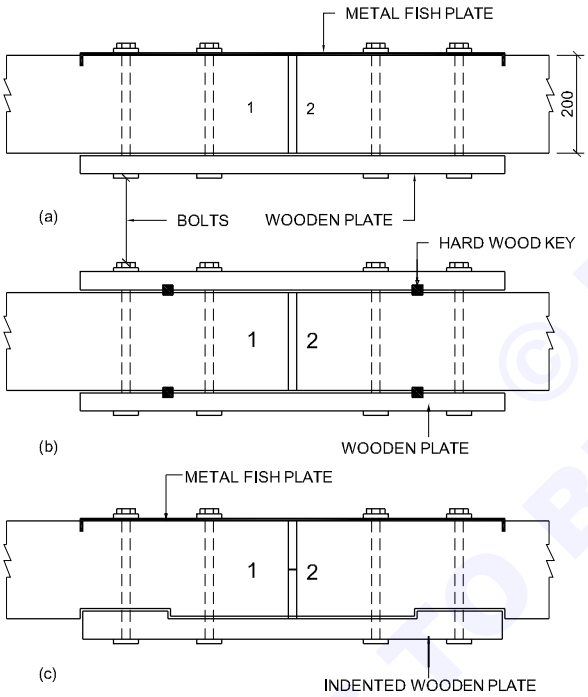


Fig 4



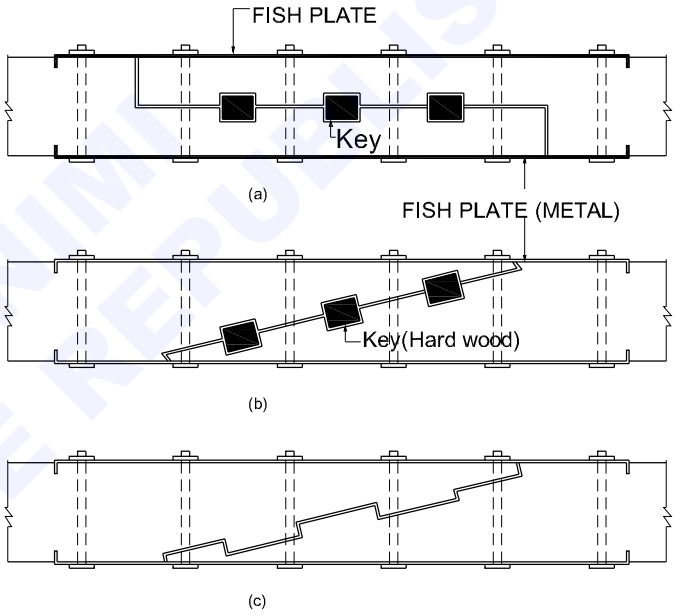
TABLED JOINTS

Fig 2



FISHED JOINTS

Fig 3



SCARFED OR SPLICED JOINTS

LENGTHENING JOINTS

AD20N1436H1

Carpentry joint - Bearing joints

Objectives: At the end of this exercise you shall be able to
- **draw the view of bearing joints**
- **draw the elevation and section of bearing joints.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3	- 1 No.
• 'T' square, set square	- 1 No.	• HB pencil	- 1 No.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw the view of bearing joint (Fig 1)**

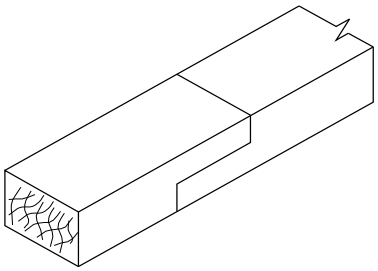
1 Draw longitudinal halved joint and Tee halved joint.
2 Draw bevelled halved joint and angle halved joint.
3 Draw single and double notched joint.
4 Draw cogged joint.
5 Draw mortise and tenon joint.
6 Draw double tenon joint.

— — — — — — — —

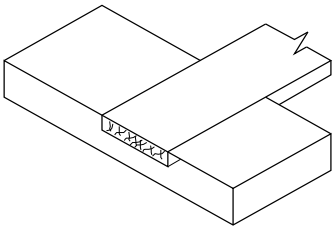
TASK 2: **Draw the elevation and section of bearing joint (Fig 1)**

1 Draw plan and elevation of joggle tenon joint.
2 Draw the elevation mortise and tenon joint.

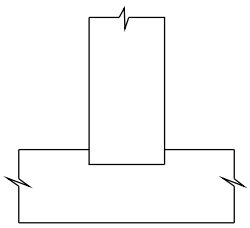
Fig 1



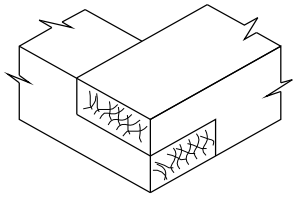
LONGITUDINAL HALVED JOINT



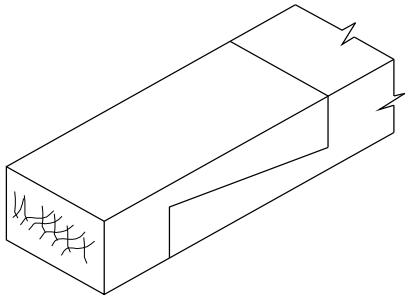
TEE HALVED JOINT



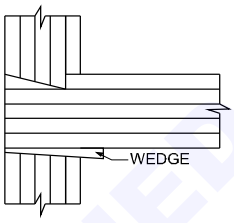
HOUSED JOINT



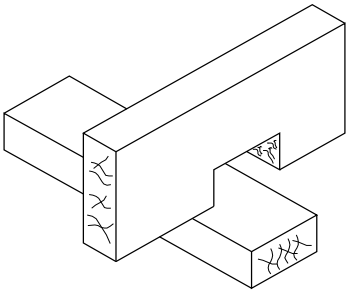
ANGLE HALVED JOINT



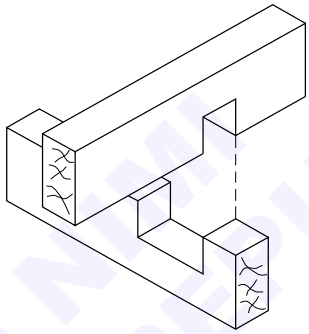
BEVELLED HALVED JOINT



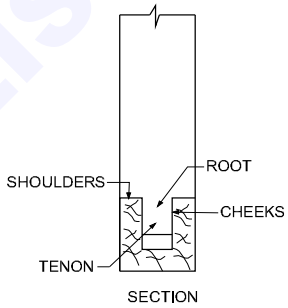
DOVETAIL JOINT



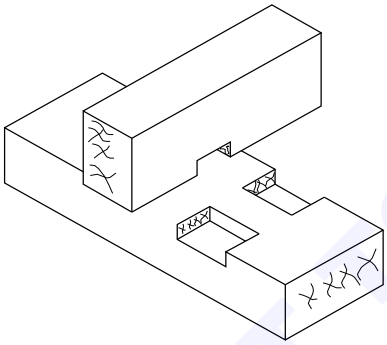
SINGLE NOTCHED JOINT

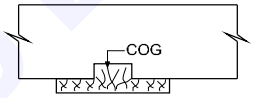


DOUBLE NOTCHED JOINT

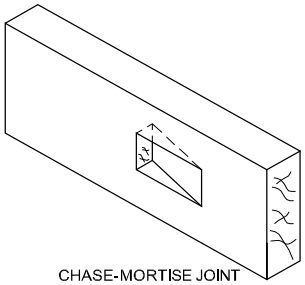


SECTION

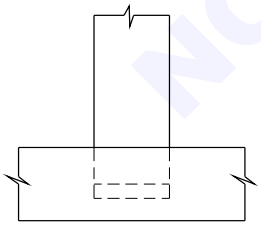




COGGED JOINT

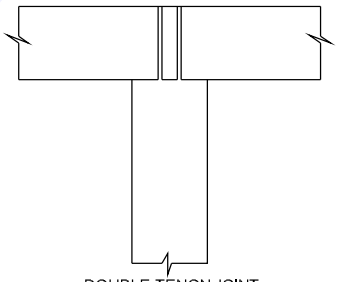


CHASE-MORTISE JOINT

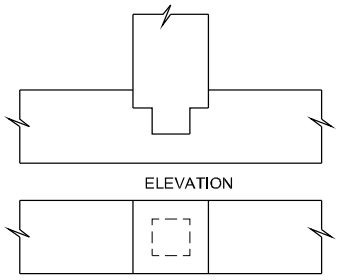


ELEVATION

MORTISE AND TENON JOINT



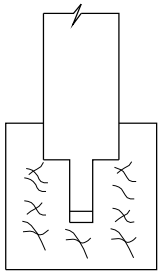
DOUBLE TENON JOINT



ELEVATION

PLAN

JOGGLE TENON JOINT



HOUSED TENON JOINT

AD20N1437H1

BEARING JOINTS

Draw carpentry joints - Framing joints

Objectives: At the end of this exercise you shall be able to
- **draw an isometric view of framing Joints.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- Adjustable set square - 1 No.
- 30 cms Metric scale - 1 No.
- 90 cms parallel bar or 90 cms T-square - 1 No.

Materials

- A1 drawing sheet - 1 No.
- HB pencil - 1 No.
- Non dust eraser - 1 No.
- Cello tape - as reqd.
- Sharpner - 1 No.
- Hand cloth - as reqd.

PROCEDURE

TASK 1: **Draw Framing Joint between Top rail and style to a scale 1:5**

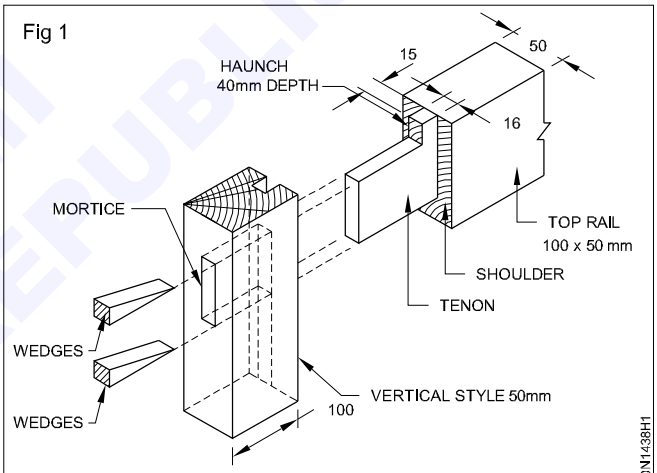
DATA

Size of vertical style 100 x 50 mm

Size of top rail 100 x 50 mm

1 Draw isometric view of vertical style
2 Draw mortice on top of vertical style
3 Draw Haunch 40mm Deep and 16mm thick
4 Draw an isometric view of top rail 100 x 50 mm
5 Draw shoulder on both side 17mm wide
6 Draw tenon 100 mm length
7 Draw the wedges.
8 Complete the drawing of framing joint between the top rail and style (Fig 1).

Fig 1



FRAMING JOINT BETWEEN TOP RAIL AND STYLE COMMON TENON JOINT STYLE

— — — — — — — —

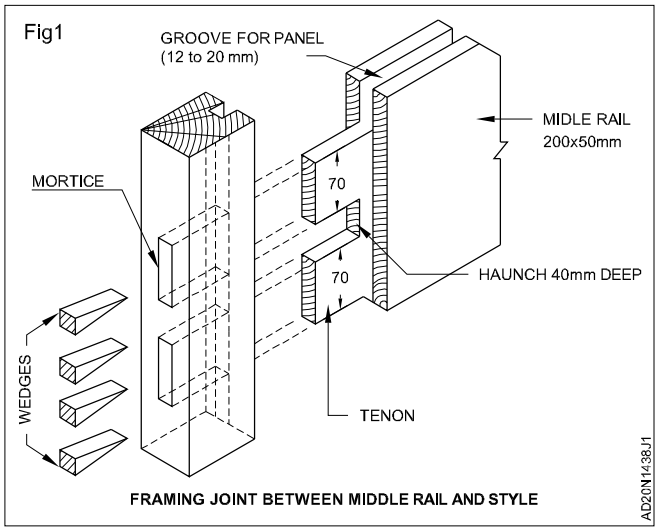
TASK 2: **Draw isometric view of Framing joint between middle rail and style**

DATA

Size of vertical style as per (Fig 1)

Size of middle rail 200 x 50 mm

1 Draw isometric view of vertical style.
2 Draw two mortice in the vertical style.
3 Draw the distance between the mortice 40mm deep.
4 Draw groove at right side for panel (12mm).
5 Draw an isometric view of middle rail 200 x 50 mm.
6 Draw 12mm groove at top for panel fixing.
7 Draw each 70mm depth tenon.
8 Draw 40 mm depth Haunch.
9 Draw wedges to tighten the joints.
10 Complete the Drawing of Framing joints between middle rail or Lock rail and style. (Fig 1)

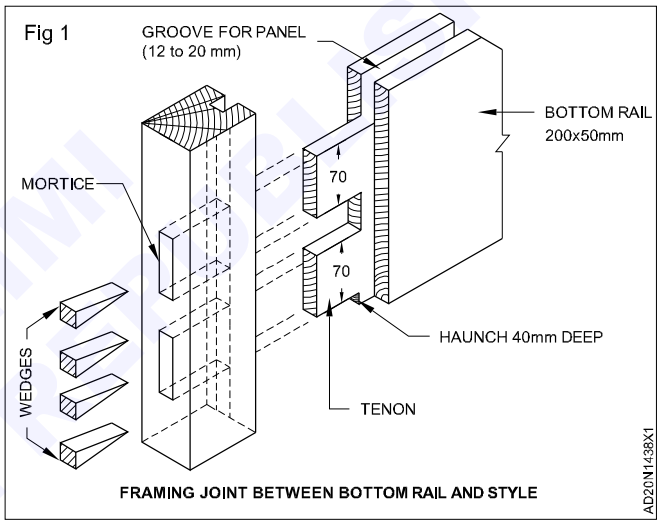


TASK 3: **Draw the isometric view of Framing joint between Bottom rail and style**

1 Draw the isometric view of Framing joint between Bottom rail and style

2 Draw the isometric view of style and Bottom rail similar to Task 2.

3 Draw and develop according to the specification givenin the Drawing. (Fig 1).



Carpentry joint - Angle or corner joint

Objective: At the end of this exercise you shall be able to
- **draw the sketches of angled or corner joints.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3	- 1 No.
• 'T' square, set square	- 1 No.	• HB pencil	- 1 No.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw the elevation of angled or corner joints (Fig 1)**

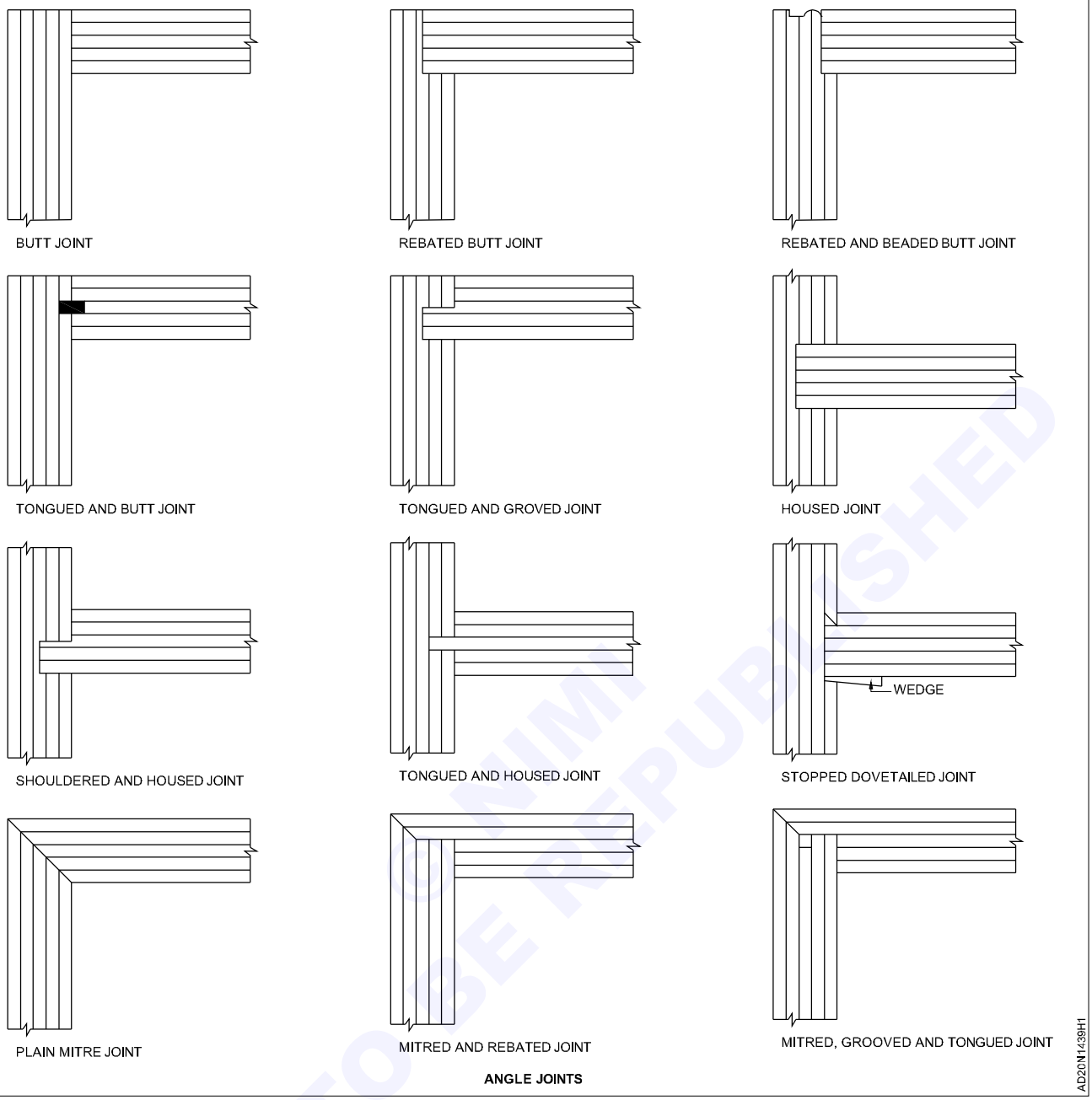
1 Draw the elevation of types of butt joint.

2 Draw the elevation of grooved and housed joint.

3 Draw the elevation of housed joint.

4 Draw the elevation mitred joint.

Fig 1



Carpentry joint - Widening or side joints

Objective: At the end of this exercise you shall be able to
- **draw the widening joints.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3	- 1 No.
• 'T' square, set square	- 1 No.	• HB pencil	- 1 No.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- as reqd.

PROCEDURE

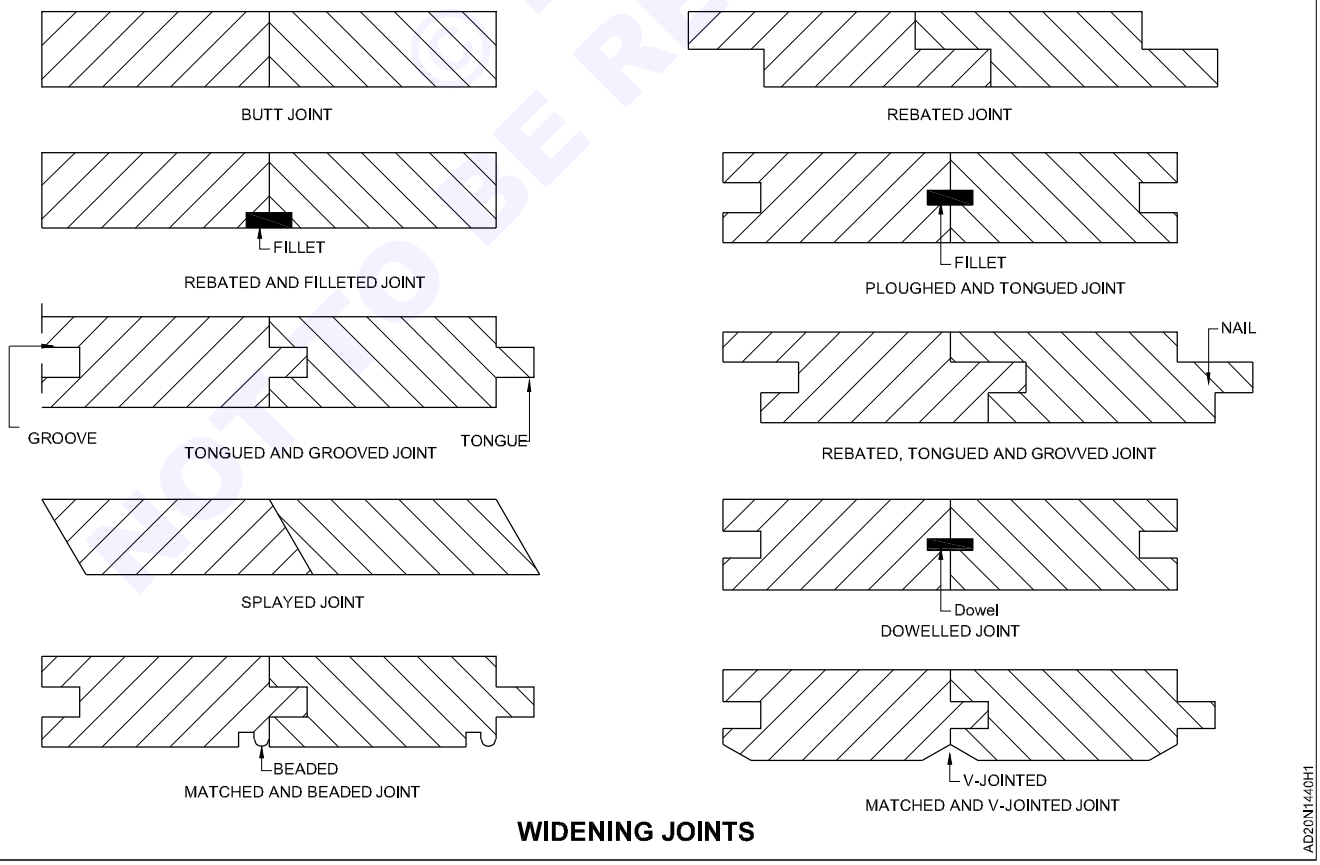
TASK 1: **Draw the sectional elevation of widening joints (Fig 1)**

DATA: Thickness of member - 200 mm.

Draw the sectional elevation of:

1 Butt joint.
2 Rebated joint.
3 Rebated and filleted joint.
4 Ploughed and tongued joint.
5 Tougued and grooved joint.
6 Rebated, tougued and grooved joint.
7 Splayed, dowelled, matched and beaded, mathced and V-joint and dovetailed joint.

Fig 1



WIDENING JOINTS

Carpentry joint - Oblique - shouldered joints

Objective: At the end of this exercise you shall be able to
- **draw the view of oblique - shouldered joints.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3	- 1 No.
• 'T' square, set square	- 1 No.	• HB pencil	- 1 No.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw the view of oblique - shouldered joints (Fig 1)**

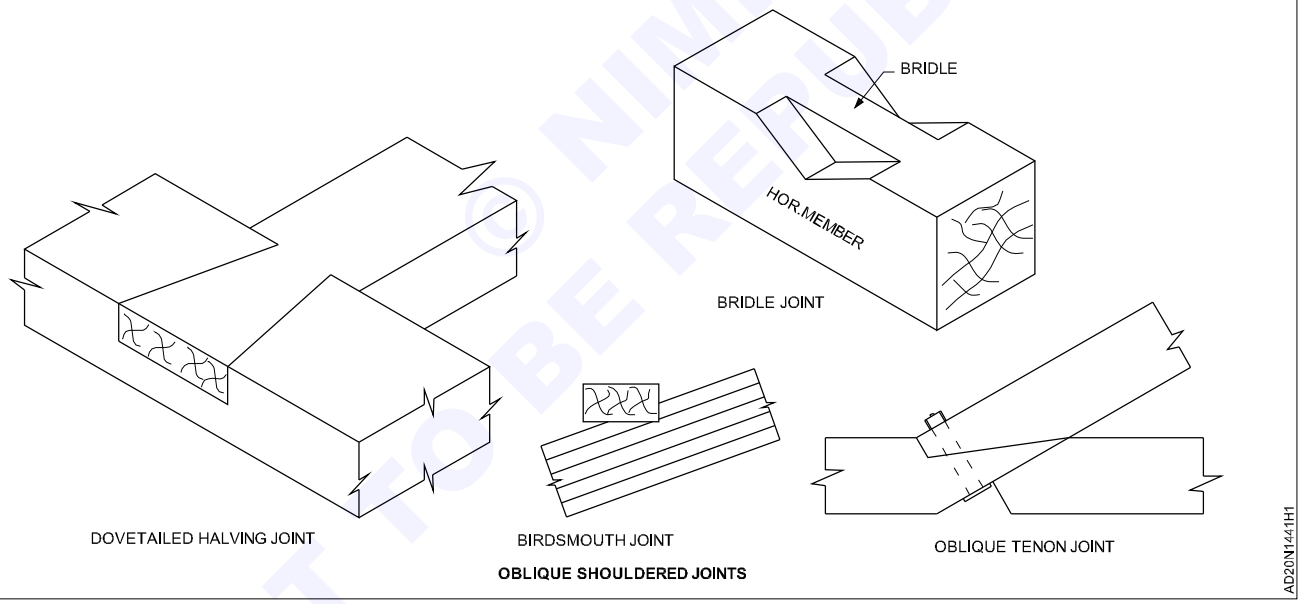
1 Draw the view of birdsmouth joint.

2 Draw the view of bridle joint.

3 Draw dovetaied halving joint.

4 Draw oblique tenon joint.

Fig 1



Types of doors

Objectives: At the end of this exercise you shall be able to
- **draw the views of ledged and battened door**
- **draw the views of ledged, battened and braced door**
- **draw the views of ledged, battened, braced and framed door.**

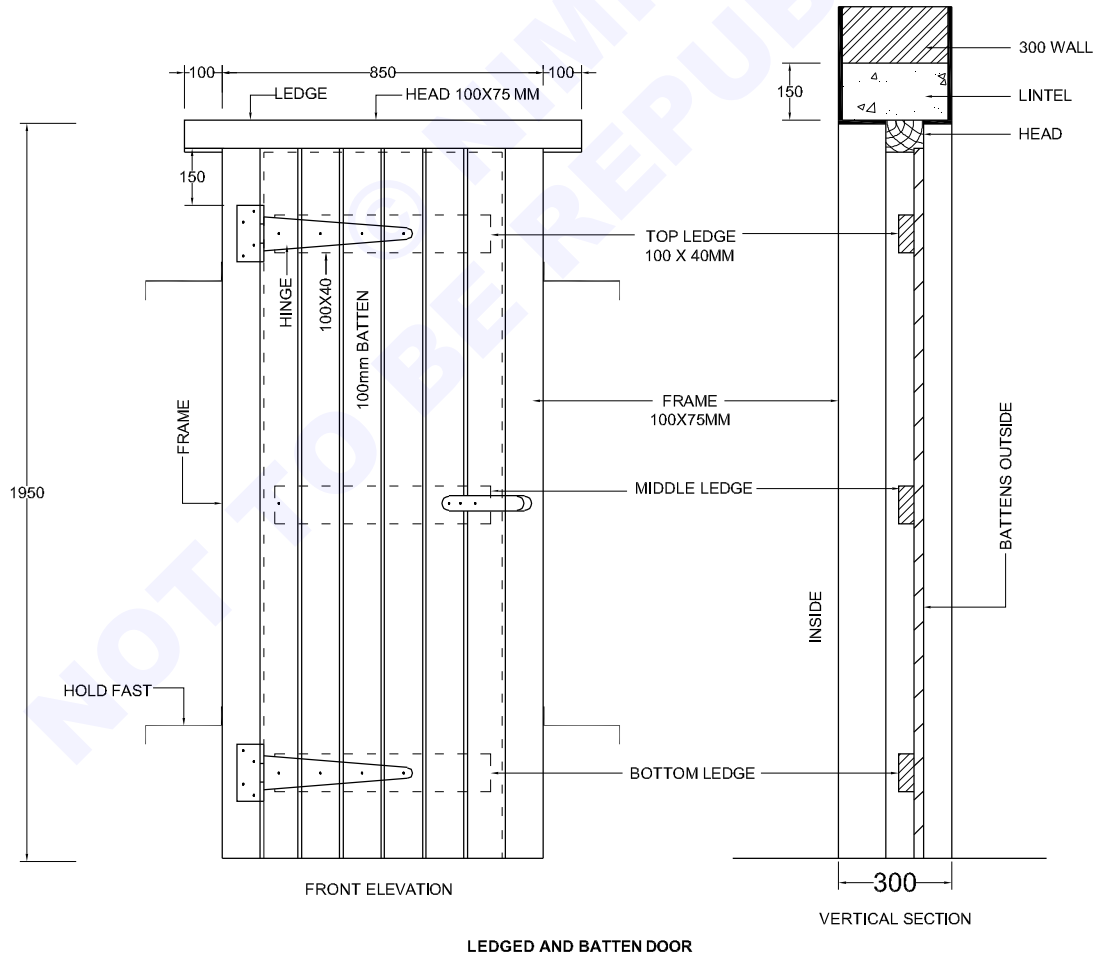
Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3	- 6 Nos.
• 'T' square, set square	- 1 No.	• HB pencil	- 1 No.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw the elevation and vertical section of ledged and battened door (Fig 1)**

Fig 1



LEDGED AND BATTEN DOOR

DATA

Width of wall	- 300 mm.
Height of lintel	- 150 mm.
Size of door	- 850 x 1950 mm.

Frame size

Head frame	- 100 x 75 mm.
Post	- 100 x 75 mm.
Ledge	- 100 x 40 mm -3 Nos.
Batten	- 32 mm thick - 6 Nos.
Length of hinges	- 400 mm -2 Nos.

1 Draw the door opening, size 850 x 1950 mm.

2 Draw two door posts, thickness 75 mm and height 1875 mm, at a distance of 700 mm apart.

3 Draw door head 75 mm thick and 1050 mm length.

4 Draw batten 6 nos, 117 mm width between the posts.

5 Draw top, middle and bottom ledges, of size 100 x 40 mm as shown in figure.

6 Draw two hinges of length 400 mm at a suitable position.

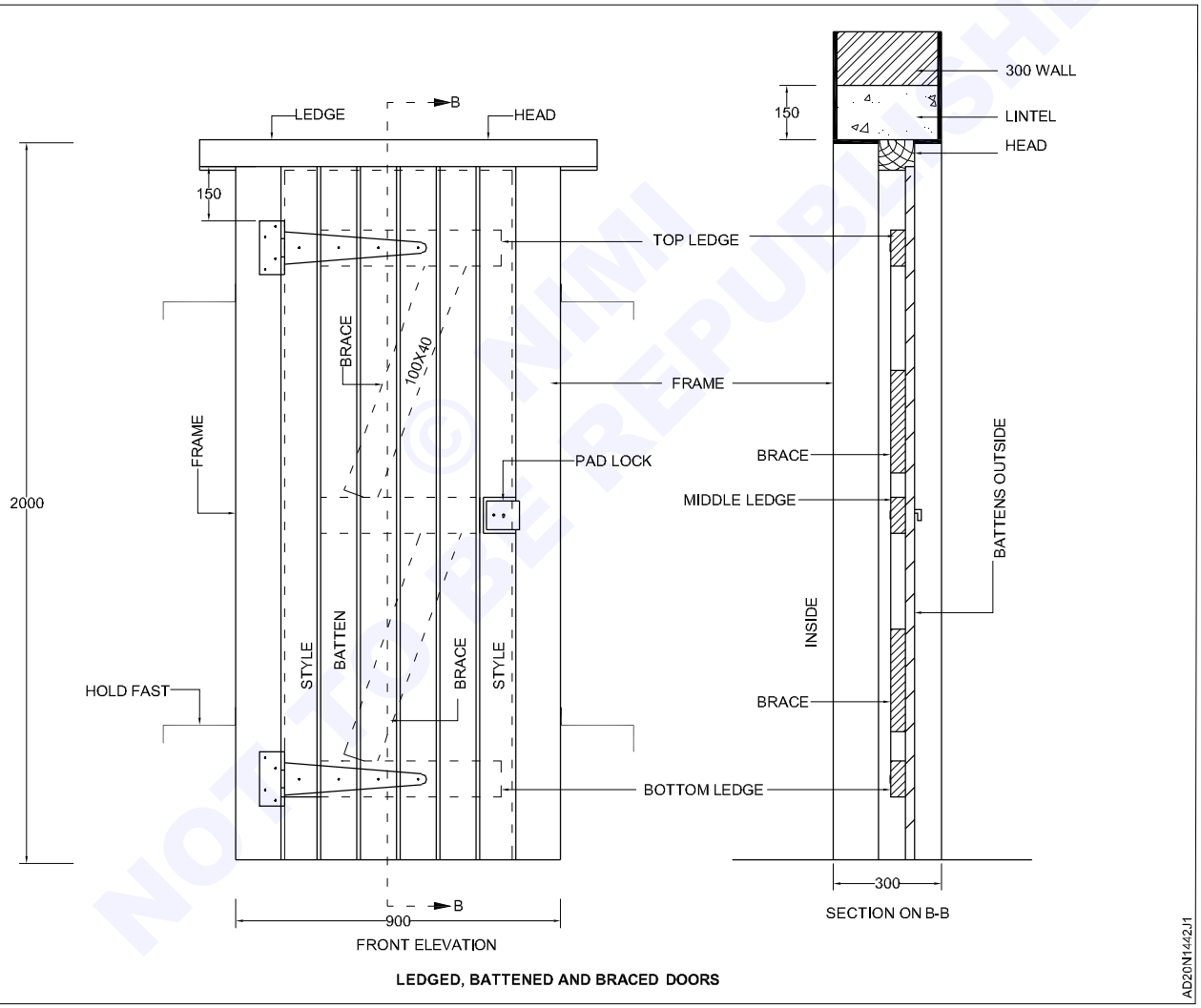
7 Develop the vertical section and fill the details as shown in figure.

8 Complete the drawing.

— — — — — — — —

TASK 2: **Draw the vertical section and elevation of ledged, battened and braced door (Fig 1)**

Fig 1



LEDGED, BATTENED AND BRACED DOORS

DATA

Width of wall	- 300 mm.
Height of lintel	- 150 mm.
Size of door	- 850 x 1950 mm.

Frame size

Head frame	- 100 x 75 mm.
Post	- 100 x 75 mm.
Ledge	- 100 x 40 mm -3 Nos.

Batten - 32 mm thick - 6 Nos.

Length of hinges - 400 mm -2 Nos.

1 Draw the door opening, size 850 x 1950 mm.

2 Draw two door posts, thickness 75 mm height 1875 mm, at a distance of 700 mm apart.

3 Draw door head 75 mm thick and 1050 mm length.

4 Draw batten 6 nos, 117 mm width between the posts.

5 Draw top, middle and bottom ledges, of size 100 x 40 mm as shown in figure.

6 Draw two hinges of length 400 mm at a suitable position.

7 Draw braces inclined between top and middle ledges and middle and bottom ledges.

8 Develop the vertical section, fill the details and Complete the drawing.

— — — — — — — —

TASK 3: **Draw the vertical section, elevation of leged, framed and braced door**

DATA	
Width of wall	- 300 mm.
Height of lintel	- 150 mm.
Size of door	- 900 x 2000 mm.

Frame size:

Head frame - 100 x 75.

Post - 100 x 75 mm.

Ledge - 100 x 30 mm -3 Nos.

Batten - 30 mm thick - 4 Nos.

Styles - 125 x 40 mm thick, 2 Nos.

Length of hinges - 400 mm -3 Nos.

1 Draw the door opening, size 900 x 2000m.

2 Draw two posts, thickness 75 mm and height 1925 mm, at a distance of 750 mm apart.

3 Draw door head 75 mm thick and 1200 mm length.

4 Draw styles 125 x 40 mm thick 2 Nos.

5 Draw battens 4 Nos, 125 mm width between the styles.

6 Draw top, middle and bottom ledges as shown in figure.

7 Draw the hinges 400 mm - 2 Nos.

8 Draw braces inclined between top and middle ledges and middle and bottom ledge.

9 Develop the vertical section and mark the symbol and complete the drawing.

Panelled door

Objectives: At the end of this exercise, you shall be able to, draw the views of
- **panelled door**
- **panelled and glazed door.**

TASK 1: **Draw the vertical section, elevation of panelled door (Fig 1)**

DATA	
Width of wall	- 300 mm.
Height of lintel	- 150 mm.
Size of door	- 1000 x 2000 mm.

Frame size:

Head frame - 90 x 70 mm.

Post - 90 x 70 mm.

Vertical styles - 95 x 35 mm -4 Nos.

Top rail - 95 x 35 mm.

Lock rail - 150 x 35 mm.

Mid rail - 95 x 35 mm.

Butt hinges - 100 mm 4 Nos.

Pannel - 6 Nos. of equal size, 20 mm thick.

1 Draw door opening, size 1000 x 2000 mm.

2 Draw two post 70 mm thick, height 1930 mm at a distance of 860 mm apart.

3 Draw door head 70 mm thick 1300 mm length inclined the horn.

4 Draw style of size 95 x 35 mm near the two post.

5 Draw top rail 95 x 35 mm.

6 Draw panel size 20 mm thick.

7 Draw middle rail 95 x 35 mm.

8 Draw lock rail 150 x 35 mm.

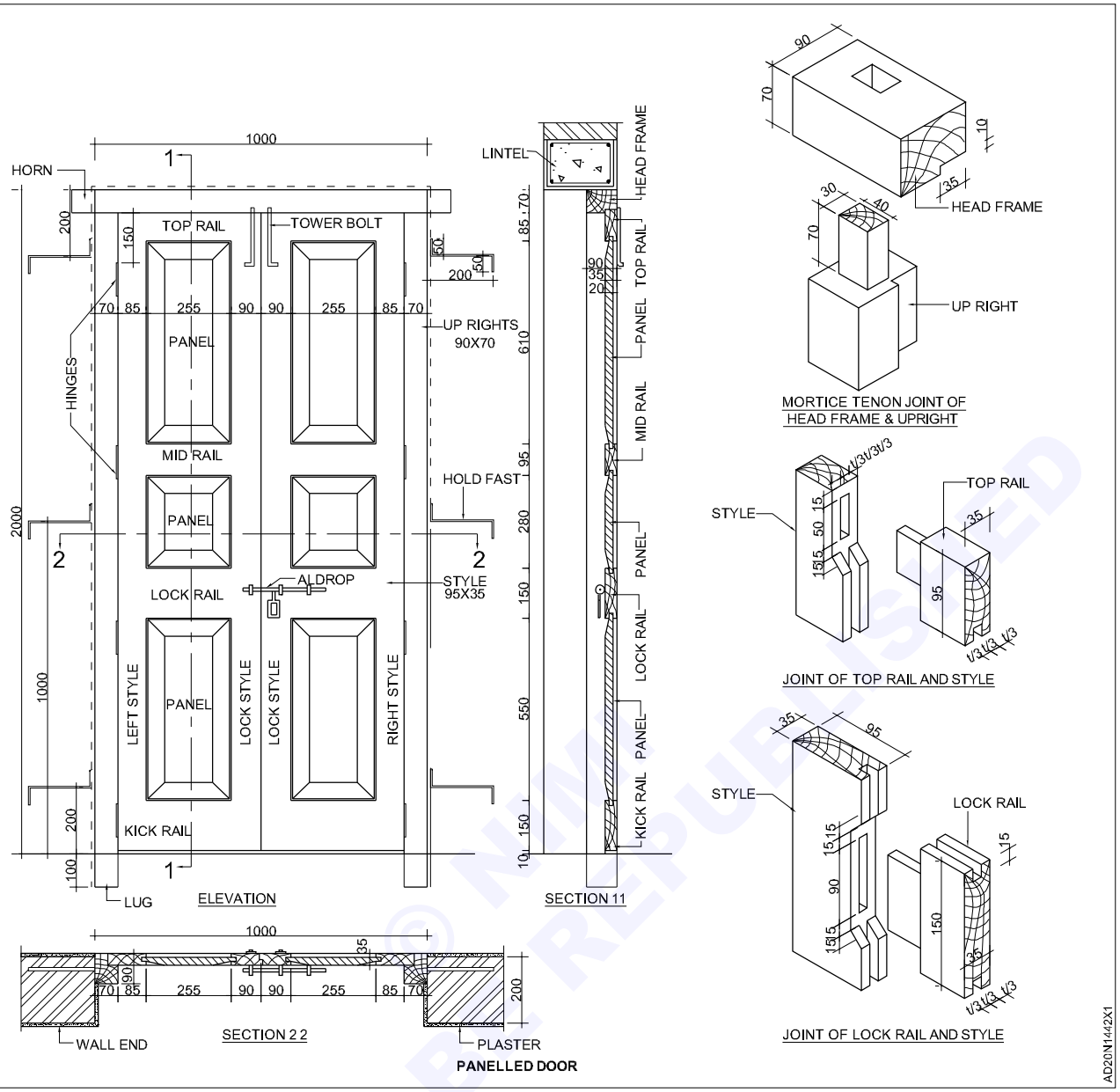
9 Draw the bottom rail 150 x 35 mm.

10 Draw panels and butt hinges as shown in figure.

11 Mark the aldrop in lock rail and complete the drawing.

12 Draw the vertical section and mark the symbols and complete the drawing.

Fig 1



Flush door

Objective: At the end of this exercise, you shall be able to
- **draw the section and elevation of the flush doors.**

TASK 1: **Draw the elevation and section of soild or laminated flush door (Fig 1A)**

DATA	
Size of door	- 1000 x 2000.
Post	- 80 x 120 mm - 2 Nos.
Head	- 80 x 120 mm.
3 ply	- 6 mm thick.
Thickness of shutter 44 mm.	

1 Draw the door opening, size of 1000 x 2100 mm.

2 Draw two posts of thickness 80 mm, and height 1920 mm at a distance of 840 mm apart.

3 Draw a head 80 mm thickness over the post.

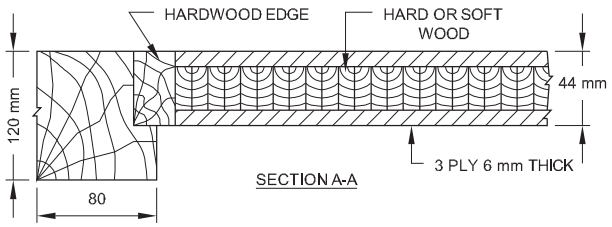
4 Draw parallel strips 16 mm each as shown in Fig 1A.

5 Draw the details of section as shown in Fig 1A.

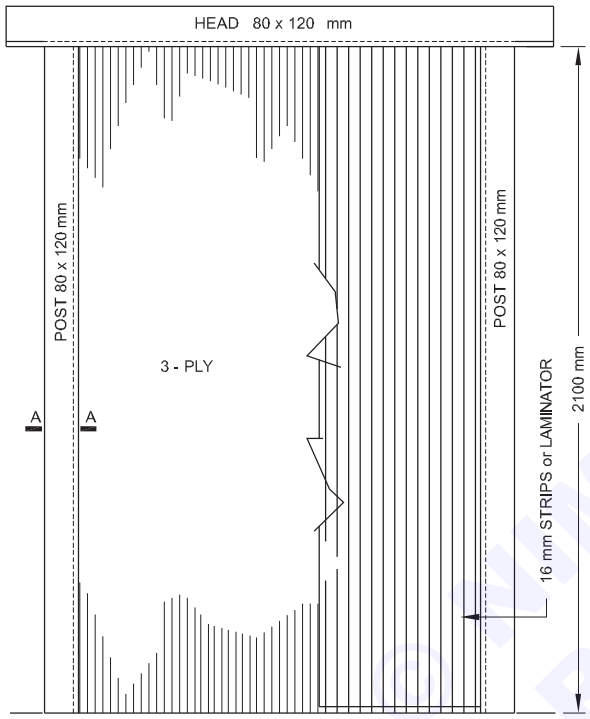
6 Complete the drawing.

TASK 2: **Draw the elevation and section of hollow core or framed flush door (Fig 1B)**

Fig 1A

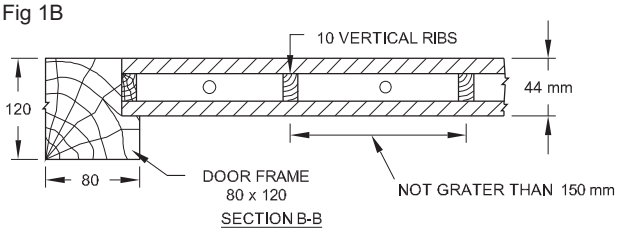


SECTION A-A

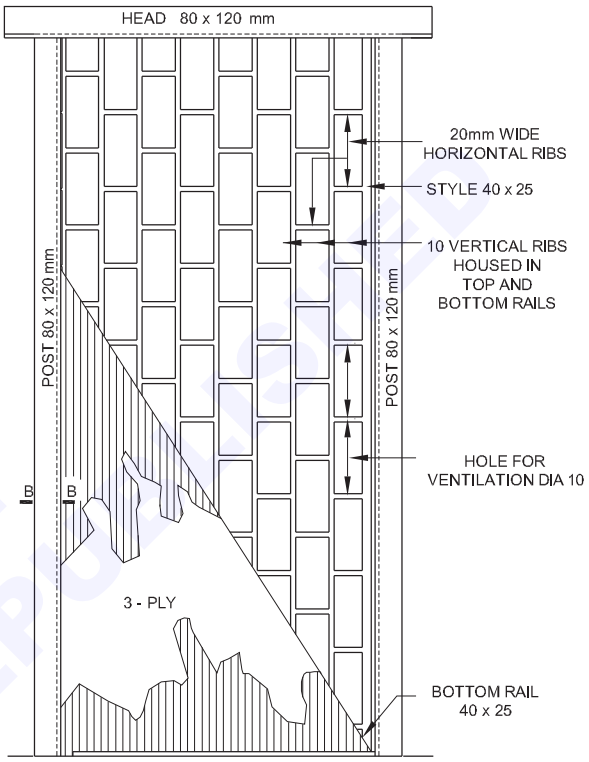


ELEVATION - SOLID OR LAMINATED FLUSH DOOR

Fig 1B



SECTION B-B



ELEVATION - HOLLOW CORE OR FRAMED FLUSH DOOR

AD20N1442Y1

Types of windows & ventilator

Objectives: At the end of this exercise you shall be able to
- **draw the elevation and vertical section of casement windows**
- **draw cross section of louvered windows**
- **draw the elevation and cross section of ventilators.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3	- 3 No.
• 'T' square, set square	- 1 No.	• HB pencil	- 1 No.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw elevation and vertical section of casement window (Fig 1)**

DATA	
Window opening	- 750 x 1200 mm.
Frame size	- 110 x 75 mm.
Head	- 75 x 110 mm.
Post	- 75 x 110 mm - 2 Nos.
Hanging style	- 75 x 32 mm - 2 Nos.
Meeting style	- 75 x 32 mm - 2 Nos.
Top rail	- 75 x 32 mm.
Frieze rail	- 75 x 32 mm.
Bottom rail	- 75 x 32 mm.
Panel	- 348 x 162 x 20 mm - 6 Nos.
Projection of horn	- 150 mm on both sides.

1 Draw the window opening of size 750 x 1200 mm.

2 Draw two posts of 75 mm thick and 1050 mm height at distance of 600 mm apart.

3 Draw a sill of 75 mm thick and 900 mm length below the post.

4 Draw the head of 75 mm thick and 900 mm length over the post.

5 Draw the hanging style of width 75 mm near the posts.

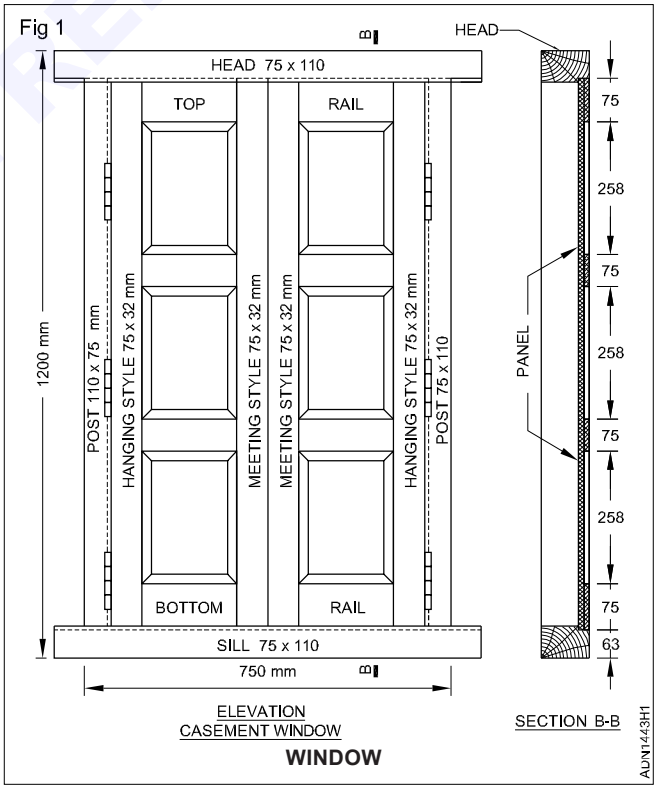
6 Draw the two meeting styles of width 75 mm in the middle.

7 Draw top rail and bottom rail of height 75 mm between the styles.

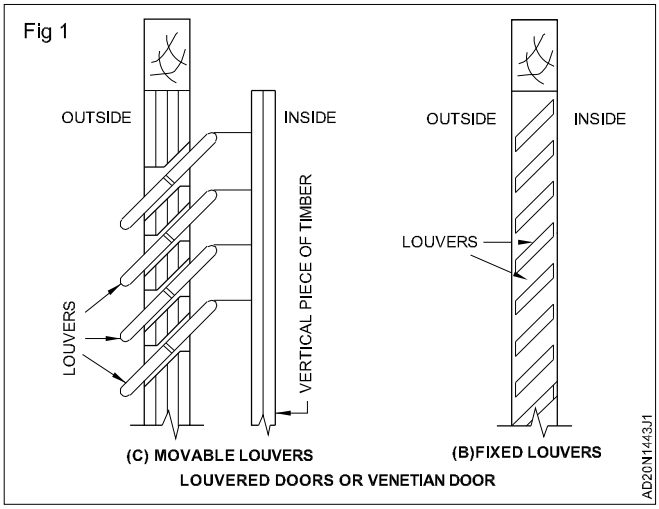
8 Draw three panels of height of 258 mm and two frieze rail of 75 mm height between the top and bottom rail.

9 Draw the vertical section as shown in Fig 1.

Fig 1



TASK 2: **Draw cross section of moveable louvers and fixed louvers of louvered windows (Fig 1)**



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TASK 3: **Draw the elevation and cross section of ventilators (Fig 1)**

DATA	
Size of ventilator	- 1000 x 600 mm.
Head	- 80 x 100 mm.
Sill	- 80 x 40 mm.
Top rail	- 80 x 40 mm.
Bottom rail	- 80 x 40 mm.
Style	- 80 x 40 mm.

1 Draw the opening of size 1000 x 600 mm.

2 Draw the posts of thickness 80 mm at a distance of 840 mm apart.

3 Draw a sill of thickness 80 mm and length 1300 mm below the post.

4 Draw a head of thickness 80 mm and length 1300 mm over the post.

5 Draw two styles of 80 mm width near the post.

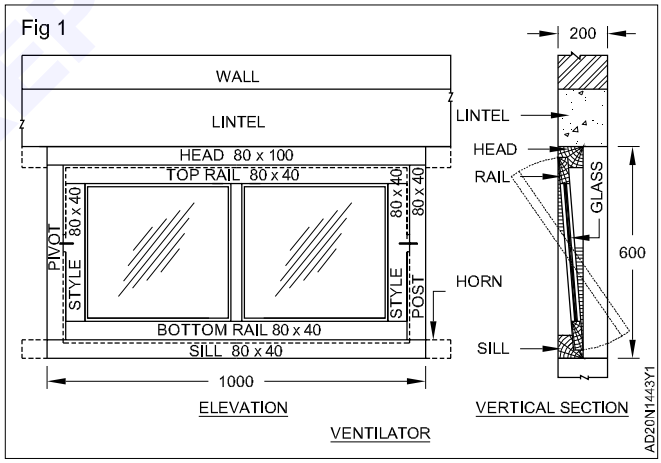
6 Draw top and bottom rails of 80 mm width.

7 Draw two glass panels.

8 Complete the elevation as shown in Fig 1.

9 Draw the section of ventilator as shown in Fig 1.

10 Complete the drawing.



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Drawing of lintels

Objectives: At the end of this exercise you shall be able to
- **Draw the elevation and section of**
  - **wooden lintel**
  - **stone lintel**
  - **brick lintel**
  - **RCC lintel**
  - **steel lintel**
  - **reinforced brick lintel.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- 'T' square, set square - 1 No.
- 30 cms Metric scale - 1 No.
- Instrument box - 1 No.

Materials

- Drawing sheet A3 - 2 No.
- HB pencil - 1 No.
- Eraser - 1 No.
- Cello tape - as reqd.

PROCEDURE

TASK 1: **Draw the elevation and section of wooden lintel (Fig 1)**

DATA

Span - 900 mm

Depth - 150 mm

Bearing - 150 mm

To draw elevation

1 Draw the 900 mm wide wall opening.

2 Draw 1200 x 150 mm Lintel.

3 Draw the symbol of wood.

4 Draw the section line A-A.

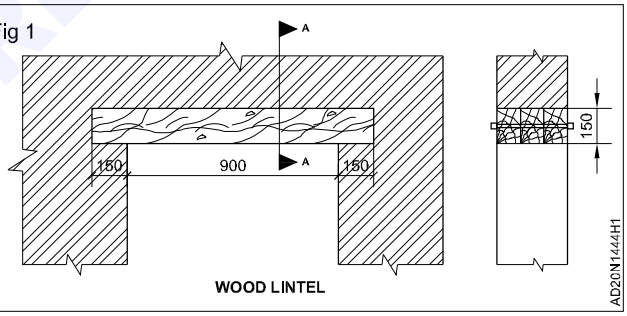
5 Complete the drawing as shown in Fig 1.

To draw section

1 Draw the projection lines from elevation.

2 Complete the drawing with suitable symbols as shown in Fig 1.

Fig 1



TASK 2: **Draw the elevation and section of brick lintel (Fig 1)**

DATA

Span - 900 mm

Depth - 200 mm

Bearing - 150 mm

To draw elevation

1 Draw the 900 mm wide wall opening.

2 Draw lintel of 1200 x 200 mm.

3 Draw the symbol of brick inside the rectangle.

4 Draw the section line A-A.

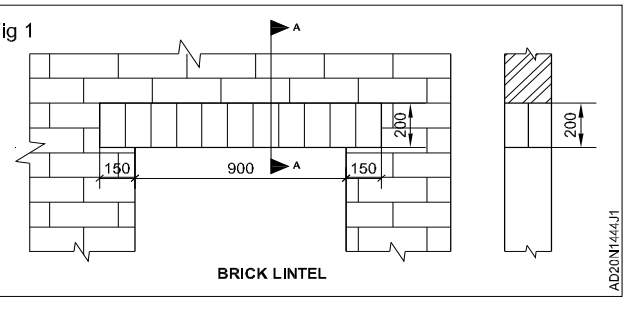
5 Complete the drawing as shown in Fig 1.

To draw section

1 Draw the projection lines from elevation.

2 Complete the drawing with suitable symbols as shown in Fig 1.

Fig 1



TASK 3: **Draw the elevation and section of stone lintel (Fig 1)**

DATA	
Span	- 900 mm
Depth	- 200 mm
Bearing	- 150 mm

To draw elevation

1 Draw the 900mm wide wall opening.

2 Draw lintel 1200 x 200mm.

3 Draw the symbol of stone.

4 Draw the section line A-A.

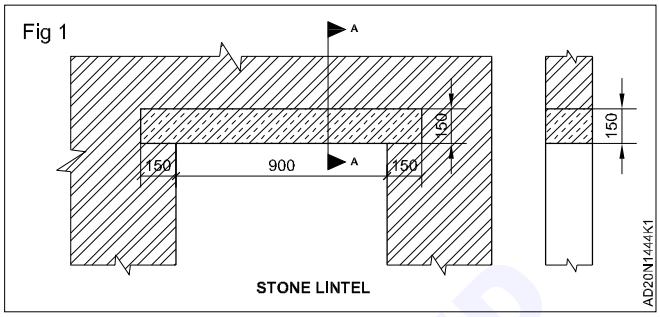
5 Complete the drawing as shown in Fig 1.

To draw section

1 Draw the projection lines from elevation.

2 Complete the drawing with suitable symbols as shown in Fig 1.

Fig 1



TASK 4: **Draw the elevation and section of steel lintel (Fig 1)**

DATA	
Span	- 1200 mm
Depth	- 150 mm
Bearing	- 150 mm

To draw elevation

1 Draw the 1200 mm wide wall opening.

2 Draw lintel of size 1200 x 150 mm.

3 Draw the symbol of steel.

4 Draw the section line A-A.

5 Complete the drawing as shown in Fig 1.

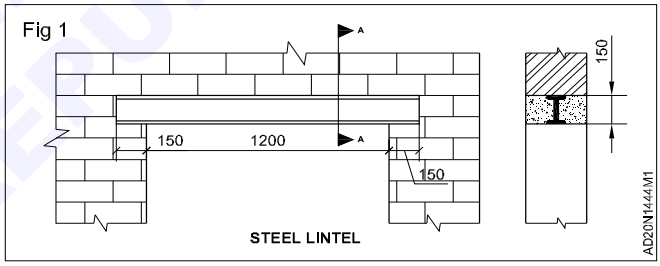
To draw section

1 Draw the projection lines from elevation.

2 Draw sectional view of steel beam.

3 Complete the drawing with suitable symbols as shown in Fig 1.

Fig 1



TASK 5: **Draw the elevation and section of R.C.C lintel (Fig 1)**

DATA	
Span	- 900 mm
Depth	- 150 mm
Bearing	- 150 mm
Diameter of main bars	- 12 mm
Diameter of stirrups	- 6 mm
Cover for reinforcement	- 25 mm

To draw elevation

1 Draw the 1200 mm wide wall opening.

2 Draw lintel 1200 x 150 mm.

3 Draw the straight bar at bottom and top level of 12 mm dia at 25 mm cover.

4 Crank the bar at one seventh of the span on 45°.

5 Draw the stirrups of 6 mm dia at 150 mm c/c.

6 Draw the symbol of RCC inside.

7 Draw the section line A-A.

8 Complete the drawing as shown in Fig 1.

To draw section

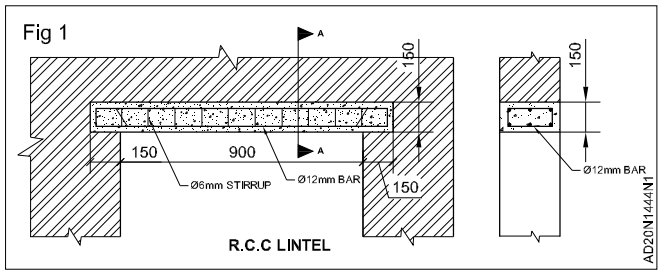
1 Draw the projection lines from elevation.

2 Draw the rectangle of size 200x150 mm.

3 Draw the stirrups details with 25 mm cover.

4 Complete the drawing with suitable symbols as shown in Fig 1.

Fig 1



TASK 6: **Draw the elevation and section of reinforced brick lintel (Fig 1)**

DATA	
Span	- 900 mm
Depth	- 200 mm
Bearing	- 100 mm
Diameter of reinforcement	- 12 mm

To draw elevation

1 Draw the 1200 mm wide wall opening.

2 Draw lintel 1200 x 200 mm.

3 Draw the elevation of bricks as header inside.

4 Show the reinforcement by dashed line with required cover.

5 Draw the section line A-A.

6 Complete the drawing as shown in Fig 1.

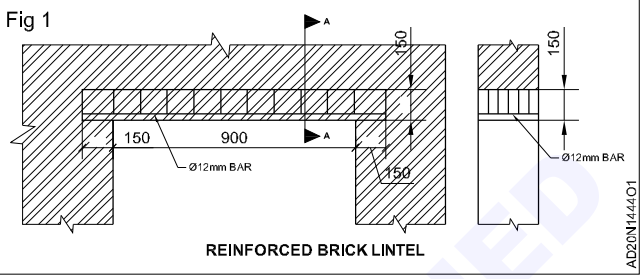
To draw section

1 Draw the projection lines from elevation.

2 Draw the rectangle of size 200 x 150 mm.

3 Draw the stirrups details with 25 mm cover. Complete the drawing with suitable symbols as shown in Fig 1.

Fig 1



REINFORCED BRICK LINTEL

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Drawing of lintel with chajjah (or) sunshade

Objective: At the end of this exercise you shall be able to
- **draw the cross section of lintel with chajjah (or) sunshade.**

TASK 1: **Draw the cross section of lintel with chajjah (or) sunshade shown in Fig 1.**

DATA	
All side cover	- 2.5 cm
Projection of sunshade	- 60 cm
Width of wall	- 20 cm
Height of lintel	- 20 cm
Fixing end of sunshade thickness	- 10 cm
Free end of sunshade thickness	- 8 cm

Lintel

1 2 Bar (top) 10 mm ϕ

2 3 Bar (bottom) 10 mm ϕ

3 Stirrups (15 cm c/c) 6 mm ϕ

Chajjah

1 10 mm ϕ bar of 10 cm c/c

2 8 mm ϕ bar of 15 cm c/c

To draw sectional view

1 Draw the 20 cm wide wall.

2 Draw the 20 cm cross section of lintel.

3 Draw the 10 cm cross section of window.

4 Draw the symbol of brick of wall.

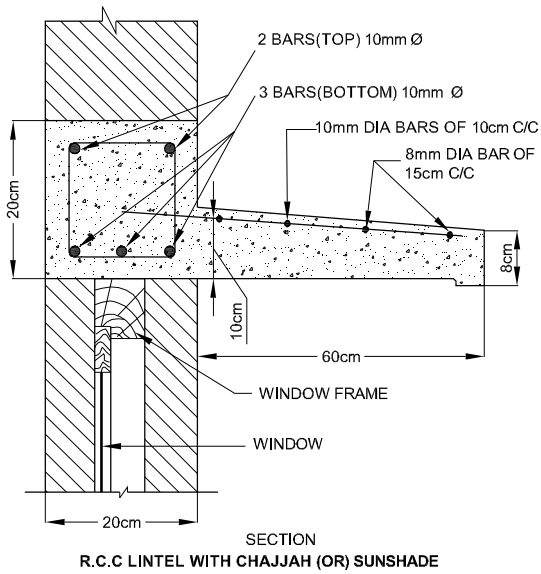
5 Draw the 60 cm projection of chajjah (Fixed end = 10 cm, free end 8 cm).

6 Mark the concrete symbol of lintel with chajjah.

7 Complete the drawing as shown in Fig 1.

8 Show the details of reinforcement of the drawing.

Fig 1



R.C.C LINTEL WITH CHAJJAH (OR) SUNSHADE

— — — — — — — —

Type of arches

Objectives: At the end of this exercise you shall be able to
- **Draw the elevation of**
  - **flat arch**
  - **semicircular arch**
  - **segmental arch**
  - **two centered arch.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3	- 2 No.
• 'T' square, set square	- 1 No.	• HB pencil	- 1 No.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw the elevation of flat arch. (Fig 1)**

DATA	
Span	- 1200mm
Depth	- 300mm
Angle of skew back	- 60°
Width of voussoir at extrados	- 100mm

1 Draw 1200 mm wide wall opening.

2 Draw an equivalent triangle (between two supports) of side 1200mm as apex down ward.

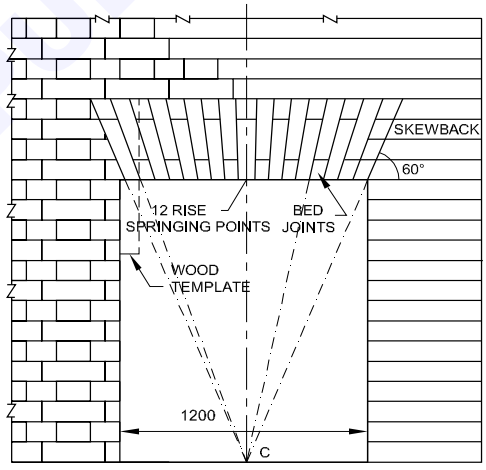
3 Draw 300 mm horizontal parallel line above, from the base of arch (extrados).

4 Extent the other two sides of equivalent triangle to wards the extrados(skew back).

5 Mark 100mm interval in extrados.

6 Join the apex and 100mm interval points and arrange the bricks as shown in Fig 1.

Fig 1



FLAT ARCH

AD20N1445H1

TASK 2: **Draw the elevation of semi circular arch (Fig 1) and mark all the parts.**

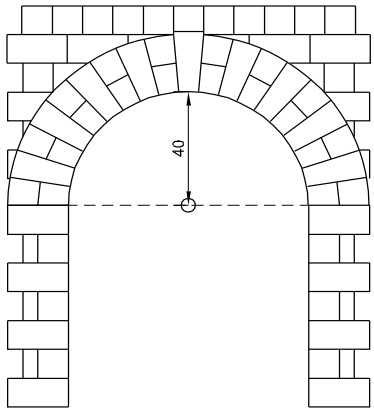
DATA	
Span	- 800mm
Depth	- 200 mm
Rise	- 400 mm
Width of voussoir at extrados	- 100 mm

1 Draw 800 mm wide wall opening.

2 Draw the springing line.

3 Midpoint of springing line as centre draw a semi circle (Intrados).

Fig 1



SEMI CIRCULAR ARCH

AD20N1445J1

4 From the same centre draw the extrados.

5 Mark 100mm interval in extrados.

6 Join the centre point of semi circle and 100 mm inter val points and arrange the bricks as shown in Fig 1.

— — — — — — — —

TASK 3: **Draw the elevation of segmental arch (Fig 1)**

DATA	
Span	- 800 mm
Depth	- 200 mm
Rise	- 200 mm
Width of voussoir at extrados	- 100 mm

1 Draw 800 mm wall opening.

2 Draw the springing line.

3 Draw the rise.

4 Join the end of springing line and rise.

5 Draw perpendicular to that inclined line.

6 Repeat above 2 steps on other side.

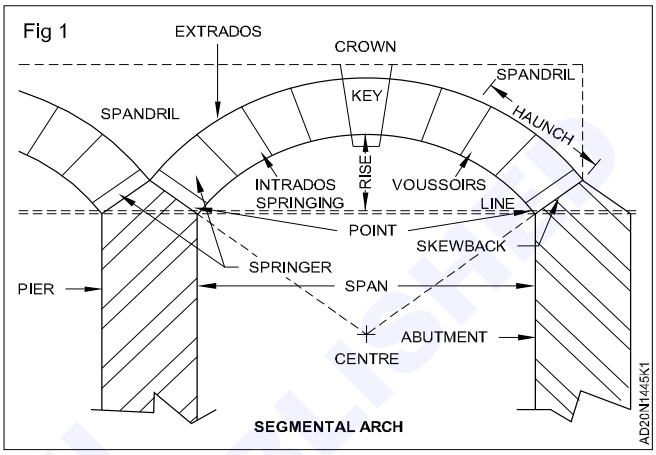
7 Joining point of the perpendiculars are the centre point of arch and draw the arc (intrados)

8 Draw extrados.

9 Mark 100mm interval in extrados.

10 Join the centre point of semi-circle and 100 mm inter val points and arrange the bricks as shown in Fig 1.

Fig 1



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TASK 4: **Draw the elevation of two centrered arch or pointed arch (Fig 1)**

DATA	
Span	- 800 mm
Depth	- 200 mm
Width of voussoir at extrados	- 100 mm

1 Draw 800 mm wide wall opening. Span AB = 800 mm.

2 Draw an arc A as centre and AB as radius.

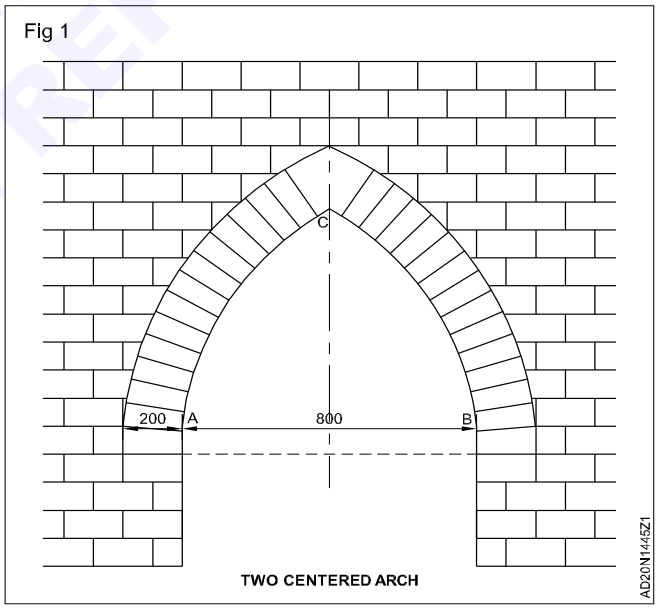
3 Draw another arc B as centre BA as radius. Both arc will intersect at C.

4 Draw arc from A and B as centers and radius = span + thickness of arch.

5 Mark 100 mm at intrados draw the bricks.

6 Complete the drawing as shown in Fig 1.

Fig 1



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Introduction to Auto CAD

Objectives: At the end of this exercise you shall be able to
- **do the application of CAD and its features**
- **creating a standard engineering layout.**

Requirements

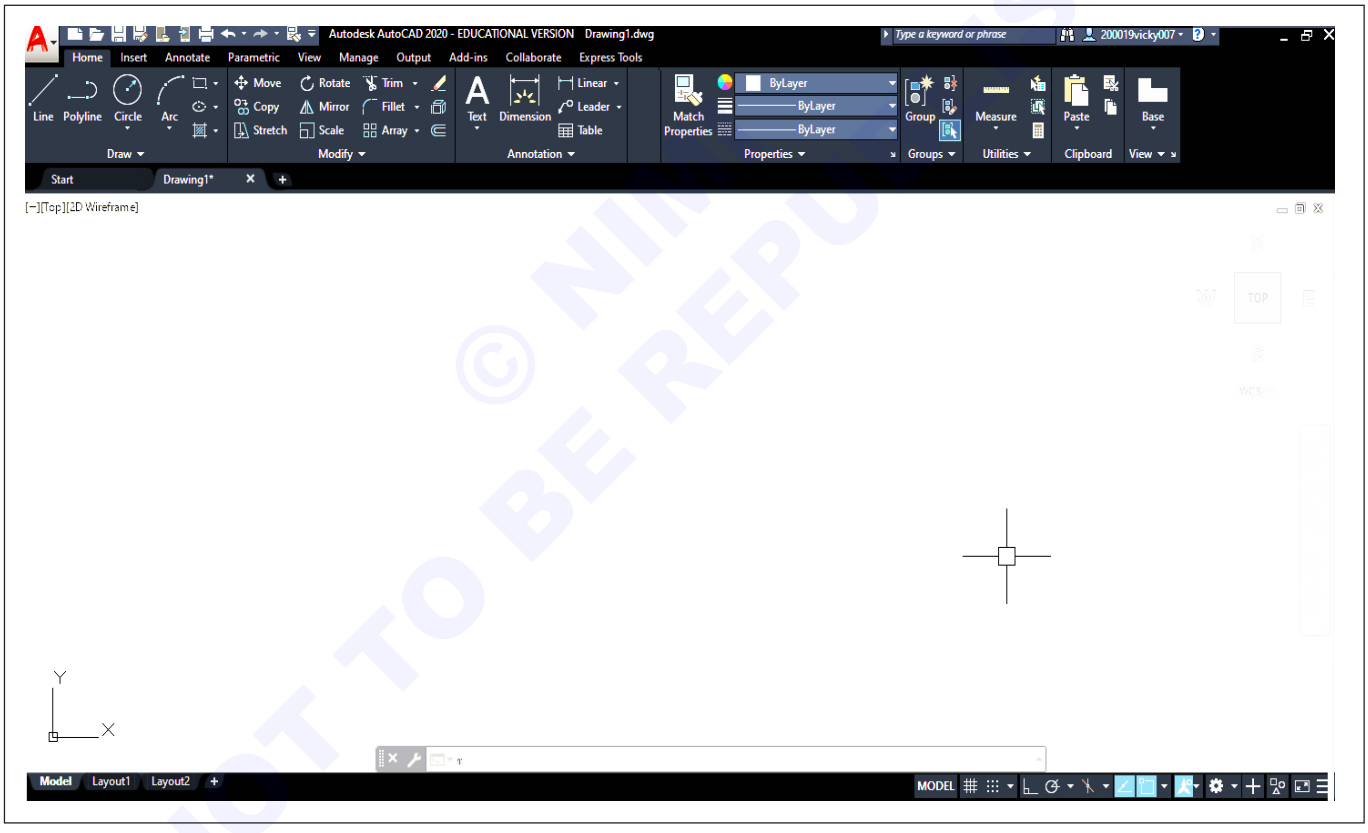
Tools/Instruments/Machines

- Computer with Auto CAD - 1 No.

PROCEDURE

TASK 1: **Application of Auto CAD operation**

Note : Instructor to guide the trainees in operationg the system for the given below features.



Tool bar : Draw

Menu : Draw Construction Line

Command entry : 'x' line

1 Specify a point or (hor/Ver/Aug/Bisect/Offset) : Specify a point or enter an option

Find

1 'X' lines are useful for creating construction and reference lines, and for trimming boundaries.

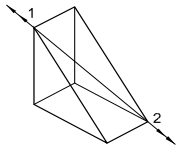
2 The following prompts are displayed.

Point

1 Specifies the location of the infinite line using two points through which it passes.

2 Specify through point: Specify the point (2) through which you want the xline to pass, or press ENTER to end the command.

3 The 'x' line is created through the specified point.

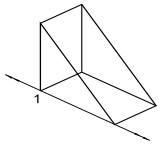


Hor

1 Creates a horizontal 'x' line passing through a specified point.

2 Specify through point : Specify the point (1) through which you want the x line to pass, or press ENTER to end the command.

3 The 'x' line is created parallel to the 'X' axis.

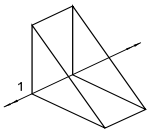


Ver

1 Creates a vertical 'x' line passing through a specified point.

2 Specify through point : Specify the point (1) through which you want the 'x' line to pass, or press ENTER to end the command.

3 The 'x' line is created parallel to the 'Y' axis.

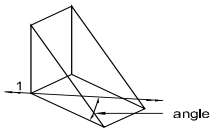


Ang

1 Creates an 'x' line at a specified angle.

2 Enter angle of 'x' line (0) or [Reference] : Specify an angle or enter.

Angle of X' line



1 Specifies the angle at which to place the line.

2 Specify through point : Specify the point through which you want the 'x' line to an 'x' line is created through the specified point, using the specified angle.

Reference

1 Specifies the angle from a selected reference line. The angle is measured counter clockwise from the reference line.

2 Select a line object : Select a line, polyline, ray, or 'x' line

3 Enter angle of xline <0> :

4 Specify through point : Specify the point through which you want the 'x' line to pass, or press ENTER to end the command.

Bisect

1 Creates an 'x' line that passes through the selected angle vertex and bisects the angle between the first and second line.

2 Specify angle vertex point : Specify a point (1)

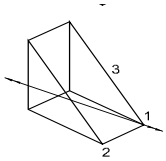
3 Specify angle start point : Specify a point (2)

4 Specify angle end point : Specify a point (3) or press ENTER to end the commend

5 The 'x' line lies in the plane determined by the three points.

Offset

1 Creates an xline parallel to another object.



2 Specify offset distance or (through) <current> : Specify an offset distance, enter t, or press ENTER

Offset Distance

1 Specifies the distance the 'x' line is offset from the selected object.

2 Select a line object : Select a line, polyline, ray, or 'x' line, or press ENTER

Through

1 Creates an xline offset from a line and passing through a specified point.

Polyline

Creates two-dimensional polylines

Tool bar : Draw 

Menu : Draw Polyline

Command entry : pline

Specify start point : Specify a point

Current line-width is <current>

Note: A temporary plus-shaped marker displays at the first point. This marker can be useful when you create long and complicated polylines. It is removed when you complete the polyline.

1 The PLINEGEN system variable controls the line type pattern display around and the smoothness of the vertices of a 2D polyline. Setting PLINEGEN to 1 generates new polylines in a continuous pattern around the vertices of the completed polyline. Setting PLINEGEN to 0 starts and ends the polyline with a dash at each vertex. PLINEGEN does not apply to polylines with tapered segments.

Next Point

Draws a line segment. The previous prompt is repeated.

Arc

1 Adds arc segments to the polyline.

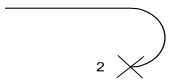
2 Specify endpoint of arc or

3 [Angle/CEnter/CLose/Direction/Halfwidth/Line/Radius/Second pt/Undo/Width]: Specify a point (2) or enter an option.

Note: For the Center option of the PLINE command, enter ce; for the Center object snap, enter cen or center.

Endpoint of Arc

1 Draws an arc segment. The arc segment is tangent to the previous segment of the polyline. The previous prompt is repeated.

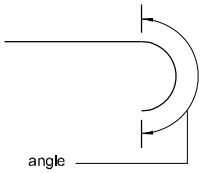


Angle

1 Specifies the included angle of the arc segment from the start point.

Specify included angle:

1 Entering a positive number creates counterclockwise arc segments. Entering a negative number creates clockwise arc segments.



2 Specify endpoint of arc or [Center/Radius]: Specify a point or enter an option

Endpoint of Arc

1 Specifies the endpoint and draws the arc segment.

Center

1 Specifies the center of the arc segment.

2 Specify center point of arc:

Radius

1 Specifies the radius of the arc segment.

2 Specify radius of arc: Specify a distance.

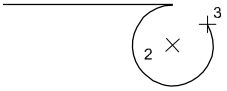
3 Specify direction of chord for arc <current>: Specify a point or press Enter

Center

1 Specifies the center of the arc segment.

2 Specify center point of arc: Specify a point (2)

3 Specify endpoint of arc or [Angle/Length]: Specify a point (3) or enter an option



Endpoint of Arc

1 Specifies the endpoint and draws the arc segment.

Angle

1 Specifies the included angle of the arc segment from the start point.

2 Specify included angle:

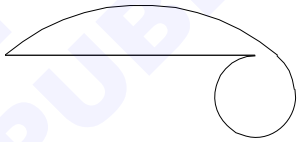
Length

1 Specifies the chord length of the arc segment. If the previous segment is an arc, the new arc segment is drawn tangent to the previous arc segment.

2 Specify length of chord:

Close

1 Draws an arc segment from the last point specified to the starting point, creating a closed polyline. At least two points must be specified to use this option.

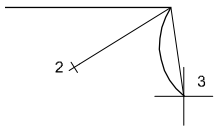


Direction

1 Specifies a starting direction for the arc segment.

2 Specify the tangent direction from the start point of arc: Specify a point (2)

3 Specify endpoint of arc: Specify a point (3)



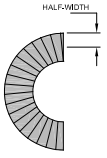
Half width

1 Specifies the width from the center of a wide polyline segment to one of its edges.

2 Specify starting half-width <current>: Enter a value or press Enter

3 Specify ending half-width <starting width>: Enter a value or press Enter

4 The starting half-width becomes the default ending half-width. The ending half-width becomes the uniform half-width for all subsequent segments until you change the half-width again. The starting and ending points of wide line segments are at the center of the line.



5 Typically, the intersections of adjacent wide polyline segments are beveled. No beveling is performed for non tangent arc segments or very acute angles or when a dot-dash line type is used.

Line

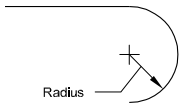
1 Exits the Arc option and returns to the initial PLINE command prompts.

Radius

1 Specifies the radius of the arc segment.

2 Specify radius of arc: Specify a distance.

3 Specify endpoint of arc or [Angle]: Specify a point or enter a.



Endpoint of Arc

1 Specifies the endpoint and draws the arc segment.

Angle

1 Specifies the included angle for the arc segment.

2 Specify included angle:

3 Specify direction of chord for arc <current>: Specify an angle or press Enter

Second Pt

1 Specifies the second point and endpoint of a three-point arc.

2 Specify second point on arc: Specify a point (2)

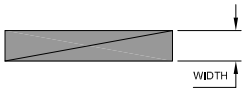
3 Specify end point of arc: Specify a point (3)

Width

1 Specifies the width of the next arc segment.

2 Specify starting width <current>: Enter a value or press Enter

3 Specify ending width <starting width>: Enter a value or press Enter



4 The starting width becomes the default ending width. The ending width becomes the uniform width for all subsequent segments until you change the width again. The starting and ending points of wide line segments are at the center of the line.

5 Typically, the intersections of adjacent wide polyline segments are beveled. No beveling is performed for non tangent arc segments, very acute angles, or when a dot-dash line type is used.

BREAK

Breaks the selected object between two points.

Tool bar : Modify

Menu : Modify Break

Command entry : break

1 The prompts that are displayed depend on how you select the object. If you select the object by using your pointing device, the program both selects the object and treats the selection point as the first break point. At the next prompt, you can continue by specifying the second point or by overriding the first point.

2 Specify second break point or [First point] : Specify the second break point (2) or enter **f**.

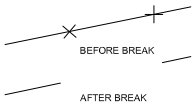
Second Break Point

Specifies a second point to use to break the object.

First point

1 Overrides the original first point where you selected the object with a new point that you specify.

2 Specify first break point :

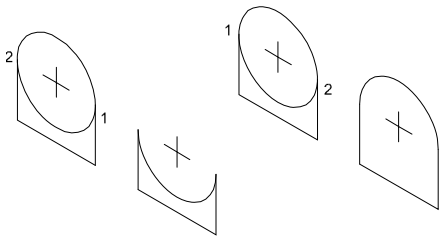


3 The portion of the object is erased between the two points that you specify. If the second point is not on the object, the nearest point on the object is selected; therefore, to break off one end of a line, arc or polyline, specify the second point beyond the end to be removed.

4 To split an object in two without erasing a portion, enter the same point for both the first and second points. You can do this by entering @ to specify the second point.

5 Lines, arcs, circles, polylines, ellipses, splines, donuts, and several other object types can be split into two objects or have one end removed.

6 The program converts a circle to an arc by removing a piece of the circle starting counterclockwise from the first to the second point.



Erase

Toolbar : Modify

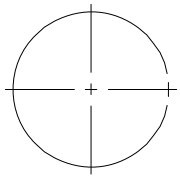
Menu : Modify - Erase

1 **Shortcut menu:** Select the objects to erase, right-click in the drawing area, and click Erase.

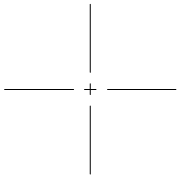
2 **Command entry:** erase

3 **Select objects:** Use an object selection method and press Enter when you finish selecting objects

4 The objects are removed from the drawing.



OBJECT SELECTED



OBJECT ERASED

Undo

Reverses the effect of commands

Toolbar : Standard

Command entry: undo

1 Enter the number of operations to undo or [Auto/ Control/ Begin/End/ Mark/Back]: Enter a positive number, enter an option, or press Enter to undo a single operation

2 UNDO displays the command or system variable name at the Command prompt to indicate that you have stepped past the point where the command was used.

3 UNDO has no effect on some commands and system variables, including those that open, close, or save a window or a drawing, display information, change the graphics display, regenerate the drawing, or export the drawing in a different format.

Number

1 Undoes the specified number of preceding operations. The effect is the same as entering u multiple times.

Auto

1 Groups the actions of a single command, making them reversible by a single U command. When the Auto option is on, starting a command groups all actions until you exit that command. You can undo the group of actions as if it were one action.

2 UNDO Auto is not available if the Control option has turned off or limited the UNDO feature.

3 Enter UNDO Auto mode [ON/OFF] <current>: Enter on or off, or press Enter

Control

1 Limits or turns off UNDO.

2 Enter an UNDO control option [All/None/One/Combine/ Layer] <All>: Enter an option or press Enter

All

1 Turns on the full UNDO command.

None

1 Turns off the U and UNDO commands and discards any UNDO command information saved earlier in the editing session. The Undo button on the Standard toolbar is unavailable.

2 The Auto, Begin, and Mark options are not available when None or One is in effect. If you attempt to use UNDO while it is turned off, the following prompt is displayed:

3 Enter an UNDO control option [All/None/One/Combine/ Layer] <All>:

One

1 Limits UNDO to a single operation.

2 The Auto, Begin, and Mark options are not available when None or One is in effect. The main prompt for the UNDO command changes to show that only a Control option or a single step of the UNDO command is available when the One option is in effect.

3 Enter and option [Control] <1>:

4 If you enter c, the previous prompt is displayed:

5 Enter an UNDO control option [All/None/One/Combine/ Layer] <All>:

— — — — — — — —

Practice on computer

Objective: At the end of this exercise you shall be able to
- **do the exercise using m.s excel package.**

TASK 1: **Practice on Computer**

1 Type as per the pattern below.

COST ESTIMATION

SL. NO.	DESCTIPTION OF ITEM	LENGTH (MTR)	WIDTH (MTR)	THICKNESS (MTR)	VOLUME (CUM)	WEIGHT (KGS)	DENSITY KG/CUM)	RATE / KG (RS.)	COST (RS.)	REMARKS
				FORMULA	=E4*D4*C4	=F4*H4			=G4*I4	
1	MS FLAT	1.2	0.1	0.01	0.0012	9.42	7850	75	707	
2	MS FLAT	1.5	0.1	0.012	0.0018	14.13	7850	75	1060	
3	MS FLAT	2	0.1	0.01	0.002	15.7	7850	75	1178	
4	MS FLAT	2.5	0.075	0.01	0.001875	14.7188	7850	75	1104	
5	MS FLAT	1.5	0.05	0.01	0.00075	5.8875	7850	75	442	
								FORMULA FOR TOTAL COST	=SUM(J4:J8)	
								TOTAL COST:	4489	

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Starting Procedure of Auto CAD

Objectives: At the end of this exercise you shall be able to
- **identify basic computer terms**
- **start auto CAD four ways.**

Requirements

Tools/Instruments/Machines

- Computer with Auto CAD - 1 No.

PROCEDURE

TASK 1: **Identifying hardwares**

Microprocessor

1 The complex procedure that transforms raw input data into useful information for output is called "processing". The Processor is the "brain" of the computer. The processor interprets and carries out instruction.

2 In personal computers the processor is a single chip plugged into a circuit board. This chip is called a microprocessor.

Central processing Unit (CPU)

1 The CPU is the term used for the computer's processor unit. The CPU contains the intelligence of the machine. It is where the calculations and decisions are made.

Memory (RAM)

1 Your CPU needs memory to hold pieces of information while it works. While this informations in memory, the CPU access it directly. This memory is called random access memory (RAM). RAM holds information only while the power is on. When you turn off or reset the computer, the information disappears.

2 The more RAM a computer has, the quicker it works and the more it can do.

3 The most common of measurement for computer memory is the byte. A byte can be described as the amount of memory it takes to store a single character. A kilobyte(KB) equals 1,024 bytes. A Megabyte (MB) equals 1,024 kilobytes, or 1,048,576 bytes. So a computer with 64 MB of memory actually has (64 × 1,048,576) 67,108,864 bytes. This is equal to approximately 1024 pages of information,

Input/output device

1 Input devices accept date and instructions from the user. The most common input devices are the keyboard, mouse and scanner. Output devices return processed data back to the user. The most common output devices are the monitor, printer, speaker and plotter.

Storage

1 The purposes of storage is to hold data that the computer isn't using. When you need to work with a set of data, the computer retrieves the data from storage and puts it into memory. When it no longer needs the data, it puts it back into storage.

2 There are 2 advantages to storage. First, there is more room in storage and second, storage retains its contents when the computer is turned off, Storage devices include: Hard disks (inside your computer), per drives, zip disks, CDR//w, pocket harddiscs, etc.

Software

Operating systems

When you turn on the computer, it goes through several steps to prepare itself for use.

The first step is a self-test. This involves:

a Identifying the devices attached to it (such as the monitor, mouse and printer).

b Counts the amout of memory available.

c Checks to see if the memory is functioning properly.

The second step is searching for a specifal progarm called the operating system. When the computert finds the operating system, it loads it into memory (remember RAM), The operating system enables the computer to:

d Communicate with you.

e Use devices such as the disk drives, keyboard and monitor.

The oprating system is now ready to accept commands form you. The operating system continues to run until the computer is turned off. Exmples of opeating systems are: Windows 7,8 windows NT, ME, 2000, XP,OS/2, Unix and more.

Note:

1 **Apple/Macintosh computers have their own operating system.**

2 **AutoCAD new version will work with Apple/ Macintosh.**

Application software

1 The operating system is basically for the computer. The application Software is for the user. Application Software is designed to do a specific task.

2 There are basically four major categories:

Business. Utility, Personal, and Entertainment.

3 Business application software would be desktop publishing, spreadsheet programs, database software and graphics, AutoCAD is a 'graphics' business application software.

4 Utility application software helps you maintain your computer. You would use a utility program to recover an accidentally deleted file, improve the efficiency of your computer and help you move, copy or delete files. Norton Utilities is an example of a 'utility application" software.

5 Personal application software is basically what is sounds like. This software is designed for your personal needs, such as: balancing your checkbook, making an address book, creating a calendar and many more tasks.

6 Entertainment application software are video games, puzzles, filght simulators and even educational programs.

Starting AutoCAD

1 To Start AutoCAD, select the START button/programs/ AutoCAD. If one of the dialog boxes shown be low does not appear automatically. Select the system take to change your settings.

2 Prefer these dialog boxes for trainee new to AutoCAD. But after you become an "expert" you may disable this option.

3 Notice the four buttons located in the upper left corner of this dialog box. Each button provides a different way to start a drawing. A brief description of each is listed below.

Open a drawing

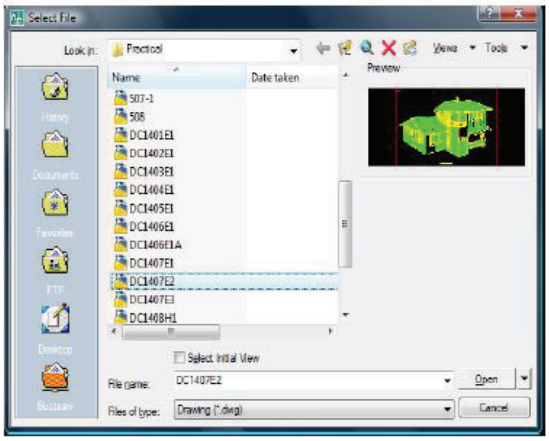
1 Allows you to select a drawing from a list of the most recently opened drawings or select the "Browse" button to search for more drawing files. After you select the file desired, select the OK button. (Fig 1)

2 The file selected will appear on your screen. (This option is only active when you first enter AutoCAD. Normally you will use **file/open.**

Start from scratch

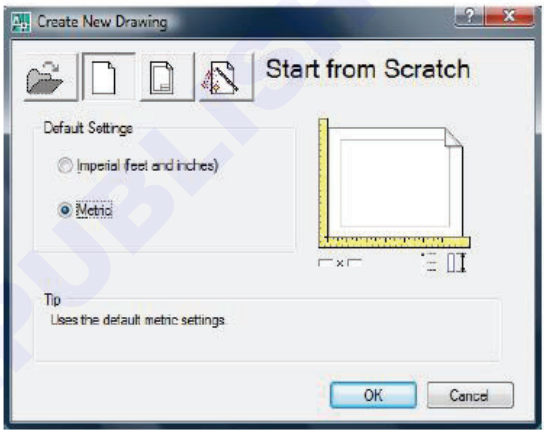
1 Allows you to begin a new drawing from scratch. Starting from scratch means all settings are preset by AutoCAD.

Fig 1



2 You must select the measurment system on which to base your new drawing; Imperial or Metric. (Fig 2)

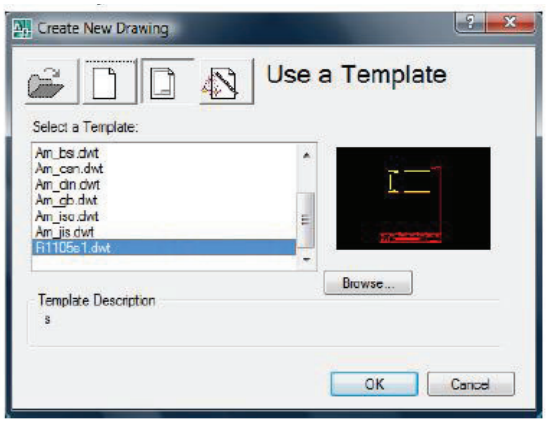
Fig 2



Use a template

1 Allows you to choose a previously created template. You can choose one of the templates supplied with AutoCAD or create your own. (Fig 3)

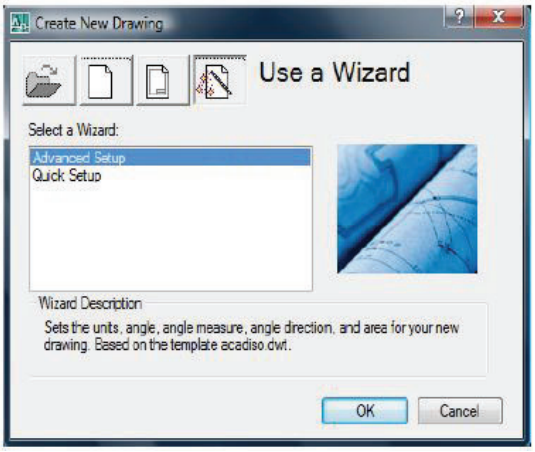
Fig 3



Use of a wizard

1 Allows you to start new drawing using either the "Quick" or "Advanced" setup wizard sets the units, angle, angle measurement, angle direction and area for your new drawing. (Fig 4)

Fig 4



Opening AutoCAD

1 For starting Auto CAD, double click the Auto CAD icon on the desk top or CAD from start menu, if startup dialog box not shown in GUI, follow the following.

Procedure: right click on the screen

1 Select option.

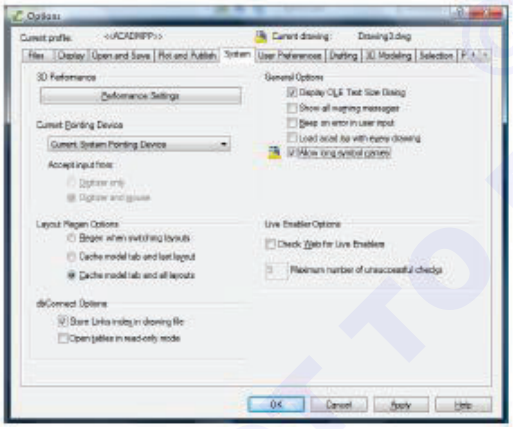
2 Option dialogue box.

3 Select system tab.

4 Click on the startup.

5 Select show startup dialogue box.(Fig 5)

Fig 5

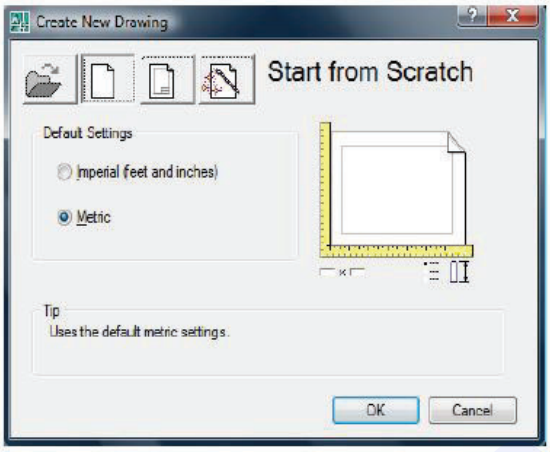


6 Startup dialogue box shown below. In the startup dialogue box, four options are available such as, open drawing, start from scratch, use a template and use a wizard.

- Opening a drawing.
- Start from scratch.(Fig 6)
- Use template.
- Use a wizard.

1 Open a drawing: To open an already saved drawings.

Fig 6



2 Starts an empty drawing using default imperial or metric settings. Auto CAD stores this setting in the measurement system variable. You can change measurement system for a given drawing by using the measurement system variable.

Imperial: Starts a new drawing based on the Imperial measurement system. The default drawing boundary (The drawing limits) is 12 x 9 inches.

Metric: Starts new drawing based on the metric measurement system. The default drawing boundary (the drawing limits) is 420 x 297 millimeters.

3 Use a template: Starts a drawing based on a drawing template file.

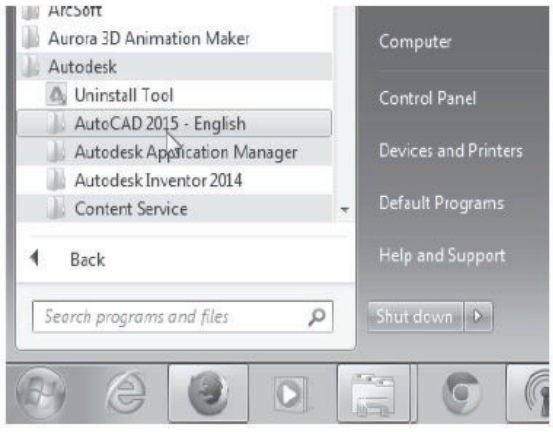
4 Use a Wizard: Sets up a drawing using a step-by-step guide. You can choose from two wizards: Quick set up and Advanced Set up.

Starting up AutoCAD (Fig 7)

1 Select AutoCAD option on the program menu or select the AutoCAD icon on the desktop.

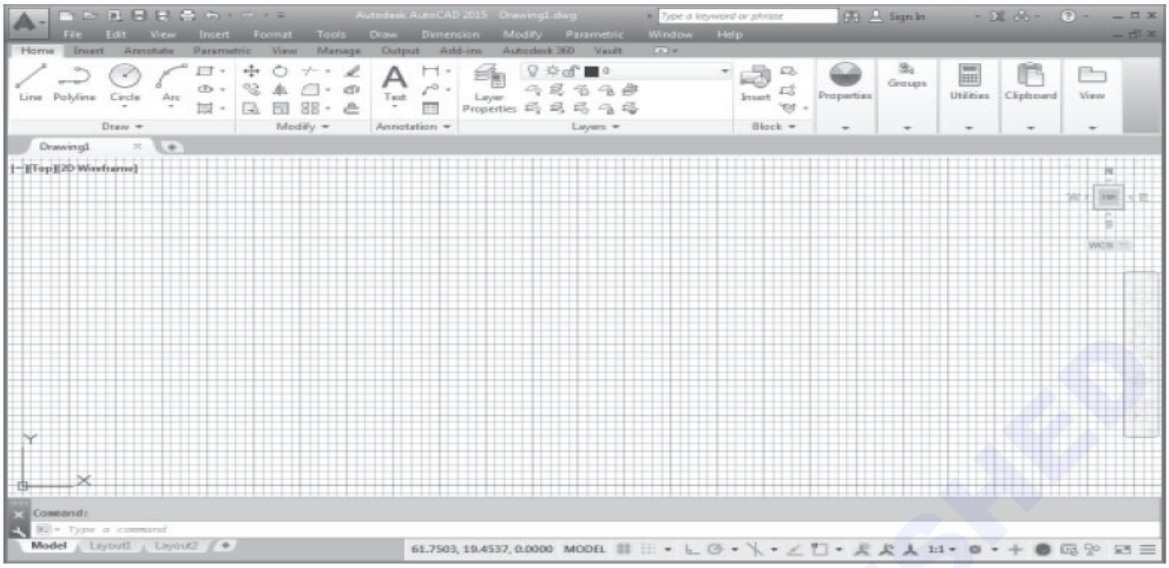
Once one program is loaded into memory, the AutoCAD drawing screen will appear on the screen.

Fig 7



2 Note that AutoCAD automatically assigns generic name, Drawing X, as new drawings are created. In our example, AutoCAD opened the graphics window using the default system units and assigned the drawing name Drawing 1. (Fig 8)

Fig 8

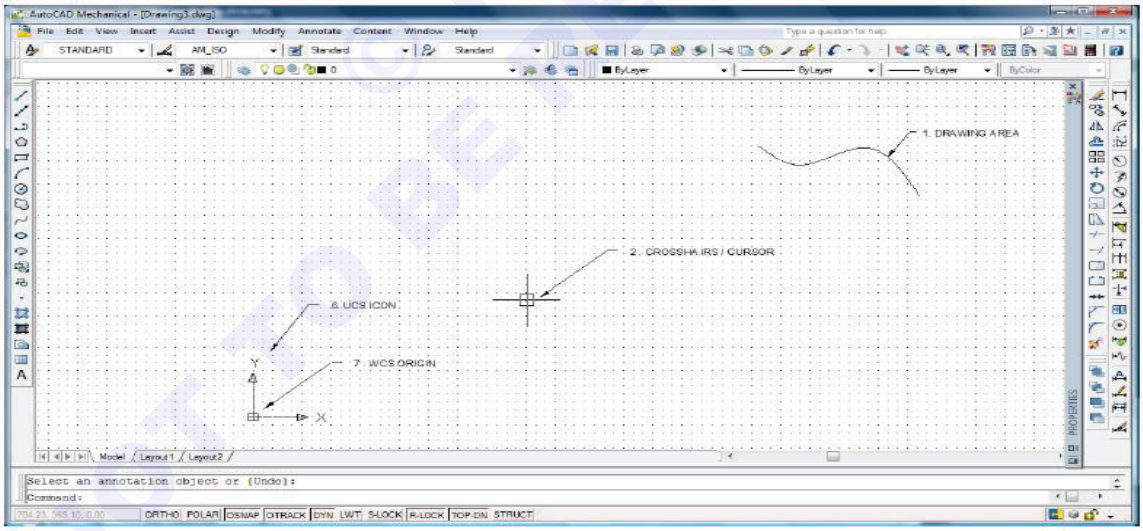


TASK 2: **Getting familiar with the autocad window**

1 Before you can start drawing you need to get familiar with the AutoCAD window. In the following lessons, will be you referring to all of the areas described below. (Fig 1)

2 So it is important for you to understand each of them. But remember, this page will always be here for you.

Fig 1



Drawing area

1 Location: The large area in the center of the screen.

2 This is where you will draw. This area represents a piece of paper.

3 The color of this area can be changed using Tools/ Option/ Display Color.

2 Crosshairs/cursor

Location: Can be anywhere in the drawing area. The movement of the cursor is controlled by the movement of the pointing device such as a mouse. You will use the cursor to locate points, make selections and draw objects. The size can be changed using Tools/Options/ Display. Crosshair size.

3 Command line

Location: The three lines at the bottom of the screen. This is where you enter commands and Autocad will prompt you enter commands and Autocad will prompt you to input information.

4 Coordinate display (F6)

Location: Lower left corner.

In the Absolute mode (coords = 1) displays the location of the crosshais / cursor in reference to the origin. The first number represents the horizontal movement (X asix), the second number represents the vertical movement (Y axis) and the third number is the Z axis which is used for 3D.

In the relative polar mode (coords = 2) displays the distance and angle of the cursor from the last point entered. (Distance < Angle)

5 Status bar

Location: Below the command line.

Display your current settings. These settings can be turned on the and off by clicking on the word (snap, grid, ortho, etc.) or by pressing the function keys, F1, F2 etc. See button description below.

[Snap] (F9)

Increment snap controls the movement of the cursor. If it is off, the cursor will move smoothly. If it is ON, the cursor will jump in an incremental movement.

The increment spacing can be changed at any time using tools / Drafting Setting / Snap and Grid.

[Ortho] (F8)

When Ortho is ON, cursor movement is restricted to horizontal or vertical. When Ortho is OFF, the cursor moves freely.

[Polar] (F10)

Polar tracking creates “Alignment paths” at specified angles.

[Osnap] (F3)

Running object snap. Specific object snaps can be set to stay active untill you turn them off.

[Otrack] (F11)

Object Snap tracking

Creates Alignment paths at precise positions using objects snap locations.

[LWT]

Line weight. Displays the width assigned to each object. Model.

Switches your drawing between paperspace and model space.

6 UCS ICON (User coordinate system)

Location: Lower left corner of the screen. The UCS icon indicates the location of the Origin. The UCS icon appearance can be changed using: **View/ Display/ Icon / Properties.**

7 Origin

The location where the x,y, and Z axes intersect. 0,0,0

FUNCTION KEYS

F1	Help	Explanations of commands.
F2	Flipscreen	Toggles from Text Screen to Graphics Screen.
F3	Osnap	Toggles Osnap On and off.
F4	Tablet	Toggles the tablet On ane Off.
F5	Isoplane	Changes the Isoplane fron Top to Right to Left.
F6	Coordinate display	Changes the display from ON/Off/
F7	Grid	Toggles the Grid On or Off.
F8	Ortho	Toggles Ortho On or Off.
F9	Snap	Toggles Increment Snap on or off.
F10	Polar	Toggles Polar Tracking On or Off.
F11	Otrack	Toggles Object Snap Tracking On and Off.

Special key functions

- **Escape key** cancels the current command, menu or Dialog box.
- **Enter key** ends a command, or will repeat the previous command if the command line is blank.
- **Space bar** same as the enter key, except when entering text.

Pull-down “MENU BAR”

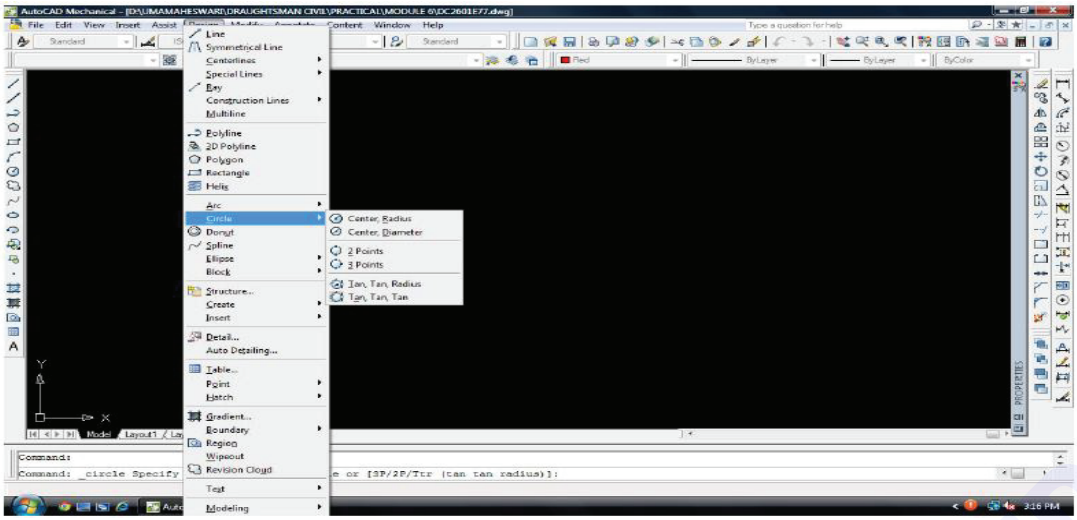
1 The pull-down “MENU BAR” is located at the top of the screen.

File edit view insert format tools draw dimension modify express window help.

by selecting any of the words in the **menu bar**, a **(2) pull down menu** appears. If you select a word from the pull down menu that has an **(3) arrow** a **(4) sub menu** if you select a word with **(5) ellipsis**.... a dialog box will appear. (Fig 2)

(Example: draw/boundary....)

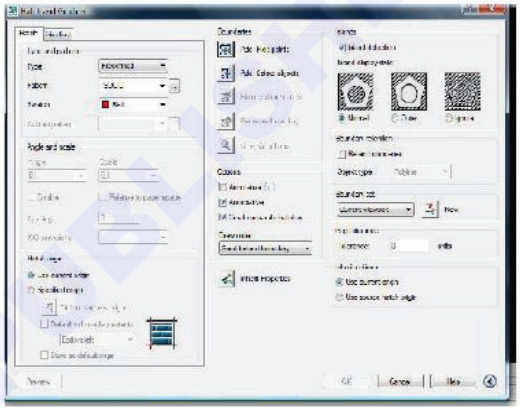
Fig 2



Dialog box

Many commands have **multiple options** and require you to make selections. These commands will display a dialog box. Dialog boxes, such as the **hatch** dialog box shown here, make selecting and setting options easy. (Fig 3)

Fig 3

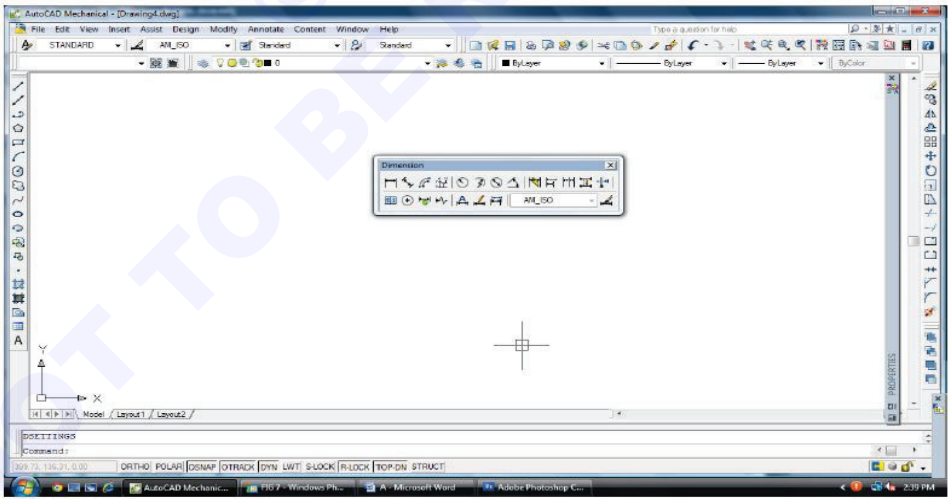


Tool bars

AutoCAD provides several toolbars to access frequently used commands. (Fig 4)

The **standard, object properties, draw, and modify** toolbars are displayed by default.

Fig 4



Toolbars contain **icon buttons**

These icon buttons can be selected to draw or edit objects and manage files.

If you place the pointer on any icon and wait a second, a **tool tip** will appear and a **help message** will appear at the bottom of the screen.

Basic Auto CAD drafting commands - I

Objectives: At the end of this exercise you shall be able to
- **starting a new drawing**
- **opening a template**
- **create a template.**

Requirements

Tools/Instruments/Machines

- Computer with Auto CAD - 1 No.

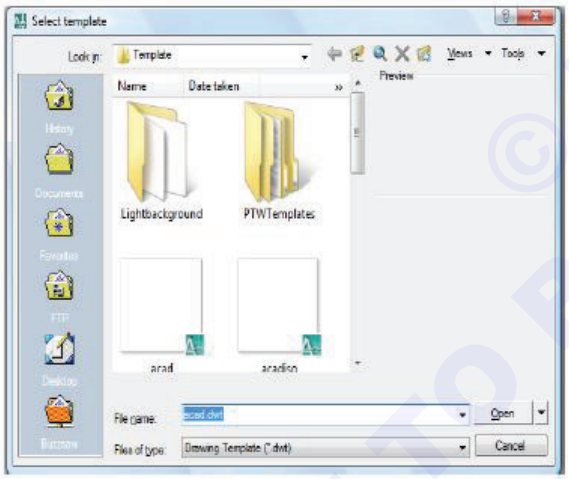
PROCEDURE

TASK 1: **Starting a new drawing**

Pulldown menu: file, new.

1 When you invoke this command Autocad displays the select template dialogue box.(If you selected "show startup dialogue box' from option dialogue box you cannot see the following dialogue box. Instead of this you can see the start up dialogue box itself) (Fig 1)

Fig 1



Opening a template

The template that you create by using F 8. It will appear as a blank screen, but there are many variables that have been preset. This will allow you to start drawing immediately. You will learn how to set those variables before you complete this workbook, but for now will concentrate on learing the AutoCAD commands and hopefully, have some fun.

Let's start by opening the "1 Workbook". (Fig 2)

1 Select file/new

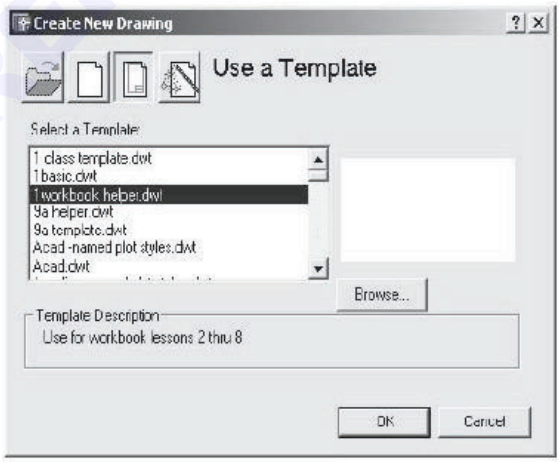
2 Select use a template box (third from the left).

3 Select 1 workbook helper. dwt from the list of templates.

Fig 2

4 Select the ok button. (Fig 3)

Fig 3



Create a template

Now you can create a template. This will be a very easy task (Fig 4)

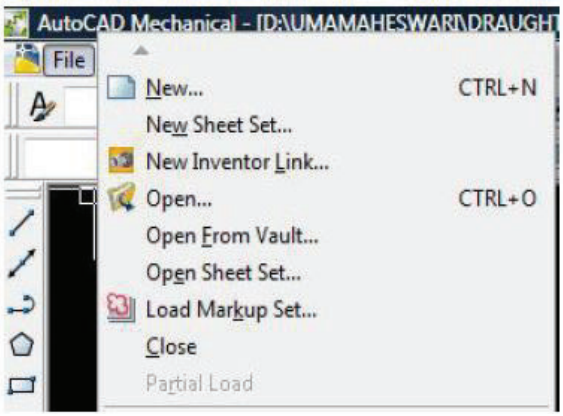
1 Start AutoCAD as follows.

Start button/programs/AutoCAD.

The 3 letter extension for drawing file is drawing If a dialog box appears select the "Cancel" Button.

2 Select **file/open.**

Fig 4



3 Select the **directory** in which the files located.(click on the) (Figs 5 to 7)

Fig 5

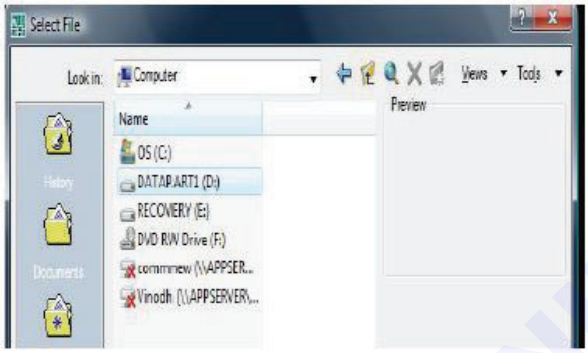


Fig 6

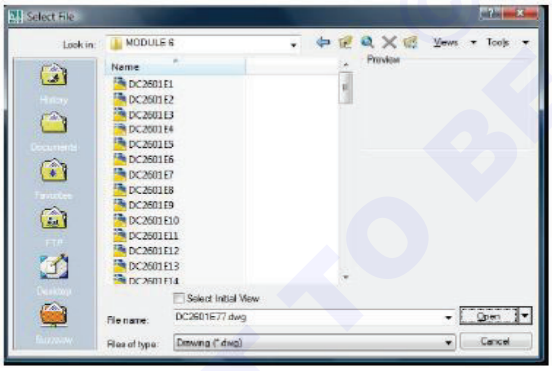
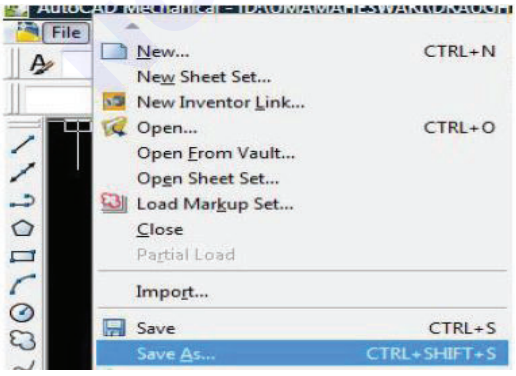


Fig 7



4 Select the file **"Workbook** and then **"Open"** button.

5 Select **"File / save as"**

6 Select the **"File of type"** down arrow to display different saving formats. Select " Autocad drawing template (*.dwt)".

The 3 letter extension for template is "dwt".

A list of all the AutoCAD templates will appear. (Your list may be different)

7 Type the new name "1 Workbook" in the file name". box and then select the save button.

The "1" before the name will place the file at the top of the list. (Figs 8 & 9)

Fig 8

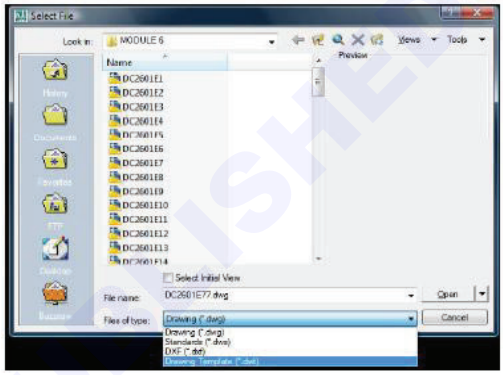
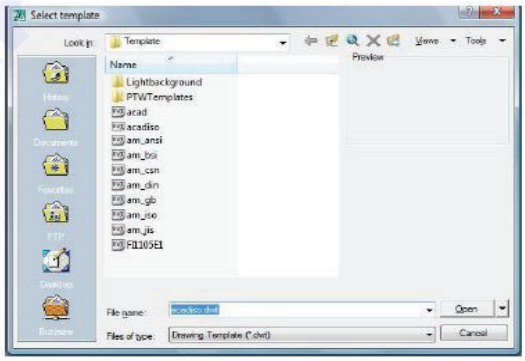


Fig 9



AutoCAD displays numerical first and then alphabetical.

8 Type a description and the select the "OK" button.

Now you have a template to use for lesson 2 through 8. At the beginning of each of the exercises you will be instructed to open this template.

Using a template as a master setup drawing is good CAD management.(Fig 10)

Creating a new drawing

New command

Create a new drawing file.

1 Choose File, new. or

2 Press Ctrl + N or

3 Click The new icon or

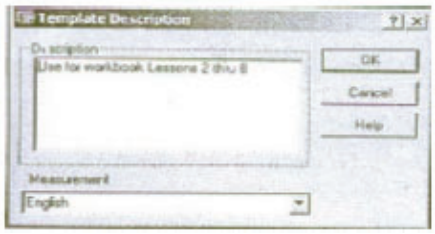
4 Type New at the comand prompt.
Command: new

5 Choose One of the options for creating a new drawing.

6 Click The ok button.

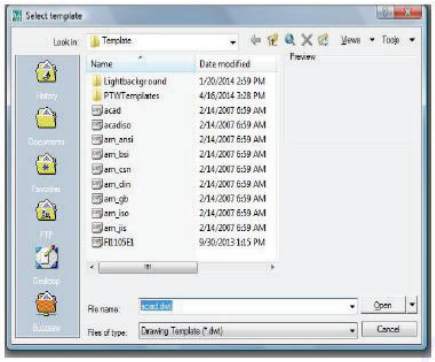
7 Save the drawing as another name.

Fig 10



TIP: New drawings can also be created from template files. (Fig 11)

Fig 11



Open existing drawings

1 Choose File, open. or

2 Press Ctrl + O

3 Click The open icon. or

4 Type Open at the command prompt.
command: open

5 Press Enter

6 Double click The desired directory to find the drawing to open.

7 Click The drawing name to open.

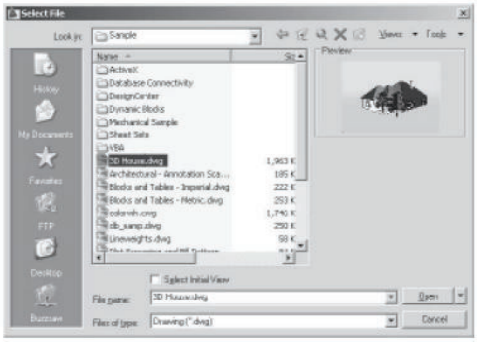
8 Click The ok button. (Fig 12)

Preview shows a bitmap image of the drawing selected. This image is the view that was last saved in the drawing.

Saving drawings

Saves the most recent changes to a drawing. The first time an unnamed drawing is saved the "Save As" Dialog box appears. AutoCAD saves its drawings as files with extensions ending in . DWG.

Fig 12



1 Choose File, save or save as

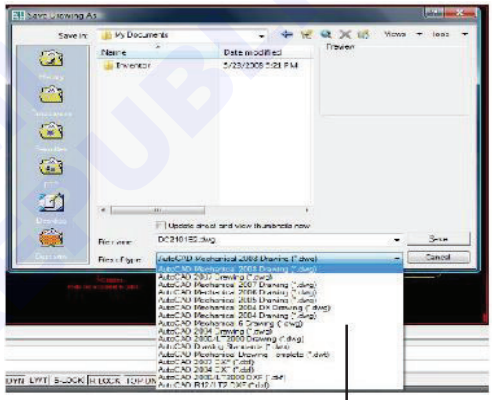
2 Type Save or save as at the command prompt command: Save or Save as

3 Press Enter

4 Type A new drawing name or keep the existing drawing name.

5 Click The ok button. (Fig 13)

Fig 13



Various file type can be saved as

TIP: Clicking the dropdown list for file type changes the format that the drawing can be saved in.

Quick save

1 The Qsave command is equivalent to clicking Save on the file menu.

2 If the drawing is named, AutoCAD saves the drawing using the file fromat specified on the open and save tab of the Options dialog box and does not request a file name. If the drawing is unnamed, AutoCAD displays the save drawing. As dialog box **(see save as)** and saves the drawing with the file name and format you specify.

1 Press Ctrl + S.
or

2 Click The save icon.
or

3 Type Qsave at the command prompt,
Command: Qsave.

Tips: Drawings can be saved as different versions of AutoCAD (e.g. R13, R14, R2000, etc.)

AutoSave settings under Tools, options...

Existing AutoCAD

1 Choose File, exit.

or

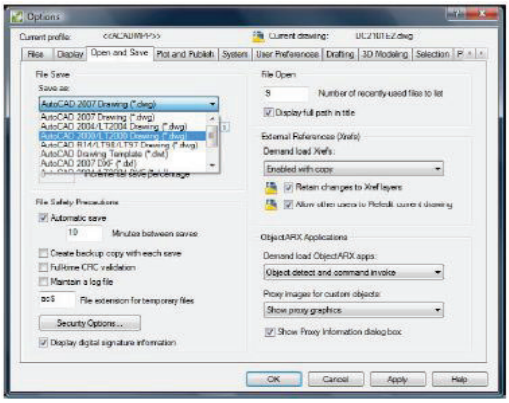
2 Type Quit at the command prompt.

Command: Quit

3 Press ENTER.

4 Click Yes to save changes or No to discard changes.

Fig 14



Drawing area control

Objectives: At the end of this exercise you shall be able to
- **identify method of entering commands**
- **practice drawing command set up**
- **practice drawing area set up.**

TASK 1: **Methods of entering commands**

1 AutoCAD has 3 different methods of entering commands. All 3 methods will accomplish the same end result. AutoCAD allows you to use the method you prepare. The following are descriptions of all 3 methods and an example of how each one would be used to start command such as the line command.

- Pull down Menu (Ex-6-02) (select draw / line).
  - a Move the cursor to the Menu Bar.
  - b Click on a Menu header such as “Draw”.
  - c Slide the cursor down the list of commands and click to select.
- Tool bar select the line icon from the draw tool bar).

  Move the cursor to an icon on a toolbar and press the left mouse button.
- Keyboard (Type L and <enter>).

  Type the command on the command line.

What is a shortcut menu?

In addition to the methods listed above, AutoCAD has shortcut menus. Shortcut Menus give you quick access to command options. Shortcut Menus are available when brackets [] enclose the options, on the command line. (Example below) To activate a Shortcut Menu, press the right mouse button.

Example

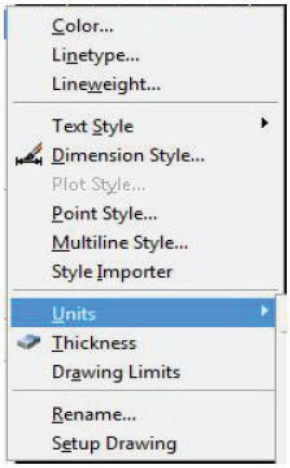
Select: draw /circle / center, radius._circle specify center point for circle or **[3P / 2P/ Ttr (tan tan radius)]:**

If you press the right mouse button now, the shortcut menu on the left will appear. This allows you to select the options 3P, 2P, or Ttr with the mouse rather than typing your selection.

Drawing units setup

1 Every object we construct in a CAD system is measured in Units. We should determine the system of units within the CAD system before creating the first geometric entities. (Fig 1)

Fig 1



2 In the menu bar select:

[Format] [Units] (Fig 2,3,4)

The AutoCAD menu bar contains multiple pull down menus, where all of the AutoCAD commands can be accessed. Note that many of the menu items listed in the pull-down menus can also be accessed through the Quick Access toolbar and / or Ribbon panels.

3 Click on the length type option to display the different types of length units available. Confirm the length type is set to decimal.

4 On your own, examine the other settings that are available.

Fig 2

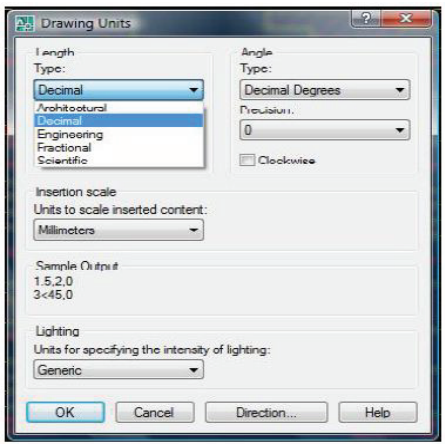


Fig 3

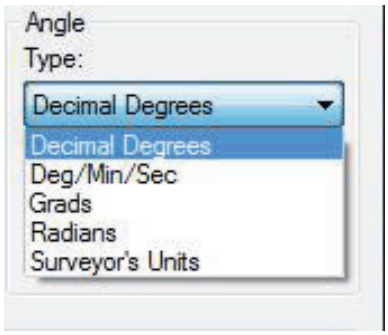
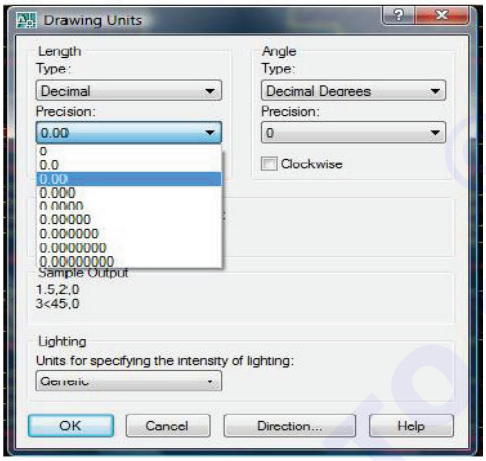


Fig 4



5 In the drawing Units dialog box, set the length type to decimal. This will set the measurement to the default english units, inches.

6 Set the precision to two digits after the decimal point as shown in the above Figure.

7 Pick ok to exit the drawing units dialog box.

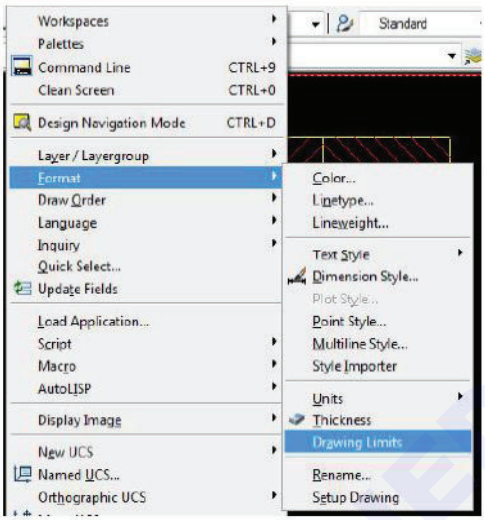
Drawing area setup (Fig 5, 6, 7)

Next, we will set up the **drawing limits** by entering a command in the command prompt area. Setting the Drawing Limits controls the extents of the display of the grid. It also serves as a visual reference that marks the working area. It can also be used to prevent construction outside the grid limits and as a plot option that defines an area to be plotted / printed. Note that this setting does not limit the region for geometry construction.

1 In the menu bar select:

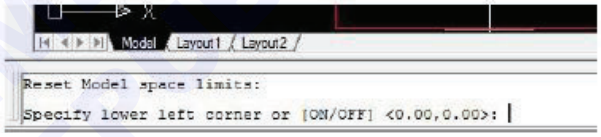
[Format] [Drawing Limits]

Fig 5



2 In the command prompt area, the message “Reset model space limits: Specify lower left corner or [on/off] <0.00,0.00>.” is displayed. Press the **ENTER** key once to accept the default coordinates <**0.00,0.00**>.

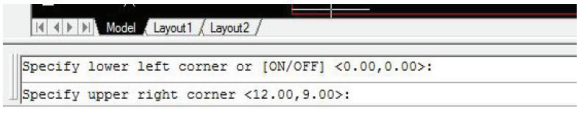
Fig 6



3 In the command prompt area, the messsage “specify upper right corner <12.00,9.00>” is displayed. Press the ENTER key again to accept the default coordinates <12.00,9.00>.

4 On your own, move the graphic cursor near the upper right corner inside the drawing area and note that the drawing area is unchanged. (The drawing limits command is used to set the drawing area, but the display will not be adjusted until a display command is used.)

Fig 7



Setting limits of a drawing

In AutoCAD The drawing must be drawn in full scale. So limits are needed to size up a drawing area. The limits are determined by the following factor.

i Size of drawing.

ii Space needed for dimensions, notes and other details.

iii Space between different views.

iv Space for the border and a title block etc.

Limits

Pull down: Format, drawing limits.

Command: Limits.

The command **LIMITS** allows you to change the upper and lower limits of the drawing.

Example: Set the drawing screen to A4 size (210 x 297)

Command: LIMIT.

Specify lower left corner or (ON/OFF) <0.000,0.000>:

Specify upper right corner <12.000,9.000>: 210,297

Give ZOOM command with ALL option to view all the drawing area (A4 size)

MVSETUP = Multiview Setup

MVSETUP offers two different setup options depending on whether you are in Model Space or in a Layout (Paper Space).

In model space- you set the units type, drawing scale factor, and paper size at the command prompt using MVSETUP. Using the settings you provide, a rectangular border is drawn at the grid limits.

In Paper Space - you can insert one of several predefined title blocks into the drawing and create a set of layout viewports within the title blocks. You can specify a global scale as the ratio between the scale of the title block in the layout and the drawing on the Model tab. The model tab is most useful for plotting multiple views of a drawing within a single border.

MVSETUP commands

- No (to not create a new layout tab - we will do this in another lesson)
- A (Metric units)
- 48 (Scale factor - common arch, scale factor is 1:1)
- 24 Width- see table below for paper size.

  (example 210 x 297) Since we are printing in “land scape“ mode, we enter the bigger number of the paper size first.
- 18 Length - Smaller number from the list below.

Once MVSETUP is finished, it will show a rectangle. This is the area where your grid wil show up if you have the grid on. This box is pretty much useless so just erase it. You will not need it.

From here, set up dimensions styles, text styles. layer.

If these settings will used in other drawings here are two suggestions, the first of which is recommended because it is less error prone.

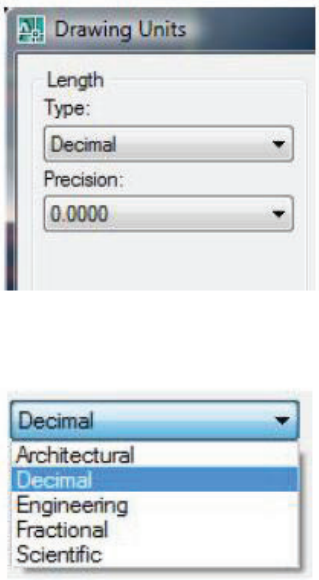
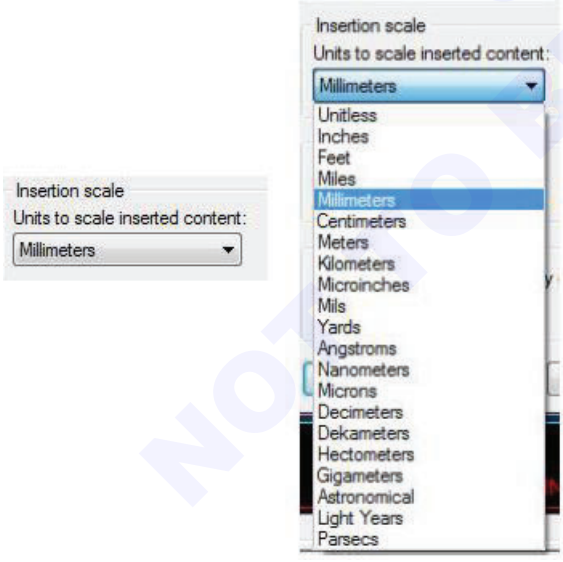
1 After creating the desired settings, do a save-as and save t as a . dwt. All of the settings that you created will be saved.

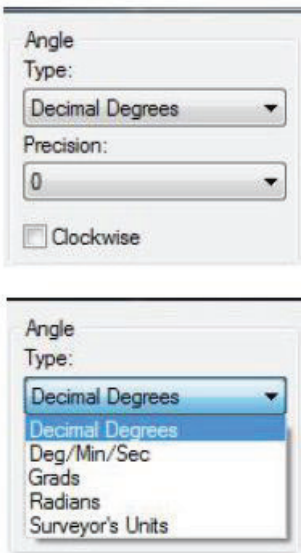
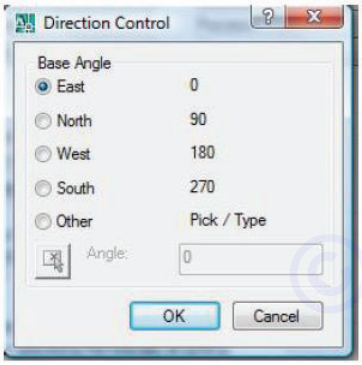
2 After using this drawing, open it and erase all objects. The settings will remain but you will have to hunt down the objects that need to be erased in layouts.

Setting units of a drawing (Fig 8 & 9)

- Every object you create is measured in drawing units. Before you start to draw, you must decide what one drawing unit will represent based on what you plan to draw. Then you create your drawing at actual size with that convention. For example, a distance of one drawing unit typically represents one millimeter, one centimeter, one inch, or one foot in real - world units.
- UNITS Command is used to set the units of measure, angle measurement, direction and precision.Pull down Menu: Format, UNITS
- Command: UNITS
- If you enter-units at the command prompt, UNITS displays prompts on the command line.There are five fundamental types of units i.e. Decimal, architectural, engineering, fractional & scientific.
- The text window displays the following prompt.
- There are five fundamental types of units i.e. Decimal, architectural, engineering, fractional & scientific.

  There are five fundamental types of units i.e.

Icon/Button	Description
Fig 8 	Decimal, Architectural, Engineering, Fractional & Scientific. Report formats: (Examples) 1 Scientific (1.55E + 01) 2 Decimal (915.50) 3 Engineering 1'-3.50" 4 Architectural 1'-3 1/2" 5 Fractional 15 1/2 Enter choice, 1 to 5 <Current >: Enter a value (1-5) or press ENTER The following prompt for decimal precision is displayed if you specify the scientific, decimal, or engineering format. Enter number of digits to right of decimal point (0 to 8) <Current >: Enter a value (0-8) or press ENTER. The following prompt for the denominator of the smallest fraction is displayed if you specify the architectural or fraction format. Enter denominator of smallest fraction to display. (1,2,4,8,16,32,64,128,or 256) <current>: Enter a value (1,2,4,8,16,32,64,128,or 256) or press
Fig 9 	ENTER **Inserting scale** Controls the units of measurement for blocks and drawings that are inserted into the current drawing. A block or a drawing that is created with units that are different from the units specified with this option is scaled when inserted. The insertion scale is the ratio of the units used in the source block or drawing and the units used in the target drawing and the units used in the target drawing. Select Unitless to insert the block without scaling it to match the specified units.

Icon/Button	Description
Fig 10 	The next prompts is for angle formats and precision. (Fig 10) System of angle measure: (Exmaple) 1 Decimal degree 45.000 2 Degree/minutes/seconds 45d0'0. 3 Grads 50.000g. 4 Radians 0.78454r. 5 Surveyor's units N 45d0'0"E. Enter choice ,1 to 5< Current>:Enter a value (1-5) or press ENTER. Enter number of fractional places for display of angles (0-8) <Current>:Enter a value (0-8) or press ENTER.
Fig 11 	The next prompt is for the direction for angle 0. **Direction for angle 0:** **East 3 o'clock = 0.** **North 12 o'clock = 90.** **West 9 o' clock = 180.** **South 6 o' clock = 270.** Enter direction for angle 0<current>: Enter a value or press ENTER. (Fig 11) The default direction for 0 degrees is to the east quadrant, or 3 o' clock. The default direction for positive angular measurement is counter clockwise. Measure angles clockwise? [Yes/No] <current>: Enter y or n or press ENTER. Select the unit you want from the dialogue box. This unit is used for dimensioning of the drawing. Input from the user accepted in this unit only.

Drafting setting a display commands

Objectives: At the end of this exercise you shall be able to
- **practice the drafting setting**
- **identify the visual reference**
- **identify esc, undo, redo**
- **practice display commands.**

TASK 1: **Drafting Settings (Fig 1, 2, 3)**

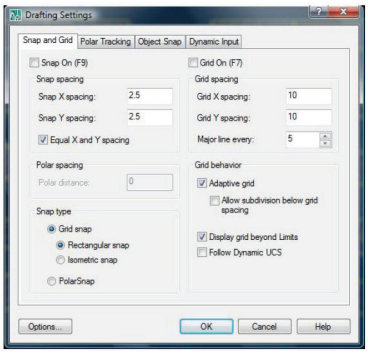
1 Drafting settings includes the commands for initial setting of a drawing. Some of the drafting settings are **snap, grid, polar tracking, osnap.**

2 Switches the grid on/off.

3 Set the size of the grid in the current drawing units

4 Snap: Snap is used to move the cursor at a defined value. This will set a position on the drawing quickly and accurately. The snap mode can be switched ON / OFF by pressing function key F9.

Fig 1



Grid: Grid command is used to display dots, which is easy for us to fix the points. But these dots were not printed. Grid points have default spacing of one unit. We can change the spacing too. This mode can be ON / OFF by using the function key F7.

Object snap settings (Fig 3 & 4)

Object snap settings are used to pick a geometric point on an object. Object snap mode can be ON / OFF by using the function key F3 or by clicking O snap button on the status bar. There are various options for object snap settings such as end point, mid point, centre, quadrent etc.

Ortho: Ortho command forces lines to be drawn exactly perpendicular directions. While using this command we have to turn ortho ON/OFF (otherwise press F8 according to our need

The grid and snap mode option can be turned ON or OFF through the status bar. The status bar area is located at the bottom left of the AutoCAD drawing screen, next to the cursor coordinates.

Fig 2

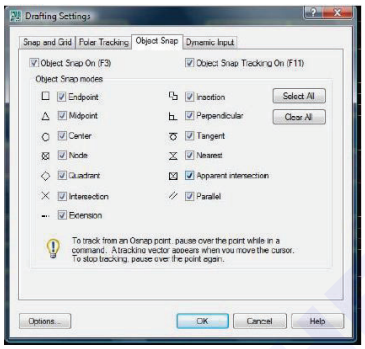


Fig 3

The second button in the status bar is the snap mode option and the third button is the grid display option. Note that the buttons in the status bar area serve two functions: (1) the status of the specific option, and (2) as toggle switches that can be used to turn these special options on and off. When the corresponding button is highlighted, the specific option is turned on. Using the buttons is quick and easy way to make changes to these drawing aid options. Another aspect of the buttons in the Status Bar is these options can be switched on and off in the middle of another command.

Fig 4

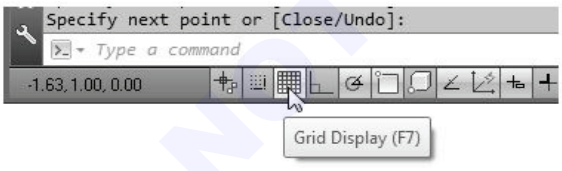


Fig 5

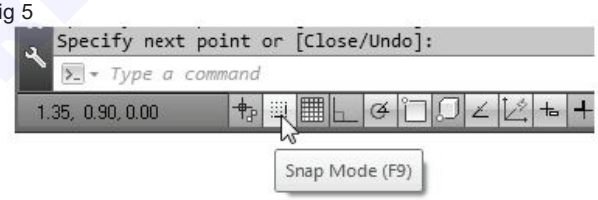
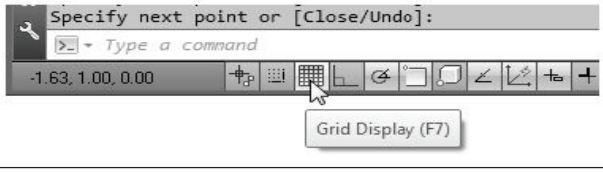


Fig 6



Grid on (Fig 5&6)

1 Left-click the grid button in the status bar to turn on the **grid display** option. (Notice in the command prompt area, on the massage “<Grid on>” is also displayed.)

2 Move the cursor inside the graphics window, and estimate the distance in between the grid lines by watching the coordinates display at the bottom of the screen.

The grid option creates a pattern of llines that extends over an area on the screen. Using the grid is similar to placing a sheet of grid paper under a drawing. The grid helps you align objects and visualize the distance between them. The grid is not displayed in the plotten drawing.

The default grid spacing. Which means the distance in between two lines in the screen, is 0.5 inches. We can see that the sketched horizontal line in the sketch is about 4.5 inches long. (Fig 7, 8, 9)

Fig 7

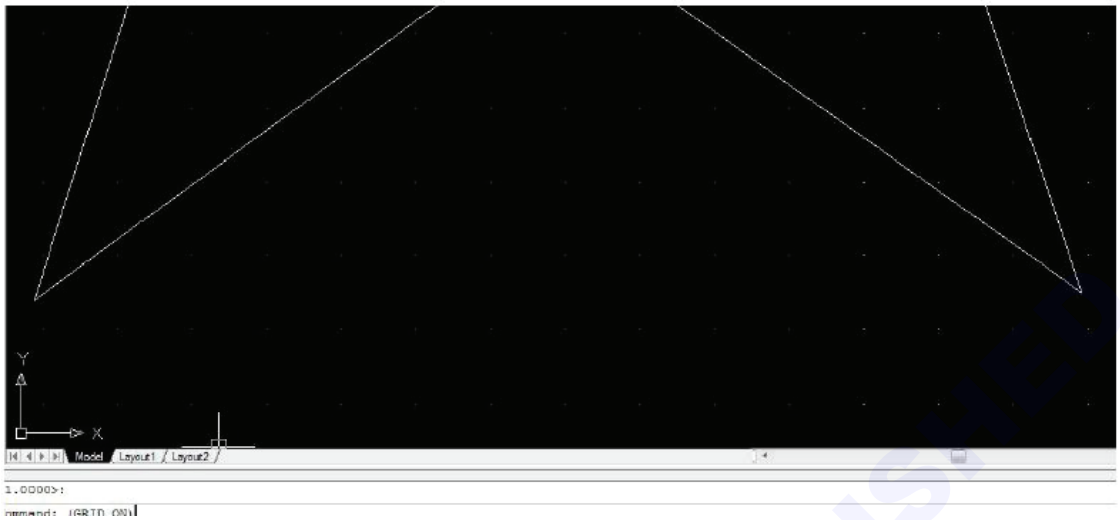


Fig 8

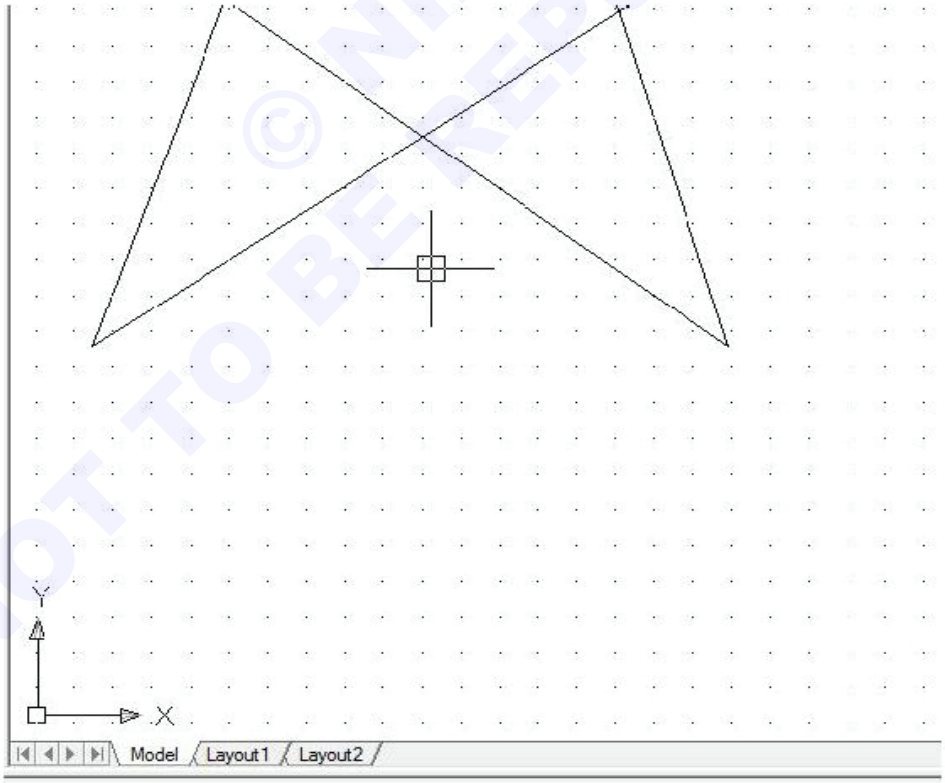
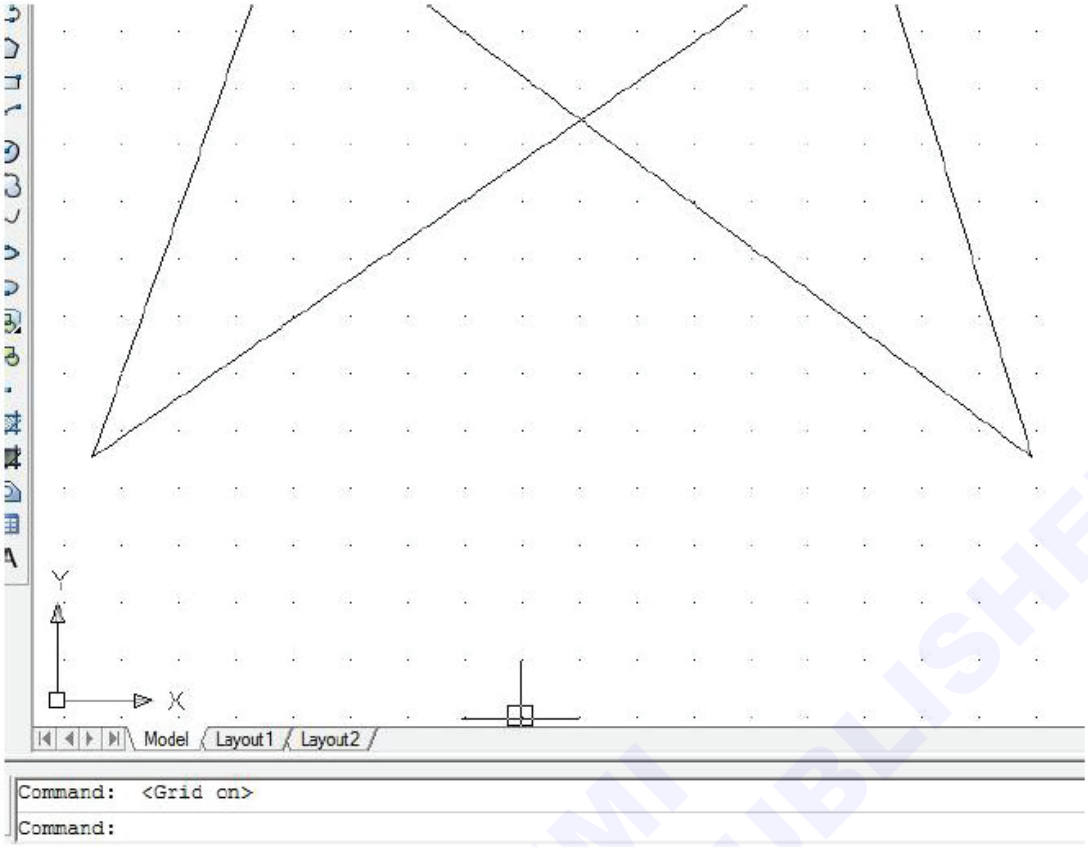


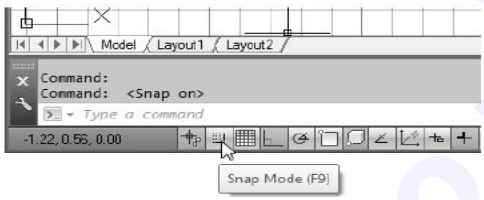
Fig 9



Snap mode on (Fig 10)

1 Left- click the snap mode button in the status bar to turn on the snap option.

Fig 10



2 Move the cursor inside the graphics window, and move the cursor diagonally on the screen. Observe the movement of the cursor and watch the coordinates display at the bottom of the screen.

SNAP mode is on, the screen cursor and all input coordinates are snapped to the nearest point on the grid. The default snap interval is 0.5 inches, and aligned to the grid points on the screen.

In case of any mistake

Pressing the ESC key

The Esc key at the top of the key board will get you out of most problems you encounter using AutoCAD. Here are some examples of the times you would press Esc key.

- If a command is not responding the way you expect.
- If you want to cancel a command you started.
- If you clicked a point on the screen unintentionally.
- If a dialogue box appears on the screen accidently.

In all these cases above, pressing Esc once will free the command line.

Example

Issue the line command, click a point on the screen and then press the esc key to cancel the command.

Using undo 

You can undo the last command by typing U at the command line and pressing the enter key, or by clicking on the Undo icon on the tool bar.

Using redo

The Redo command will reinstate the last command you applied undo to. You may undo as may commands as like you, but you may only redo once.

Display commands

Zoom

Zoom command enlarges or reduces the view of the drawing. When we are working on a drawing it is always required to bring the area of our interest to focus on to the screen. The zoom tool bar may be accessed from the standard tool bar at the top of the screen or from the dropdown menu > view >Tool bars....> Zoom. The icons are;

Icon	Function
Realtime	This allow you to select a window or box around the area you want to magnify.
Dynamic	This is both zoom and pan. When the command is issued a view box will be displayed with the drawing inside. The view box can be resized (Zoom) and moved around pan.
Scale	The drawing is at a scale of 1.A zoom scale of 2 doubles the magnification of the drawing, while 0.5 halves it.
Center	Allows you to pick a point which will be the center of the zoom area.
In	Just click on it zoom in on the drawing. You may preset the amount it zooms in a the command line.
Out	Just click on it zoom out from the drawing. You may preset the amount it zooms out at the command line.
All	This zooms to show the complete electronic page you set up. It zooms out to the electronic sheet limits.
Extents	This will zoom to fit the complete drawing on the screen.
Previous	This displays the last view created by zoom, pan or view command.

Pan (Fig 11a, b, c)

Pull down menu: view, pan.

The cursor changes to a hand cursor.

Fig 11

(a) (b) (c)

1 By holding down the pick button on the pointing device, you lock the cursor to its current location relative to the view port coordinate system. Graphics within the window are moved in the same direction as the cursor.

2 When you reach a logical extent (edge of the drawing space), bar is displayed on the hand cursor on the side where the extend has been reached. Also a message is displayed in the status bar as “already bottom most extent”. Depending upon whether the logical extent is at the top, bottom, or side of the drawing, the bar is either horizontal (top or bottom) or vertical (left or right side).

3 When you release the pick button, panning stops. You can release the pick button move the cursor to another location in the drawing, and the press the pick button again to pan the display from that location.

4 On your own, move the graphic cursor near the upper-right comer inside the drawing area and note that the drawing area is unchanged. (The Drawing Limits command is used to set the drawing area, but the display will not be adjusted until a display command is used.)

5 Inside the Menu Bar area

Select: **[View] [Zoom] [All] (Fig 12)**

6 Zoom All command will adjust the display so that all objects in the drawing are displayed to be as large as possible. If no objects are constructed, the Drawing Limits are used to adjust the current viewport.

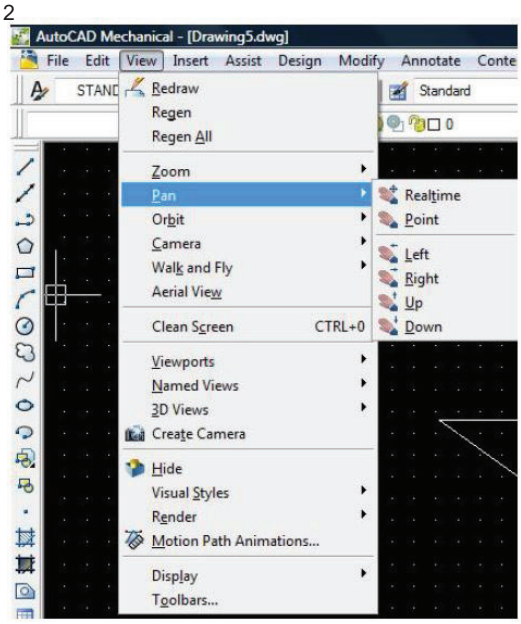
7 Move the graphic cursor near the upper - right comer inside the drawing area and note that the display area is updated.

8 In the menu bar area select: [View] [pan] [Realtime]

9 The available pan commands enable us tomove the view to a different position. The pan - realtime function acts as if you arre usisng a video camera.

10 Move the cursor, which appears as a hand inside the graphics window, near the center of the drawing window, then push down the left - mouse - button and drag the display toward the right and top side until we can see the sketched line. (Notice the scroll bars can also be used to adjust viewing of the display.)

Fig 12



Commands & co-ordinate system

Objectives: At the end of this exercise you shall be able to
- **use draw command line**
- **practice co-ordinate system**
- **use modify command erase.**

TASK 1: **Draw commands Line**

From tool bar: Line

Draw menu: Line

Command : Line, L

Example:

Command: L - Line

1 Specify first point: Select one point on the screen.

2 Specify next point or [Undo]: Select second point on the screen.

3 Specify next point or [Undo]:

Continue

1 Continue a line from the end point of the most recently drawn line.

2 If the most recently drawn line is an arc, its end point defines the starting point of the line, and the line is drawn tangent to the arc.

Close

1 Ends the last line segment at the beginning of the first line segment, which forms a closed loop of line segments.You can close after you have drawn a serious of two or more segments.

Undo

1 Erase the most recent segment of a line sequence. Entering “U” more than once back tracks through line segments in the order you created them.

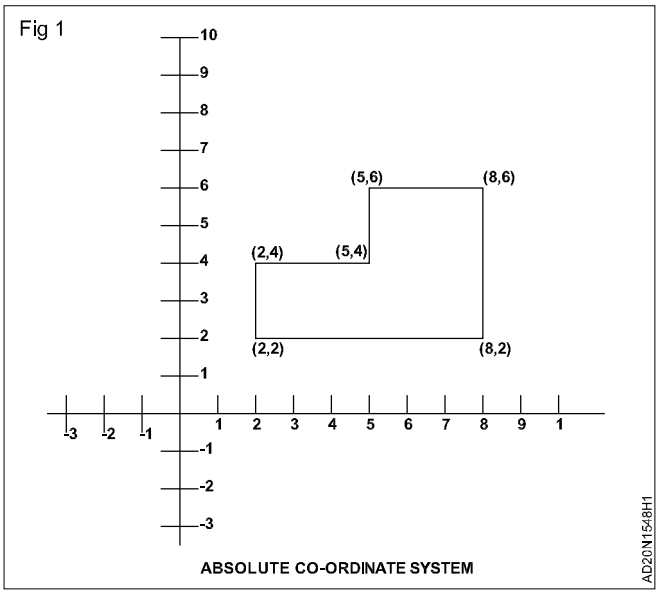
Co-ordinate system in autocad

1 All drawings are superimposed on an invisible grid, or co-ordinate system, with a horizontal X-axis and a verticasl Y-axis.

2 You can establish grid and snap setting that match the units of the co-ordinate system or some multiple or fraction of it.

3 Absolute co-ordinate system (X, Y): To enter an absolute coordinate, specify a point by entering its X and Y values in the format X,Y. (Fig 1)

Fig 1



4 Use absolute coordinate when you know the precise X and Y values in the point from the origin. The following sequence of coordinates draw a triangle, as shown below.

Command _ Line specify first point: 2,2

Specify next point or [undo]: 8,2

Specify next point or [undo]: 8,6

Specify next point or [undo]: 5,6

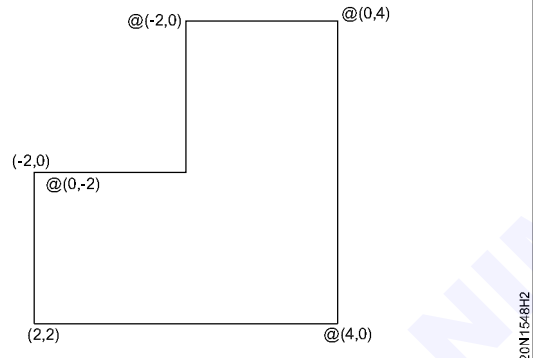
Specify next point or [undo]: 5,4

Specify next point or [undo]: 2,4

Relative rectangular co-ordinate system @ X distance, Y distance (Fig 2)

Use relataive coordinates when you know the position of a point with respect to the previous point, the relative rectangular coordinate is represented in the following format.

Fig 2



RELATIVE RECTANGULAR CO-ORDINATE SYSTEM

X displacement, Y-displacement

Command:_ line specify first point:2,2

Specify next point or [undo]: @ 4,0

Specify next point or [undo]: @ 0,4

Specify next point or [Close/ undo]: @ 0,-2

Specify next point or [Close/ undo]: @ -2,0

Specify next point or [Close/ undo]: @ c

Relative polar co-ordinate system @ distance angle (Fig 3a & b)

Polar co-ordinate system uses a distance and an angle with reference to the previous point to locate a point. Angle is measured in anti-clock direction, taking 0° towards right.

The relative polar coordiante is representing in the following format.

@Distance<angle

Command: _ line specify first point:2,3.

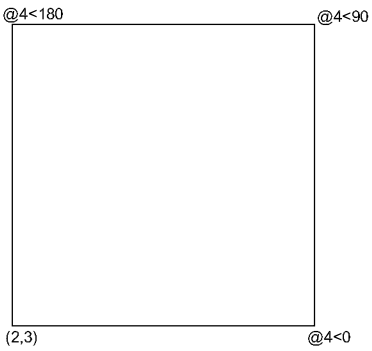
Specify next point or [undo]: @ 4<0.

Specify next point or [undo]: @ 4<90.

Specify next point or [close / undo]: @ 4<180.

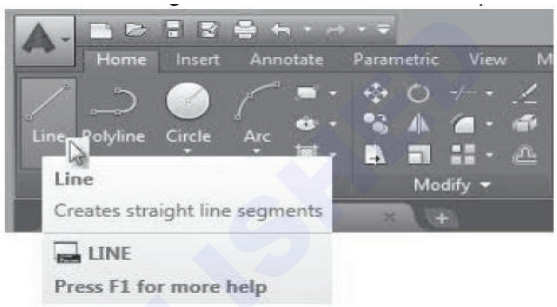
Specify next point or [close / undo]:c.

Fig 3a



RELATIVE POLAR CO-ORDINATE SYSTEM

Fig 3b



Drawing lines with the line command (Fig 4 & 5)

1 Move the graphics cursor to the first icon in the draw panel. This icon is the **line** icon. Note that a brief description of the line command appears next to the cursor.

2 Select the icon by clicking once with the **Left - mouse-button,** which will activate the line command.

3 In the command prompt area, near the bottom of the AutoCAD drawing screen, the message " - line specify point:" is displayed. AutoCAD expects us to identify the starting location of a straight line. Move the graphics cursor inside the graphics window and watch the display of the coordinates of the graphics cursor at the bottom of the AutoCAD drawing screen. The three numbers represent the location of the cursor in the X,Y, and Z directions. We can treat the graphics window as if it was a piece of paper and we are using the graphics cursor as if it were a pencil with which to draw.

We will create a freehand sketch of a five - point star using the Line command. Do not be overly concerned with the actual size or the accuracy of your freehand sketch.

4 We will start at a location about one - third from the bottom of the graphics window. Left - click once to position the starting point of our first line. This will be point 1 of our sketch. Next move the cursor upward and toward the right side of point 1. Notice the rubber band line that follows the graphics cursor in the graphics window. Left - click again (pint 2) and we have created the first line of our sketch.

5 Move the cursor to the left of point 2 and create a horizontal line about the same length as the first line on the screen.

Fig 4

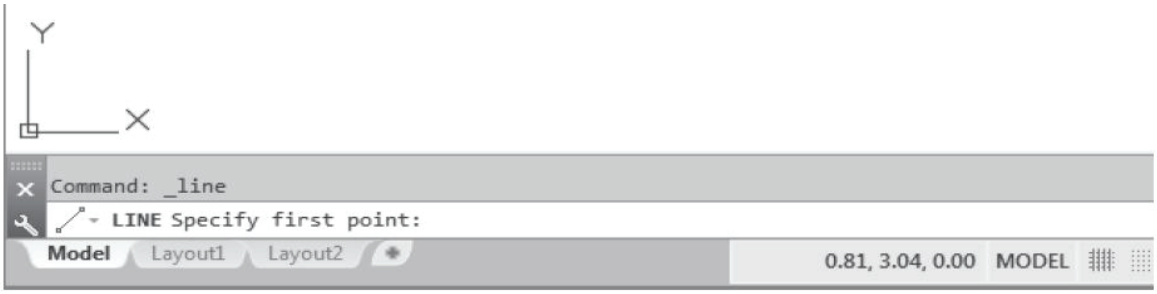
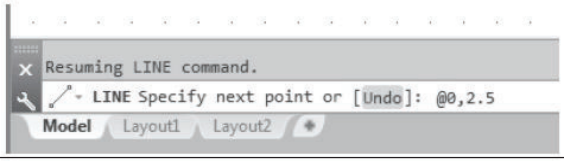


Fig 5



6 Repeat the above steps and complete the freehand sketch by adding three more lines (from point 3 to point 4, point 4 to point 5, and then connect to point 5 back to point 1). (Fig 6 & 7)

Fig 6

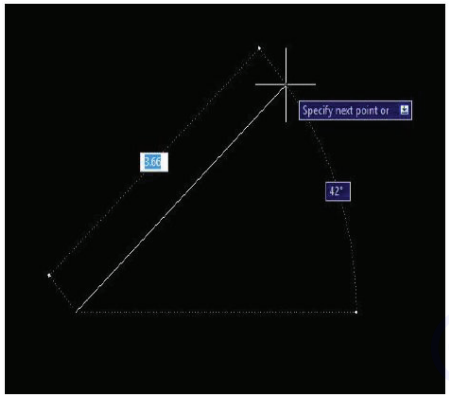
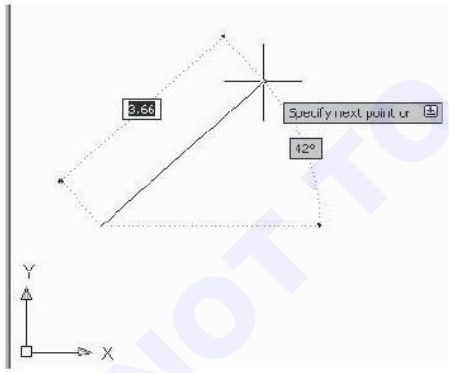


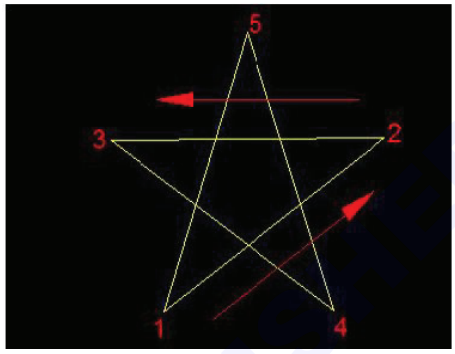
Fig 7



7 Notice that the Line command remains activated even after we connected the last segment of the line to the starting point (point 1) of our sketch. Inside the graphics window, **Click once** with the **right - mouse-button** and a popup menu appears on the screen.

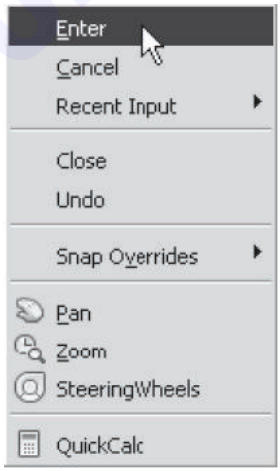
8 Select enter with the left - mouse - button to end the line command. (This is equivalent to hitting the [ENTER] key on the keyboard.) (Fig 8)

Fig 8



9 Move the cursor near point 2 and point 3, and estimate the length of the horizontal line by watching the displayed coordinates for each point. (Fig 9)

Fig 9



ERASE : There are 3 methods to **erase** (delete) objects from the drawing. You decide which one you preper to use. They all work equally well.

METHOD 1

Select the Erase command first and then select ther objects

1 Start the Erase command by using one of the following.

TYPING = E <enter>.

PULLDOWN = MODIFY / ERASE

TOOLBAR = MODIFY

2 Select objects: **Pick one or more objects**

Select objects: **Press <enter> and the objects will disappear.**

METHOD 2

Select the objects first and then the Erase command from the shortcut menu

1 Select the object (s) to be erased.

2 Prees the right mouse button.

3 Select **"Erase"** from the short - cut mentu.

METHOD 3

Select the objects first and then the delete key

1 Select the object (s) to be erased.

2 Press the delete key.

Very important : If you want the erased objects to return, press U <enter> or Ctrl + Z or the Undo arrow icon. This will "Undo" the effects of the last command.

Using the ERASE command (Fig 10)

One of the advantages of using a CAD system is the ability to remove entities without leaving any marks. We will erase two of the lines usisnsg the Erase command.

1 Pick Erase in the modify toolbar. (The icon is a picture of an eraser at the end of a pencil.) The message "Select objects" is displayed in the command prompt arrea and AutoCAD awaints us to select the objects to erase.

2 Left - cllick the SNAP MODE button on the status bar to turn OFF the SNAP MODE option so that we can more easily move the cursor on top of objects. We can toggle the Status Bar options ON or OFF in the middle of another command.

3 Select any two lines on the screen; the selected lines are displasyed as dashed lines as shown in the figure below.

To deselect an object from the selection set, hold down the [SHIFT] keyand select the object again. (Fig 11)

Fig 10

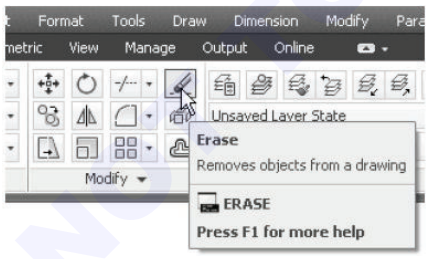
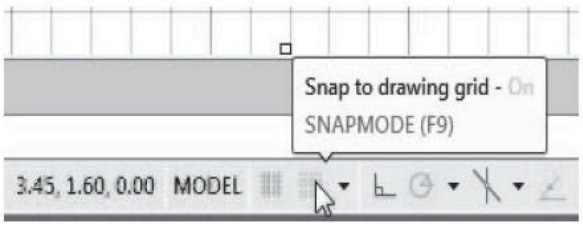


Fig 11



4 Right - mouse - click once to accept the selections. The selected two lines are erased.

The last command

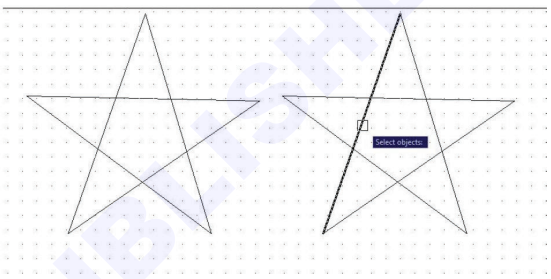
1 Inside the graphics window, click once with the right-mouse-button to bring up the popup option menu.

2 Pick repeat erase, with the left - mouse - button, in the popup menu to repeat the last command. Notice the other options available in the popup menu.

3 Move the cursor to a location that is above and toward the left side of the entities on the screen. Left - mouse - click once to start a corner of a rubber - band window.

Move the cursor toward the right and below the entities, and then left-mouse-click to enclose all the entities inside the selection window. Notice all entities that are inside the window are selected.(Fig 12)

Fig 12



Inside the graphics window, right-mouse-click once to proceed with erasing the selected entities.

When your own create a free hand sketch of your chice using the line comman. Experiment with using the different commands we have discussed so far, Reset the satusbutton so that only the GRID DISPLAY option is turned ON as shown. (Fig 13, 14, 15)

Fig 13

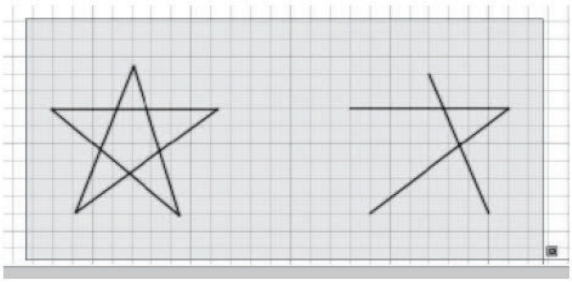
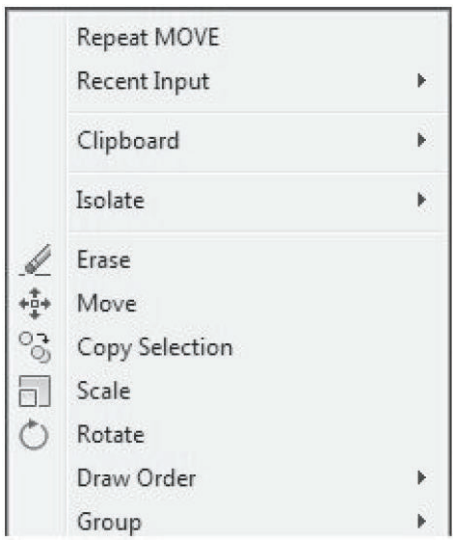


Fig 14

Fig 15



Practice - I

Instructions

1 Start a **New file**

2 **Draw** the objects below using

LINE command.

Ortho (f8) **ON** for **Horizontal** and **Vertical** lines.

Ortho (f8) **OFF** for lines drawn on an **Angle.**

Increment Snap (f9) **ON** Osnap (f3) **OFF.**

3 **Save** this drawing using:

Practice - II (Fig 16)

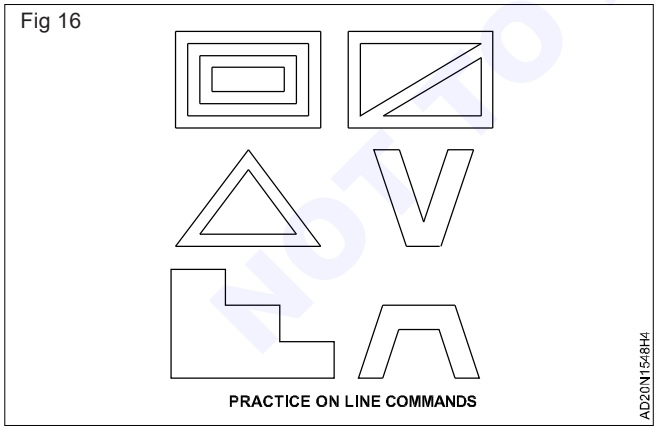
Instructions

1 Using drawing DRG NO **ERASE** the missing lines.

2 **Save** this drawing using:

File / Save as / DRG NO.

Fig 16



Practice - III (Fig 17)

Instructions

1 Start a **New** file. **(Fig 18)**

2 **Draw** the objects below using.

Draw / Line.

Ortho (f8) **ON** for **Horizontal** and **Vetical** Lines.

Ortho (f8) **OFF** for lines drawn on an **Angle**.

Increment Snap (f9) **ON**

Osnap (f3) **OFF**

Fig 17

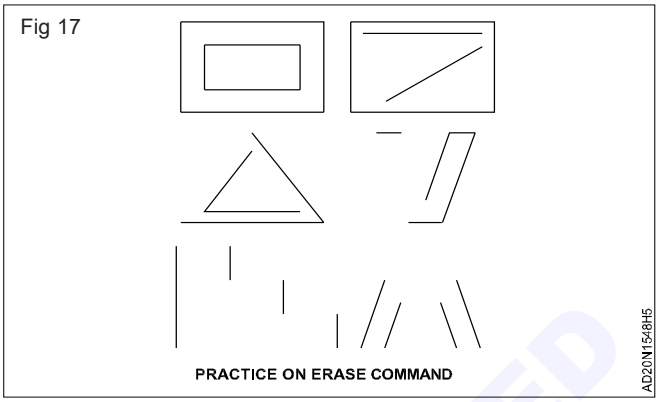
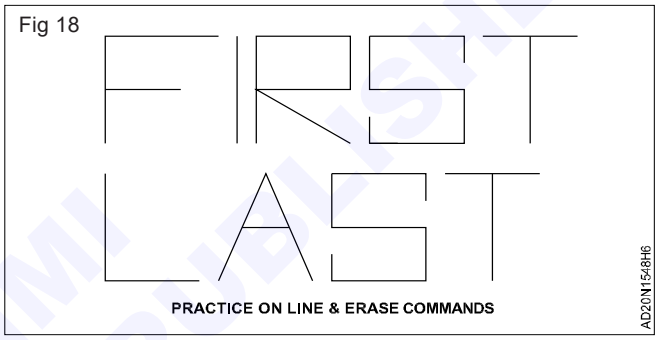


Fig 18



3 **Save** this drawing using.

File / Save as DRG NO.

Practice - IV (Fig 19)

Instructions

1 Start a New file.

2 **Draw** the objects below using

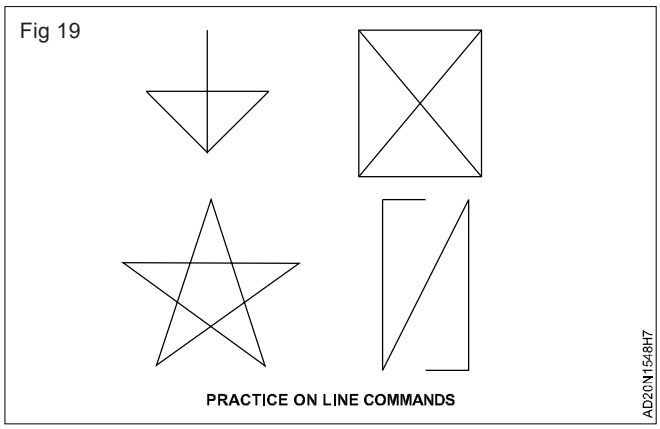
Draw / Line.

Osnap (f3) **OFF.**

3 **Save** this drawing using.

File / Save as (give file name).

Fig 19



Skill Sequence

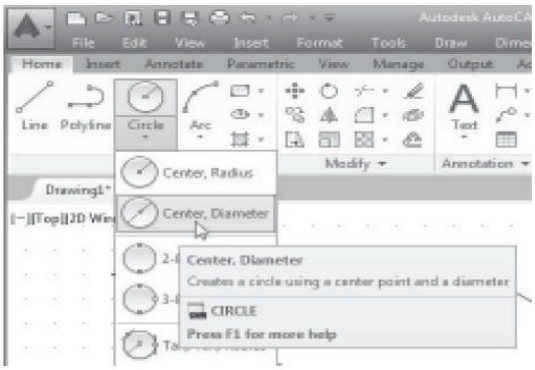
Basic commands - I

Objectives: At the end of this exercise you shall be able to
- **create circle**
- **create arcs**
- **creat polygon.**

Creating circles

The menus and toolbars is **AutoCAD 2013** are designed to allow the CAD operators to quickly activate the desired commands. (Fig 1)

Fig 1



1 In the Draw toolbar, click on the little triangle below the circle icon. Note that the little triangle indicates additional options are available.

2 In the aws a circle based on two endpoints of the diameter.

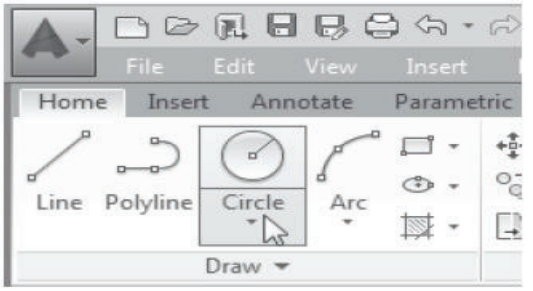
Notice the different options available under the circle submenu.

- **Center, radius:** Draws a circle based on a center point and a radius.
- **Center, diameter:** Draws a circle based on a center point and a diameter.
- **2 points:** Draws a circle based on two.
- **3 Points:** Draws a circle based on three points on the circumference.
- **TTR - Tangent, Tangent, Radius:** Draws a circle with a specified radius tangent to two objects.
- **TTT - Tangent, Tangent, Tangent:** Draws a circle tangent to three objects.

Circle (Fig 2)

AutoCAD provides the following ways of drawing circles.

Fig 2



1 Centre and radius (Fig 3)

This is the classical method. The first point define the circle‘s center,

The second one radius

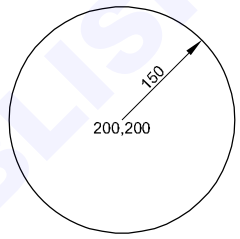
Example

Command. : Circle or C.

3P / 2P / TTR /<Center point>. : 200,200.

Diameter / <Radius>. : 150.

Fig 3



PRACTICE ON CIRCLE COMMAND

AD20N154-8J1

2 Centre and diameter (Fig 4)

After the circle’s center has been defined the diameter can be given

Example

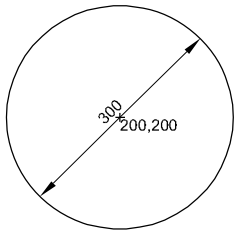
Command : Circle or C

3P/2P/TTR/<Center Point> : 200, 200

Diameter/<Radius> : D

Diameter : 300

Fig 4



PRACTICE ON CIRCLE COMMAND

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3 2 Points (Fig 5)

With this option, the user can specify two points constituting the end points of the circles diameter.

Example

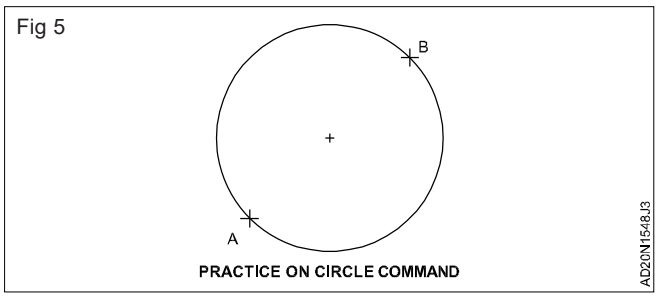
Command : Circle or C

3P/2P/TTT/<Center point> : 2P

First point on Diameter : 200,200

Second point on Diameter : 400,400

Fig 5



4 3 Points (Fig 6)

With this option the user can specify two points constituting the end points of the circles diameter.

Example

Command : Circle or C

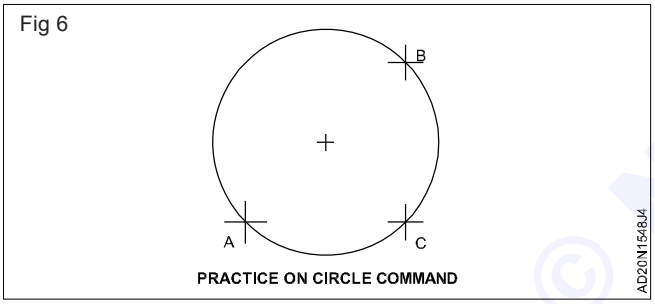
3P/2P/TTR/<Center point> : 3P

First point on Diameter : 200,200

Second point on Diameter : 400,400

Third point on Diameter : 300,350

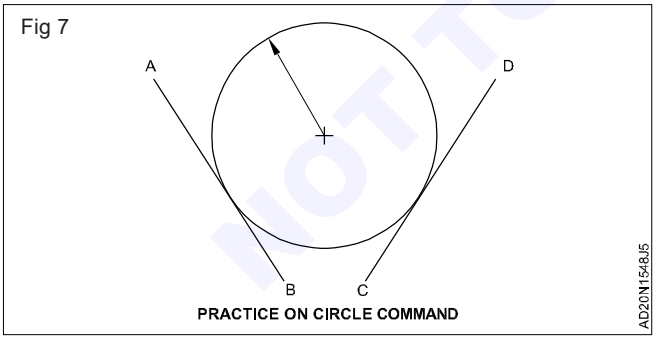
Fig 6



5 Tangent, tangent and radius (Fig 7)

This option allows the user to define two tangential points and then the circle's radius. In order to invoke this option it should have two entities draw. The circle can be drawn between Tangentially to two lines, two circles, or two Arc's or combination of any two.

Fig 7



Example

Command : Circle or C

3P/2P/TTR/<Center point> : TTR.

Enter Tangent Space : Pick by using mouse on the entity drawn already.

Radius : 100

AutoCAD procides 11 different ways of drawing Arcs.

1 3 Points (Fig 8a & 8b)

In this method three points define the Arc's Start point, Second point that the Arc passes through, and the arc's end point.

Fig 8a

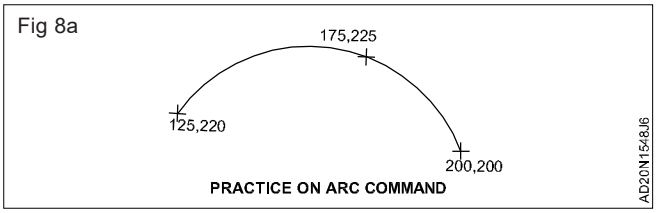
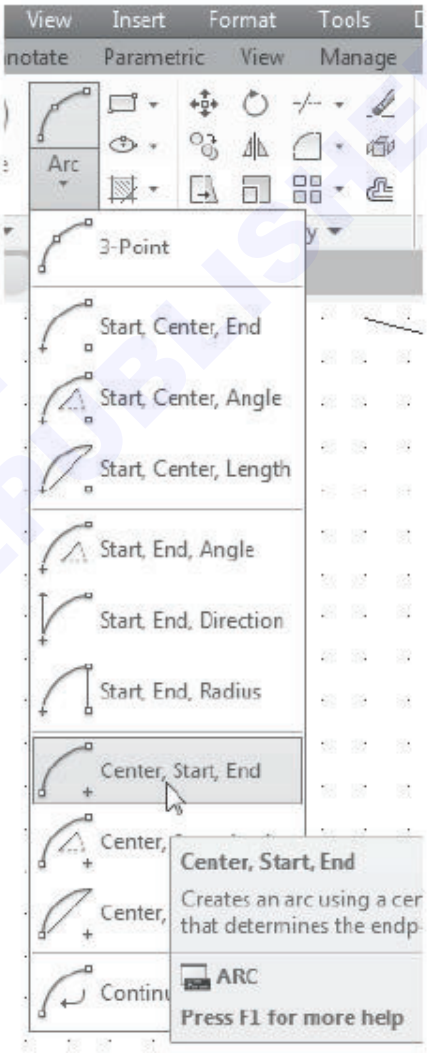


Fig 8b



2 Start point, centre, end point (S,C,E) (Fig 9)

Center refers to the center point of the circle of while the arc is a part.

Example

Command : Arc or A

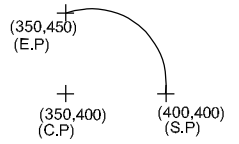
Center/<Start point> : 400,400.

Center/End<Second point> : C.

Center point : 350,400.

Angle/Length of chord/
<End point> : 50,450.

Fig 9



3 Start point, centre, included angle (S,C,A) (Fig 10)

In this method first specify the start point of the arc, then the center point or the arc, and then the include angle between the start point and the end point of the arc.

Example

Command : Arc or A

Center/<Start point> : 400,400.

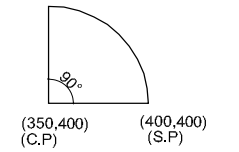
Center/End<Second point> : C.

Center point : 350,400.

Angle/Length of Chord/
<End point> : A.

Included Angle : 90.

Fig 10



4 Start point centre, length of chord (S,C,L) (Fig 11)

In this method first specify the start point of the arc, then the center point of the arc and then the chord length.

Example

Command : Arc or A.

Center/<Start point> : 400,400.

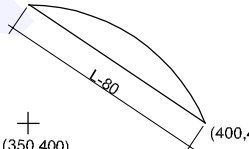
Center/End<Second point> : C.

Center Point : 350,400.

Angle/Length of Chord/
<End point> : L.

Length of Chord : 80.

Fig 11



5 Start point, end point, radius (S,E,R) (Fig 12)

In this method first specify the start point of the arc, then the end point and finally the radius of the arc.

Example

Command : Arc or A.

Center/<Start point> : 400,400.

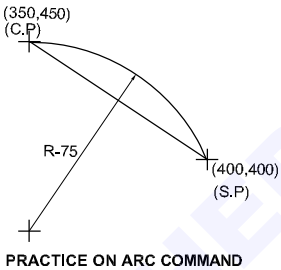
Center/End<Second point> : E.

End point : 350,450.

Angle/Direction/Radius/
<Center point> : R.

Radius : 75.

Fig 12



6 Start point, end point, included angle (S,E,A) (Fig 13)

In this method first specify the start point of the arc, then the end point and finally the included angle of the arc.

Example

Command : Arc or A.

Cener/<Start Point> : 400,400.

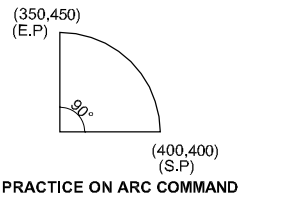
Center/End<Second point> : E.

End point : 350,450.

Angle/Direction/Radius/
<Center poinmt> : A.

Included angle : 90.

Fig 13



7 Start point, end point, starting direction (S,E,D) (Fig 14)

In this method first specify the start point of the arc, then the end point and finally the starting direction of the arc from the start point.

Example

Command : Arc or A.

Center/<Start point> : 400,400.

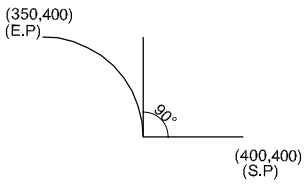
Center/End<Second point> : E.

End point : 350,450.

Angle/Direction/Radius/
<Center point> : D.

Direction from start point : 90.

Fig 14



PRACTICE ON LINE COMMANDS

AD20N154BJC

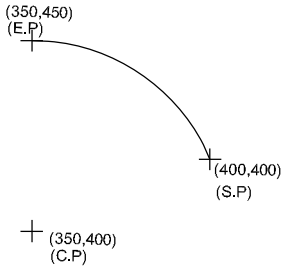
8 Start point, end point, centre point (S,E,C) (Fig 15)

In this method first specify the start point of the arc, then the end point and finally the center point of the arc.

Example

Command	: Arc or A.
Center/<Start Point>	:400,400.
Cener/End<Second point>	: E.
End point	: 250,450.
Angle/Direction/Radius/ <Center point>	: 350,400.

Fig 15



PRACTICE ON ARC COMMAND

AD20N154BJD

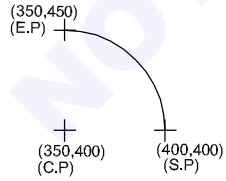
9 Centre point, start point, end point (C,S,E) (Fig 16)

In this method first specify the center point of the arc, then the start point and finally the end point of the arc.

Example

Command	: Arc or A.
Center/<Start point>	: C.
Center point	: 350,400.
Stat point	: 400,400.
Angle/Length of chord/ <End point>	: 350,450.

Fig 16



PRACTICE ON ARC COMMAND

AD20N154BJE

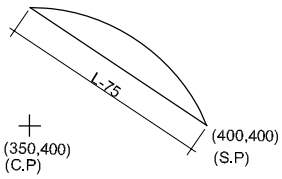
10 Centre point, start point, length of the chord (C,S,L) (Fig 17)

In this method first specify the center point of the arc, then the start point and finally the length of chord.

Example

Command	: Arc or A.
Center/<Start point>	: C.
Center point	: 350,400.
Stat point	: 400,400.
Angle/Length of chord/<End point>	: L.
Length of chord	: 75.

Fig 17



PRACTICE ON ARC COMMAND

AD20N154BJF

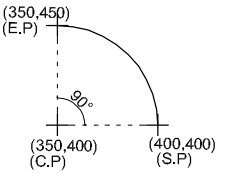
11 Centre point, start point, included angle (C,S,A) (Fig 18)

In this method first specify the center point of the arc, then the start point and finally the included angle.

Example

Command	: Arc or A.
Center/<Start point>	: C.
Center point	: 350,400.
Stat point	: 400,400.
Angle/Length of chord/<End point>	: A.
Included angle	: 90.

Fig 18



PRACTICE ON ARC COMMAND

AD20N154BJG

Ellipse

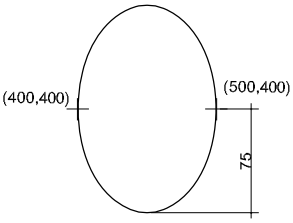
This command approximates an ellipse is to choose the default options:

1 Ellipse by axis and eccentricity (Fig 19)

Example

Command	: Ellipse or EL.
Axis end point of ellipse or (Arc/Center)	: 400,400.
Other end point of axis	: 500,400.
Distance to other axis or [Rotation]	: 75.

Fig 19



PRACTICE ON ELLIPSE COMMAND

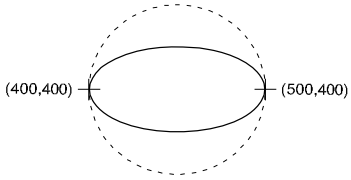
AD20N154BJH

2 Ellipse by axis and rotation (Fig 20)

Example

Command	: Ellipse or EL.
Axis end point of ellipse or (Arc/center)	: 400,400.
Other end point of axis	: 500,400.
Distance to other axis or [Rotation]	: R.
Rotation around major axis	: 60.

Fig 20

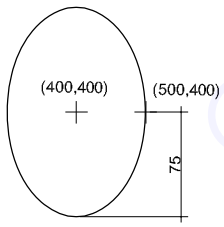


3 Ellipse by centre and two axes (Fig 21)

Example

Command	: Ellipse or EL.
Axis end point of ellipse or (Arc/center)	:400,400.
Center of ellipse	: 400,400.
Axis end point	: 500,400.
Distance to other axis or [Rotation]	: 75.

Fig 21

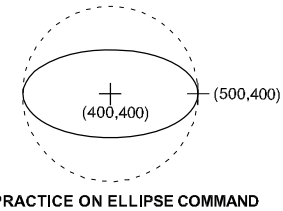


4 Ellipse by centre, one axis, and rotation (Fig 22)

Example

Command	: Ellipse or EL.
Axis end point of ellipse or (Arc/center)	: C.
Center of ellipse	: 400,400.
Axis end point	: 500,400.
Distance to other axis or [Rotation]	: R.
Rotation around major axis	: 60.

Fig 22



Polygon

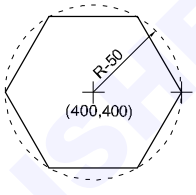
This command allows the user to draw regular 2D polygons.

1 Centre of polygon, inscribed circle, radius (Fig 23)

Example

Command	: POL.
POLYGON Enter number of sides <default>	: 6.
Center of polygon or [Edge]	: 400,400.
[Inscribed in circle/ Circumscribed about circle]<I>	: I.
Specify radius of circle	: 50.

Fig 23

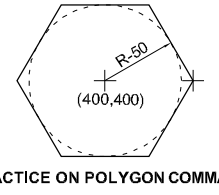


2 Centre of polygon, circumscribed about circle radius of circle (Fig 24)

Example

Command	: Polygon/POL.
POLYGON Enter number of sides<default>	: 6.
Center of polygon or [Edge]	: 400,400.
[Inscribed in circle/ Circumscribed about circle]<I>	: C.
Radius of circle	: 50.

Fig 24

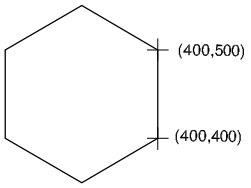


3 Edge option (Fig 25)

Example

Command	: Polygon/POL
POLYGON Enter number of sides <default>	: 6.
Center of polygon or [Edge]	: E.
First end point of edge	: 400,400.
Second end point of edge	: 400,500.

Fig 25



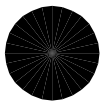
PRACTICE ON POLYGON COMMAND

AD20N1548JN

Doughnut (Donut) (Fig 26)

This command allows the user to draw filled circles and rings.

Fig 26



PRACTICE ON DOUGHNUT COMMAND

AD20N1548JO

Example of filled circle option

Command : Donut.

Inside diameter <default> : 0.

Out side diameter <default> : 50.

Center of doughnut : 100,100.

Example for rings (Fig 27& 28)

Command : Donut.

Inside diameter <default> : 30.

Out side diameter <default> : 50.

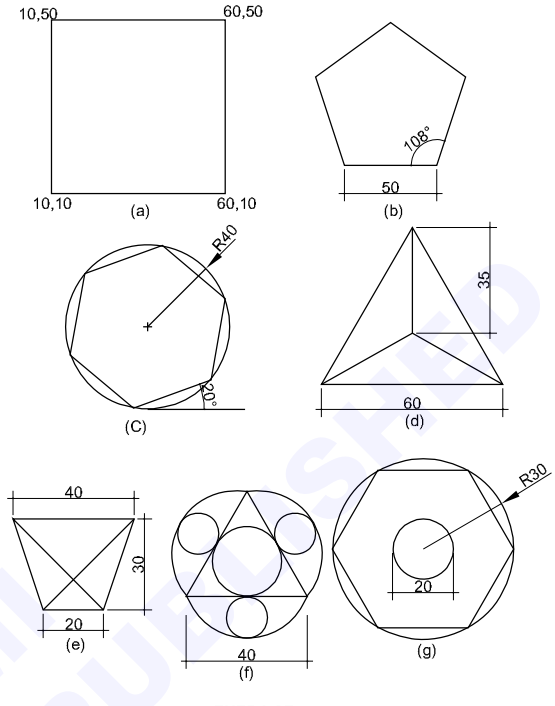
Center of doughnut : 100,100.

Fig 27

PRACTICE ON DOUGHNUT COMMAND

AD20N1548JP

Fig 28



EXERCISE

AD20N1548JQ

Basic Auto CAD drafting commands - II

Objectives: At the end of this exercise you shall be able to
- **erase oops move copy offset rotate**
- **scale fillet trim champer extend break**
- **join mirror array strech lengthen explode.**

Requirements

Tools/Instruments/Machines

- Computer with Auto CAD - 1 No.

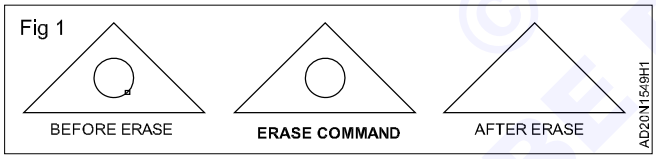
PROCEDURE

TASK 1: **Modifying commands**

Modifying commands are used for modifying the existing drawings. Thus it helps to prepare a final drawing incorporating the necessary changes and a lot of time is saved. Modifying commands are properties, erase, copy, mirror, offset, array,move,rotate, scale, trim, extend, explode etc.

1 Erase (Fig 1)

This command allows the user to specify entities permanently removed from the drawing. The selection can be made with any of the standard SELECT OBJECT method.



Tool bar : Modify, Erase.

Pull down : Modify, Erase.

Command : Erase./ E.

Example

Command : Erase or E.

Select objects : Select the objects using mouse.

Select objects :

2 Oops (Fig 2)

This command restore objects that have been unexpectedly erased by the previous ERASE command

Example

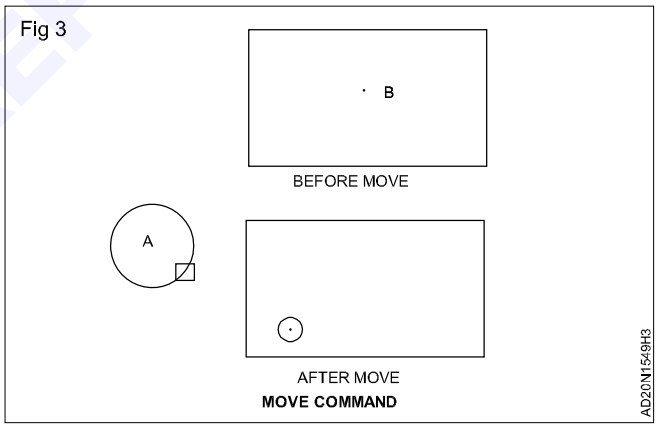
Command : Erase or E

Select objects : Select the objects using mouse

Command : Oops

3 Move (Fig 3)

This command is used to move a single or a set of objects to a new location on a drawing.



Tool bar : Modify, Move.

Pull down : Modify, Move.

Command : Move / M.

Example

Command : Move or M.

Select objects : Select circle.

Select objects : One found.

Select objects :

Base point or displacement : Click A as basepoint.

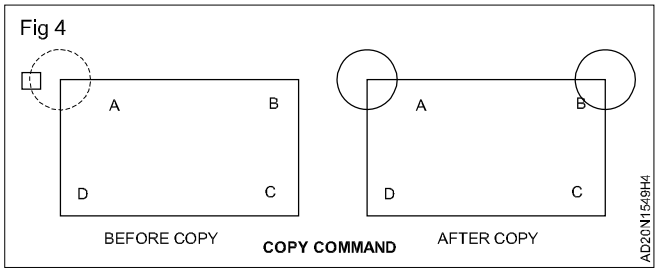
Second point of displacement : Select B.

4 Copy (Fig 4)

Tool bar : Modify, Copy.

Pull down : Modify, Copy.

Command : Copy.



This command is used to copy the existing drawing to another place.

Example

Command : Copy or Co or CP

Select objects : Select object to Copy

Select objects : One found

Base point or displacement : Select a base point.

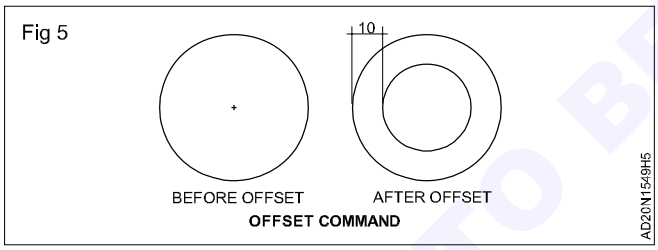
Second point of displacement : Drag cursor at desired place and click mouse.

5 Offset (Fig 5)

Tool bar : Modify, Offset.

Pull down : Modify, Offset.

Command : Offset / O.



This command is used to draw parallel lines, concentric circle, arcs etc. When offset is used, it is necessary to specify the offset distance and side of offset.

Command : Offset or O.

Offset distance or through <current> : 10.

Select the object : Select the circle.

Side to offset : Specify the side for offsetting.

6 Rotate (Fig 6)

This command is used to rotate an object or set of objects to a specified angle.

Tool bar : Modify, Rotate.

Pull Down : Modify, Rotate.

Command : Rotate / Ro.

Example

Command : Rotate / Ro.

Select objects : Select the object by window.

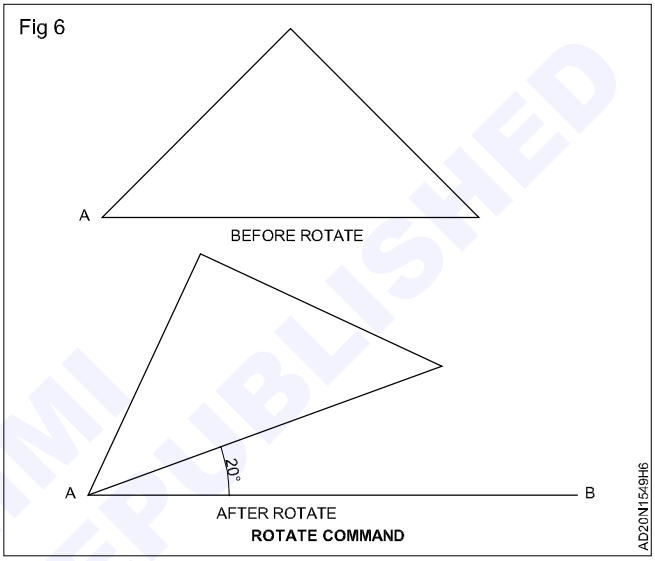
Select objects : Three found.

Select objects :

Specify base point or displacement: Click A as basepoint.

Specify rotation angle or [Copy / Reference] < default>:

Specify rotation angle or [Copy / Reference] < default>: 20.



7 Scale (Fig 7)

This command is used to change the size of an object

Tool bar : Modify, Scale

Pull down : Modify, Scale

Command : Scale / SC

Example

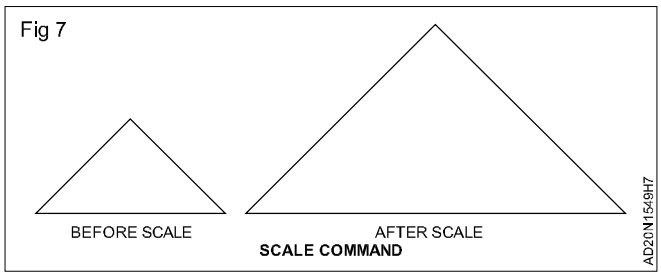
Command : Scale / SC

Select objects : Select the object by window.

Select objects : Three found.

Select objects :

Specify scale factor or [Copy/Reference]<Default> : 2.



8 Fillet (Fig 8)

This command is used to connect two parallel lines, arcs etc., smoothly by a curve of specified radius.

Tool bar : Modify, Fillet.

Pull down : Modify, Fillet.

Command : Fillet or F.

Example

Command : Fillet or F

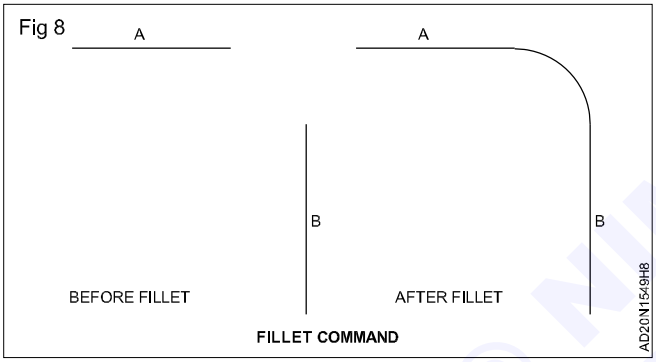
Current settings : TRIM, Radius = 0,0000

Select first object or [Undo/Polyline/Radius/Trim/ Multiple]: R

Specify fillet radius<0.0000>

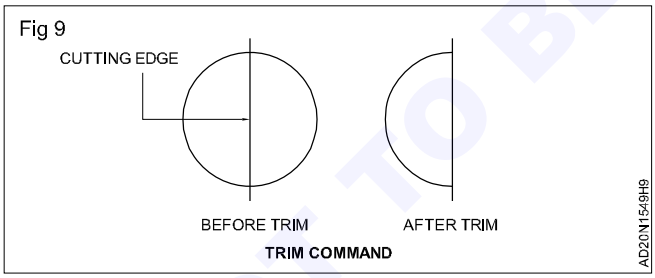
Select first object or [Undo/Polyline/Radius/Trim/ Multiple]: Select A

Select second object or shift - selected to apply corner: Select B



9 Trim (Fig 9)

This command is used to removed a part of a line, circle or arc based on a cutting edge.



Tool bar. : Modify, Trim.

Pull Down. : Modify, Trim.

Command : Trim or TR

Example

Command : TR TRIM.

Select objects or <Select all>: Select cutting edge, 1 found

Select objects:

Select object to trim of shift - select to extend or

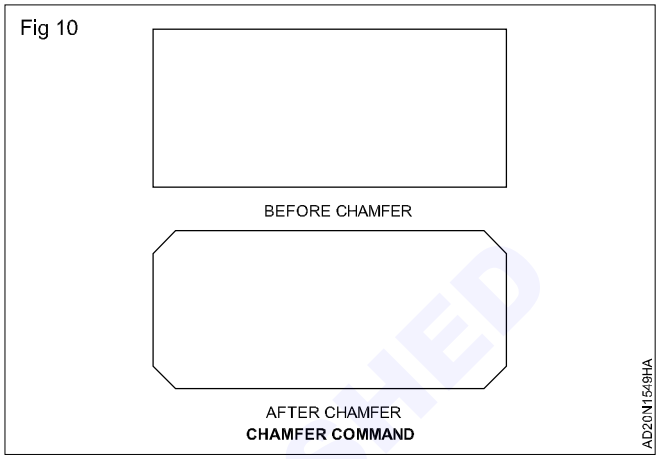
[Fence / Crossing / Project / Edge / eRase / Undo]: Select object to trim.

Select object to trim or shift - select to extend or

[Fence / Crossing / Project / Edge/ Erase/ Undo]:

10 Chamfer (Fig 10)

This command is used to join two non parallel lines with an intermediate line. It produces an inclined surface at the edge of two intersetting lines.



Tool bar : Modify, Chamfer.

Pull down : Modify, Chamfer.

Command : Chamfer or CHA.

Example

Command : Chamfer or CHA.

(TRIM mode) Current chamfer Dist1 <Default>, Dist2 <Default>.

Select first line or [Undo Polyline/Distance/Angle/.

Trim/mEthod/Multiple] : D.

Specify first chamfer distance <0.5000>.

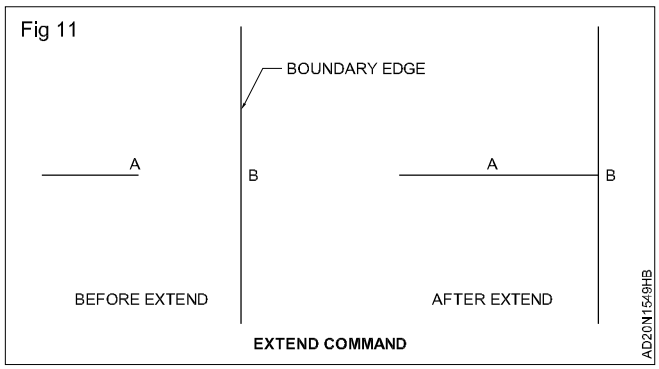
Specify second chamfer distance <3.0000>.

Select first line:

Select second line:

11 Extend (Fig 11)

This command is used to extend the shorter lines to meet another object.



Tool bar : Modify, Extend.

Pull down : Modify, Extend.

Command : Extend or EX.

Example

Command : Extend or EX.

Select boundary edges.

Select objects or <Select all> : Select A, 1 found.

Select objects:

Select object to extend or shift - select to trim or [Fence/ Crossing/Project/Edge/Undo]:Select B.

Select object to extend or shift - select to trim or [Fence/ Crossing/Project/Edge/Undo]:

12 Break (Fig 12)

This command is used to erase a part of an object between two points.

Tool bar : Modify, Break.

Pull Down : Modify, Break.

Command : Break or BR.

Fig 12

Example : To break a line

Command : Break or BR.

Select objects : Select A.

Specify second break point : Select B.

13 Join (Fig 13)

This command is used to join two lines.

Tool bar : Modify, Join.

Pull down : Modify, Join.

Command : Join or J.

Fig 13

Example

Command : Join or J. Select source object.

Select lines to join to source : Select A and B.

14 Mirror (Fig 14)

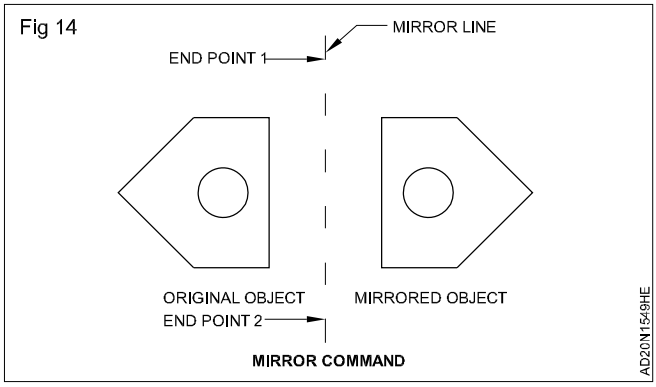
Tool bar : Modify, Mirror.

Pull down : Modify, Mirror.

Command : Mirror or MI.

This command is used to create a miror image of the select objects. After selecting the objects the beginning point and end point of a mirror line is entered.

Fig 14



Example

Command : Mirror.

Select object : Select the object.

Select object :

First point of mirror line : Specify the first point.

Second point : Specify the second point.

Delete old object ? retaining <N> : Enter Y for deletion, N for the previous object.

15 Array (Fig 15)

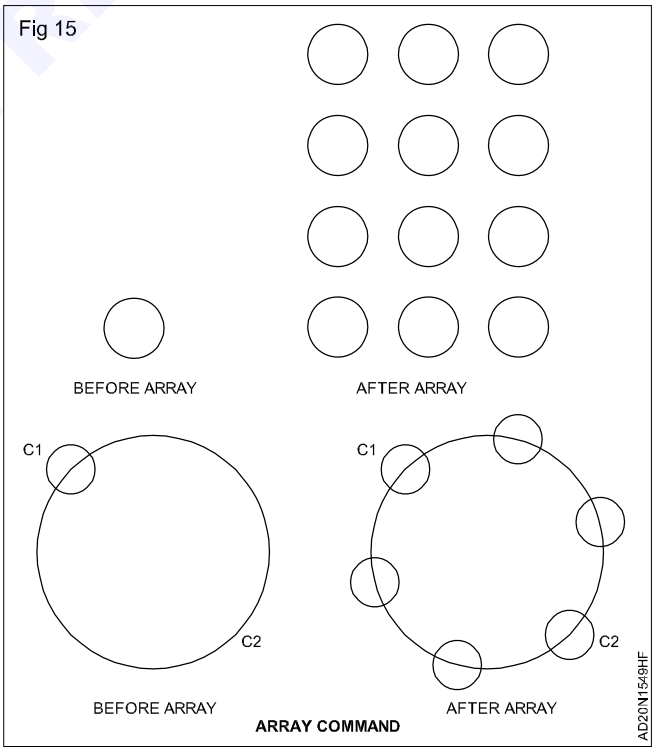
Tool bar : Modify, Array.

Pull down : Modify, Array.

Command : Array or AR.

This command is used to make multiple copies of an object in rectangular or polr (circulr) patterns.

Fig 15



Example : 1

Command : Array.

Select objects : Select circle of radius 5.

Rectangular or polar array (R/P) : R.

Number or rows (----) <1> : 4.

Number of columns (III) <1> : 3.

Unit cell or distance between Rows (----) : 3.

Distance between columns (III) : 3.

Example : 2

Command : Array.

Select objects : Select circle C1.

Rectangular or polar Aarray (R/P) : P.

Base /<Centre point of Array> : Select circle C2.

Number or Items : 4.

Angle to fill <360> : Press to acept 360°.

Rotate objects as they are copied ? <Y> : Enter Y or N.

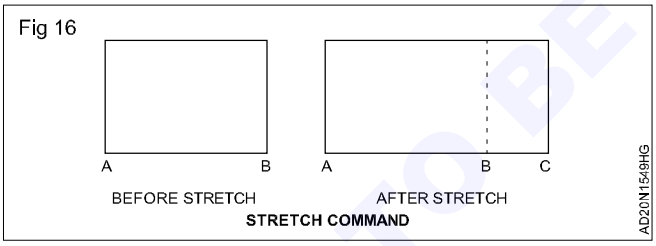
16 Strech (Fig 16)

Tool bar : Modify, Strech.

Pull down : Modify, Strech.

Command : Strech or S.

This command is used to lenghten or shorten the line or objects.



Example : 1

Command : STRETCH.

Select objects to stretch by crossing - window

Select objects : Select A and B by crossing - window.

Select objects :

Specify base point or [Displacement] <Displacement>.

Specify second point: Mouse click at C.

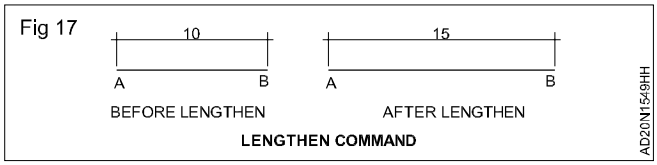
17 Lenthen (Fig 17)

Tool bar : Modify, Lengthen.

Pull down : Modify, Lengthen.

Command : Lengthen or LEN.

This command is used to lengthen or shorten a line.



Example : 1

Command : LEN or LENGTHEN.

Select an object or [DElta/Percent/Total/Dynamic]: T

(Current length: 10).

Specify total length of [Angle] <1.0000)>:15.

Select an object to change or [Undo]: Select line AB

Select an object to change or [Undo]

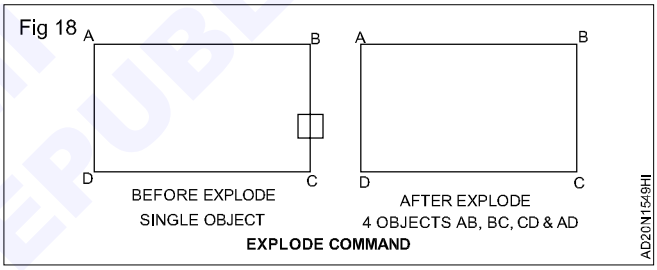
18 Explode (Fig 18)

Tool bar : Modify, Explode.

Pull down : Modify, Explode.

Command : Explode or X.

This command will split the component objects such as blocks, polylines, regions etc. If you explode a ploryline the result will be ordinary lines or arcs.



Example : 1

Command : EXPLODE or X.

Select an object : Select the rectangle.

19 SCALE (Fig 19)

Choose Modify, Scale.

Click the Scale icon.

Type SCALE at the command prompt.

Command : SCALE.

Select objects: (Select Objects).

Pick A pivot point to scale about base point : (point).

Type A rotation angle <Scale factor> / Reference: (number).

or

Pick A scale factor< Scale Factor>/ Reference: (Point).

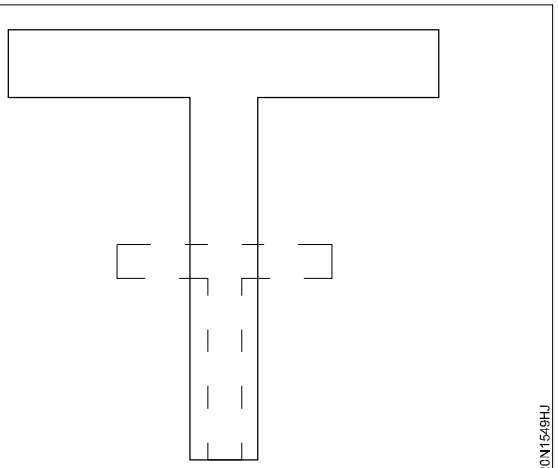
Scale factor / Reference: (points).

Scale by specifying length

You can show AutoCAD the reference length (by pointing to the two endpoints of a line to be scaled), and then

specify the new length. You can specify the new length by pointing, or by dragging the object.

Fig 19



1 Type R to define a reference length

Scale factor / Reference: (R)

2 Choose A reference scale factor.

Reference length; (number or points)

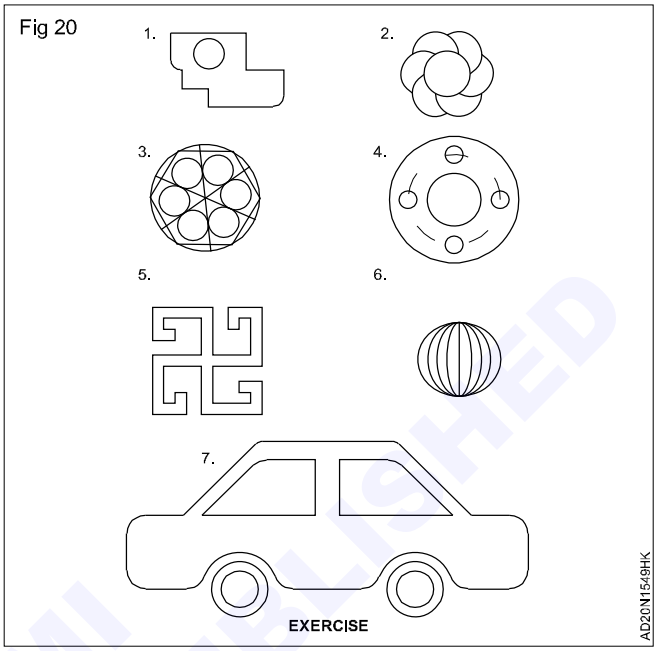
3 Choose A new scale factor.

New length: (number of points) .

can be closed to form enclosed to form enclosed shapes. A closed multiline automatically joins the beginning and end of the shape. When you are drawing a multiline shape, the command option 'c' closes the shape otherwise just press enter to finish the command.

Editing multiline (Fig 20)

Fig 20



TASK 2: **Basic commands - 3**

1 Point

This command is used to display a point on the screen (Drawing area).

Command : Point.

Point : 5,6.

Changing the point type.

Normally the point appears as a dot on the screen, the style in these dialog box by clicking the pointing device (mouse) then select the OK button.

Command : PDMODE.

Pull down : Format, point style.

While using the pull - down menu, the point style dialogue box will appear select a point style in this dialog box by clicking the pointing device (mouse) then select the OK button.

Command : PDMODE.

New value for PDMODE<current>: Enter new value (2) .

Command : Point.

Point : (2.2).

2 Rectangle

This command is used to draw Rectangle.

Example

Command : RECTANGLE / REG.

First comer or (Chamfer / Elevation / Fillet / Thickness / Width) : 2,1

Other corner (Area / Dimension / Rotation): 5,6.

Chamfer : Used for chamfering the edges.

Fillet : Used for filleting the edges.

Width : to change the width.

Thickness: allows to draw rectangle that projects in Z-direction by the specified value of thickness.

Elevation: allows to draw a rectangle at a specified distance from the XY-plane along the Z-axis.

3 Poly line

This command is used to draw poly lines. The PLINE command functions like the LIKE command with additional option like arc, length, width, etc.

Example

Command : P LINE.

Start point : select a point.

Current the width is 0.0000.

Next point or (Arc / Half width / Length / Undo / Width):

Select P1.

Next point or (Arc / Close / Half width / Length / Undo / Width): Select P2.

1 **Width:** To change the width of the poly line, enter W atlast prompt. It asks you to enter the starting width and ending width of the poly line.

2 **Undo:** This erase the most recently drawn poly line segment. This can be invoked by entering U at the last prompt.

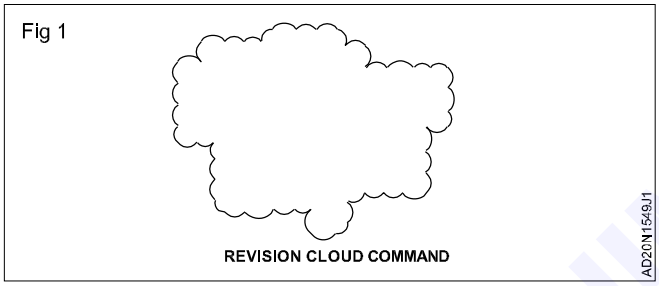
3 **Length:** This asks you to enter the length of a new poly line segment. This can be invoked by entering U at the last prompt.

4 **Half width:** This is used to specify the starting and ending hald width or a poly line. This can be invoked by entering H at last prompt.

5 **Arc:** This is used to draw poly arcs from the previous point. It provides the various option for drawing poly arcs. The Arc option can be invoked by entering a last prompt.

4 Revision cloud (Fig 1)

This command is used to high light your mark-ups.



Example

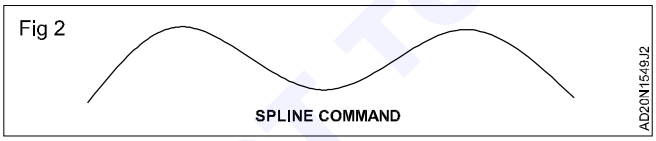
Command : REVCLOUD.

Minimum arc length: 2.0000 Maximum arc length: 3.0000 Style: Normal specify start point or (Arc length / object / Style) <Object>: Specify start point.

Guide crosshairs along cloud path:

Revision cloud finished.

5 Spline (Fig 2)



Example

Command : SPLINE.

Specify first point or [Object]: Click on the first point.

Specify next point: <Ortho off>.

Specify next point or [Close/Fit tolerance] <start tangent>: Click on the point.

Specify next point or [Close/Fit tolerance] <start tangent>: Click on the point.

Specify next point or [Close/Fit tolerance] <start tangent>: Click on the point.

Specify next point or [Close/Fit tolerance] <start tangent>: Click on the point.

Specify next point or [Close/Fit tolerance] <start tangent>: Enter.

Practice 1: Instructions (Fig 3)

1 Start a New file and select 1 workbook helper. Dwt.

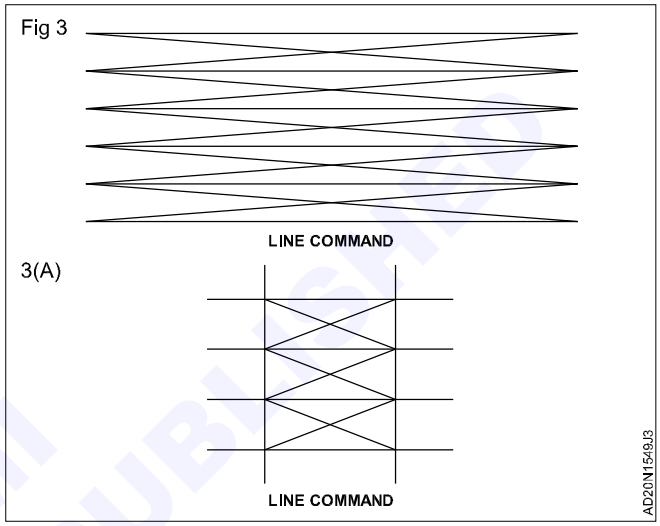
2 Draw the objects below using:

DRAW / LINE.

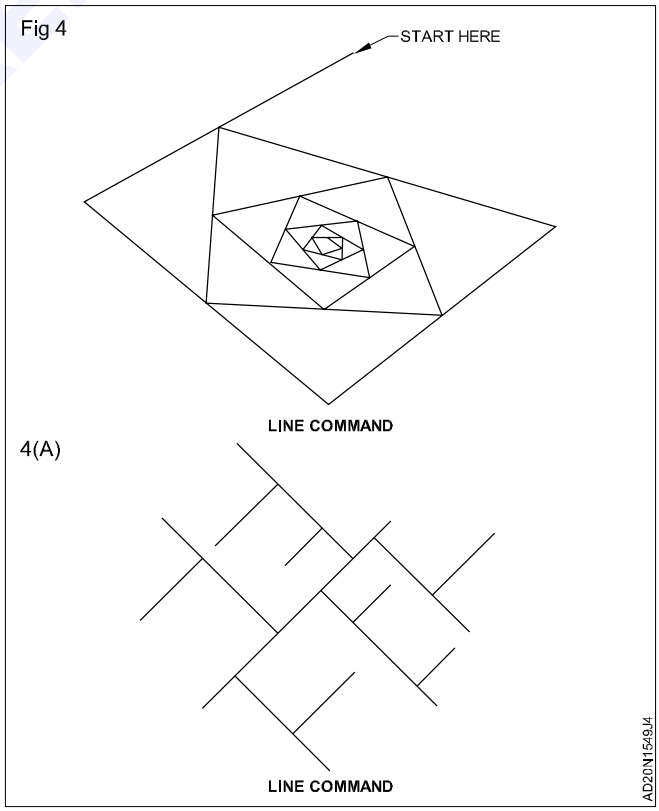
ORTHO ON for Horizontal lines.

OBJECT SNAP = ENDPOINT.

3 Save this drawing as. (Fig 3A)



Practice 2: Instructions (Fig 4)



1 Start a New file and select 1 workbook helper. Dwt

2 Draw the 2 vertical and 4 horizontal lines using.

DRAW / LINE.

ORTHO (F8) = ON.

SNAP (F9) = OFF.

3 Then draw the diagonal lines using.

DRAW / LINE.

ORTHO & SNAP = OOF.

OBJECT SNAP = INTERSECTION.

4 Save this drawing as. (Fig 4A)

Practice 3: Instructions

1 Start a New file and select 1 workbook dwt.

2 Using FORMAT / UNITS:

Set the units to DECIMALS.

Set the precision to 0.00.

3 Using FORMAT / DRAWING LIMITS set the drawing limits to :

Lower left corner = 0,0.

Upper right corner = 12,9.

4 Use view/zoom/ all to make the screen adjust to the new limits.

5 Turn OFF the GRIDS (F7) SNAP (F9) and ORTHO (F8)

(Your screen should be blank and your crosshair should move freely).

6 Draw the Lines below using.

DRAW / LINE.

OBJECT SNAP = MIDPOINT.

7 Save this drawing as.

Practice 4: Instructions (Fig 4A)

1 Using a new file and select 1 workbook helper. dwt.

2 Using FORMAT / UNITS

Set the units to ARCHITECTURAL

Set the precision to ½"

A warning may appear asking you if you "are sure you want to change the units"? Select the OK button.

3 Using FORMAT / DRAWING LIMITS set the drawing limits to.

Lower left corner = 0.0

Upper right corner = 25, 20

4 Use VIEW / ZOOM / ALL to make the screen adjust to the new limits

5 Turn OFF the GRIDS (F7) SNAP (F9) and ORTHO (F8)

(Your screen should be blank and your crosshair should move freely)

6 Draw the Lines below using.

DRAW / LINE

OBJECT SNAP = MIDPOINT.

7 Save this drawing as.

Practice 5: Instructions (Fig 5)

1 Start a New file and select 1 workbook helper. dwt.

2 Draw the house below using at least 4 commands.

3 You can change the GRID and INCREMENT SNAP setting to whatever you like.

4 You decide when to turn Ortho and Snap On or Off. Have some fun with this one.

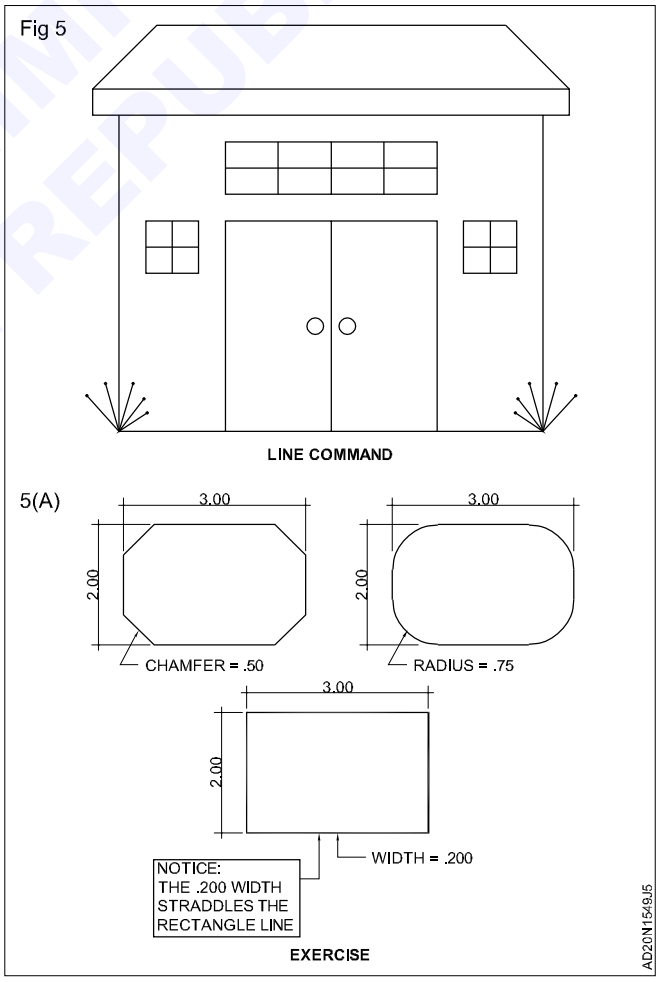
5 Save this drawing as.

Practice 6: Instructions (Fig 5A)

1 Start a New file and select 1 workbook helper. dwt.

2 Draw the rectangles below using the options, dimension, chamfer, fillet and width.

3 Save this drawing as.



Practice 7: Instruction (Fig 6)

1 Start a New file and select 1 workbook dwt.

2 Using FORMAT / UNITS:

Set the units to FRACTIONAL

Set the precision to ¼".

3 Using FORMAT / DRAWING LIMITS set the drawing limits to:

Lower left corner = 0,0.

Upper right corner = 12,9.

4 Use VIEW / ZOOM / ALL to make the screen adjust to the new limits.

5 Turn OFF the GRIDS (F7) SNAP (F9) and ORTHO (F8).

(Your screen should be blank and your crosshair should move freely).

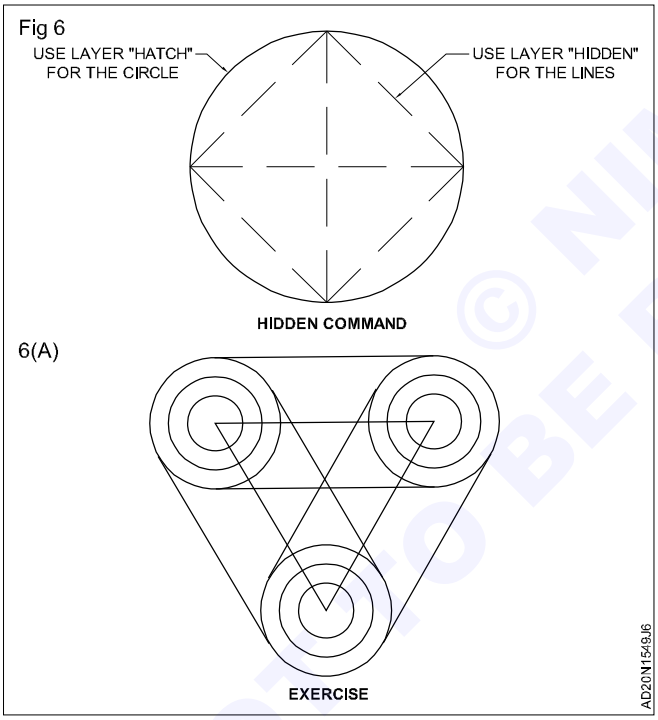
6 Draw the objects below using:

DRAW / CIRCLE (CENTER, RADIUS) and LINE.

OBJECT SNAP = QUADRANT.

7 Save this drawing as.

Practice 8: Instructions (Fig 6A)



1 Start a New file and select 1 workbook dwt.

2 Using FORMAT / UNITS.

Set the units to FRACTIONAL.

Set the precision to ½".

3 Using FORMAT / DRAWING LIMITS set the drawing limits to:

Lower left corner = 0,0.

Upper right corner = 20,15.

4 Use view/zoom/all to make the screen adjust to the new limits.

5 Turn OFF the GRIDS (F7) SNAP (F9) and ORTHO (F8).

(Your screen should be blank and your crosshair should move freely).

6 Draw the objects below using

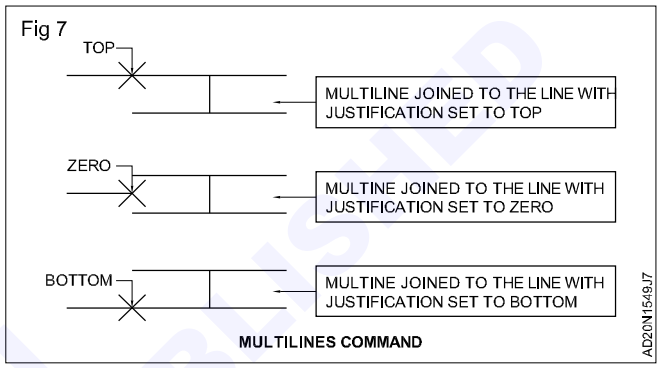
DRAW / CIRCLE (CENTER, RADIUS) and LINE.

OBJECT SNAP = CENTER and TANGENT.

Very important: Use the Tangent option at each end of the line. AutoCAD needs to be told that you want each end of the line to be tangent to a circle.

7 Save this drawing as.

6 Multilines (Fig 7)



This command allows you to draw between 1 and 16 lines parallel to each other. You must tell AutoCAD the distance between the parallel lines.

Pull down menu : Draw, Multiline.

Command : Draw multiline, ml.

Once the command is issued, Autocad responds with

Current settings: Justification = Top, Scale = 1.00, Style= STANDARD.

Specify start point or [Justification/Scale/Style]:

Scale is the distance in units between the parallel lines. Justification determines where the start point of a vertex is. Both these settings are illustrated in the diagram below. Top, Zero and Bottom refer the justification.

Multiline can be closed to form enclosed to form enclosed shapes. A closed multiline automatically joins the beginning and end of the shape. When you are drawing a multiline shape, the command option ‘c’ closes the shape otherwise just press enter to finish the command.

Editing multiline

Command line: mledit

Menu: Modify, object, multiline

When the command is issued, the mulitiline edit tools dialogue box is displayed. The box is divided in to four columns. Each column helps you to edit a different type of intersection.

7 Construction line (X line)

X line is a linear object, which starts at infinite and ends at infinite, or we can say that it is a line, which has no

start or end point but passes through a specified point. These lines are used for projections.

Command : X line.

Specify a point or [hor/ver/ang/bisect/offset]: use one of the point fixing methods or enter.

An option. Eg. H.

Specify through point: Use one of the point fixing methods

8 RAY

Ray creates semi infinite lines commonly used as construction lines. A ray has a finite starting point and extends to infinity.

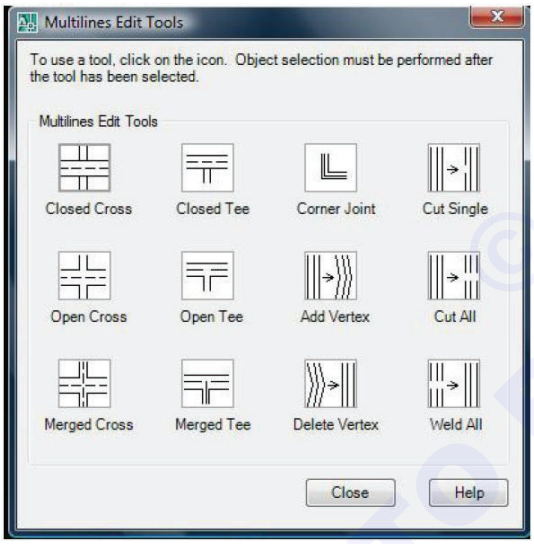
Command : Ray.

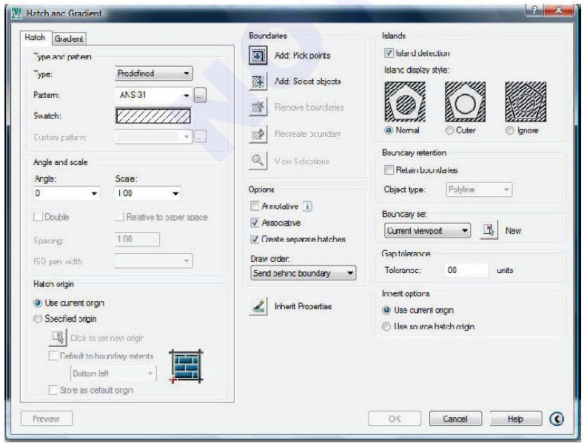
Menu : Draw, Ray.

Specify start point : Fix a point on the screen.

Specify through point

AutoCAD draws a ray and continue to prompt for though points so you can create multiple rays. Press to end the command.

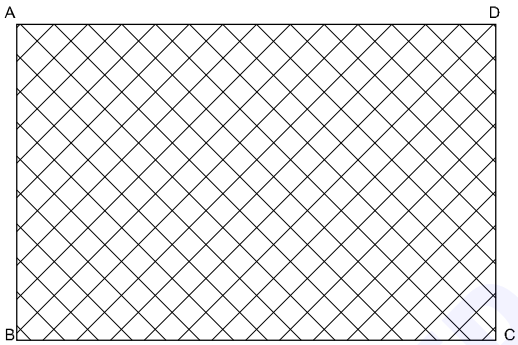




9 Hatch (Fig 8)

Hatch is used to fill an area defined by lines arcs, circles or poly line with either a predefined pattern, a user defined pattern or a simple hatch pattern. It is used to show the section of solids or objects.

Fig 8



Tool bar: Draw, Hatch.

Pull down menu: Draw hatch B.

Command: Hatch or H.

This allows you to hatch a region enclosed within a boundary by selecting the objects to be hatched. When you invoke the HATCH command. The hatch and gradient dialogue box is displayed. This dialogue box has several options which give various aspects of hatching.

Command: Hatch or H

1 Select type and pattern from predefined, user defined and customer select colour from gradients.

2 Mouse click on add pick point.

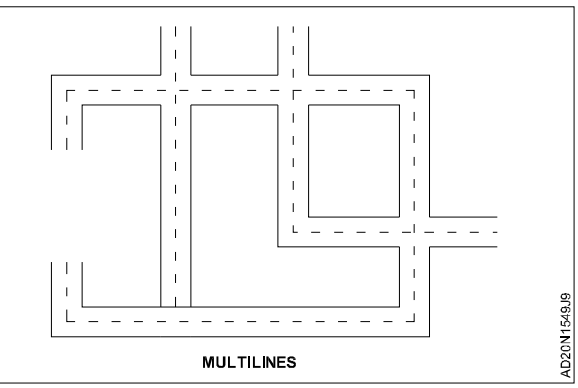
3 Click inside ABCD.

4 Change angle and scale if you want click on preview. If it is ok then click on in the dialogue.

Example

Command: Hatch, H (Fig 9)

Fig 9



1 Select type and pattern from predefined user defined cand custom or select colour from gradient

2 Mouse click on add pick point.

3 Mouse inside ABCD.

4 Change angle and scale if you want.

5 Click on preview.

6 If it is ok then click on OK in the dialogue box.

List

AutoCAD lists out the properties and the geometrical parameters of the selected objects.

Pull down menu :- Tools, inquiry, list.

Command: list.

Select objects: use any object selection method select rectangle ABCD.

Select objects: 1 found.

Select objects:

Properties of the rectangle ABCD = LWPOLYLINE layer: "0"

Space: Model space, Handle = d8a, Closed, Constant width 0.0000

Area 16486.7990, perimenter 551.6401.

Distance

Pull down menu: Tools, inquiry, distance.

To measure the distance between two points.

Command: Dist.

Specify first point: Select A.

Specify second point: Select B.

Distance = 118.6843, Angle in XY Plane = 0, Angle from XY Plane = 0.

Delta X = 118.6743, Delta Y = 0.0000, Delta Z = 0.0000.

Area (Fig 10)

Calculate the area and perimater of object or of defined areas.

Pull down menu: Tools, inquiry, area.

Command Area.

Specify first corner point or [Object / Add / Subtract] first point A.

Specify next corner point or press ENTER for total: Select next point B.

Specify next corner point or press ENTER for total: Select next point C.

Specify next corner point or press ENTER for total: Select next point D.

Specify next corner point or press ENTER for total: Select next point E.

Specify next corner point or press ENTER for total: Select next point F.

Specify next corner point or press ENTER for total.

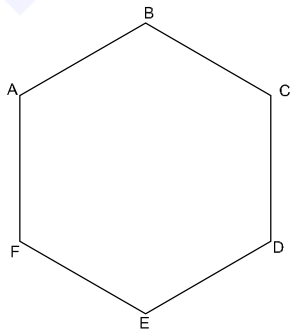
Area = 8316.3401, Perimeter = 339.4622.

REGEN.

Command : Regen.

This command makes Auto CAD to regenerate the entire drawing to update it. By using this commands, the circles and arcs can be smoothened.

Fig 10



AREA COMMAND

Draft plan and elevation of Interior elements using basic Auto CAD Commands

Objective: At the end of this exercise you shall be able to
- **draft a 3 seater or 1 seater sofa plan and elevation**
- **draft a Bed/Cot plan and elevation**
- **draft Chair and Tables plan and elevation**
- **draft TV unit and other furniture plan and elevation**

Requirements

Tools/Instruments/Machines

- Measuring tape - 1 No.
- Computer with Auto CAD - 1 No.
- Printer - 1 No.

Materials

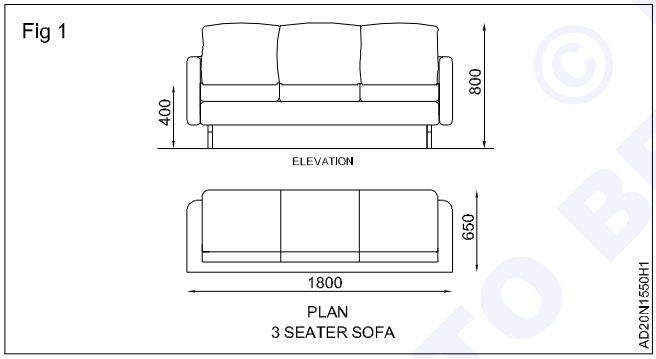
- A3 size paper - 5 Nos.

PROCEDURE

TASK 1: **Plan and elevation of a 3 seater / 1 seater sofa draw them by using basic CAD command (Fig 1)**

- Using RECTANGLE command draw a square seat of size 500x500mm
- Copy the square up to 3 seats next to each other
- Use LINE and OFFSET command to draw handrest and back side of the sofa
- Draw a Ground Level line and project all vertical lines from the plan
- Mark different height levels like bottom of the sofa, hand rest, seating level, top of the sofa using OFFSET command
- Remove unwanted lines using TRIM, FILLET and ERASE commands
- You can use FILLET – radius, SPLINE, ARC etc. commands to design the sofa's texture for more realistic design

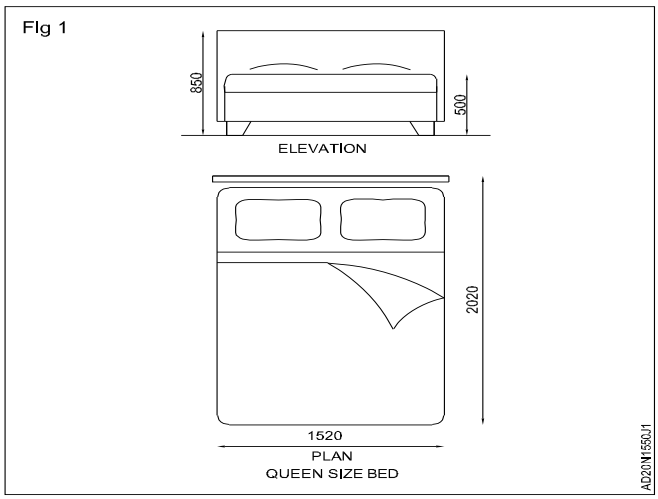
Fig 1



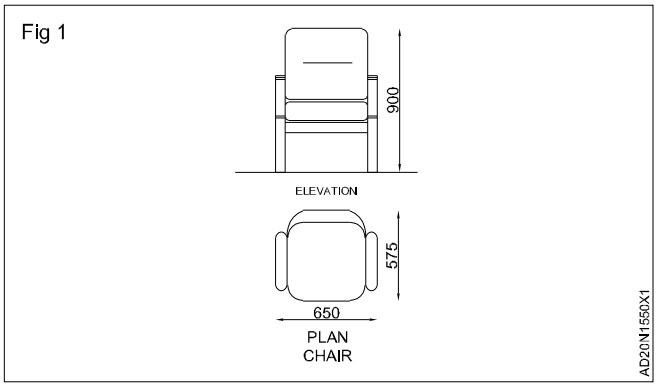
TASK 2: **Plan and elevation of a Bed/Cot plan and elevation**

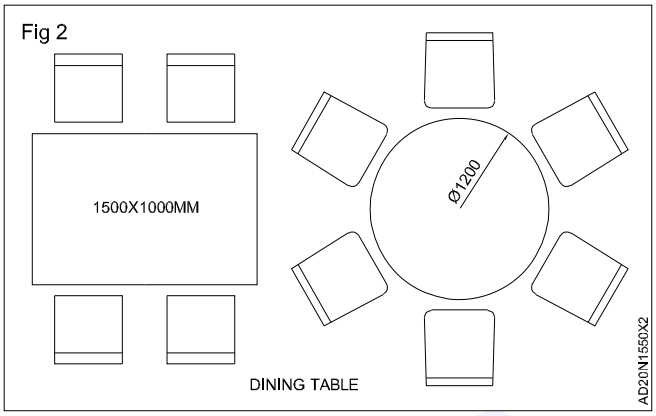
- Using RECTANGLE command draw a Queen size bed of size 1520x2020mm
- Draw pillows and other elements using same RECTANGLE, LINLE or SPLINE commands
- Draw a Ground level line and project all the vertical boundaries from the plan
- Mark the bottom and top of the bed using OFFSET command (Fig 1) Queen size Bed

Fig 1



TASK 3: **Plan and Elevation of a Chair and Dining Table using basic CAD commands (refer task 1 & 2)**
(Fig 1 & 2) Chair and Dining Table





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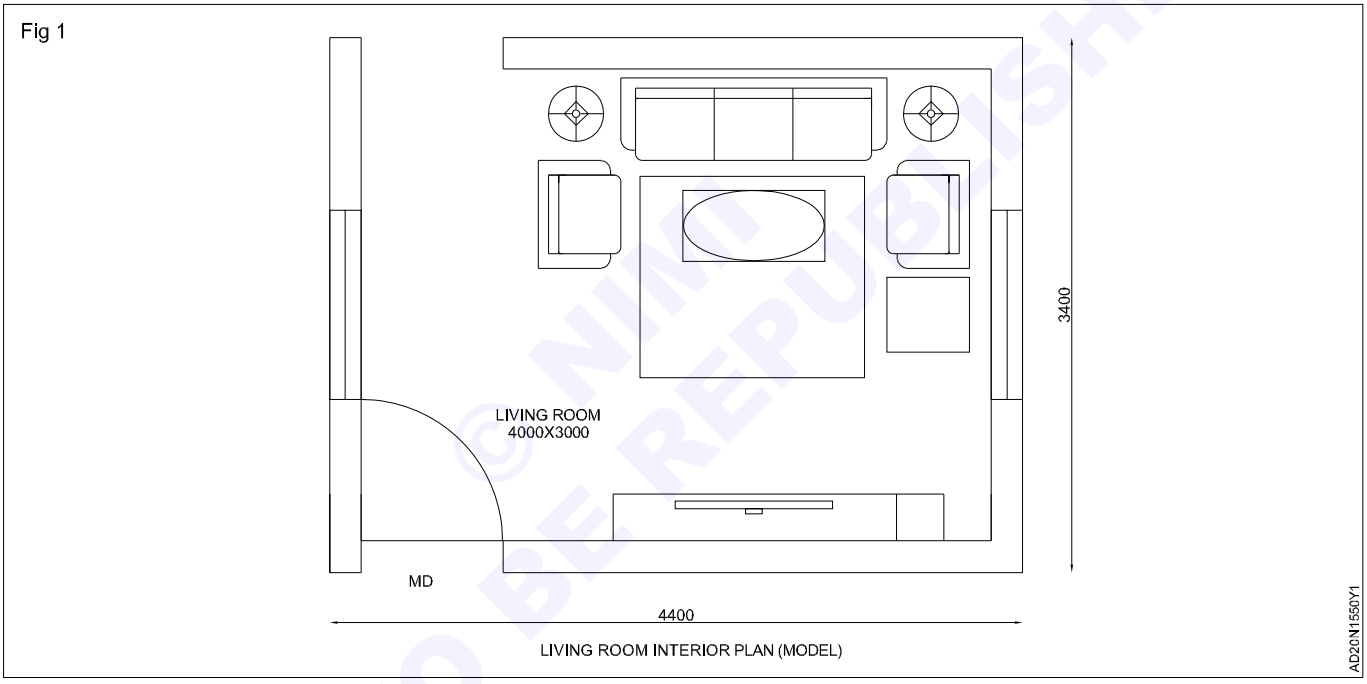
TASK 4: **Plan and Elevation of TV/Media unit using basic CAD commands (refer task 1 & 2)** (Fig 1) TV unit



Note: Instructor has to guide the trainees to collect sizes of various types of furniture and other interior elements using measuring tape

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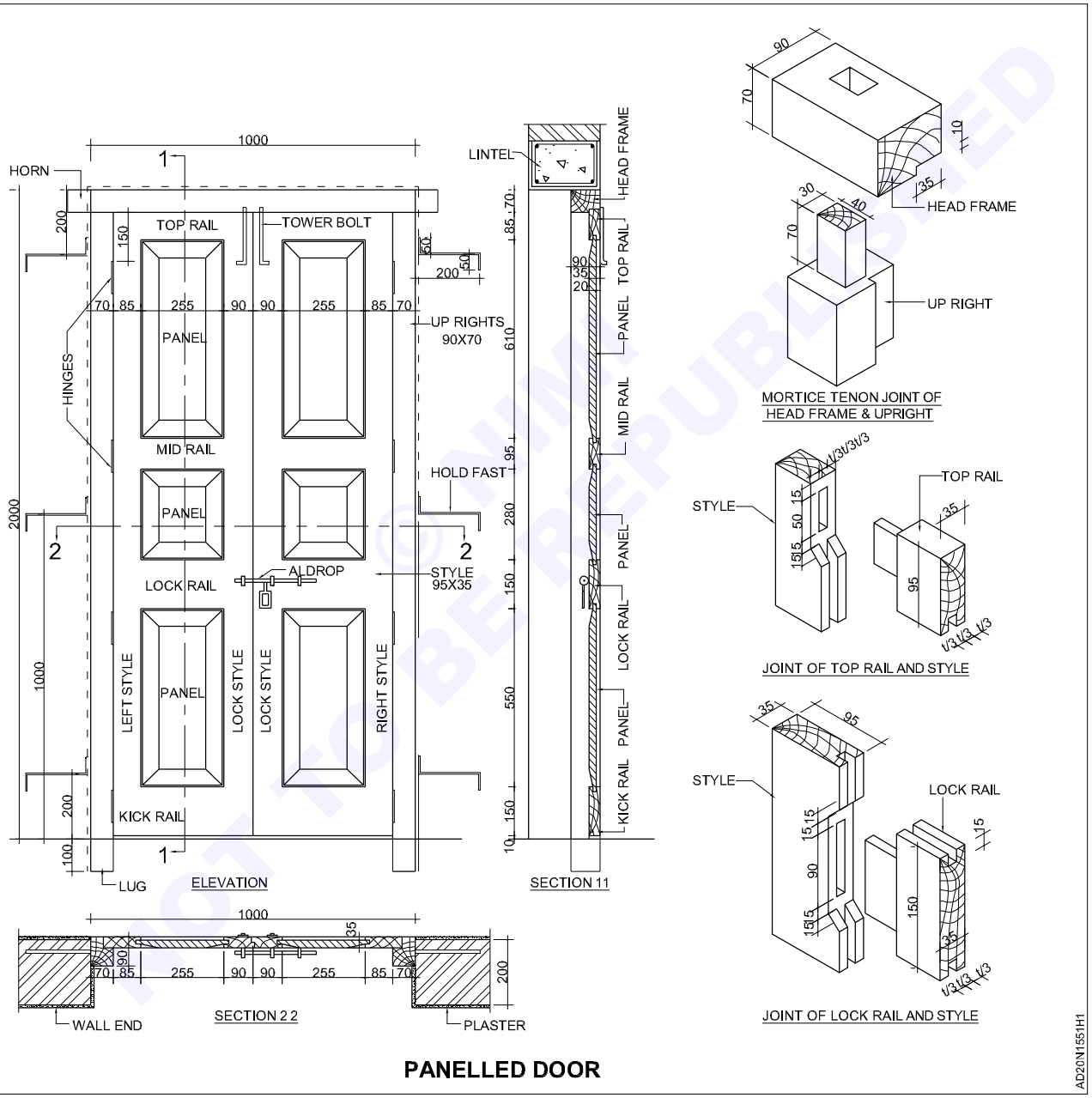
Draft the Door/ Window and Ventilators in detailed section

Objective: At the end of this exercise you shall be able to
- **draft the door/ window & ventilators using basic CAD commands.**

PROCEDURE

TASK 1: **Draw the plan elevation and section of a paneled door given in Fig 1 by using basic CAD commands with given data**

Fig 1



PANELLED DOOR

DATA

Width of the wall	- 300mm
Height of the lintel	- 150mm
Size of the door	- 1000 x 2000mm

Frame size

Head frame	- 90 x 70mm
Post	- 90 x 70mm
Vertical styles	- 95 x 35mm - 4 Nos
Top rail	- 95 x 35mm
Lock rail	- 150 x 35mm
Mid rail	- 95 x 35mm
Butt hinges	- 100mm - 4 Nos.
Pannel	- 6 Nos. of equal size, 20mm thick

1 Draw door opening size 1000 x 2000mm.

2 Draw two post 70mm thick, height 1930mm at a distance of 860mm apart.

3 Draw door head 70mm thick 1300mm length inclied the horn.

4 Draw style of size 95 x 35mm near the two post.

5 Draw top rail 95 x 35mm.

6 Draw panel size 20mm thick.

7 Draw widrail 95 x 35mm

8 Draw lockrail 150 x 35mm

9 Draw the bottom rail 150 x 35mm

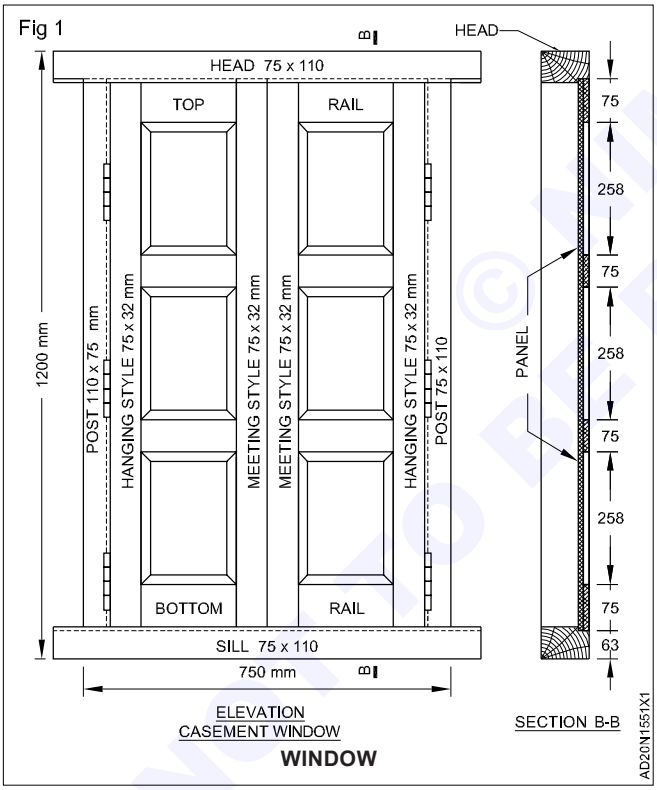
10 Draw panels and butt hinges as shown in figures.

11 Mark the aldrop in lock rail and complete the drawing.

12 Draw the vertical section and mark the symbols and complete the drawing.

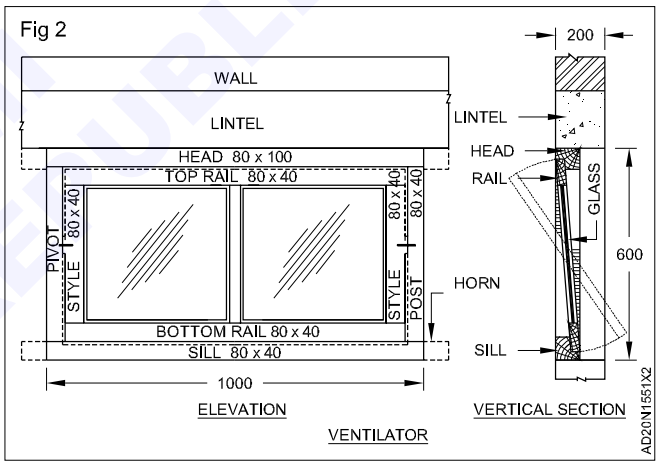
TASK 2: **Draw the plan elevation and section of a casement windows and ventilators in AutoCAD (Fig 1 & 2)**

Fig 1



WINDOW

Fig 2



Draft interiors of bed room/ living room using basic Auto CAD commands

Objective: At the end of this exercise you shall be able to
- **Draft interior plan of a residential house with furniture arrangements**
- **Explore various furniture layout ideas for a given size of a room.**

PROCEDURE

TASK 1: **Draft Interiors of Living room/bedroom using basic Auto CAD commands**

1 Draw a plan of living room/bedroom with the help of line, offset, fillet commands.

2 Draw plan of all the furnitures and other elements of living room and bedroom, like Sofa set, Chairs/ recliners, media unit, Coffee table, Indoor Plant, Carpet, wardrobe, bed/cot with the help of line, rectange, circle, arc. offset, spline etc. basic drawing commands

3 Use trim, erase and fillet commands to finish the edges

4 After drawing all the required interior elements explore various possibilities of effective layout by arranging all elements for same size of the room.

5 Refer AutoCAD Design Centre to explore various default interior elements given by AutoCAD (Fig 1) & (Fig 2)

INTERIORS OF LIVING ROOM DRAWING

Fig 1

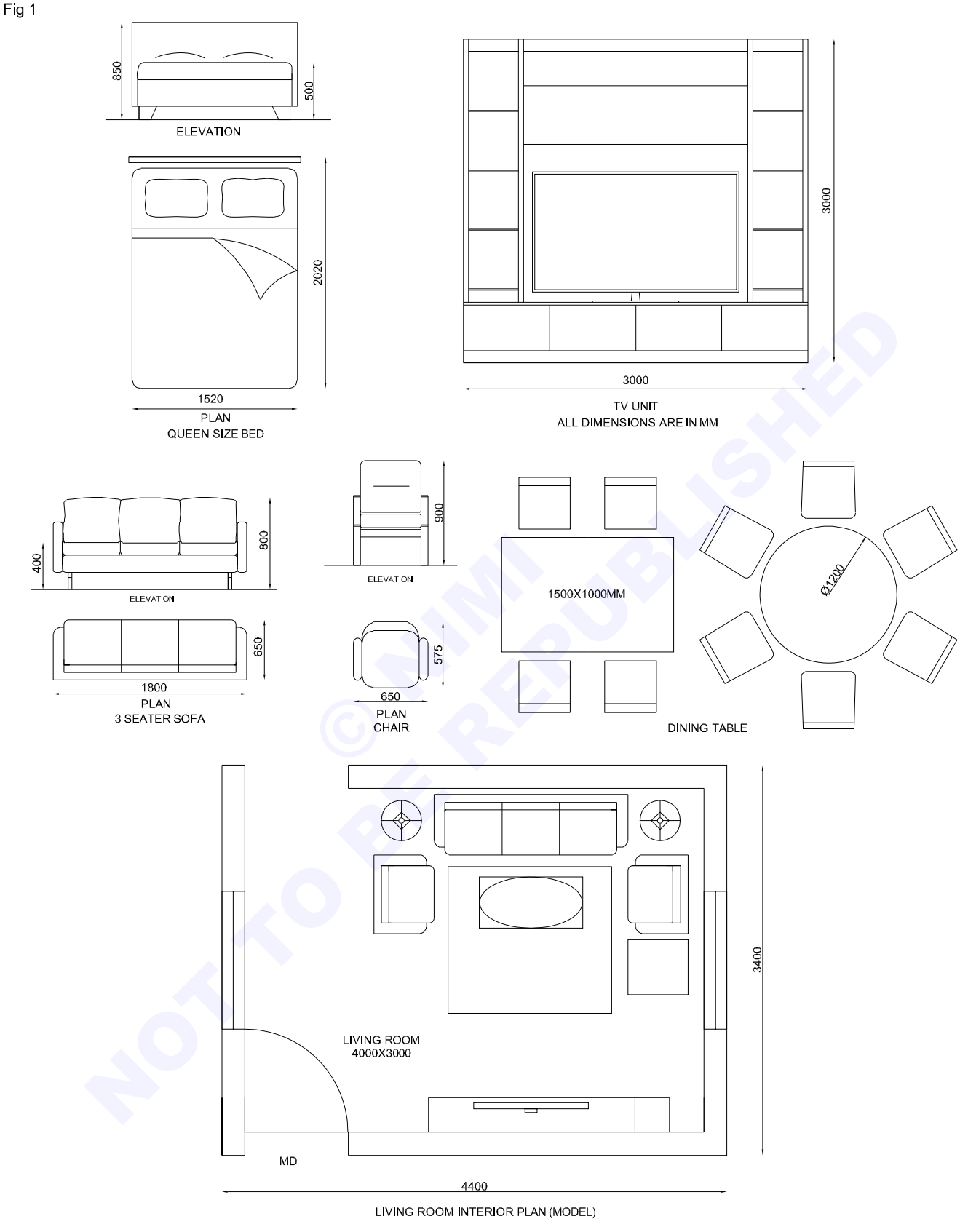
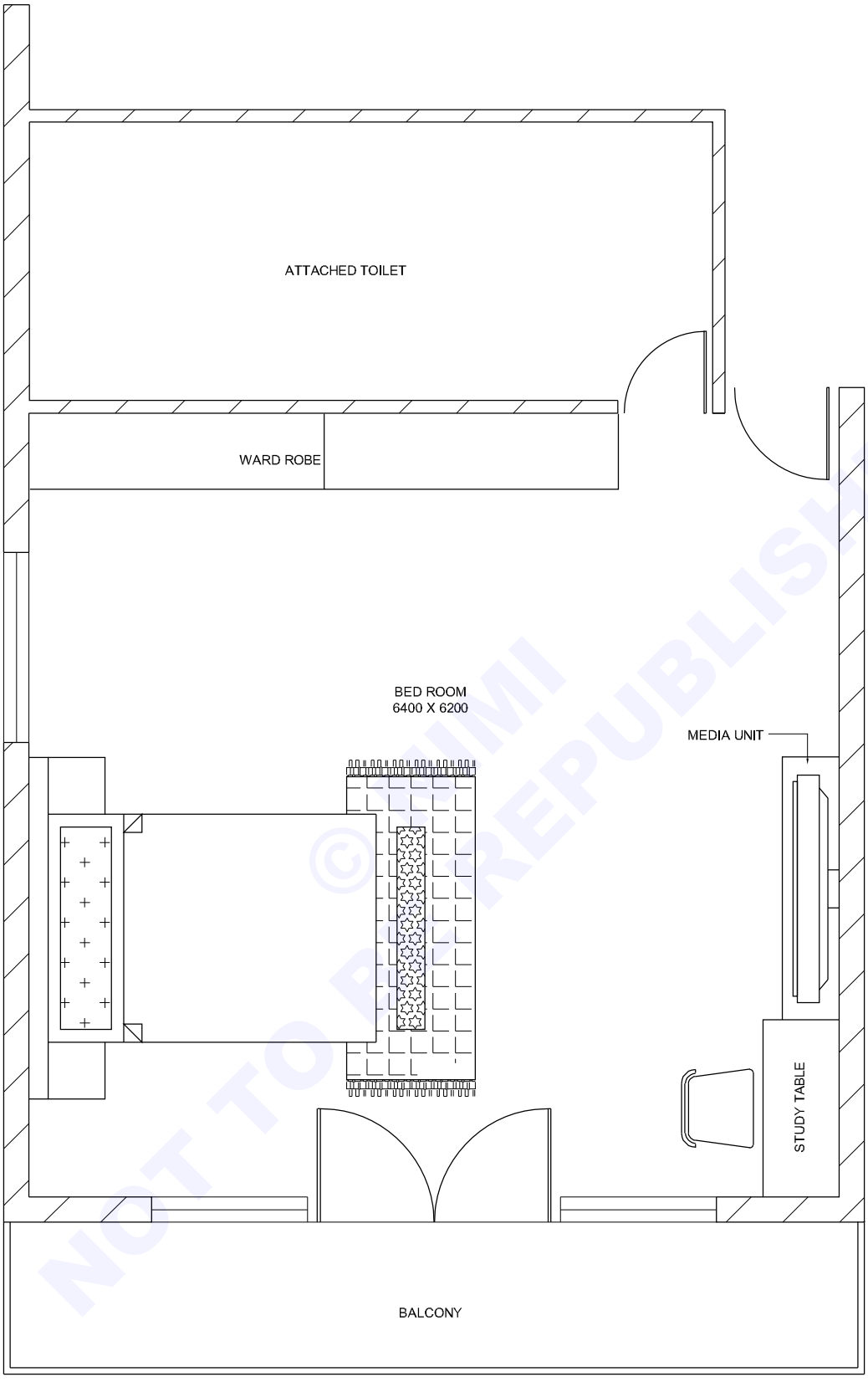


Fig 2



BED ROOM INTERIOR PLAN (MODEL)

Projection of solids in inclined position

Objective: At the end of this exercise you shall be able to
- **draw the projection of different geometrical solids in inclined positions.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A2	- 2 Nos.
• Scale 30cm	- 1 No.	• HB pencil	- 1 No.
• Set square (45° - 60°) each	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **A cube of 30mm sides rests with one of its edge on HP such that one of the square faces containing that edge is inclined at 30° to HP and the edge on which it rests being inclined to 60° to VP. Draw its projections**

1 As stated above, start by drawing the elevation (square of side 30mm rest with one of its edges on HP and mark the corners as a', b',c' and d'.

2 Draw the plan projecting from the above elevation.

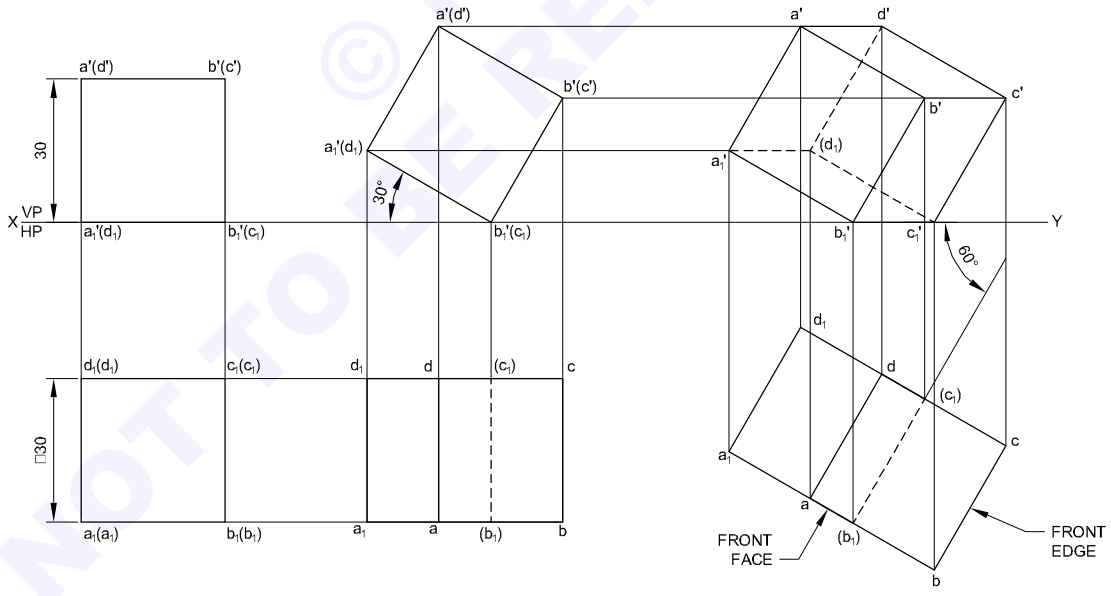
3 Reproduce the elevation marking 30° to XY and protect it.

4 For the plan as shown in Fig 1.

5 Reproduce the plan inclined at 60° to the XY as shown.

6 Project from plan and elevation, and draw the required line as shown in Fig 1.

Fig 1



TASK 2: **Draw the plan, elevation and side view of a pentagonal prism of side 30mm and length 70mm given its position as below (Fig 1)**

1 One of its lateral surfaces rests on HP.

2 The axis makes 30° with HP.

NOTE: In this exercise none of three views required will confirm to the true shape. Therfore the final views cannot be drawn straight away. The views have to be arrived at by first drawing some views using given data. Therefore we first draw plan and elevation as if it is lying on HP and axis perpendicular to VP.

3 As stated above, start by drawing the elevation (pentagon of side 30mm) and mark corners as a',b',c',d' and e'. (Fig 1)

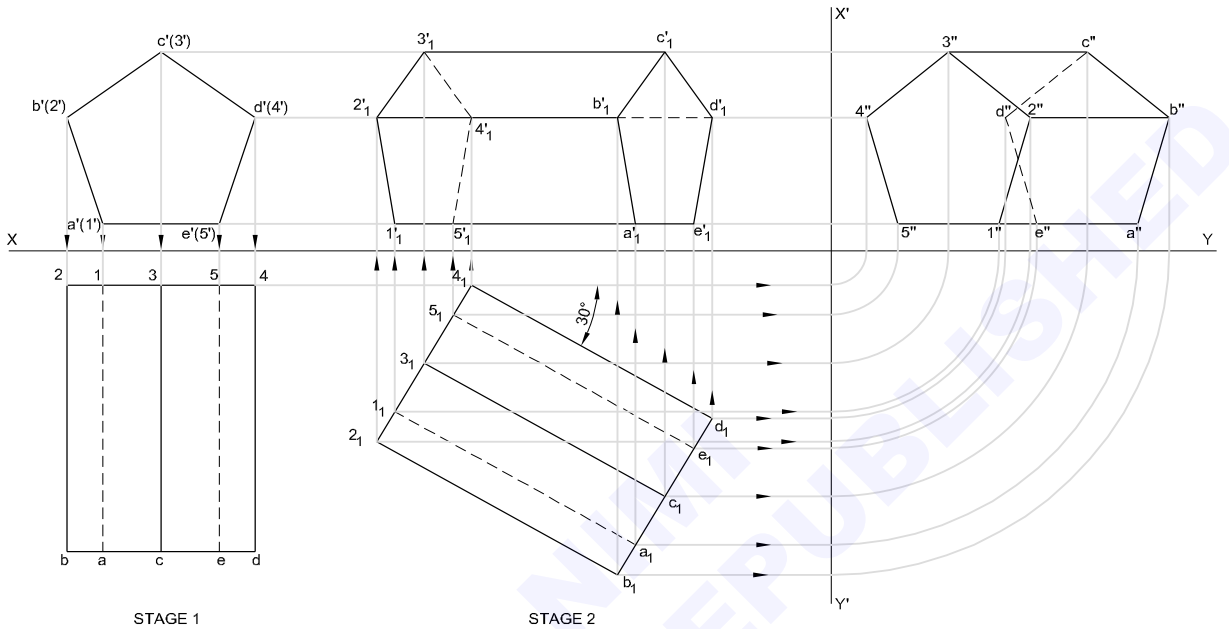
4 Draw the plan projecting from the above elevation.

5 Reproduce this plan with the axis making 30° with XY line as shown in Fig 1. This is required plan.

6 Draw the horizontal projectors from the elevation of first stadge and vertical projectors from plan of second stage and complete the required elevation as shown.

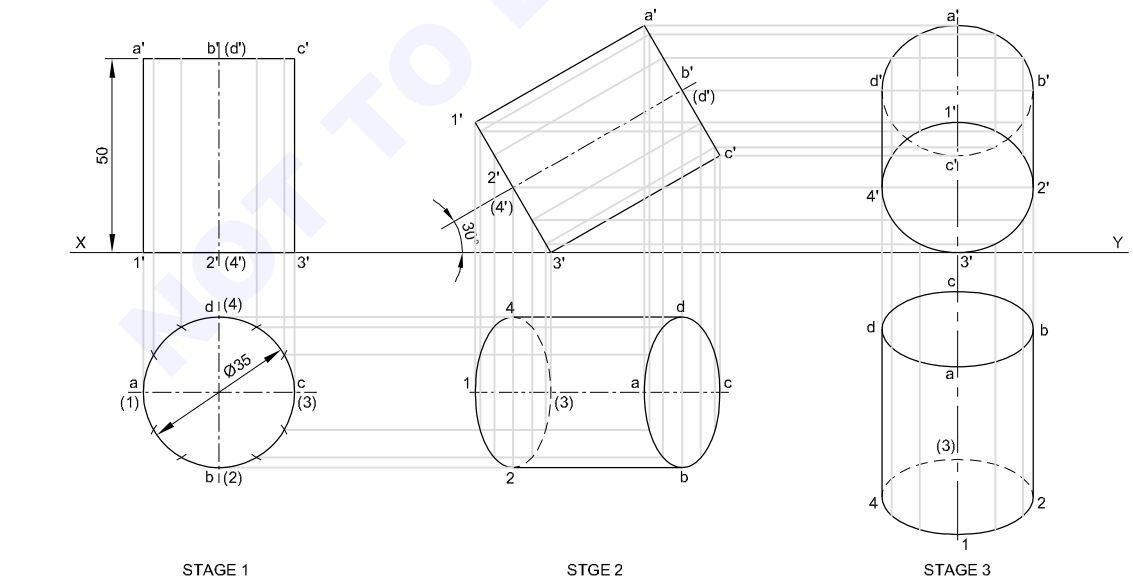
7 Complete the side view by drawing horizontal projectors form the elevation and by transfering the distances from plan of the second stage.

Fig 1



TASK 3: **Draw the plan, elevation and end view of an cylinder whose base dia 25mm and length of axis 50 mm and its position given below (Fig 1)**

Fig 1



1 Its base in point contact with HP

2 Axis making an angle of 30° with HP.

3 Cylinder rotated about the contact point on HP such that the axis of the cylinder in the plan will be perpendicular to XY line.

Note: The position given above suggest that the axis is parallel to AVP. Therefore the side view will be a rectangle 50 x 35 with the axis inclined 30° to XY line. Also plan and elevation a distorted cylinder with the axis perpendicular to XY line.

4 Similar to the previous examples the construction in this exercise also has to be made in three stages.

Stage 1

1 Draw plan and elevation as if the cylinder is resting on its base on HP.

2 Divide the circle (plan) into number of equal parts and draw projectors upwards. Mark the points as per conventions.

Stage 2

1 Reproduce the elevation of stage I its axis inclined to 30° with HP.

2 Draw the stage 2 plan by drawing projectors from the elevation of stage 2 and plan of stage 1.

3 Draw the plan of final position which is same as in plan in stage II but the axis in perpendicular to XY.

4 Draw the projectors from elevation of stage 2, but the axis is perpendicular to XY.

5 Draw the projectors from elevation of stage 2 and plan of final position complete the elevation of the final position.

As stated in the note above, the required side view of the final position will be the same as the elevation of stage 2.

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TASK 4: **A hexagonal pyramid of side 30 mm and height 60 mm is resting with its base on HP. Draw its projections where one of the base edges is at right angle to VP and the base makes 30° with the HP**

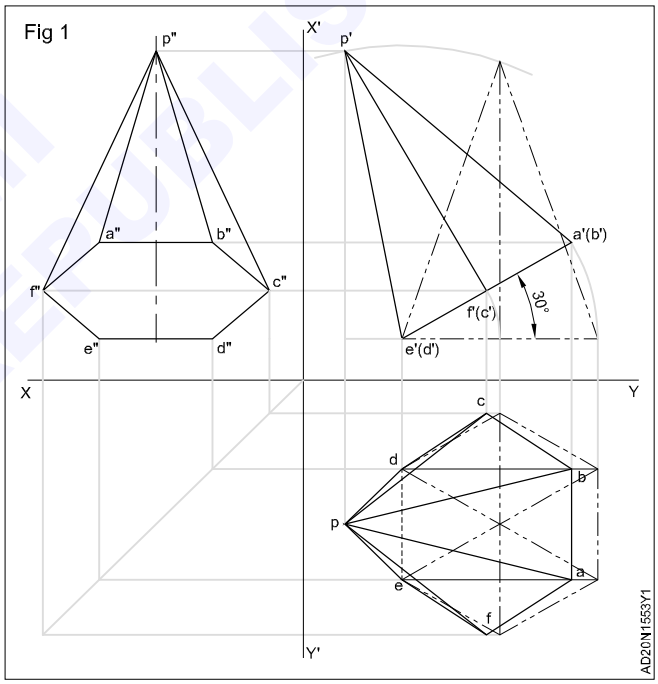
Note: This is similar to the previous example with the only difference that is base makes 30° to HP. Therefore elevation will be same as in the previous exercise, but tilted to 30°.

1 Draw the front view and top view of the pyramid as in the previous example. (Fig 1)

2 Draw the required elevation by tilting the elevation of stage I to 30°.

3 Draw the vertical projectors from the elevation and horizontal projectors from Ist stage plan and complete the required plan.

4 Draw the required end view by drawing projectors from elevation and plan.



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TASK 5: **Draw the projections of a cone of base diameter 60 mm and height 80 mm when its position is as under**

1 Its circular base touching HP and making an angle of 45° with HP.

2 Axis parallel to VP.

Note: The elevation of a cone, which is standing vertical is a triangle. The base of the cone will be elliptical in both the plan and side view.

3 Draw the plan and elevation of cone as if it is standing vertically on HP. (Stage 1) (Fig 1)

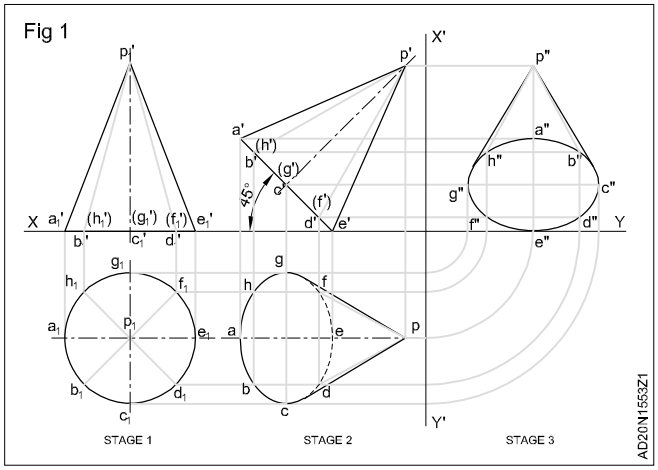
4 Divide the circumference of the plan into number of equal parts. (say 8) and mark them. From these points draw projectors to XY line and mark the intersection is a',b' (h') c' etc.

5 Draw the required elevation, same as in stage 1, but with the axis 45° to XY line and mark the points as a'b'(h') c'(g') etc.

6 Draw the ellipse through the intersection of the corresponding points of the vertical and horizontal projectors and complete the required plan.

7 From the final plan and elevation, draw projectors and complete the required end view.

Fig 1



Drawing projection of solids in different section plane

Objectives: At the end of this exercise you shall be able to
- **draw elevation and sectional plan square prism**
- **draw sectional plan, elevation of cut surface cyclinder**
- **draw sectional plan, elevation of the surface of a cone**
- **draw elevation and true shape of the cut surface of a hexagonal pyramid.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A2	- 2 Nos.
• Scale 30cm	- 1 No.	• HB pencil	- 1 No.
• Set square (45° - 60°) each	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw elevation, sectional plan and the true shape of the section of a square prism**

1 Length of side of square prism standing vertically.

2 One diagonal of the base is perpendicular to VP and another diagonal parallel to VP.

3 Cutting plane makes 45° to the axis and intersects the axis 40 mm above the base.

Draw the plan and elevation of the prism (Fig 1)

1 Draw the cutting plane in the elevation of the drawing.

2 From the point m' draw projector to meet the plan at mn.

3 Hatch the portion of the plan and complete the required sectional plan.

To get the true shape

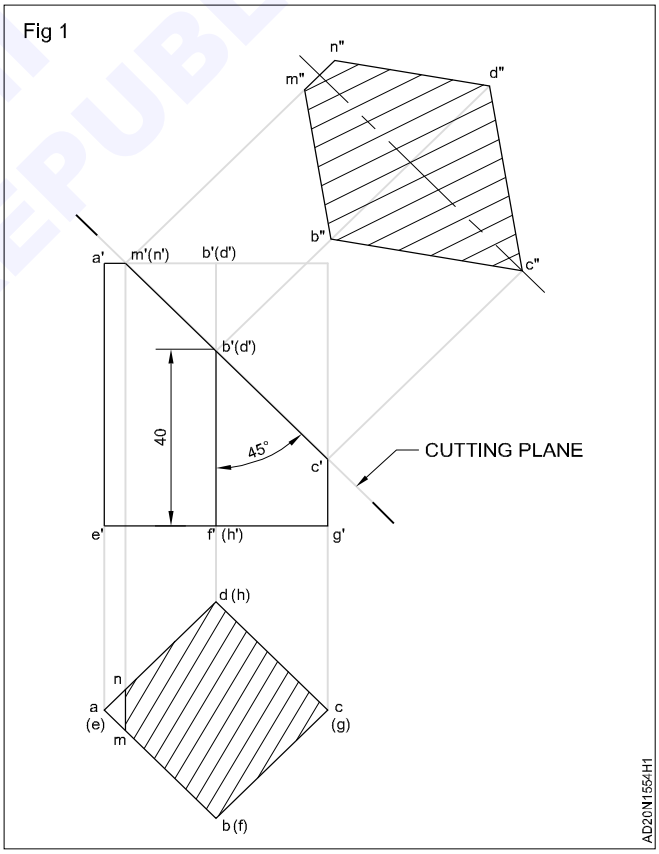
1 Draw a line parallel to the cutting plane.

2 Draw projectors perpendicular to the cutting plane from points m',b' & c' and extend beyond the line, drawn parallel to the cutting plane.

3 Transfer the distances mn and db symmetrically about the line and also mark c".

4 Join m"-n", n"-d", d"-c", c"-b" & b"-m" and hatch the area to complete the required true shape. (auxiliary view)

Fig 1



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TASK 2: **Draw the sectional plan, elevation and true shape of the cut surface of a cylinder given the details as under**

1 Cylinder is of diameter 50 mm and height 60 mm stands on HP with its axis vertical.

2 Cutting plane makes 40° to the horizontal and intersecting the axis at the mid-point of the vertical axis.

Draw the plan and elevation of the cylinder (Fig 1)

1 Indicate the cutting plane in the elevation.

2 Divide the plan into any number of equal parts, (say 12) and mark the points a,b,c....l.

3 Project the points a to l vertically to intersect the cutting plane line at a'b'c' etc.

4 Project horizontally the points a,b...l in the plan by transfer method for the side view.

5 Mark the intersection points of the corresponding projection in the previous two steps and complete the end view.

To draw the true shape of the section

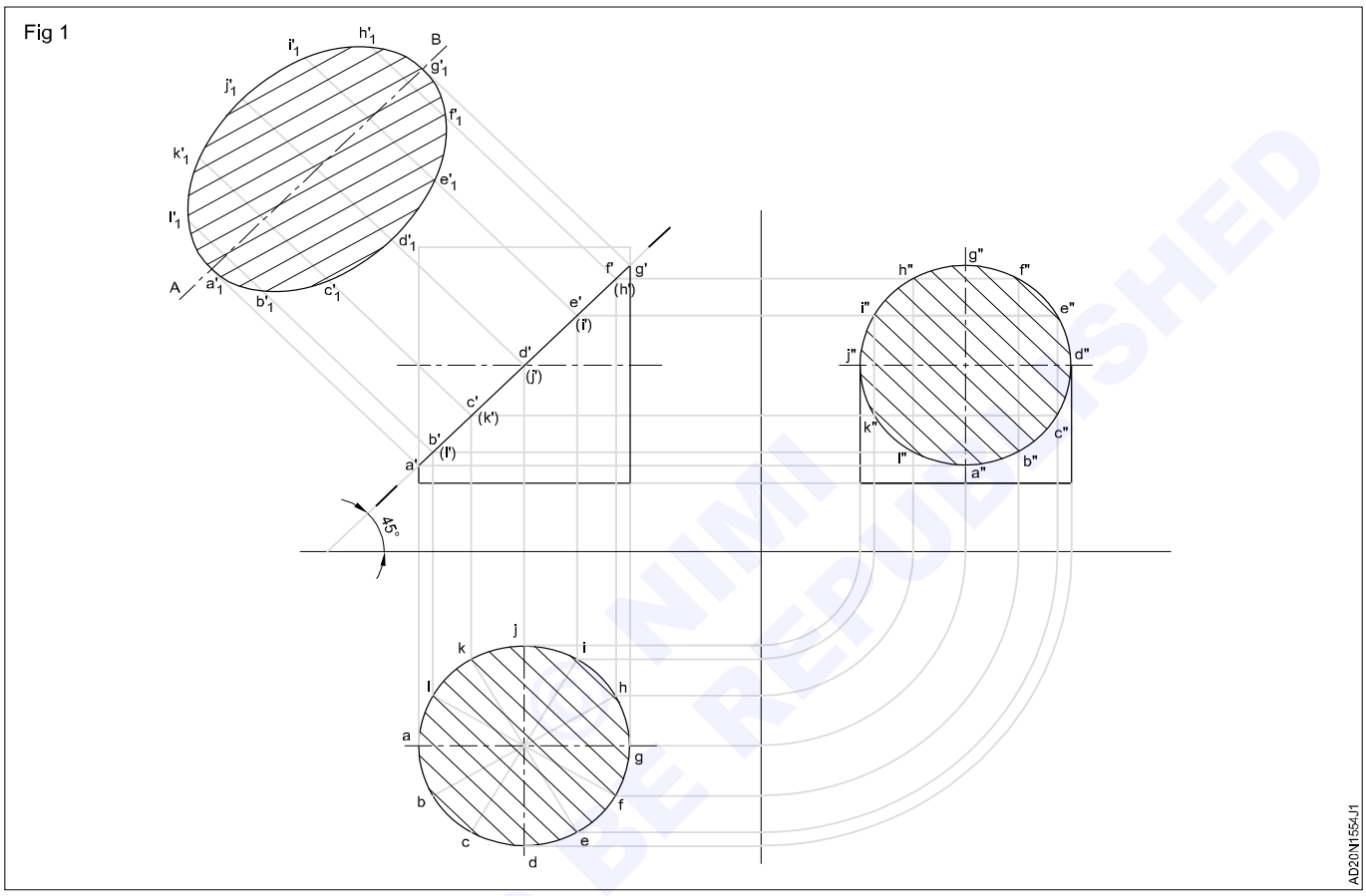
1 Draw a line AB parallel to the cutting plane line.

2 Draw perpendicular projectors perpendicular to the cutting plane line.

3 From points a',b', c' extend beyond the line AB.

4 Mark the points a'_1,b'_1, c'_1 etc such that the distance l"b" k"c" at in the end view are equal to lb, kc etc in the plan.

5 Join the points a'_1,b'_1, c'_1 and complete the true shape.



TASK 3: **Draw the sectional plan, elevation and true shape of the surface of a cone given with the following details**

1 Diameter of cone is 50 mm and height of cone is 65 mm.

2 Standing vertically on HP.

3 Cutting plane is parallel to slant length of the cone in the elevation at a distance of 10 mm.

Draw the plan and elevation of the cone for the given positions (Fig 1)

1 Draw the cutting plane in the elevation and mark the points 1',3' & 4'.

2 Divide the plan into 12 equal parts and mark a,b,c,d...l.

3 Project the points upwards and get the intersecting point 2.

4 Project the point 1',2',3' & 4' downwards and obtain the points $m_1n_1q_1s_1t_1r_1$ & p_1.

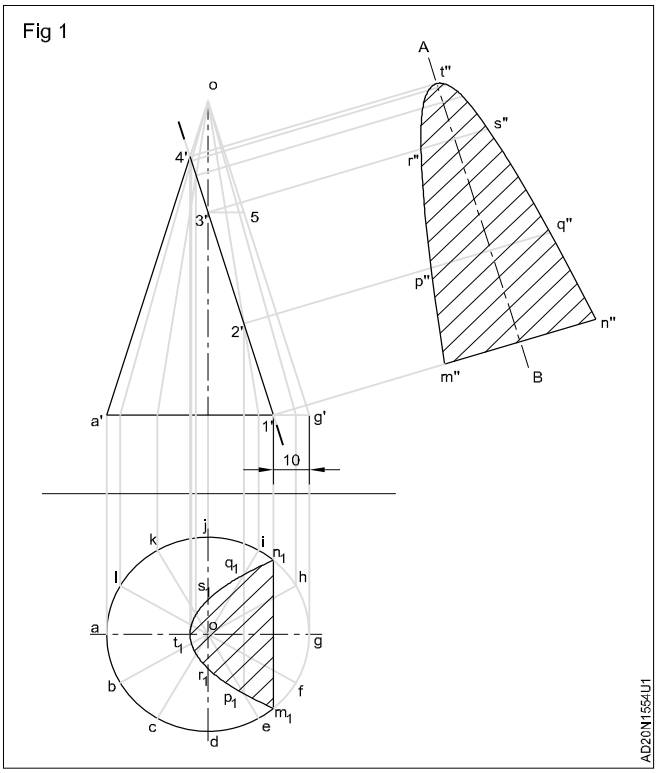
5 Joint the points and hatch the space. This is the required plan.

6 Draw a line AB parallel to cutting plane at a suitable distance.

7 Project the point 1',2',3' & 4' from the cutting plane, intersecting AB and extend beyond AB.

8 Transfer the dimensions m_1n_1, p_1q_1, r_1s_1 and point t_1.

9 Joint the line m"n" and draw a smooth curve through the points m",p", r", t", s", q" & n" and hatch the required auxiliary view.



TASK 4: **Draw the sectional plan, elevation and true shape of the cut surface of the hexagonal pyramid given the details as under**

1 Side of the hexagon is 25 mm height of the pyramid is 65 mm.

2 Stands vertically on its base with one edge of the base is parallel to VP.

3 Cutting plane makes 40° to HP and intersects the base at a distance of 6 mm from the left corner of the base.

Draw the elevation and plan for the given position (Fig 1)

1 Draw the cutting plane in the elevation and mark points 1',2',3' & 4'.

2 Project these points downward and beyond the line ad in the plan.

3 Mark the points of intersection of the radial lines in the plan and projectors drawn in the previous step.

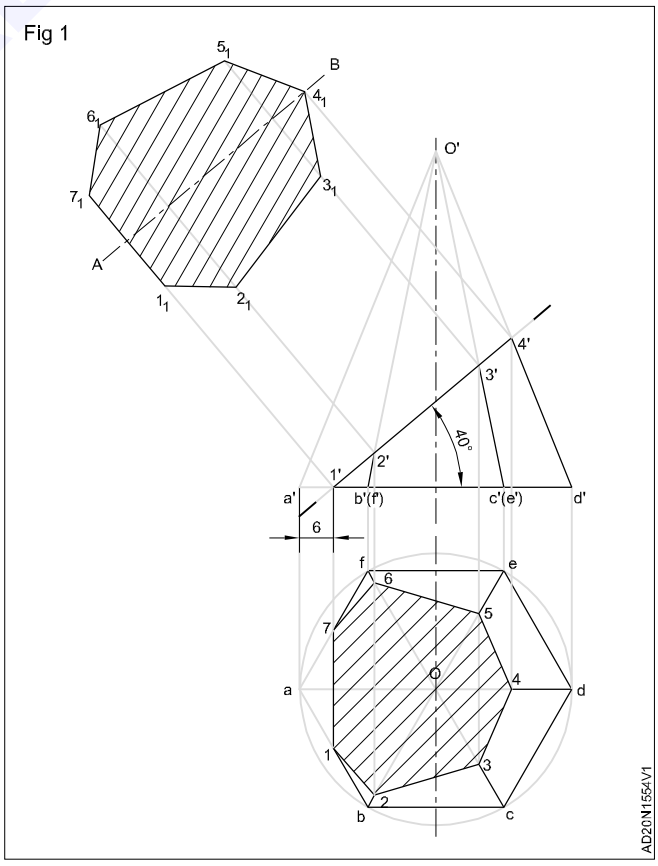
4 Join the points marked in the previous step to form a closed figures and hatch the area. This together with the hexagon already drawn is the required plan.

To draw the true shape

1 Draw a line AB parallel to the cutting plane.

2 Draw projectors perpendicular to the cutting plane from points 1',2',3' & 4' and extend beyond AB. On the projectors drawn set off 1,-7, equal to 1-7 of plan. Similarly set off the other points 2,-6, , 3,-5, by transfering from the plan equals to 2-6, 2-5 respectively. The point 4, obtained by projecting the point 4'.

3 Join all the points to form a closed figure and hatch the same to get the required true shape of the section.



TASK 5: **Draw the plan, elevation and (true shape) auxiliary view of a pentagonal pyramid of base 35 mm and height 65 mm given the condition as under**

1 Standing vertically with one edge of the pentagonal base parallel to VP.

2 The pyramid is cut by a cutting plane sloping towards left, at an inclination of 45° to HP passing through the axis at a point 40 mm above the base.

Draw the plan and elevation of the pentagonal pyramid. (Fig 1)

1 Draw the cutting plane line and mark 1s, 2s, 3s, 4s & 5s at the intersection of this line and the lines of surfaces in front elevation.

2 Draw the vertical projectors from the intersecting points cutting the radial line ao, co, do and eo at 1p, 2p, 3p and 4p respectively.

Note: To obtain the point 5p in the plan. Draw a line parallel to base through 5s meeting the true length. Take the distance as radius set off with `O' as centre in the plan and 05p on the line Ob.

3 Join 1p, 2p, 3p, 4p & 5p and hatch the space. this is the required sectional plan.

4 Draw a reference line x'y' parallel to the cutting plain line.

5 Draw perpendicular projectors to the cutting plane line from the points 1s, 2s, 5s & 4s beyond the reference line X'Y'.

6 Draw line AB parallel to XY below plan.

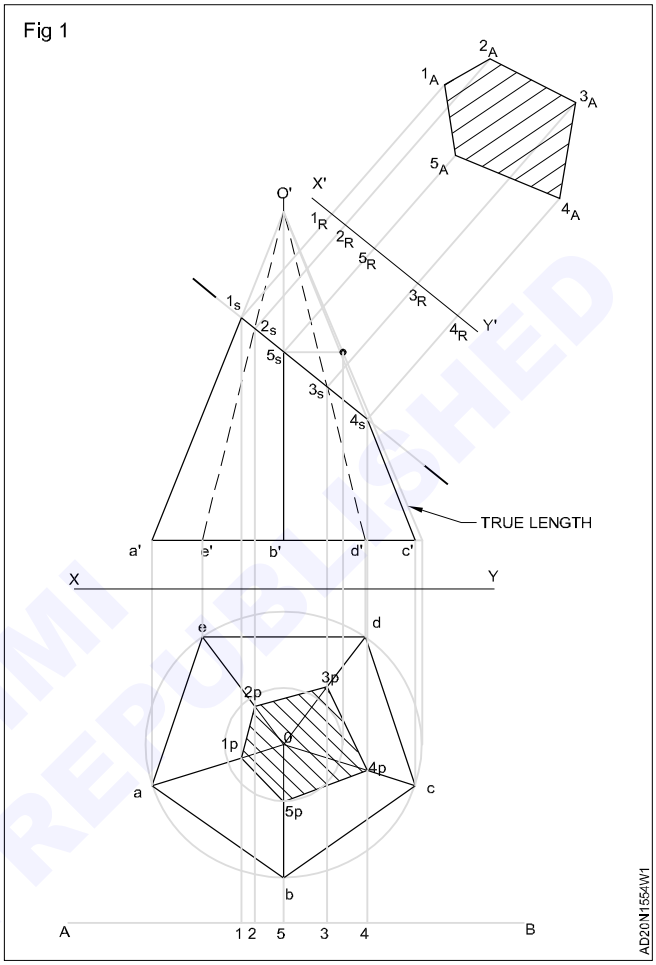
7 Project points 1p, 2p, 3p, 4p & 5p down to touch the line and mark points 1,2,5,3 & 4.

8 Transfer the distance 1-1P from 1R and mark 1_A.

9 In the same way transfer 2-2p, 5-5p, 3-3p & 4-4p and get points 2A, 5A, 3A & 4A.

10 Join points 1A, 2A, 3A, 4A & 5A and form the auxiliary view.

Fig 1



TASK 6: **Draw the plan, elevation, side view and true shape of the truncated surface of the prism of side 50mm given the following details**

1 Side of prism 50 mm

2 Prism standing vertically.

3 One side of the prism is perpendicular to VP.

4 The truncated surface makes 40° to the horizontal and at a height of 10 mm to the base.

Draw the plan and elevation of the truncated prism.

1 Mark the corners.

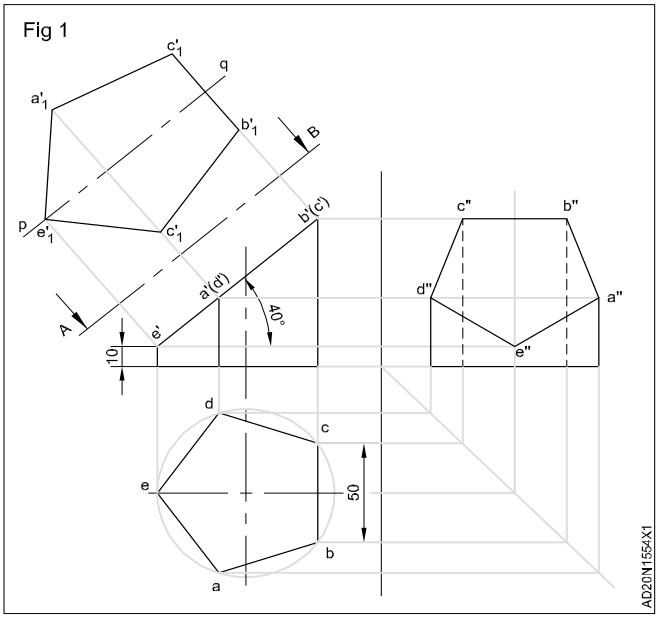
2 Draw the centre lines of the prism.

3 Draw the side view by projecting from plan and elevation.

4 Mark the corners of the side view.

5 Draw a line pq parallel to the inclined surface at a suitable distance.

Fig 1



6 project from the truncated surface and transfer the dimensions from side view to locate the corner points of the auxiliary view.

6 Join the points to complete the required auxiliary view.

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TASK 7: **Draw the plan, side view and true shape of a truncated cone shown in figure given its position as under**

1 The truncated cone is standing on HP.

Draw the plan and elevation of the cone before it is truncated. (Fig 1)

1 Form the required elevation by drawing the 40° inclined line or edge.

2 Divide the plan i.e circle of diameter 45 mm into 12 equal parts and mark them as shown.

3 Draw vertical projectors to meet the base in the elevation and mark them as shown.

4 Join these points with the apex of the cone and mark the points of intersection of these lines with the inclined line.

5 From the points marked in the previous step, draw projectors downwards for the plan, horizontal projectors for the side view and project perpendicular to the 40° inclined line for auxiliary view.

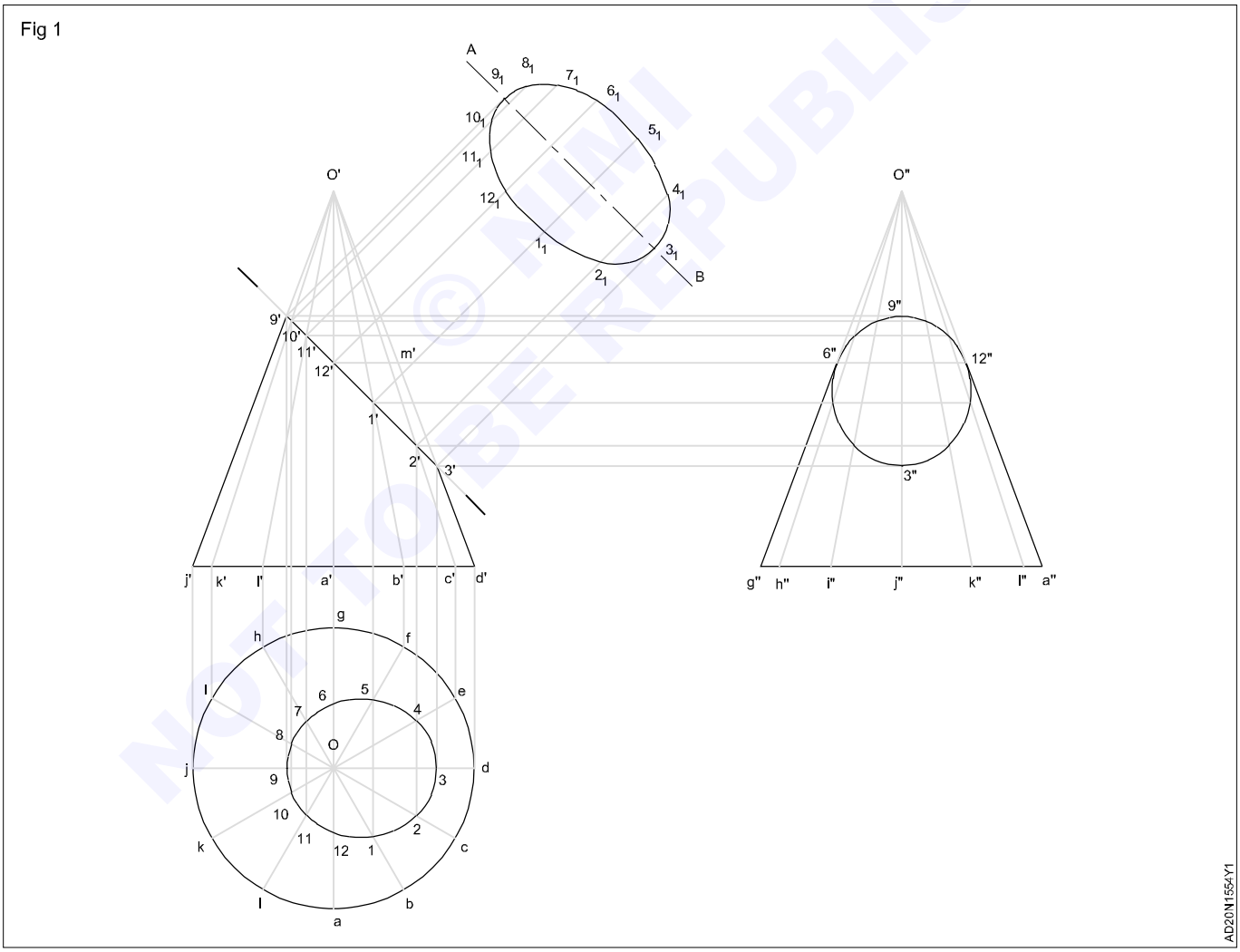
6 Mark the intersecting points of vertical projectors on the corresponding radial lines drawn from b,c,d,e,f,h,i,j,k,l at 1,2,3,4,5,7,8,9,10 & 11.

7 Set off 0-6 and 0-12 equal to 12' - m' of elevation.

8 Join the points 1 to 12 smoothly and complete the plan.

9 Draw projectors from the plan and mark the intersecting points with the corresponding horizontal projectors and complete the side view.

Fig 1



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Different types of stairs

Objectives: At the end of this exercise you shall be able to
- **draw the plan and section of straight stair**
- **draw the plan and section of quarter turn newel stair.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- 'T' square, set square - 1 No.
- 30 cms Metric scale - 1 No.
- Instrument box - 1 No.

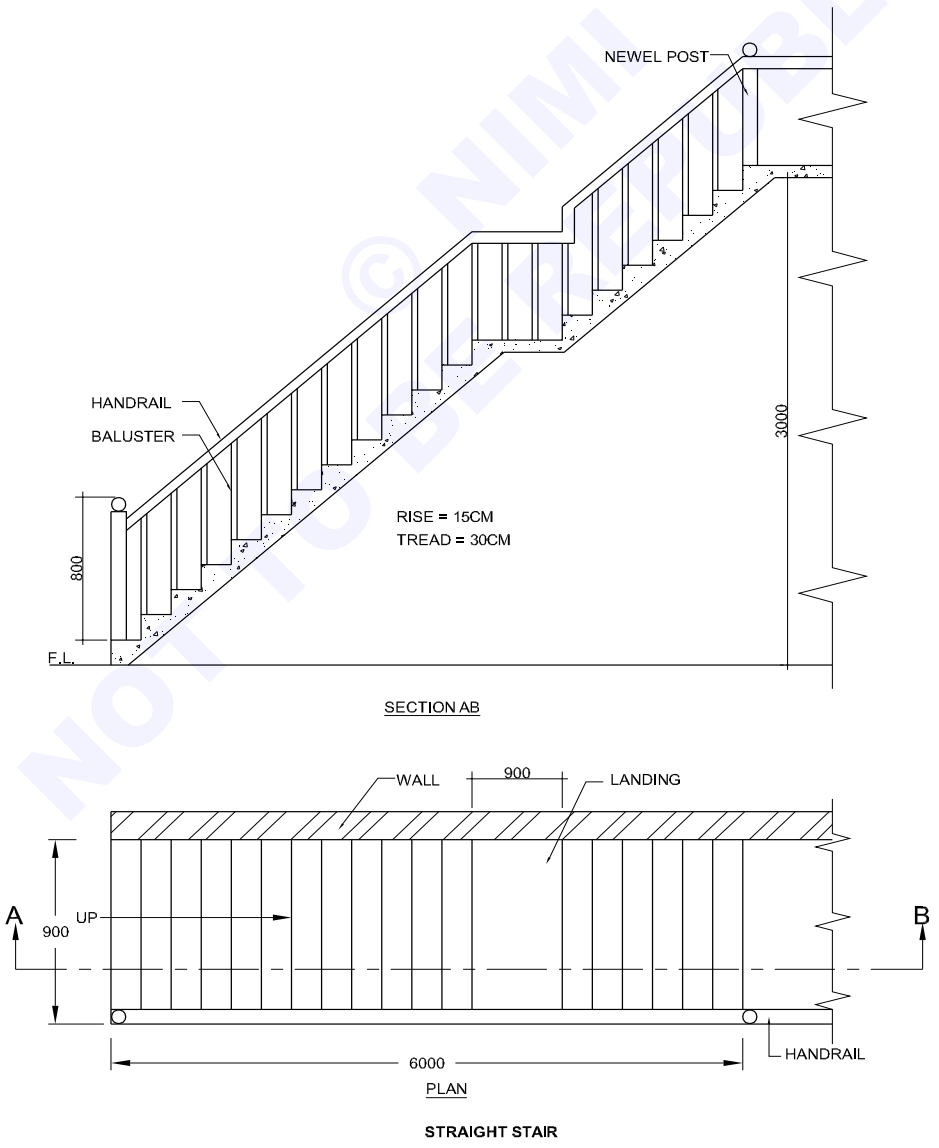
Materials

- Drawing sheet A3 size - as reqd.
- H, HB pencil - each one.
- Eraser - 1 No.
- Cello tape - as reqd.

PROCEDURE

TASK 1: **Draw the plan and section of straight stair (Fig 1)**

Fig 1



DATA

Height of upper floor	- 3m.
The total runs of straight stair	- 6m.
R.C.C waist	- 10cm thick.
The rise	- 15cm.
The Tread	- 30cm.
No.of Steps in the flight	- 20 Nos.
Width of stair	- 0.90m.
The handrail G.I pipe	- 50mm Dia.
Newel post G.I pipe	- 75mm 80cm height.

The baluster 25mm G.I pipe and missing data may be assumed.

I PLAN

1 Select scale 1:50.

2 Draw plan of the straight stair with proper number of treads.

3 Draw the landing after twelve risers.

4 Draw the treads (6 Nos) after the landing.

5 Dimension the drawing properly.

II Sectional Elevation

1 Draw upward projector lines to mark the risers from each tread and complete the section as indicated in figures.

2 Draw hand rail details.

3 Fully dimension the drawing.

TASK 2: **Draw the plan and section of quarter turn newel stair (Fig 1)**

DATA

Stair room size	- 2.4 x 4.6m.
Height between floors	- 315 cm.
Tread	- 30cm.
Rise	- 15 cm.
Width of landing	- 1m.
Width of stair	- 1m.
Wall thinkness	- 20cm.
R.C.C slab thickness	- 12 cm.
No.of risers 1st flight	- 12 Nos.
No.of risers 2nd flight	- 9 Nos.
Hand rail, newel post, baluster	- 25 mm.

I PLAN

1 Draw the plan of quarter turn newel stair as per given data with proper number of treads.

2 Draw the landing after 12 risers.

3 Draw the treads (8 Nos) after the landing on rightside.

4 Draw the Hand rail in plan.

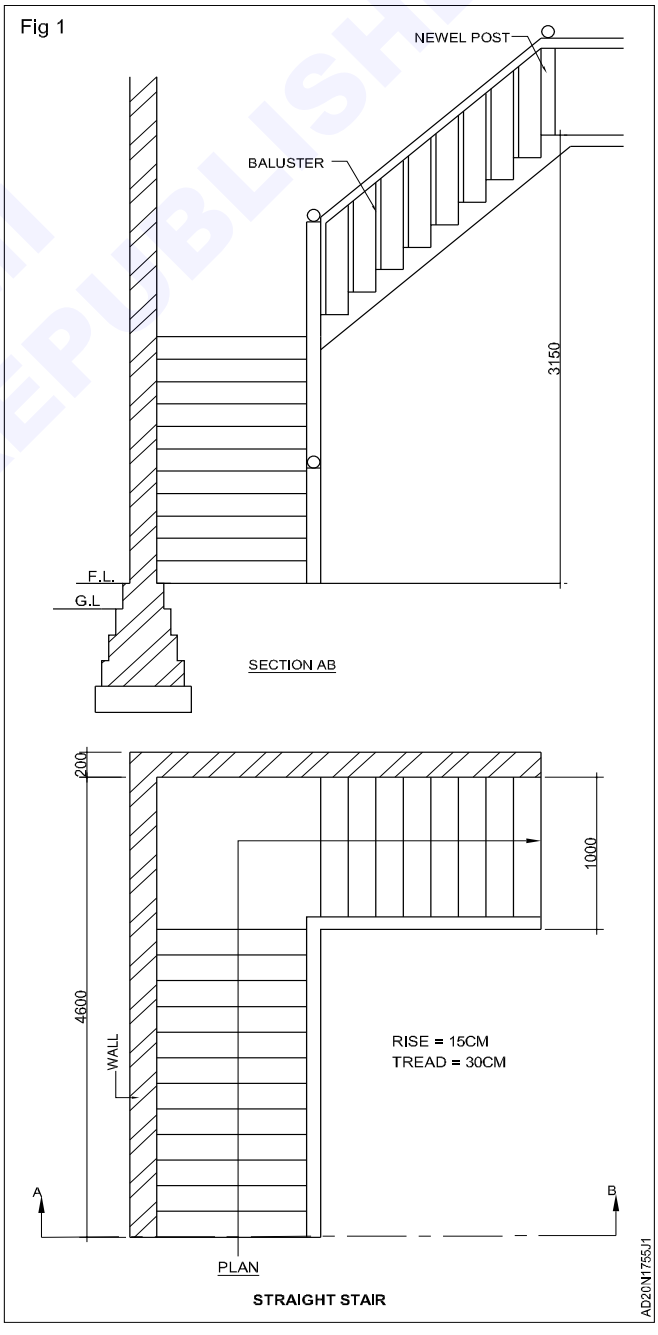
II Draw the elevation

1 Draw the projectors up ward from each tread to mark the risers.

2 Draw the hand rail details as per the drawing.

3 Dimension the drawing properly.

Fig 1



Half turn stair (geometrical)

Objective: At the end of this exercise, you shall be able to
- **draw the plan and section of half turn stair geometrical.**

TASK 1: **Draw the plan and section of half turn stair (geometrical) (Fig 1)**

DATA

Height between floors	- 3m.
Tread	- 30cm.
Rise	- 15cm.
Width of stair	- 0.90m.
Open space	- 0.90m.
Wall thickness	- 20cm.
R.C.C slab thickness	- 12cm.
No.of steps	- 20 Nos.
Hand rail, newel post, baluster balustrade height	- 25mm, - 80cm.
Window size	- 1350 mm x 1450mm.

I PLAN

1 Draw the plan of the stair room and treads as per given data.

2 Draw the radiating treads from the centre.

3 Draw handrail and window in plan.

4 Complete the drawing with necessary dimensions.

II ELEVATION

1 Draw the upward projector lines from end of each tread to show the risers.

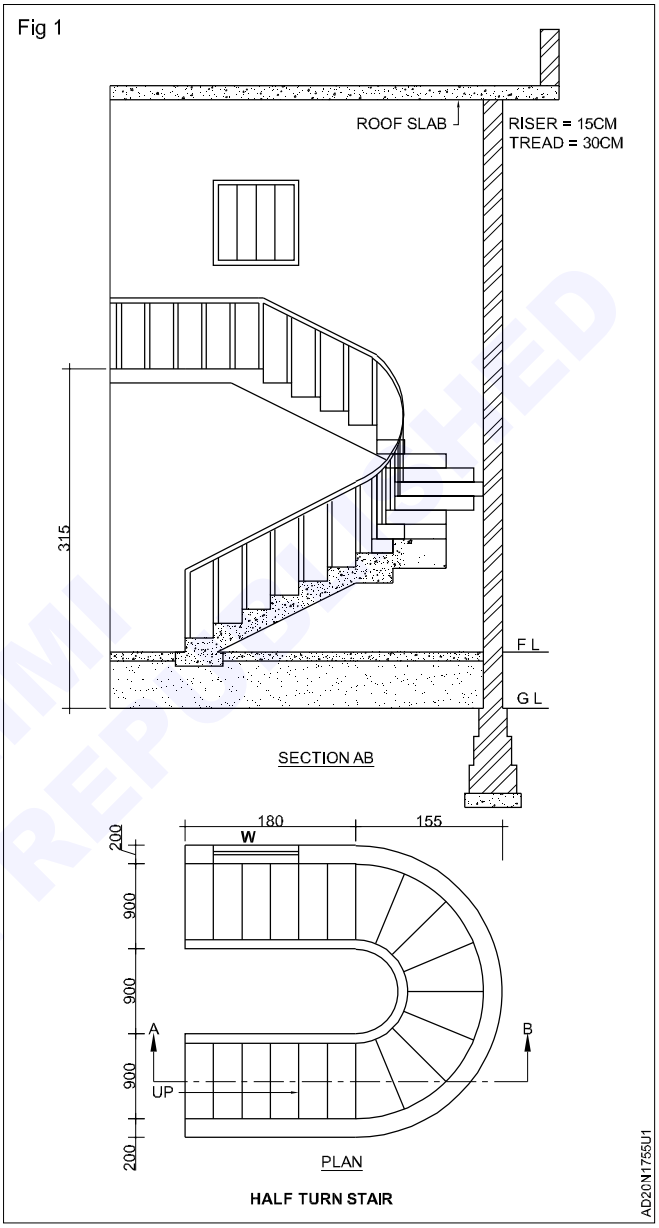
2 Complete the drawing as per given data as shown in Fig 1.

3 Draw hand rail details as per data given.

4 Draw elevation of the window.

4 Dimension the drawing properly.

Fig 1



Bifurcated stair

Objective: At the end of this exercise, you shall be able to,
- **draw the plan and section of bifurcated stair.**

TASK 1**: Draw the plan and section of bifurcated stair (Fig 1)**

DATA

Height between floors	- 3m.	Middle landing	- 1m (width).
Tread	- 30cm.	Width of stair	- 1m.
Rise	- 15cm.	Wall thickness	- 20 cm.
		R.C.C slab thickness	- 12 cm.

No.of risers in 1st flight - 12 Nos.

No.of risers in 2nd flight - 8 Nos.

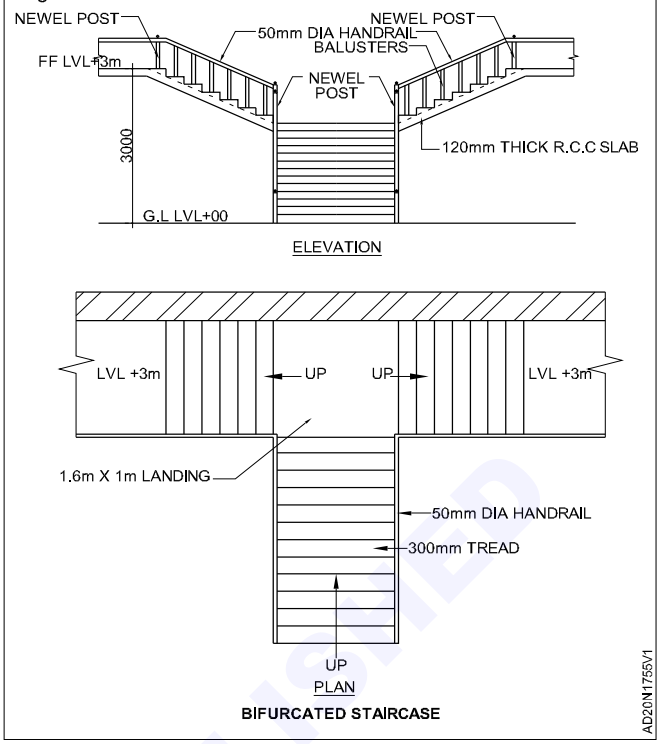
Hand rail, newel post,baluster - 25 mm.

1 Draw the plan of differential stair in 1:50 scale as per given data.

2 To develop the elements, draw projections upwards form each tread.

3 Complete the elevation as indicated in Fig 1.

Fig 1



Three quarter turn stairs

Objective: At the end of this exercise, you shall be able to
- **draw the plan and section of three quarter turn stairs.**

TASK 1: **Draw the plan and section of turn stairs (Fig 1)**

DATA

Room size - 3.50 x 2.90m.

Wall - 30cm.

Height between floor - 3.00m.

Tread - 30 cm.

Rise - 15 cm.

Width of stair - 1.00m.

Open well rectangle - 150 x 90 cm.

R.C.C. waist - 12.5 cm.

R.C.C. Beam - 20 x 25cm.

Nosing - 2.5 cm.

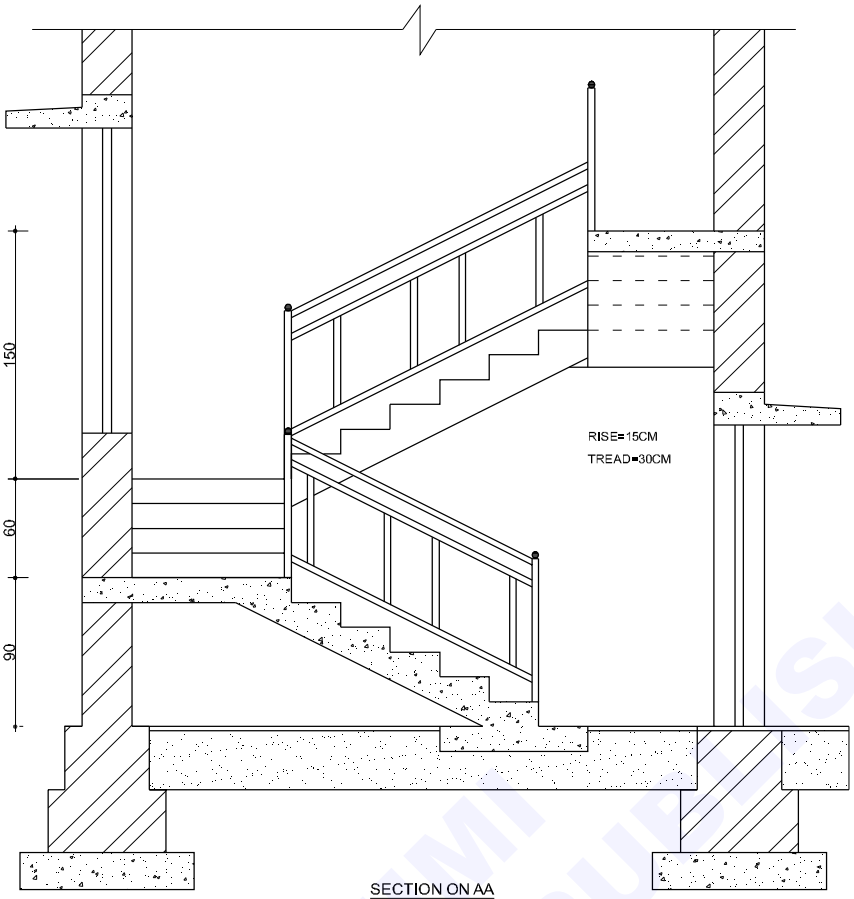
Hand rail - 50 mm.

Baluster - 25mm, 80cm height.

Balustrade - with glass and wooden combination.

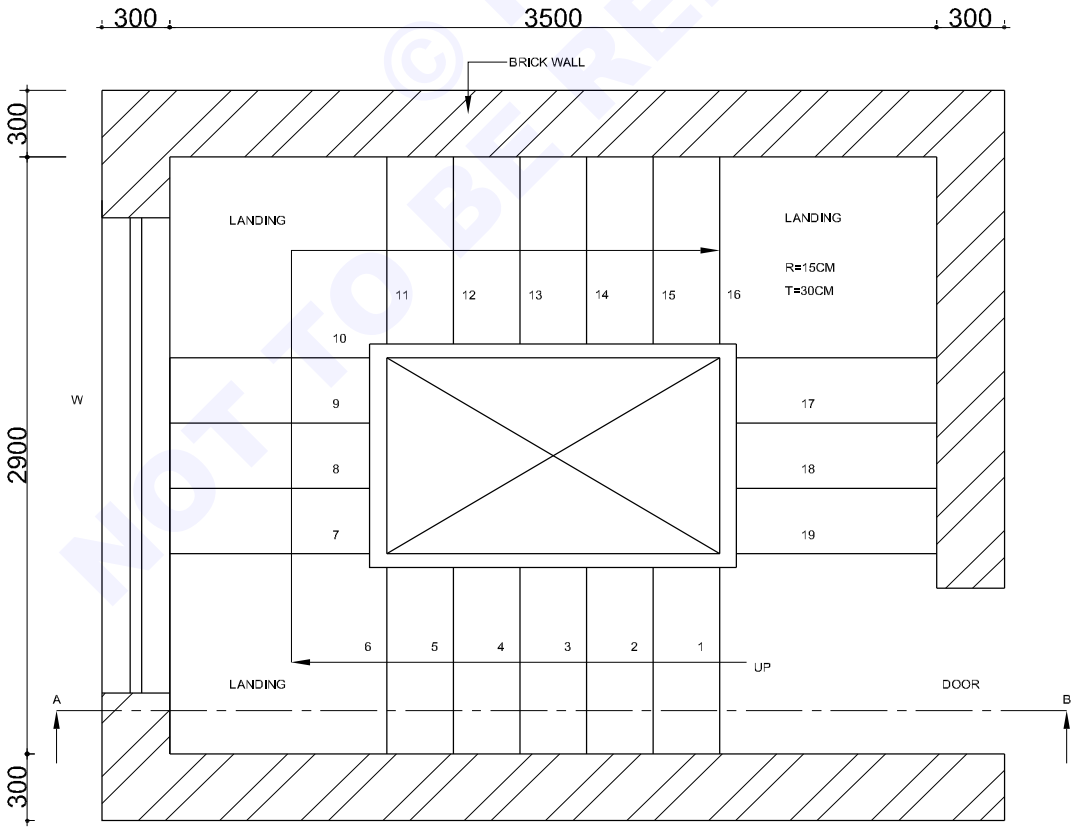
Same as previous exercise considering given data.

Fig 1



SECTION ON AA

THREE QUARTER TURN OR "WIDE U"



PLAN

THREE QUARTER TURN OR "WIDE U"

AD20N1755W1

Half turn stair R.C.C open well

Objective: At the end of this exercise, you shall be able to,
- **draw the plan and section of halfturn stair RCC open well.**

TASK 1: **Draw the plan and section of halfturn RCC open well STAIR (Fig 1 to 2)**

DATA

Room size	- 6 x 2.50m.
Wall	- 30 cm.
Height of floor	- 2.975 m.
Tread	- 25 cm.
Rise	- 17.5 cm.
Width of stair	- 1.00 m.
Width of landing	- 1.00 m.
Open well rectangle	- 50 cm width.
R.C.C waist	- 12.5 cm.
R.C.C Beam	- 20 x 25 cm.
Nosing	- 2.5cm.
Hand rail	- 50 mm.
Baluster	- 25 mm.

1 Draw the plan of room with size 6 x 2.5m.

2 Draw the width of stair as 1 m.

3 Draw the treads 25 cm wide and complete the plan as shown in Fig 1.

4 To develop the section, draw projectors upwards from each tread.

5 Complete the section as indicated in the figure 2.

Fig 1

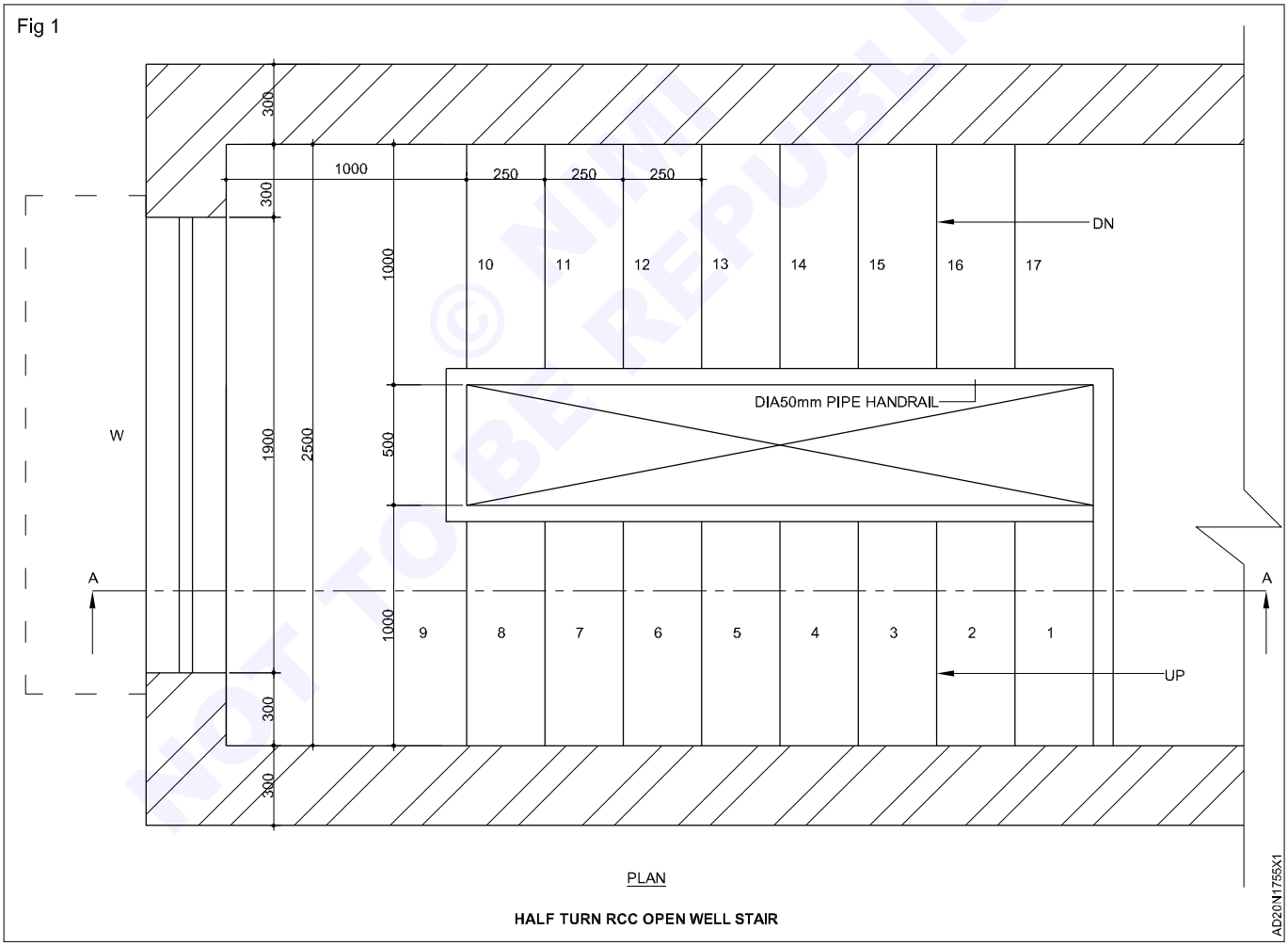
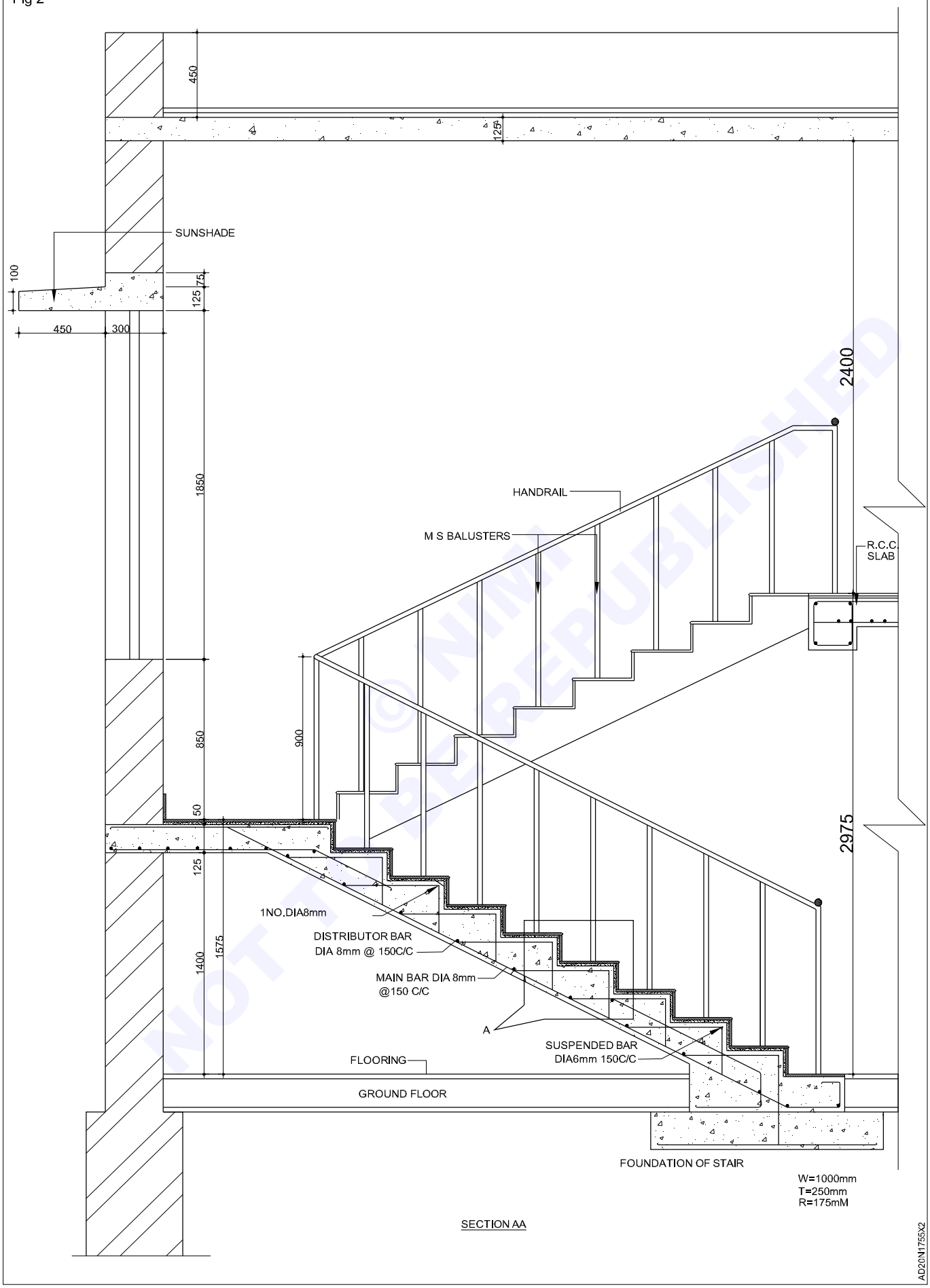


Fig 2



Draw plan and elevation of circular stair

Objective: At the end of this exercise, you shall be able to,
- **draw the plan and elevation of circular stair.**

TASK 1: **Draw the plan of circular stair**

DATA

Height between the floors	- 3000
Width of the flight	- 900
Diameter of GI pipe handrail	- 50
Height of the baluster	- 900
Width of the flight	- 50

Rise and going 173.6 and 300 respectively

Total no of steps in the flight as per the rule.

Note: No of risers - 3 (min) & 12 maximum (all dimensions are in mm).

1 Draw the plan of the stair with the given diameter.

2 Draw the radiating treads from the centre.

3 Draw the handrail in plan.

4 Complete the drawing with necessary dimensioning. (Fig 1)

Draw the elevation of the circular stair

1 Draw the projected vertical lines to show the risers.

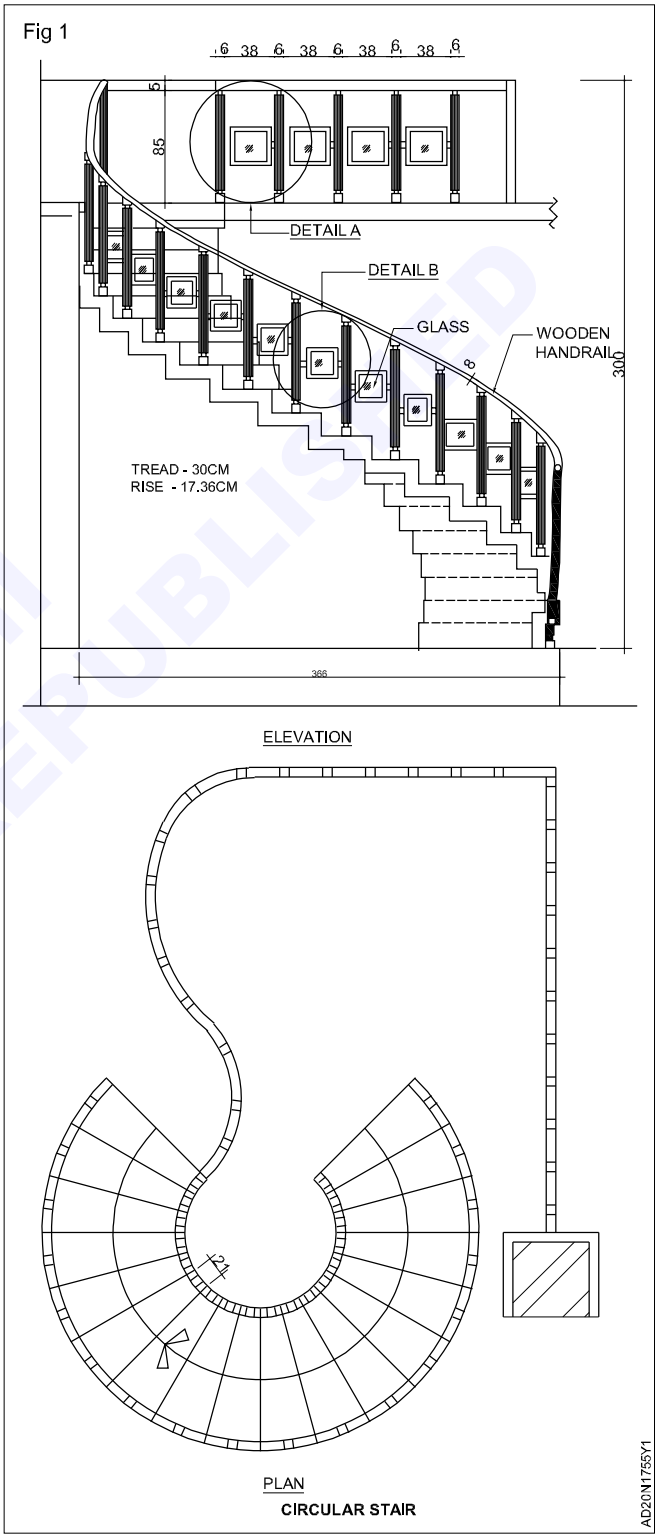
2 Draw the vertical lines to show the baluster.

3 Draw the handrail and as per the details in drawing.

4 Draw the details of handrail and balusters in enlarged scale.

5 Dimensions the drawing properly. (Fig 1)

Fig 1



Construction details of dog - legged stairs

Objective: At the end of this exercise you shall be able to
- **draw plan and section of R.C.C. dog - legged stairs.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- 'T' square, set square - 1 No.
- 30 cms Metric scale - 1 No.
- Instrument box - 1 No.

Materials

- Drawing sheet A3 size - 4 Nos.
- H, HB pencil - Each one.
- Eraser - 1 No.
- Cello tape - As reqd.

PROCEDURE

TASK 1: **Draw the plan of RCC dog legged stairs (Fig 1)**

DATA

Room sizes - 5 x 2m.
Wall - 30 cm.
Height of floor - 2.975m.
Tread - 25cm.
Rise - 17.5cm.
Width of stair - 1m.
Width of landing - 1m.
R.C.C Slab - 12cm.
R.C.C Beam - 20 x 30 cm.
Hand Rail - 25 mm.
Baluster - 25mm.

I PLAN

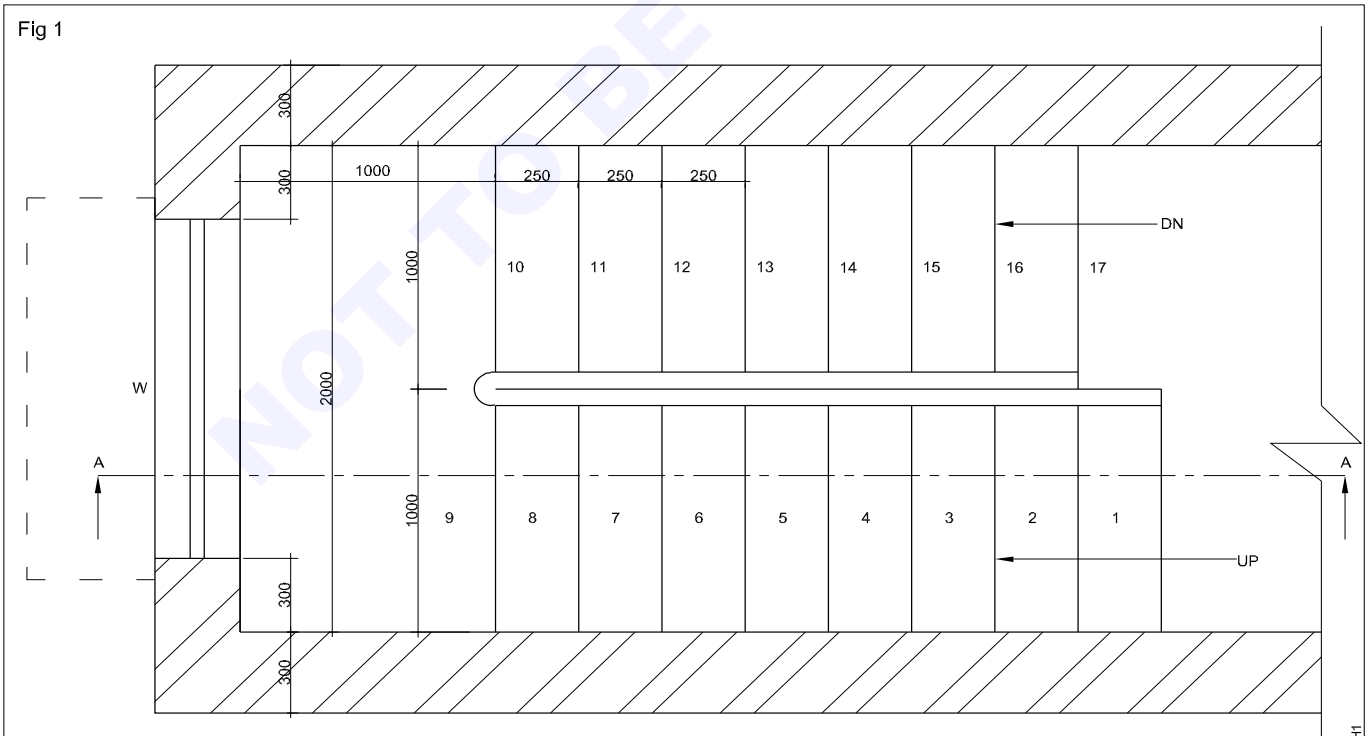
1 Draw the plan of half turn R.C.C dog legged stair room as per data given with proper number of treads as shown Figure 1.

2 Draw the landing after nine risers.

3 Draw the window in plan.

4 Dimension the drawing properly.

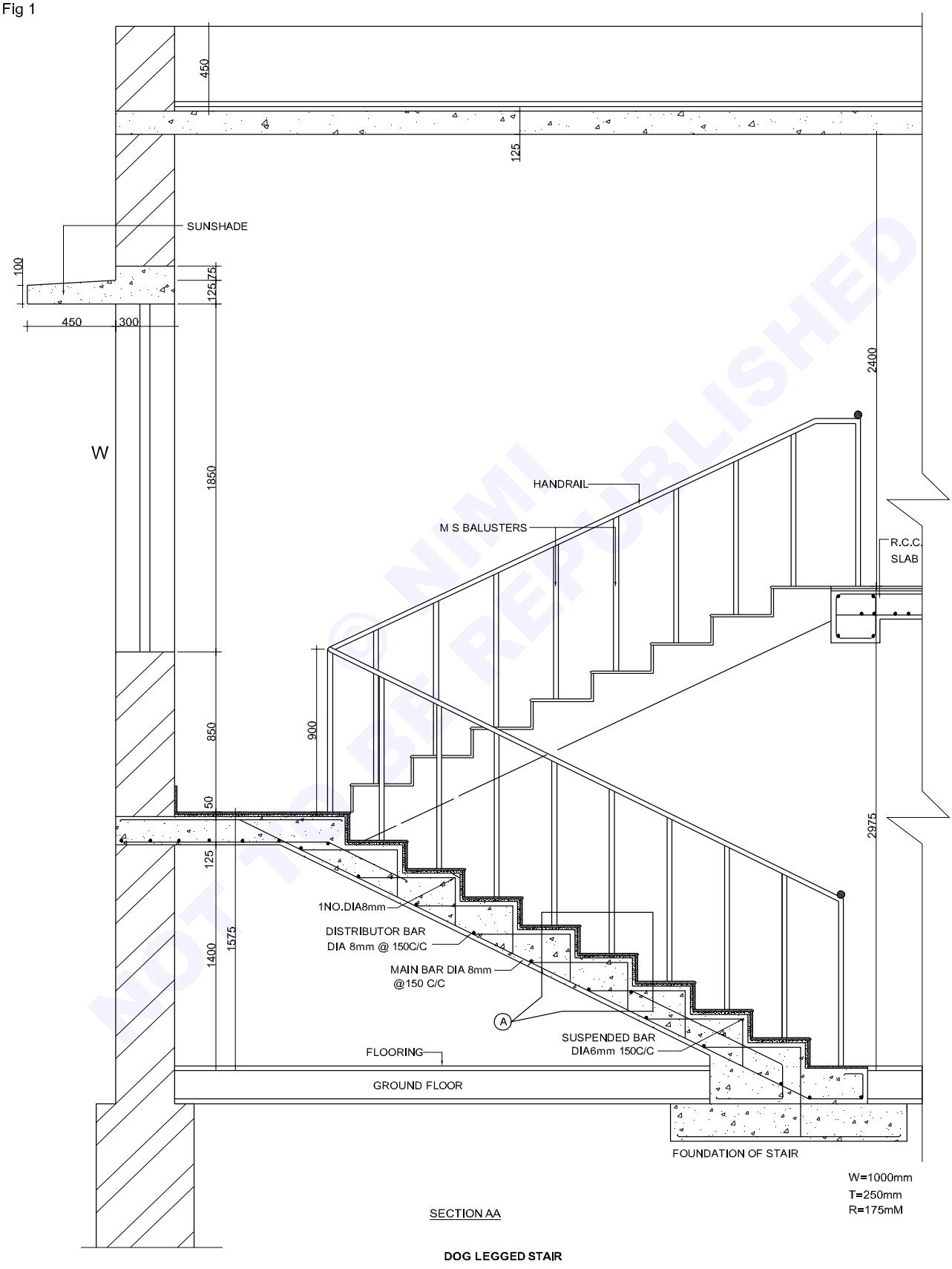
Fig 1



TASK 2: **Draw the section of R.C.C. dog logged stair**

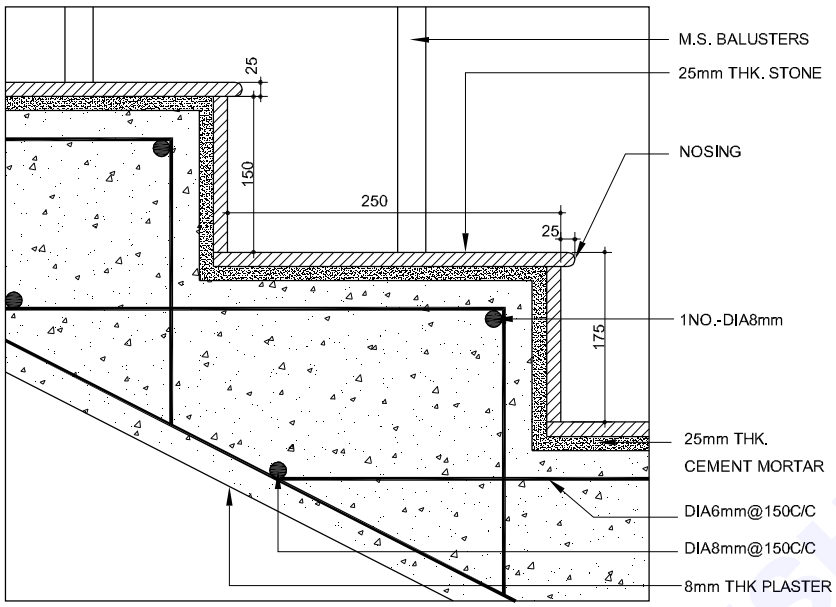
- Draw the Sectional Elevation of the stair by drawing projectors upward from each treads (Fig 1)
- Draw the handrail details as pre given datas.
- Draw the Elevation of the window.
- Dimension the drawing properly.

Fig 1



TASK 3: **Draw the tread, riser & nosing details**

Fig 1



DETAIL A

HALF TURN RCC OPEN WELL STAIR

Tread & Riser Calculation

Given DATA

Height of floor to floor = 2.975 m

Riser size = 17.5cm = 0.175 m

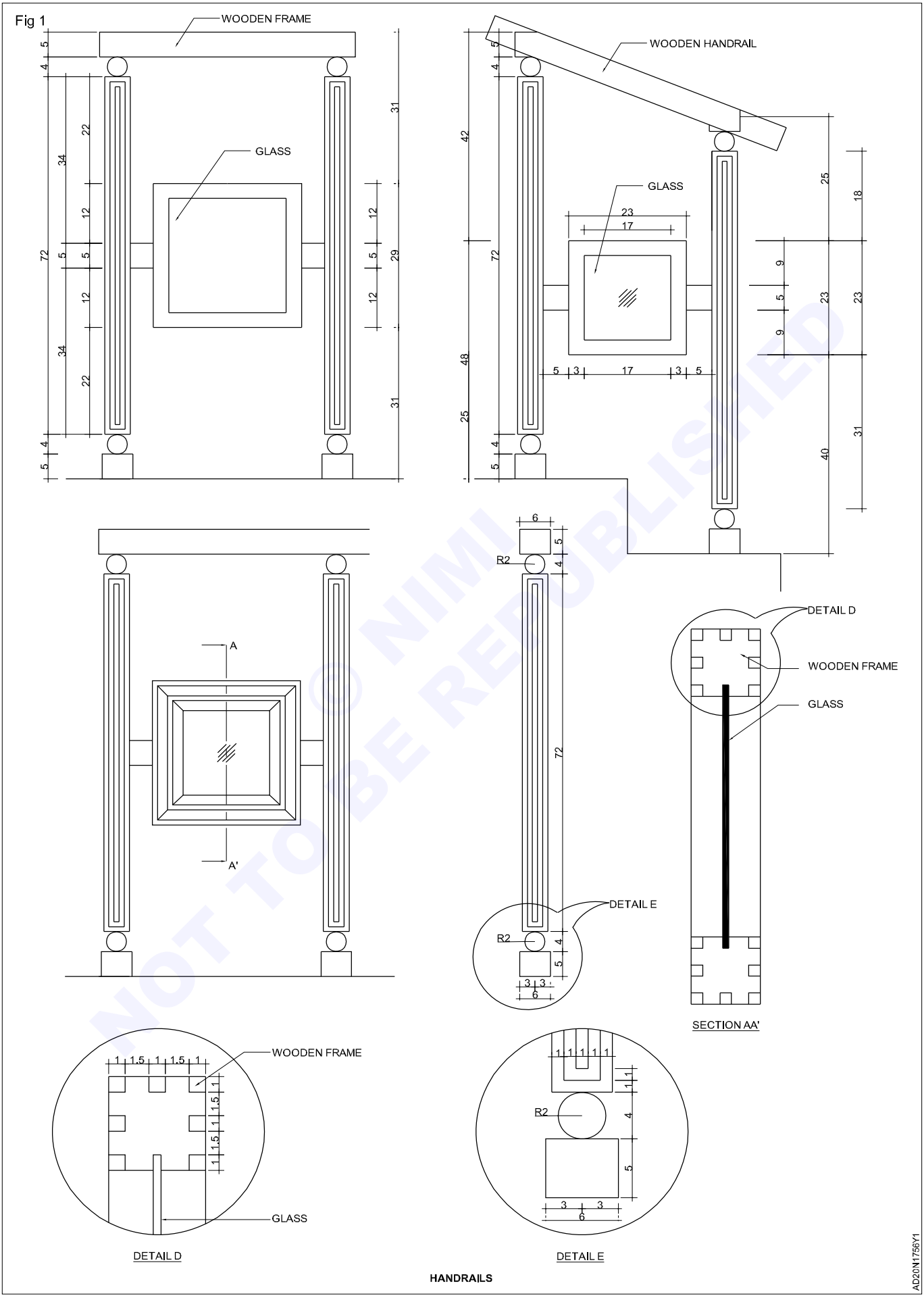
Number of Risers = $\frac{\text{2.975 (height of floor)}}{\text{0.175 (Riser height)}}$ = 17 nos

Since it is a dog legged staircase,divide the number of steps into (9 + 8) two flights tread size = 25 cm

First flight total number = 9 x 25 = 225 cm or 2250 mm

Second flight total number = 8 x 25 cm or 2000 mm

TASK 4: **Draw the baluster details**



Details of wooden stairs

Objective: At the end of this exercise you shall be able to
- **draw the plain and section of wooden stairs.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- 'T' square, set square - 1 No.
- 30 cms Metric scale - 1 No.
- Instrument box - 1 No.

Materials

- Drawing sheet A2 size - 1 No.
- H, HB pencil - Each one.
- Eraser - 1 No.
- Cello tape - As reqd.

PROCEDURE

TASK 1: **Draw the plan and section of moving stairs (esclators) (Figs 1 to 3)**

DATA

Room Size - 6 x 2.50m.
Wall - 30 cm.
Height of floor - 1.50m.
Tread - 25cm.
Rise - 17.5cm.
Width of stair - 1.00m.
Plank - 12.5cm.
Nosing - 2.5cm.
Hand rail - 50mm.
Baluster - 25mm.
Width of landing - 1m.
Open well space - 50cm. (rectangle)
Stringer beam - 10 x 20cm.
Horizontal member - 10 x 20cm.
Wooden beam - 20 x 25cm.

Complete the drawing showing all details as shown in figures.

Fig 1

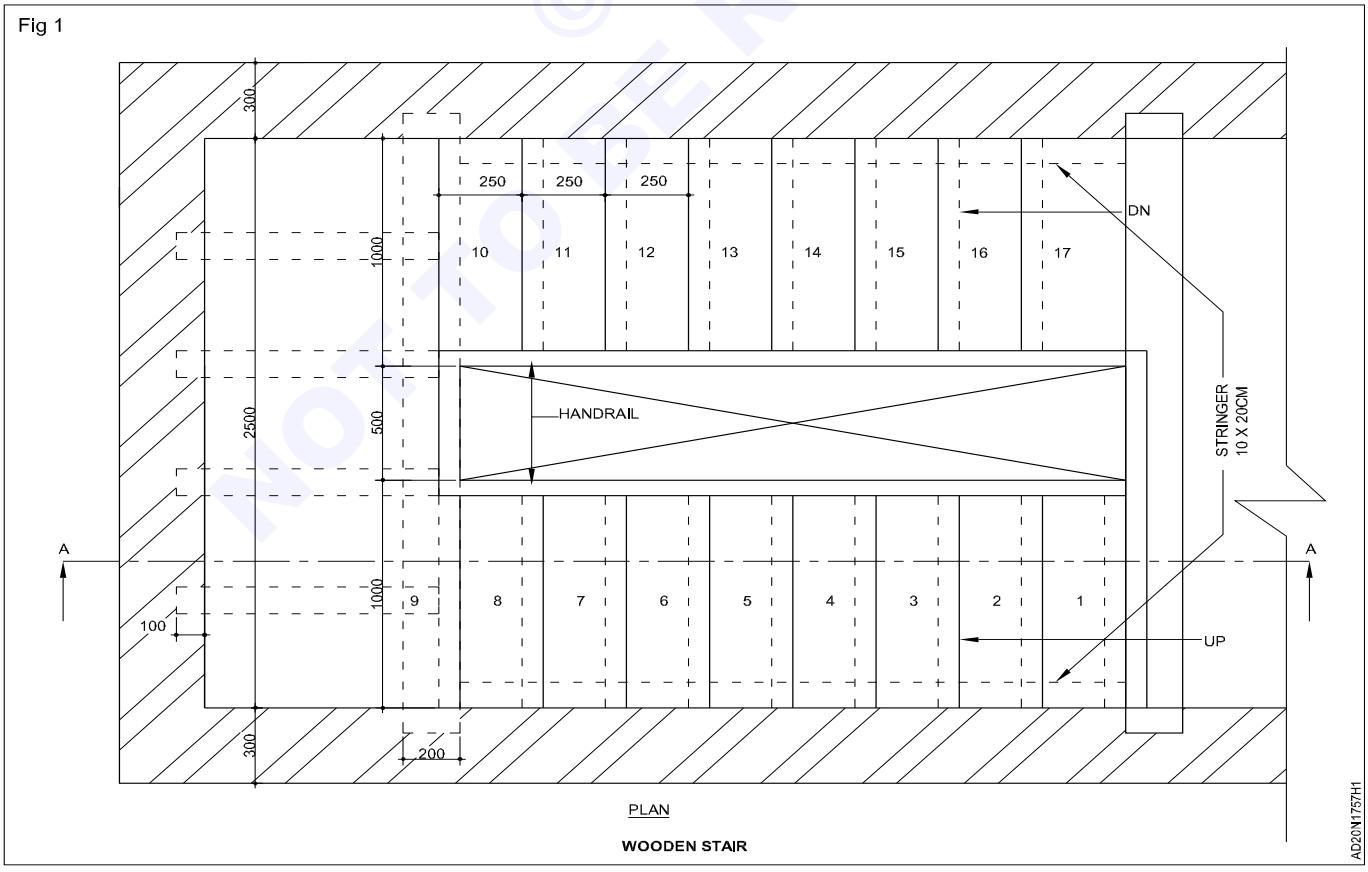


Fig 2

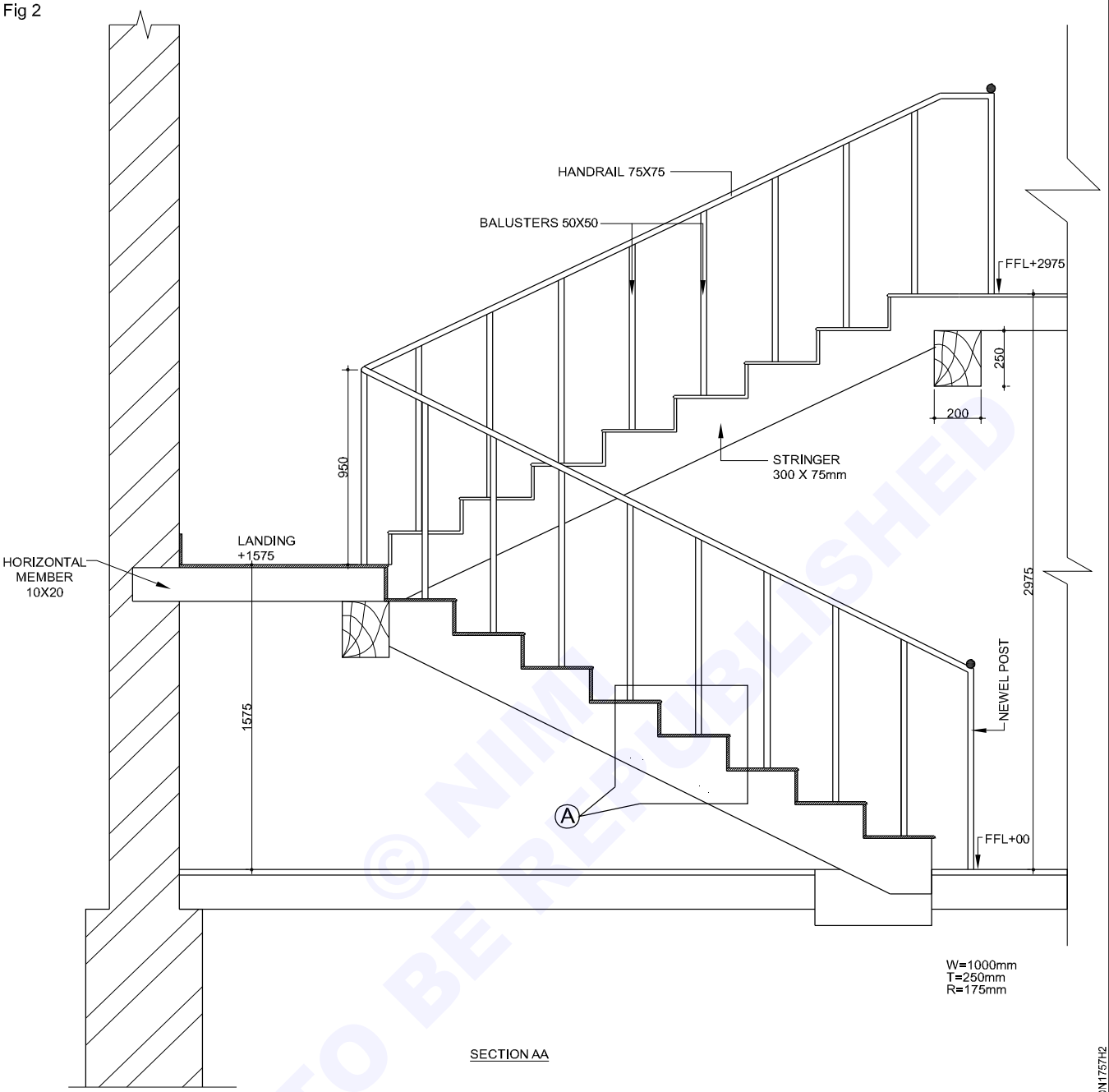
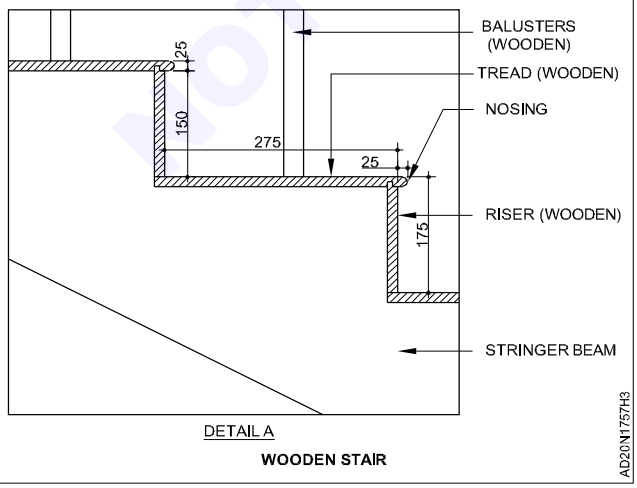


Fig 3



Draw the details of M.S. spiral stair

Objective: At the end of this exercise you shall be able to
- **draw the details of M.S. spiral stair.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A2 size	- 1 No.
• 'T' square, set square	- 1 No.	• H, HB pencil	- Each one.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- As reqd.

PROCEDURE

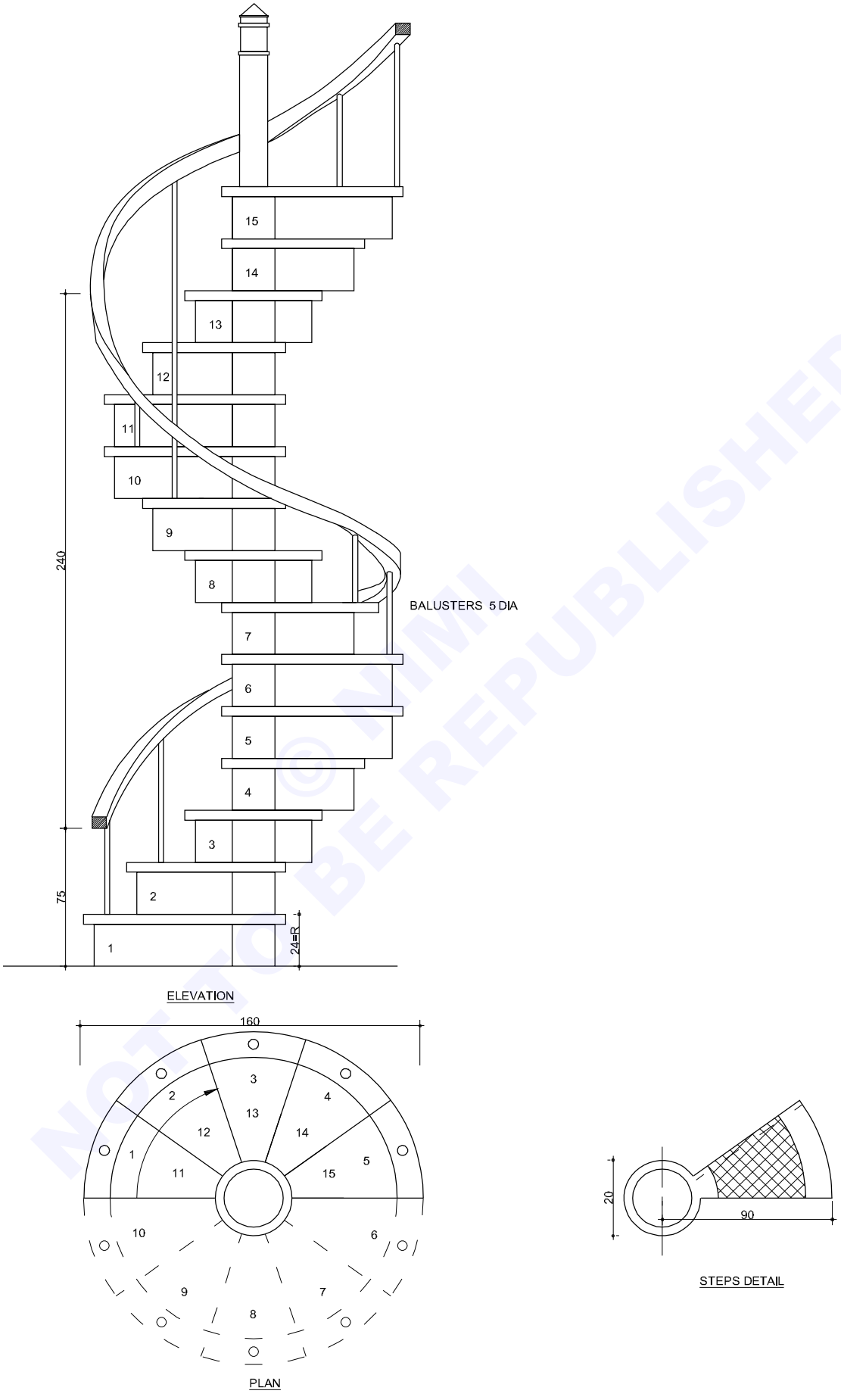
TASK 1: **Draw the plan and section of spiral stairs (Fig 1)**

DATA

Height of floor	- 3m.
Wall	- 30cm.
Tread	- 19cm inner circle and 56 cm outer circle.
Rise	- 21.80cm.
Width of stair	- 0.80cm.
R.C.C Waist	- 12.5cm.
R.C.C Pilar	- 20cm.
Hand rail	- 50mm.
Baluster	- 25mm.

1 Draw the column dia 20cm.
2 Draw the outer circle of 0.9m radius.
3 Divide the circle in to 10 Equal parts.
4 Draw the 10 Winders.
5 Draw the outer circumference of handrail of 50mm.
6 Draw the complete plan.
7 Develop the elevation by projecting each and very points form plan as shown.
8 Draw the balusters and handrail and complete the elevation.
9 Complete the plan and elevation of spiral stair.

Fig 1



Components of ground floor

Objective: At the end of this exercise you shall be able to
- **draw the components of floor of timber.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3 size	- 1 No.
• 'T' square, set square	- 1 No.	• H, HB pencil	- Each one.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- As reqd.

PROCEDURE

TASK 1: **Draw the section of a timber ground floor (Fig 1)**

DATA

Wall	- 200 mm thick.
Base concrete	- 150 mm thick.
Sleeper walls Wallplate	- 100 mm thicks, at 1500 mmc/c. 100 mm thick.
D.P.C -	- 25 mm thick.
Bridging joint	- 50 x 180 mm.
Floor boards	- 32 mm thick.

1 Draw the section of wall above and below ground floor.

2 Draw the base concrete, 150 mm depth.

3 Draw the sleeper wall of height 1000 mm at 1500 mm c/c.

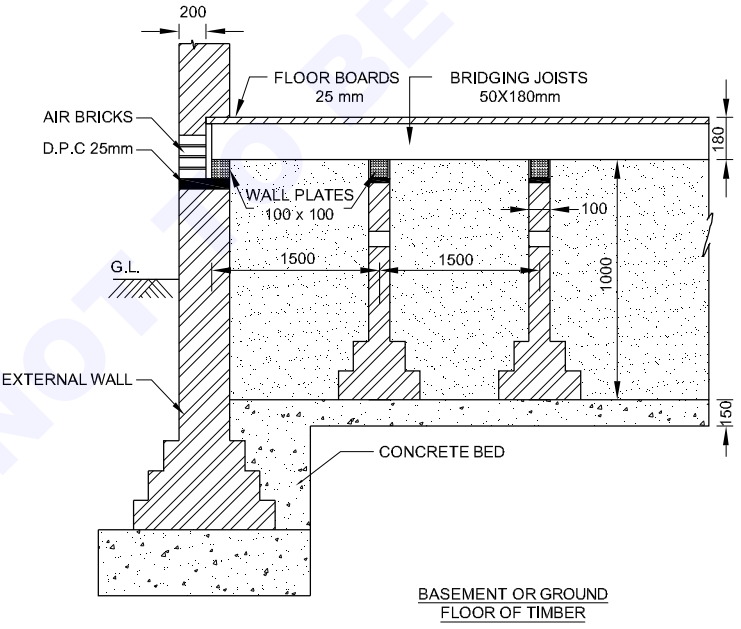
4 Draw the section of wall plate 100 mm x 100 mm, over 300 mm thick D.P.C on end wall and centre of sleeper wall.

5 Draw the elevation of bridging joint 180 mm depth over these wall plates.

6 Draw the section of floor boards, 32 mm thick over joint.

7 Finish the drawing with proper conventional symbols.

Fig 1



Details of cement flooring

Objectives: At the end of this exercise you shall be able to
- **draw the section of cement concrete floor**
- **draw the section of terrazzon floor**
- **draw the section of mosaic floor.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3 size	- 1 No.
• 'T' square, set square	- 1 No.	• H, HB pencil	- Each one.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- As reqd.

PROCEDURE

TASK 1: **Draw the section of cement concrete floor (Dimensions are given in) (Fig 1a)**

1 Draw section of a wall, with basement.
2 Draw a line to mark to ground level.
3 Show hard earth filling, of suitable (it may varies) thickness above ground level.
4 Draw 100 mm thick base concrete above earth fill.
5 Draw 25mm thick floor finish with cement plastering.

— — — — — — — —

TASK 2: **Draw the section of terrazzon floor (Fig 1b)**

1 Draw section of a wall with basement.
2 Draw a line to mark ground level.
3 Show well consolidated earth fill above ground level.
4 Draw 150 mm thick sand filling above earth fill.
5 Draw 75 mm thick cement concrete over sand filling.
6 Draw 34 mm thick cement mortar.
7 Draw 6 mm thick terrazzo flooring.

— — — — — — — —

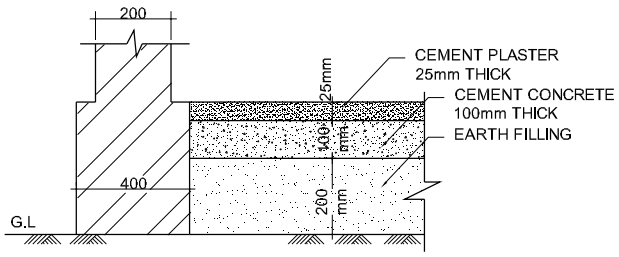
TASK 3: **Draw the section of mosaic floor (Fig 1c)**

1 Draw section of a wall with basement.
2 Draw a line to mark ground level.
3 Show well consolidated earth fill above ground level.
4 Draw 150 mm thick sand filling above earth fill.
5 Draw 75 mm thick cement concrete over sand filling.
6 Draw 34 mm thick cement mortar.
7 Show 6 mm thick marble chips is cementing materials, as mosaic flooring.

— — — — — — — —

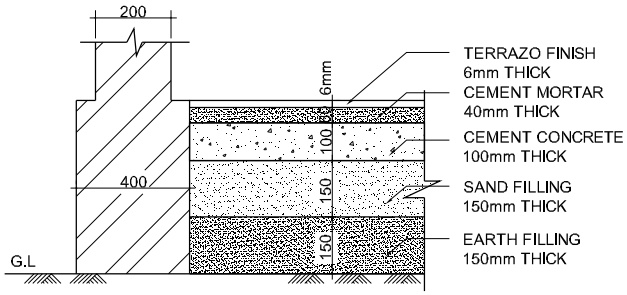
Fig 1

1 (a)



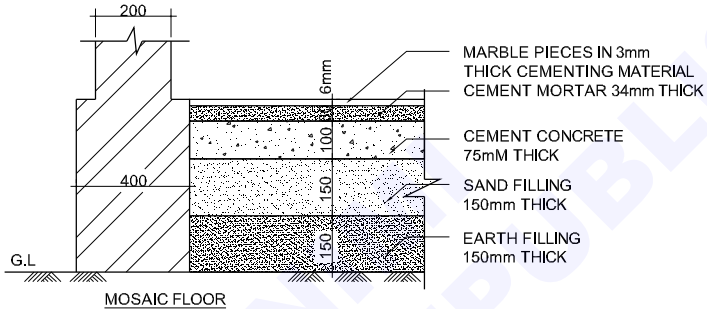
CEMENT CONCRETE

1 (b)



TERRAZZO FLOOR

1 (c)



MOSAIC FLOOR

FLOORS (GROUND)

AD20N1760H1

Details of stone/ tile flooring

Objective: At the end of this exercise you shall be able to
- **draw the isometric view of flag stone floor.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3 size	- 1 No.
• 'T' square, set square	- 1 No.	• H, HB pencil	- Each one.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- As reqd.

PROCEDURE

TASK 1: **Draw the isometric view of flag stone floor (Fig 1)**

DATA

Stone size - 60 x 45 x 20 mm.

Depth of concrete for subgragde - 100 mm.

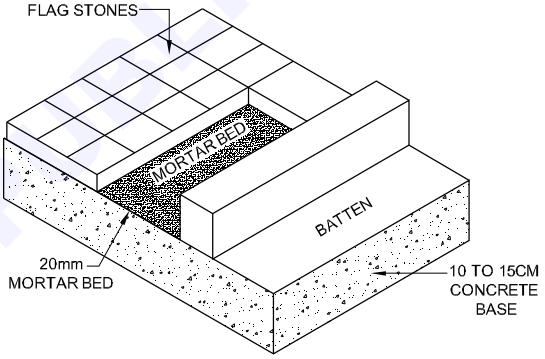
Mortar bed - 20 mm thick.

1 Draw the sub grade with 100 mm thick lean concrete as shown in figure.

2 Draw 20 mm thick lime / cement mortar over this sub grade.

3 Draw the stone slabs over this mortar bed as shown in figure 1.

Fig 1



FLAG STONES FLOOR

Draw the details of wooden suspended flooring

Objective: At the end of this exercise you shall be able to
- **draw plan and section of single joist timber floor.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3 size	- 1 No.
• 'T' square, set square	- 1 No.	• H, HB pencil	- Each one.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- As reqd.

PROCEDURE

TASK 1: **Draw plan and detailed section of a single joist timber floor (Fig 1A)**

DATA

Room size	- 300 x 4900 mm.
Wall	- 300 mm thick.
Bridging joist	- 50 x 100 mm at 350 mm c/c.
Herring bone strutting	- 32 x 50 mm.
Floor board	- 32 mm.
Wall plate	- 100 x 75 mm.
Wedge	- 75 x 100 mm.

1 Draw the plan of the room 3000 x 1900 mm, width wall thickness 300 mm.

2 Draw wall plate 100 mm wide on longer side, in dashed line.

3 Draw 75 mm thick wedges on shorter walls.

4 Draw the bridging joists, 50mm width at 350 mm c/c in shorter span.

5 Draw 32 mm wide strut in the middle of shorter span and between the bridging joists.

6 Show the boarding of 32 mm thick at one corner and complete the drawing as shown in figure.

— — — — — — —

TASK 2: **To draw the section along long span (Section AA) (Fig 1B)**

1 Draw the section of wall.

2 Draw the wedge 75 mm wide and 100 mm height, attached to the wall.

3 Draw bridging joists 50 mm wide, 100 mm depth, first one attached to the wedge and others, 350 mm c/c.

4 Draw the struts 32 x 50 mm diagonally between the joists

5 Draw the floor board 32 mm thick on the bridging joist.

6 Draw the ceiling joining the bridging joist at bottom and complete the drawing.

— — — — — — — —

TASK 3: **To draw the section along shorter span (Section BB) (Fig 1C)**

1 Draw the section of wall.

2 Draw wall plate 75 mm wide, 100 mm height, inside the wall.

3 Draw bridging joist 100 mm height over this wall plate.

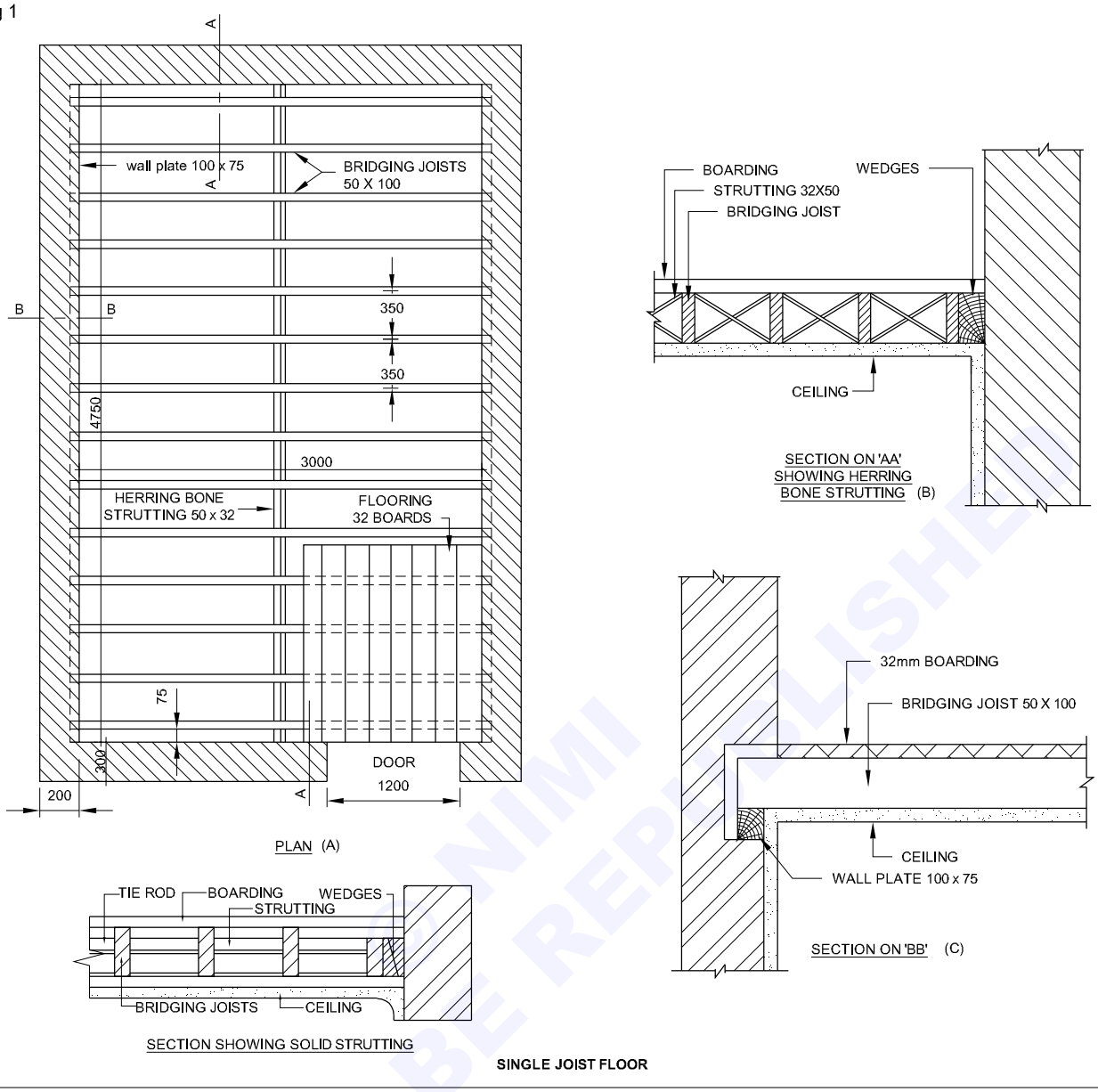
4 Draw a 32 mm thick board over the joist, starting from the side of wall.

5 Show air space as shown in figure.

6 Draw ceiling under the bridging joist, and complete the drawing.

— — — — — — — —

Fig 1



SINGLE JOIST FLOOR

Details of wooden double floor

Objectives: At the end of this exercise you shall be able to
- **draw plan and section of double joist timber floor**
- **draw plan and section of triple of framed timber floor.**

Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3 size	- 1 No.
• 'T' square, set square	- 1 No.	• H, HB pencil	- Each one.
• 30 cms Metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- As reqd.

PROCEDURE

TASK 1: **Draw the plan and detailed section of a double joist timber floor (Fig 1A, B & C)**

DATA

Wall thickness	- 300 mm.
Room size	- 5500 x 8000 mm.
Binders	- 180 x 380 mm at 2000 mm c/c.
Bed stone	- 250 x 120 x 600 mm.
Bridging joist	- 150 x 50 mm.
Struts	- 100 x 32 mm.
Boarding	- 32 mm thick.
Wall plate	- 120 x 80 mm.
Ceiling joist	- 50 x 100 mm.
Fillet	- 50 x 25 mm.

1 To draw sectional plan.

2 Draw sectional plan of room with all thickness 300 mm.

3 Draw binders in shorter span, 2000 mm c/c.

4 Draw bed stone 250 x 600 in the wall below the binders.

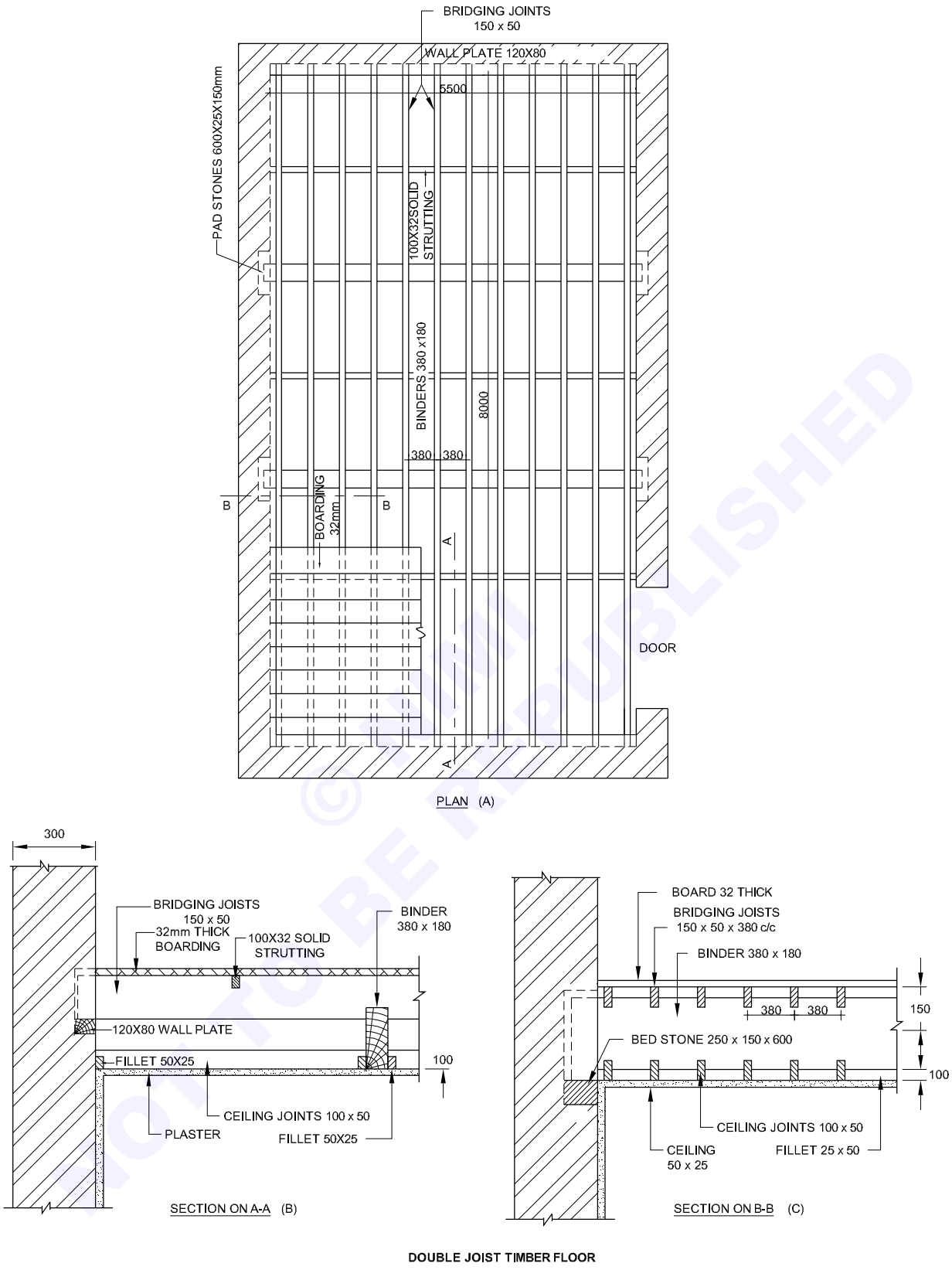
5 Draw wall plate 75 mm inside the wall, in shorter span.

6 Draw bridging joist 50 x 150 mm, 380 mm c/c along longer span.

7 Draw the struts in between the bridging joist, in each span.

8 Draw 32 mm thick boarding in one corner as shown in figure.

Fig 1



DOUBLE JOIST TIMBER FLOOR

AD20N1763H1

Design of single storied residential building

Objectives: At the end of this exercise you shall be able to
- **determine space requirments by gathering information**
- **design & develop bubble diagram and line diagram**
- **design the plan as per the given line diagram.**
- **prepare the schedule of joinery.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- Scale 30cm - 1 No.
- Set square (45° - 60°) each - 1 No.
- Instrument box - 1 No.

Materials

- Drawing sheet A2 size - 1 No.
- HB pencil - 1 No.
- Eraser - 1 No.
- Cello tape - As reqd.

DATA:

Ground floor - Foyer
Verandah
1 bed room
Living
Stairs
Dining
Kitchen
Sitout
Utility

Note: There is no book of rules for design. The original idea behind the sketch is called the concept of design. The mental ideas helps to

1 Identify the purpose of the object (building)

2 Analyse the aesthetic and functional aspects

3 Think agood solution (design)

The trainer has give a specific plot size for design or trainee can select a plot size and indicate north point and road selection.

The trainees must workout 2 or 3 such options of bubble diagram for practice.

PROCEDURE

TASK 1: **Draw site plan and set back**

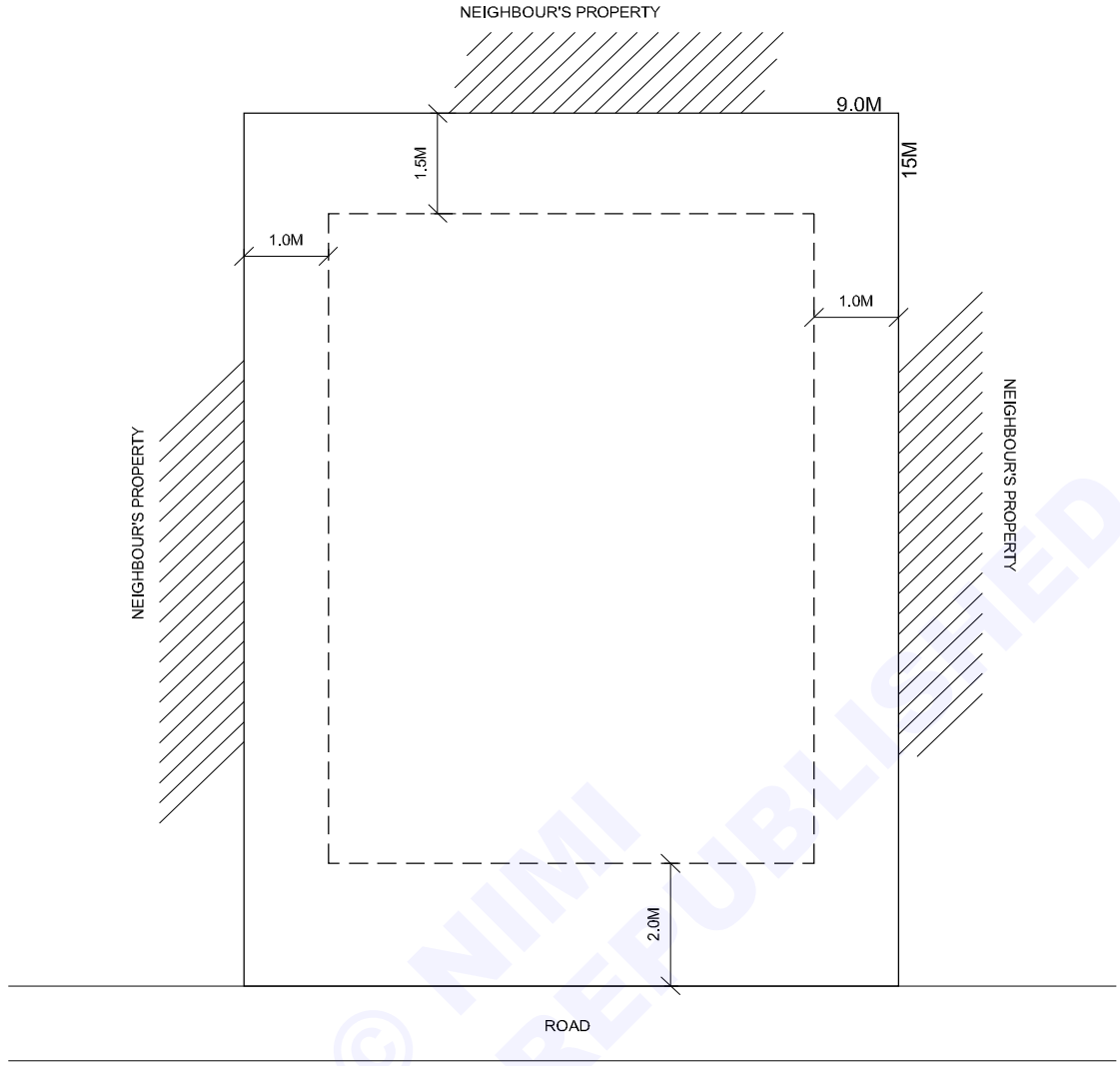
1 First you have to determine the space requirments based on your needs and requirements based on needs and requiremements.

2 The second step is to plot the boundary based on the given plot size as shown in Fig 1 in 1:100 scale.

3 Mark the set backs based on the buliding byelaws.

4 Mark the Road direction and north point. (Fig 1)

Fig 1



TASK 2: **Draw bubble diagram**

1 Develop a spatial bubble flow diagram based on the Information gathered, and within the space left after marking set backs.

2 Show the spatial relationship of the spaces between each other, their relative size and patterns connecting the spaces as shown in Fig 1

3 Several bubble diagram may be used to illustrate possible solutions.

4 You must make connections between rooms as per circulation movement.

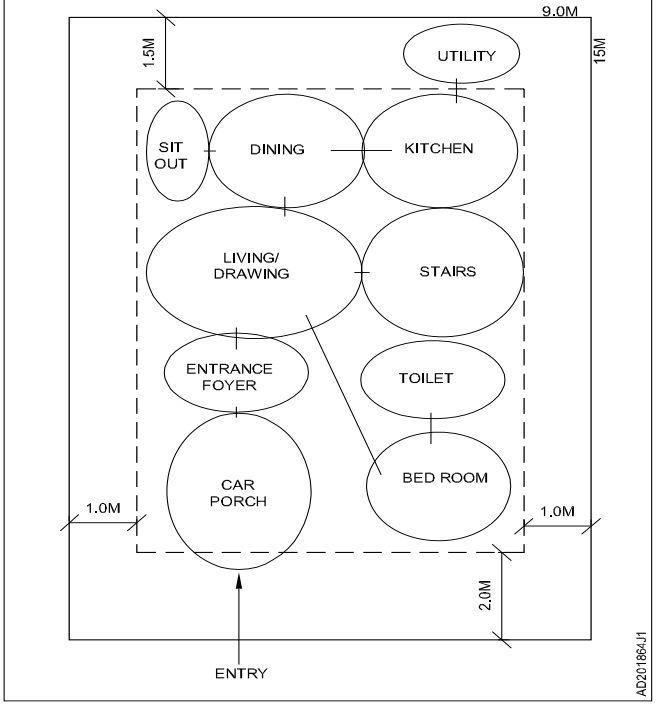
5 These should define the linkages between the different spaces and you must differentiate between the more public and private areas.

6 Develop ground floor and first floor in relation to the spaces and position of staircase has to be same.

7 It is then best to convert the bubble diagram which best suits you into the concept design. (Fig 1)

You can also colour the different spaces with different colours for better representation.

Fig 1



TASK 3: **Design single line ground floor plan (Fig 1)**

1 With reference to the conceptual plan, single line ground floor plan has to be developed.

2 Make the scheme over a 2 X 2 grid to define the plan and to work from the inside out.

3 Adjustments to the rooms and spces have to be made on the grid.

4 Natural ventilation to the rooms must be achieved by designing windows and ventilators opposite to each other.

5 The kitchen and dining room must be close to each other.

6 The staircase must be approachable from the maximum number of rooms.

7 The passage area must be minimum, well ventilated and sufficiently well it.

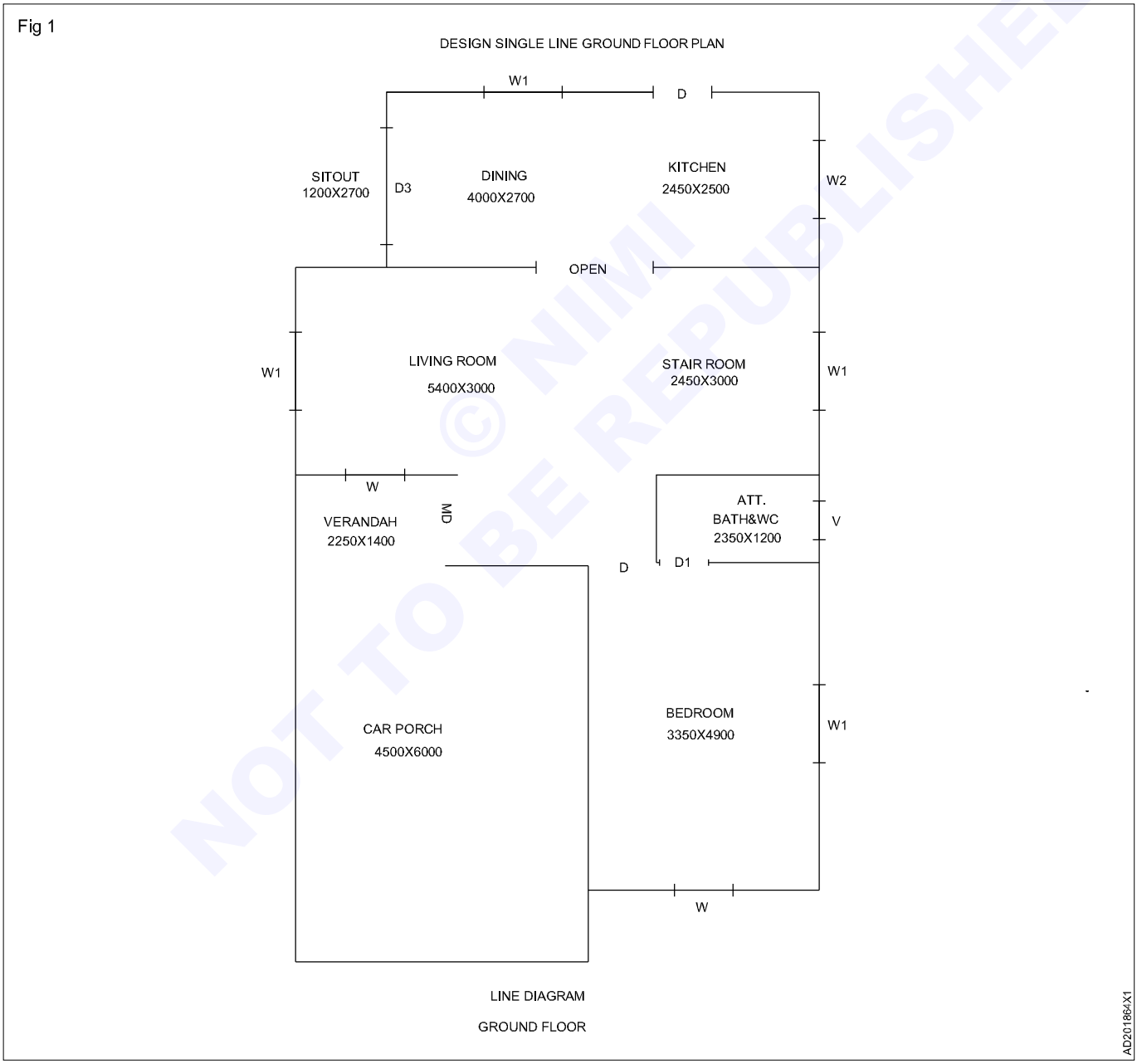
8 Location of the main door has to be easily accessible from the main road.

9 The visualisation of elevation should always be kept in mind while preparing a plan.

10 While drawing the line plan, the elevation of all the 4 sides as well as the perspective view from the road should be kept in mind.

11 An effect of spaciousness within comparatively limited dimension can be achieved by skilful treatment of form, colour natural and artifitial lighting and all the elements of furnishing.

Fig 1



Concept and visualization of design

Objectives: At the end of this exercise you shall be able to
- **orient the spaces according to the bubble diagram**
- **design the spaces considering the surrounding built and open spaces**
- **define the linkage between different spaces**
- **position the spaces according to the need for privacy easy access, wind movement, cross ventilation, pathway, etc.)**
- **site visit of various architectural building**
- **visualizing of a building for development.**

Data:

Ground floor - Foyer
Verandah
1 bed room
Living
Stairs
Dining
Kitchen
Sitout
Utility

PROCEDURE

TASK 1: **To create design concept**

1 Conceptual design should be started with respect to the bubble diagram designed in the previous exercise.

2 To make the plan, put the established facts of the site its shape and existing features-down on paper

3 Use a simple scale, say 1:100 and you could use a graph paper, which in fenths, or a grid of one me be might be easier.

4 Plot the boundary, take guide lines from an established point.

5 Mark the views you wish to keep, positon the spaces according to the need for Pricacy, easy access wind movement, cross ventilation, circulation etc

6 Now evolve a satisfactory pattern on a tracing paper put over this plan in an amalgamation of the two.

7 Complete the concept design

8 Windows can be detailed to represent the exact type““of window called for in this design.

9 Door, windows or other openings should be uniform in design and located to present a symmetrical appearance to the elevation except where the variations are an integral and necessary part of the exterior design

— — — — — — — —

TASK 2: **For the given line diagram of a residential building develop the following views**

i Full plan view

ii Elevation

iii Sectional side view

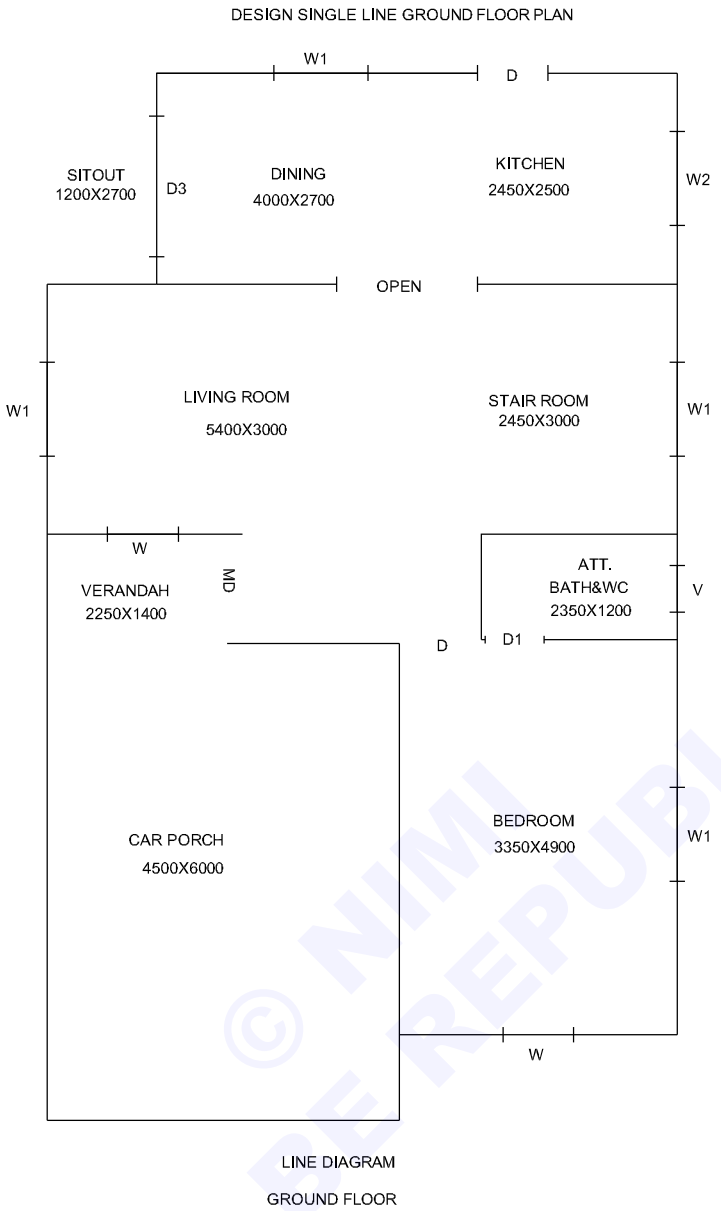
Elevation should be in where with architectural design with modern apperance.

Joinery details

Mark	Item	Size
MD	Main Door	1200 X 2100
D	Door	900 X 2100

Mark	Item	Size
D1	PVC Door	750 X 2100
D2	Sliding Door	1800 X 2100
W	Window	900 X 1200
W1	Window	1200 X 1200
W2	Kitchen window	1200 X 600
O	Open Arch	1800 X 2100

Fig 1



Single floor residential building after analyzing the requirement and area analysis (draw by AutoCAD)

Objectives: At the end of this exercise you shall be able to
- **draw the detailed plan**
- **draw the elevation**
- **draw the suitable sectional elevation**
- **prepare schedule of joinery.**

Requirements

Tools/Instruments/Machines		Materials	
• Computer with Auto CAD	- 1 No.	• A3 size paper	- 1 No.
• Printer	- 1 No.		

PROCEDURE

TASK 1: **Assign layers and colours and line weight**

1 Start the autocad applications and start a new drawing.

2 Save the file as plans with some reference and in a new folder.

3 Set units in metric and make plans in millimeters.

4 Before starting the drawing set all layers to the materials used for the drawing.

5 For architectural drawing set layer as follows.

Layer	Colour	Line weight	Line type
A- Wall	Red	0.35	Continous
A-DWV	Green	0.15	Continous
A-Text	Black	0.15	Continous
A-Above	08	0.15	Acad-----
A- boundry	Magenta	0.35	Continous
A-ele-1	Blue	0.20	Continous
A-Layout	Black	0.20	Continous

— — — — — — — —

TASK 2: **Drawing the preliminary ground floor plan**

1 Mark the plots as per the given site size.

2 Mark the offset as per buildings byelaws.

3 With refercence to the single line diagram convert the plan into wall diagram with 200mm as exterior wall thickness and 100 as internal wall thickness. (Fig 1)

4 Draw the doors and windows in the marked positions.

5 Use appropriate layers for walls,DWV,Text etc.

6 Complete the ground floor plans as shown in (Fig 2).

— — — — — — — —

TASK 3: **Prepare Joinery details and area statement**

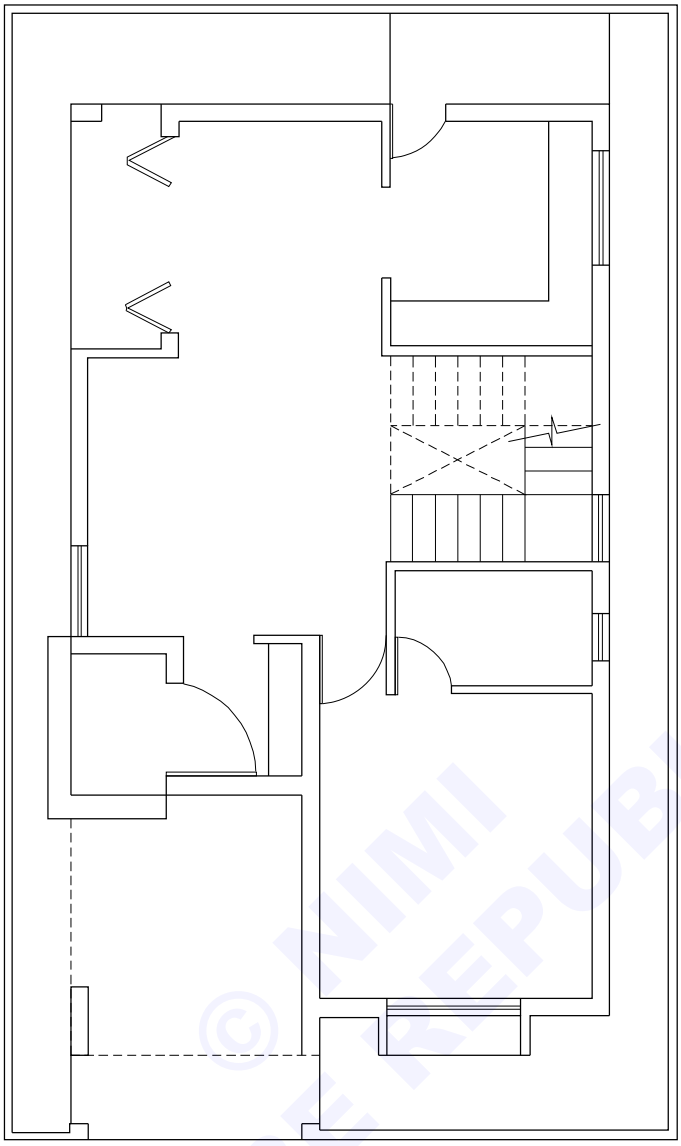
1 Identify the number of doors, windows and ventilators and their types and dimensions.

2 Type of doors, windows,ventilators and marking with the sizes.

3 Calculate area of the plot / site's area and Total builtup area by using area command.

4 Calculate vacant area and prepare the area details.

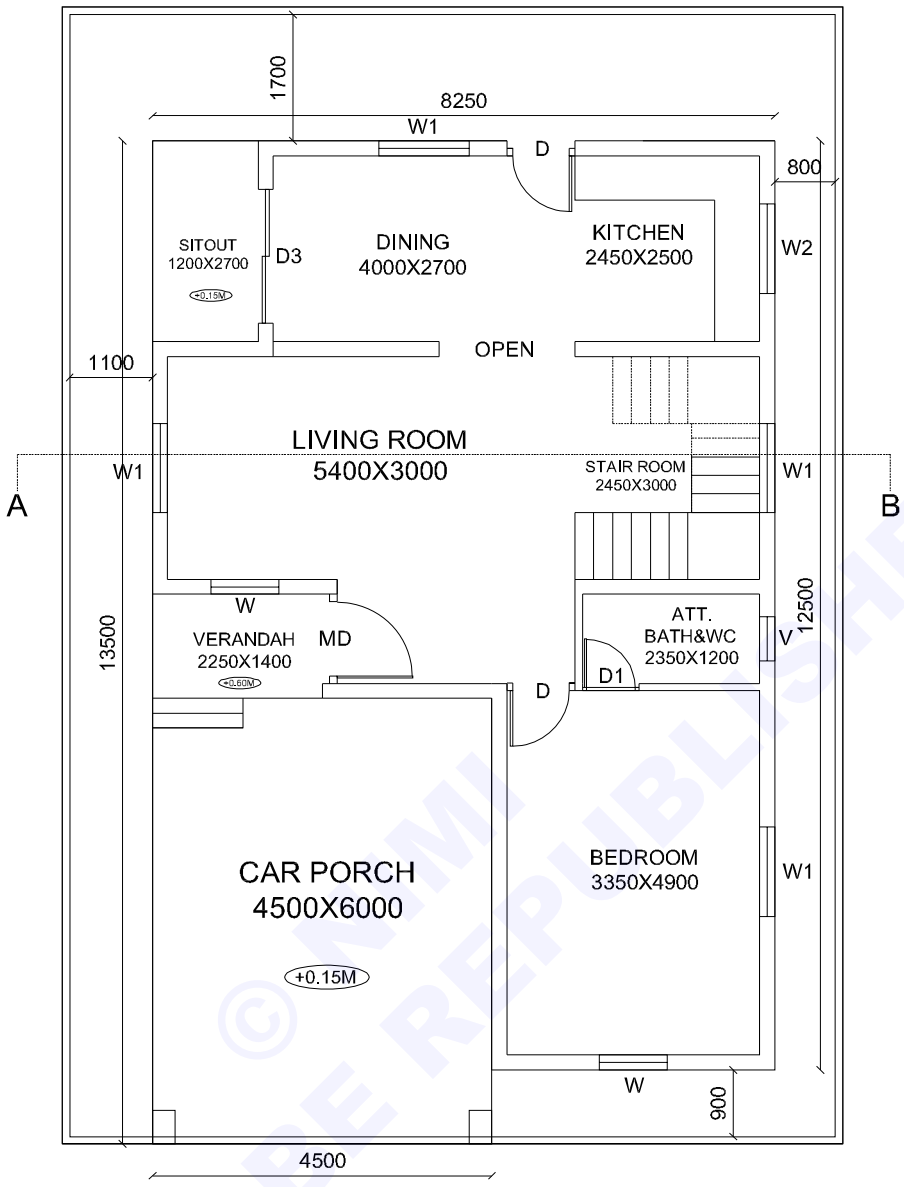
Fig 1



GROUND FLOOR PLAN

AD201866H1

Fig 2



GROUND
FLOOR PLAN

AREA STATEMENT	SQ.M	SQ.FT
OWNER'S SITE AREA	158.35	1704.51
GF BUILTUP AREA	107.63	1158.51
VACANT AREA	50.72	546.00

JOINERY DETAILS		
MARK	ITEM	SIZE
MD	MAIN DOOR	1200X2100
D	DOOR	900X2100
D1	PVC DOOR	750X2100
D2	SLIDING DOOR	1800X2100
W	WINDOW	900X1200
W1	WINDOW	1200X1200
W2	KITCHEN WINDOW	1200X600
O	OPEN ARCH	1800X2100

AD201866H2

Design and development of front elevation and one side elevation

Objective: At the end of this exercise you shall be able to
- **design the front elevation based on the designed plan**
- **design the side elevation based on the designed plan.**

Requirements

Tools/Instruments/Machines		Materials	
• Computer with AutoCAD	- 1 No.	• A3 size paper	- 1 No.
• Printer	- 1 No.		

PROCEDURE

TASK 1: **Draft the front elevation (Auto CAD)**

1 Using the floor plan, project the vertical lines that represent main lines of the building.

2 These lines show the overall length or width of the building.

3 When projecting an elevation on a cad system, use the grid pick junction to project the major lines from the floor plan to elevation plan.

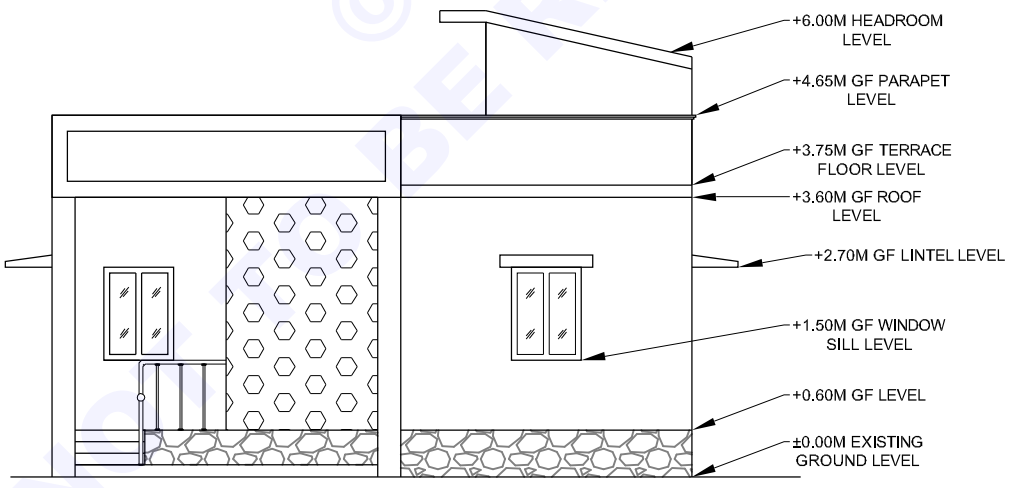
4 Measure and project horizontal lines that represent the height of the groundline, doors, top & bottom of windows and other key features.

5 Add details and symbols,such as indicating door and window bim, mullions, roofing, materials ,etc.

6 Represent texture or features as designed in front elevation.

7 Complete the front elevation with all the details as shown in Fig 1.

Fig 1



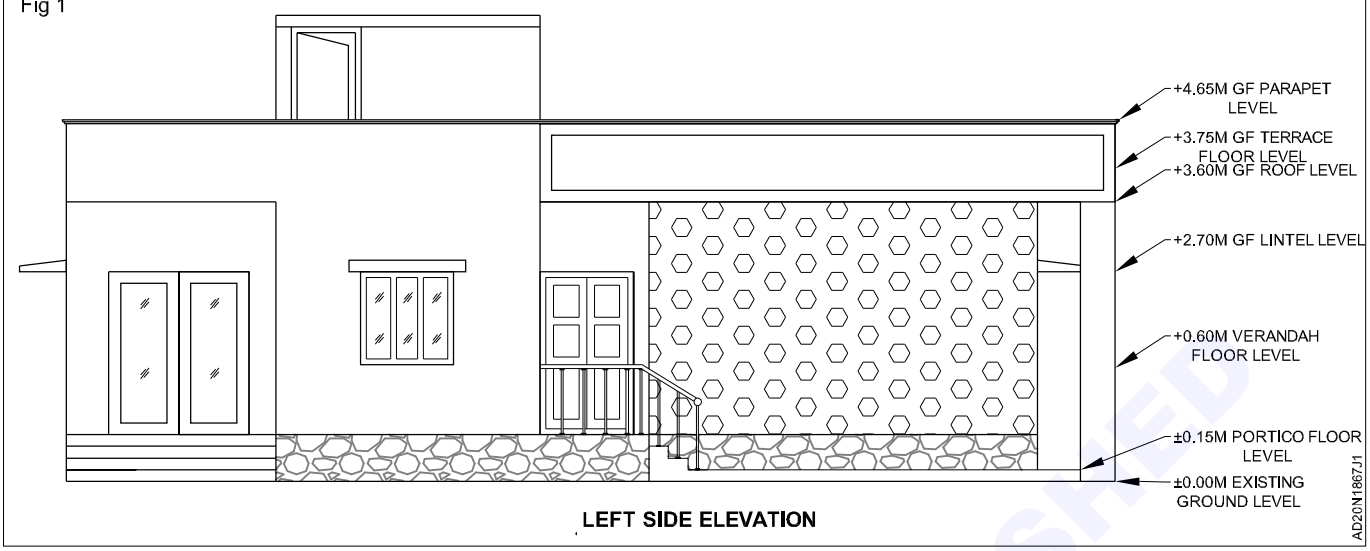
FRONT ELEVATION

TASK 2: **Draft the side elevation (Auto CAD)**

1 During the drawing process floor plans can be rotated 90^0 to position for side elevation.

2 Follow the same procedure as TASK1 and complete the side elevation as shown in Fig 1.

Fig 1



LEFT SIDE ELEVATION

Section through stair case or toilet

Objective: At the end of this exercise you shall be able to
- **draw sectional view through staircase.**
- **develop the section of the building in CAD**
- **place the section in a layout.**

Requirements

Tools/Instruments/Machines		Materials	
• Computer with AutoCAD	- 1 No.	• A3 size paper	- 1 No.
• Printer	- 1 No.		

PROCEDURE

TASK 1: **Section of the building**

1 Mark the section plane in plan in such a way that max details can be viewed through.

2 Once the section line is marked, project lines perpendicular from the floor plan outline at each corner.

3 Add ceiling lines and floor lines to give each wall its specified height.

4 Once the features of the walls are projected to the section from the floor plan, dimensions, instructional notes and additional features can be added to the drawing.

5 Interior elevations provide a great amount of detail the height of all cabinets, shelving, ledges, railing, wall““tamps, fixtures, mirror, furnitures, etc.

6 The vertical dimensions are as important as horizontal““dimensions are on floor plan.

7 Many dimensions on a section drawings show the vertical distance from a datum line.

8 Vertical dimensions should be read from the right side of the drawing

9 Levels to be dimensioned should be labeled with a note or term.

10 Room heights are shown by dimensioning from the floor line to the ceiling line.

11 The depth of the footing is shown as break in midway

12 Heights of windows and doors are dimensioned from the floor line to the top of the window or door.

13 Windows and doors may be indexed by a code or a symbol to a door or window schedule.

14 Dimensions for small or obscure areas should be indexed to a separate detail.

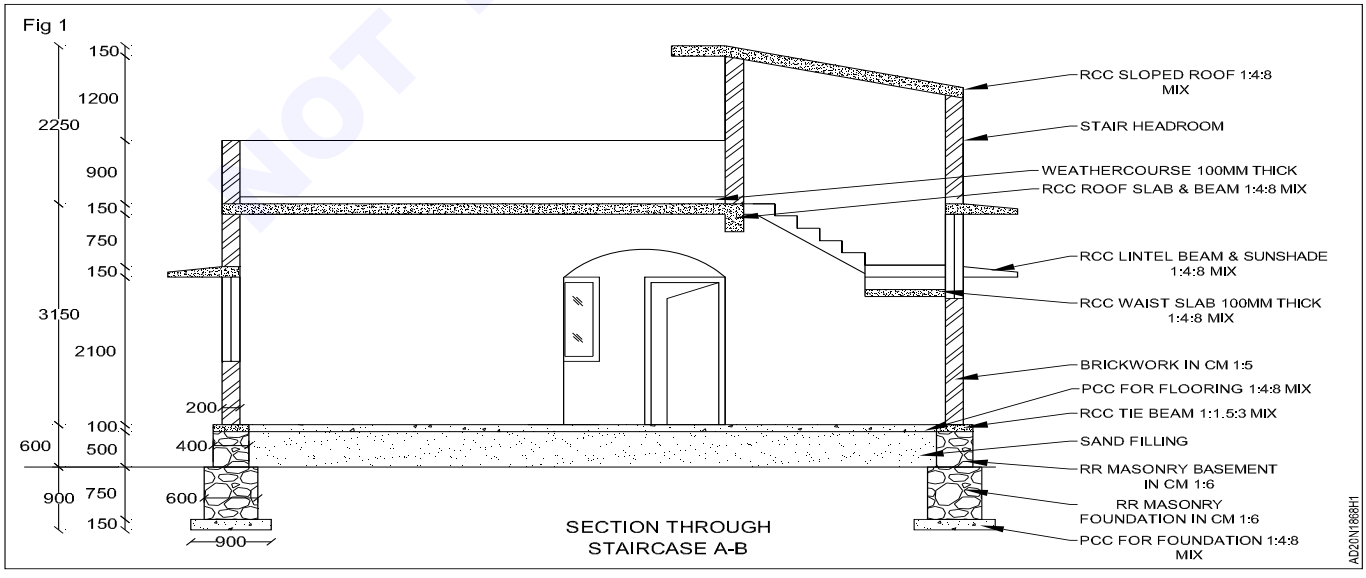
15 Floor and ceiling lines are shown with hidden lines.

16 Thickness of slabs are dimensionel.

17 Overall height are placed on the outside of sub dimensions.

18 Complete the drawing as shown in Fig 1.

Fig 1



Site plan with landscaping

Objectives: At the end of this exercise you shall be able to
- **identify the different set back in a plot**
- **create a site plan showing details.**

Requirements

Tools/Instruments/Machines

- Computer with AutoCAD - 1 No.
- Printer - 1 No.

Materials

- A3 size paper - 1 No.

PROCEDURE

TASK 1: **Prepare the site paln as per given sketch (Fig 1)**

1 Select a scale of 1:200 to 1:400 and draw the plan of the plot as per given dimensions.

2 Draw a horizontal line from the front boundary at a convenient distance.

3 Create the outer line of building by providing given set backs.

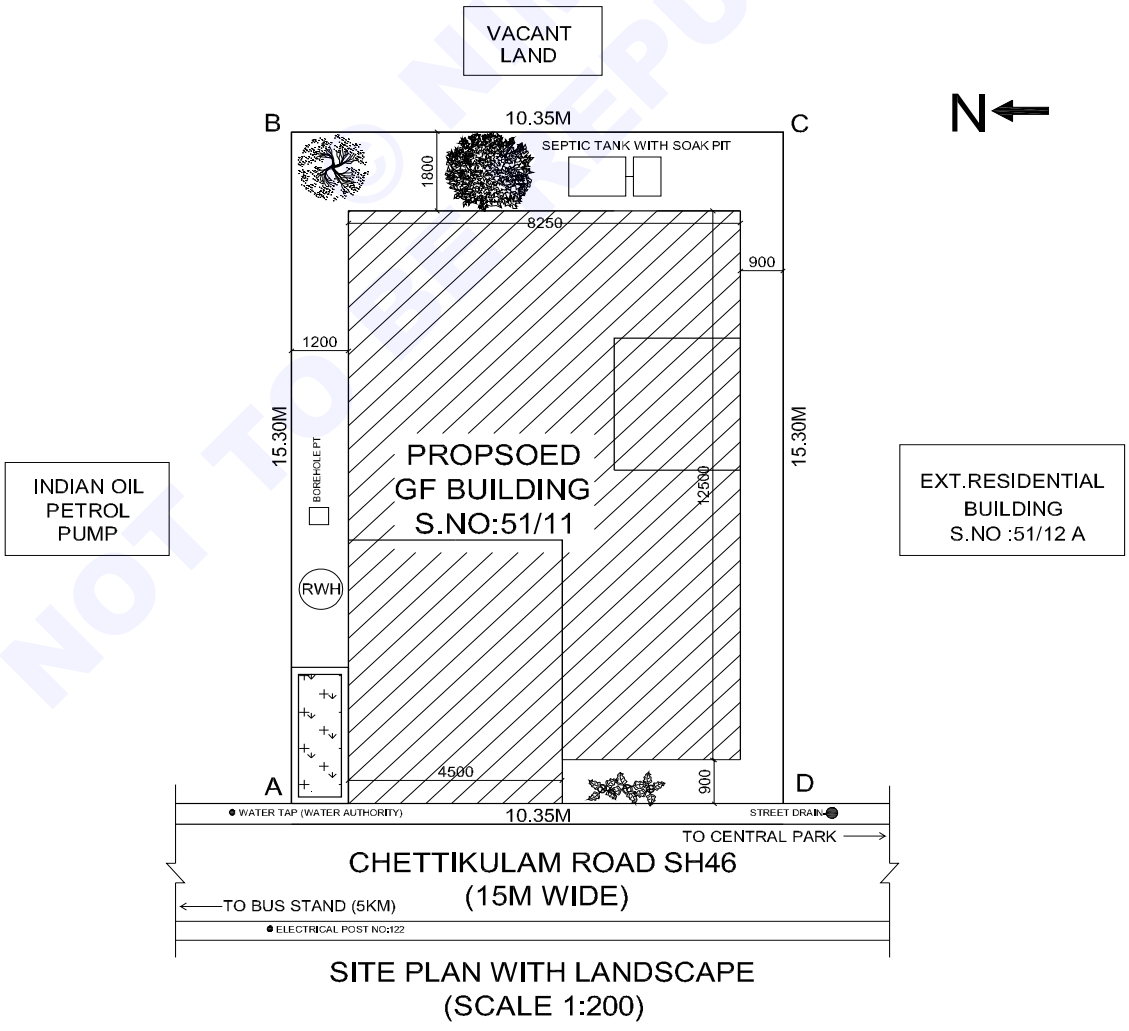
4 Create dimensions and other required notes as shown.

5 Identify and mark the front, rear and side yards.

6 Draw symbols for north direction.

7 Complete the required drawing.

Fig 1



SITE PLAN WITH LANDSCAPE
(SCALE 1:200)

AD20N1869H1

Damp proofing at plinth level

Objectives: At the end of this exercise you shall be able to
- **draw the details of damp proofing plinth in external wall**
- **draw the details of damp plinth internal wall.**

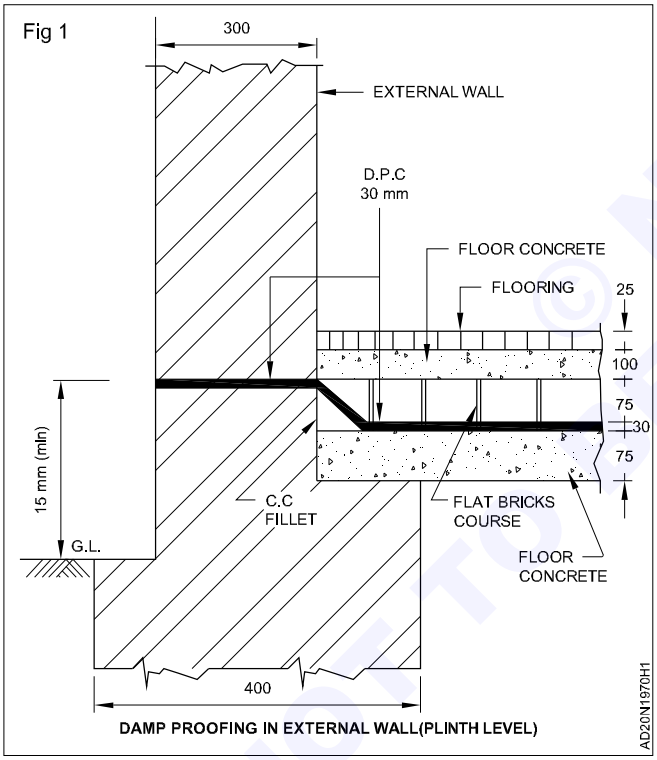
Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3	- 1 No.
• 'T' square, set square	- 1 No.	• Pencil, H, HB (each)	- 1 No.
• 30cm metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- As reqd.

PROCEDURE

TASK 1: **Draw the details of damp proofing in external wall (Fig 1)**

Fig 1



DAMP PROOFING IN EXTERNAL WALL(PLINTH LEVEL)

DATA	
Wall thickness	- 30mm
Depth of lean concrete	- 75mm
Thickness of flat brick	- 75mm
Thickness of D.P.C.	- 30mm
Thickness of floor concrete	- 100mm
Thickness of flooring	- 25mm

1 Draw the section of wall and basement.

2 Draw 75mm thick lean concrete.

3 Draw 30mm thick D.P.C cover lean concrete.

4 Draw 75mm thick brick course over D.P.C.

5 Draw 100mm thick floor concrete over the layer of bricks.

6 Draw 25mm thick flooring over concrete layer.

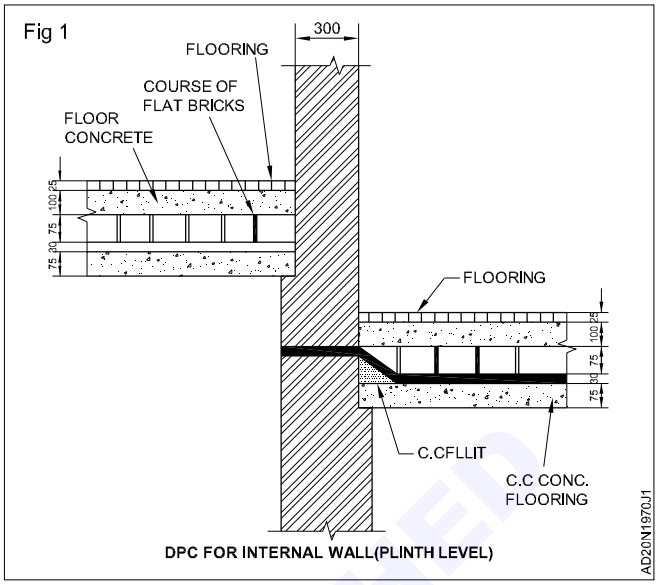
7 Show conventional symbols and mark the parts.

TASK 2: **Draw the details of damp proofing in internal wall (Fig 1)**

Two ground floors at different levels are connected by an internal wall

1 For drawing higher floor, show the floor at some height above the lower floor as shown in figure 1.

The D.P.C in the internal wall is in level with lower floor level.



Drawing damp proofing details at terrace (Roof) level

Objectives: At the end of this exercise you shall be able to
- **to draw the detailed sections of damp proofing in pitched roofs**
- **draw damp proofing in flat roof and parapet walls.**

Requirements

Tools/Instruments/Machines

- Drawing board - 1 No.
- 'T' square, set square - 1 No.
- 30cm metric scale - 1 No.
- Instrument box - 1 No.

Materials

- Drawing sheet A3 - 2 No.
- Pencil, H, HB each - 1 No.
- Eraser - 1 No.
- Cello tape - As reqd.

PROCEDURE

TASK 1: **Draw the detailed section of damp proofing in pitched roofs**

DATA	
Wall thickness	- 230 mm
Main tie beam	- 60 x 60 x 6 mm (steel)
Principle Rafter	- 75 x 75 x 6 mm
Purlin	- 18 x 12 cm (wood)
Gusst plate	- 10 mm thick
Bearing plate	- 20mm thick
Pitch of the roof	- 30°
Dia of rivet	- 16 mm
Dia of rivet head	- 26 mm
Common rafter	- 10 x 5 cm
DPC	- 20 mm
(Bitumen felt) Batten	- 50 x 12 mm,150 mm c/c
Stone pad	- 150 x 150 x 100 mm
Scale	- 1:20

Draw the section of wall

1 Draw stone pad in the wall with coping stone.

2 Draw the main tie beam. Draw principle rafter at an angle of 30^0.

3 Draw the gusset plate.

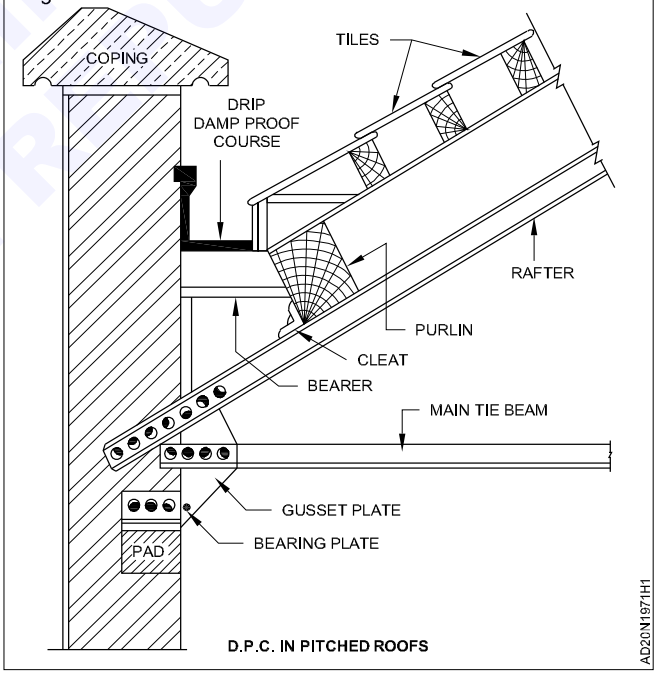
4 Draw the clean and purlin perpendicular to principle rafter.

5 Draw the common rafter and tiles as shown in Fig 1.

6 Draw DPC above the bearer and below the coping.

7 Draw the rivet heads of dia 26mm. finish the drawing by conventional symbols as shown in Figure.

Fig 1



TASK 2: **Damp proofing in flat roofs and parapet (Fig 1)**

DATA	
Wall thickness	- 300mm
R.C.C slab	- 100mm thick
Lime concrete	- 75mm thick
DPC (asphalt)	- 20mm

1 Draw the section of wall with coping.

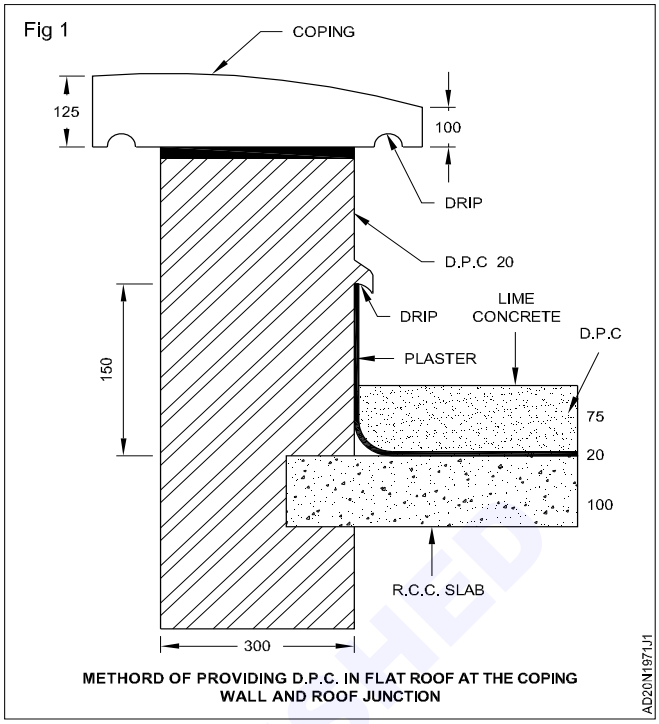
2 Draw the R.C.C slab inserting 130mm into the wall.

3 Draw DPC of 20mm thick on the roof slab and 150mm at the side of parapet wall.

4 Draw the 75mm lime concrete

5 Project the brick above vertical DPC to 5cm, and provide a drip of 6mm dia under the brick.

6 Draw the DPC below the coping and complete the drawing as shown in Fig 1.



METHORD OF PROVIDING D.P.C. IN FLAT ROOF AT THE COPING WALL AND ROOF JUNCTION

TASK 3: **Draw the details of damp proofing of flat roof by bitumen felting (Fig 1)**

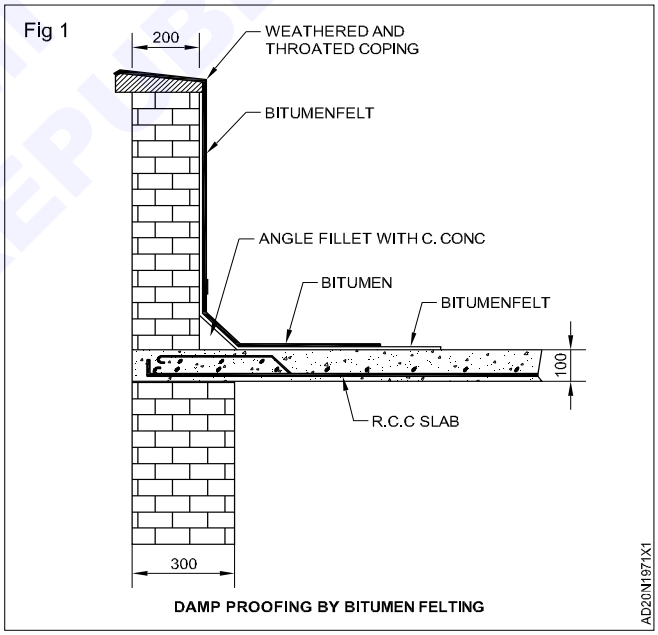
1 Draw section of wall 300 mm thick, with coping as shown in figure 1.

2 Draw the R.C.C. slab of 100 mm thick, at suitable level.

3 Draw an angle fillet with cement concrete at the junction of slab and parapet wall.

4 Draw a line to show bitumen felt over the slab and side of the parapet wall, upto coping.

5 Draw a thick line to show the hot bitumen spread on the layer of bitumen felt.



DAMP PROOFING BY BITUMEN FELTING

TASK 4: **Draw the details of damp proofing by mud phuska terracing with tile (Fig 1)**

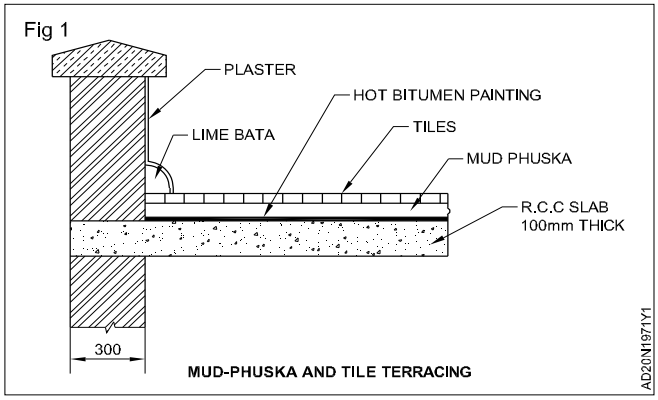
1 Draw section of wall and slab

2 Draw a line to show the bitumen spray, over the slab.

3 Draw mud phuska terrace 80 mm thick over the bitumen layer.

4 Draw tiles over 13 mm thick mud mortar.

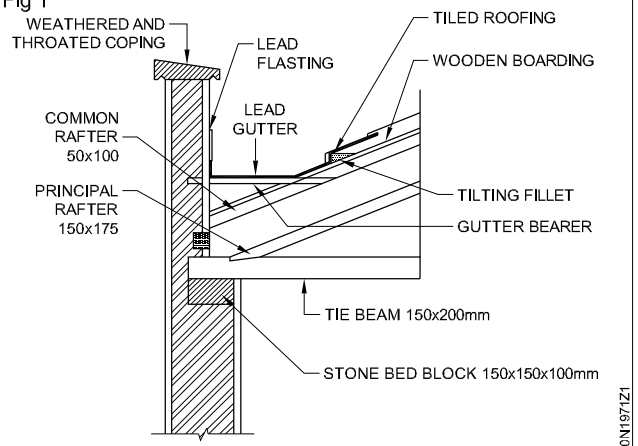
5 Draw lime/cement concrete at the junction of paved tiles and side of parapet, as shown in Fig 1.



MUD-PHUSKA AND TILE TERRACING

TASK 5: **Draw the details of damp proofing in pitched roof (Fig 1)**

Fig 1



DAMP PROOFING IN SLOPING ROOF

DATA

Wall thickness - 300 mm

Stone bed block - 150 x 150 x 100 mm

Main tie beam - 150 x 200 mm

Principal rafter-150 x 175 mm

Common rafter-50 x 100 mm

Purlin-100 x 175 mm

Battens-50 x 30 mm

Pitch of roof-30^0

1 Draw section of wall.

2 Draw the stone bed block.

3 Draw main tie beam.

4 Draw principal rafter at an angle of 30 .

5 Draw cleat and purlin over the principal rafter.

6 Draw common rafter at a distance of 150 mm above the principal rafter.

7 Draw tiled roofing over battens.

8 Show lead gutter over the bearer as shown in figure 1.

9 Shows lead flashing which extend to the vertical face of the wall and stop inside the wall.

Note : Instructor should guide the trainees to identify the location of defects due to water seepage in Roof & wall of the building.

— — — — — — —

Methods of damp proofing at basement level

Objective: At the end of this exercise you shall be able to
- **draw details of damp proofing in basement.**

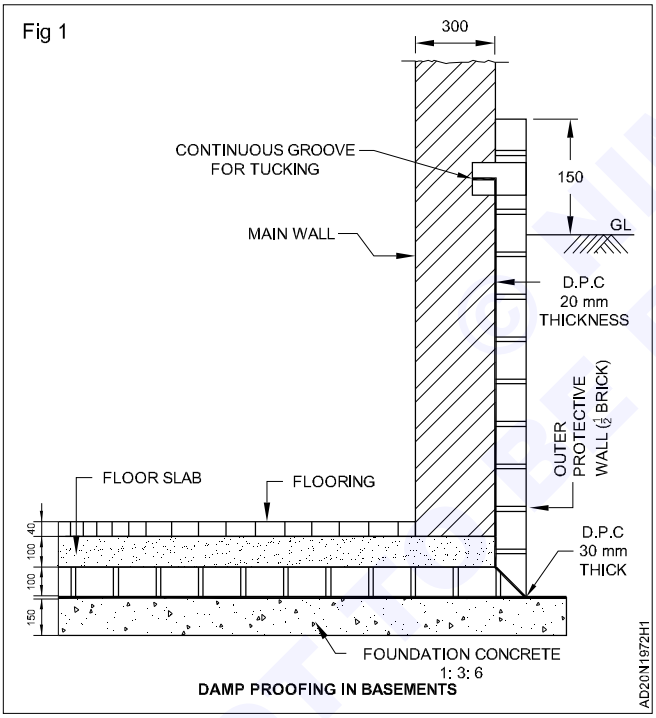
Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3	- 1 No.
• 'T' square, set square	- 1 No.	• Pencil, H, HB each	- 1 No.
• 30cm metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- as reqd.

PROCEDURE

TASK 1: **Draw the details of damp proofing in basement (Fig 1)**

Fig 1



DAMP PROOFING IN BASEMENTS

DATA	
Thickness of main wall	- 300 mm
Thickness of horizontal D.P.C	- 30 mm
Thickness of vertical D.P.C	- 20 mm
Thickness of foundation concrete	- 150 mm
Thickness of brick wall	- 100 mm
Thickness of floor concrete	- 100 mm
Thickness of flooring	- 40 mm

1 Draw the section of foundation concrete of thick 200 mm.

2 Draw horizontal D.P.C. of thick 30mm.

3 Draw vertical outer protective wall of ½ brick thick.

4 Draw vertical D.P.C. of 20 mm thick up to 150 mm above ground level.

5 Draw 100 mm thick brick layer over D.P.C.

6 Draw 100 mm thick floor concrete over brick layer.

7 Draw vertical main wall of 300mm thick.

8 Draw flooring above the floor concrete.

9 Show the proper conventional symbols and mark the important parts.

Damp proofing in cavity walls

Objective: At the end of this exercise you shall be able to
- **draw details of damp proofing by cavity wall.**

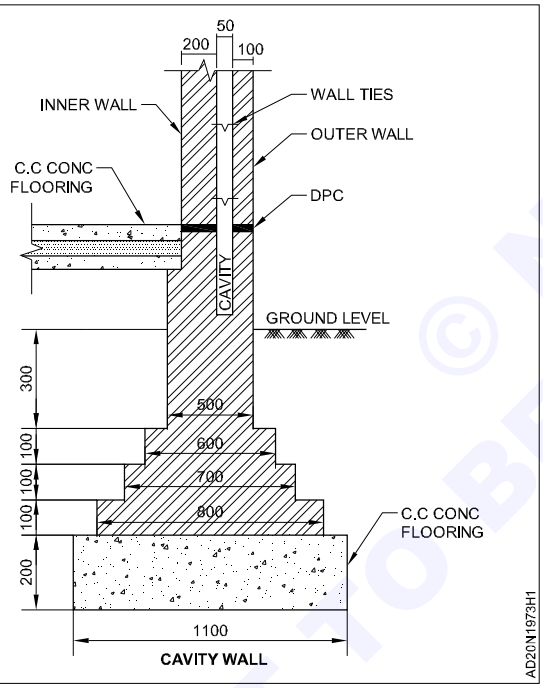
Requirements

Tools/Instruments/Machines		Materials	
• Drawing board	- 1 No.	• Drawing sheet A3	- 1 No.
• 'T' square, set square	- 1 No.	• Pencil, H, HB each	- 1 No.
• 30cm metric scale	- 1 No.	• Eraser	- 1 No.
• Instrument box	- 1 No.	• Cello tape	- As reqd.

PROCEDURE

TASK 1: **Draw details of damp proofing , by cavity wall (Fig 1)**

Fig 1



DATA

Thickness of outer wall	- 100 mm
Thickness of inner wall	- 200 mm
Thickness of Cavity	- 50 to 75 mm

Metal ties-900 mm c/c horizontally and 450 mm vertically.

1 Draw section of foundation, floor, and wall as shown in figure.

2 Draw the inner wall of thickness 200 mm and outer wall of thickness100 mm leaving a cavity of 50 mm in between them.

3 The cavity starts from 15 to 30 cm above ground level.

4 Draw D.P.C. at floor level for inner and outer walls.

5 Draw the metal ties at a distance of 450 mm c/c vertically.

Load Bearing wall

Objective: At the end of this exercise you shall be able to
- **draw a load bearing wall.**

Requirements

Tools/Instruments/Machines		Materials	
• Computer with CAD	- 1 No.	• A3 size paper	- 1 No.
• Printer	- 1 No.		

PROCEDURE

TASK 1: **Draw a cross section of a load bearing wall**

DATA	
Width of foundation	- 1200 mm
Height of sub structure	- 1500 mm
Height of super structure	- 4800 mm
Height of basement	- 600 mm
Height of window	- 1200 mm
Size of lintel	- 200 x 200 mm
Projection of chajjah	- 600 mm
Height of room	- 3000 mm
Roof slab thickness	- 150 mm
Weathering course thickness	- 100 mm
Parapet wall height	- 800 mm
Wall thickness	- 200 mm

Complete the drawing of component part of a double storied residential building.

1 Select a scale 1:20

2 Layout the drawing sheet of section a load bearing wall

3 Prepare foundation.

4 Prepare basement level

5 Prepare wall thickness with cross section window details

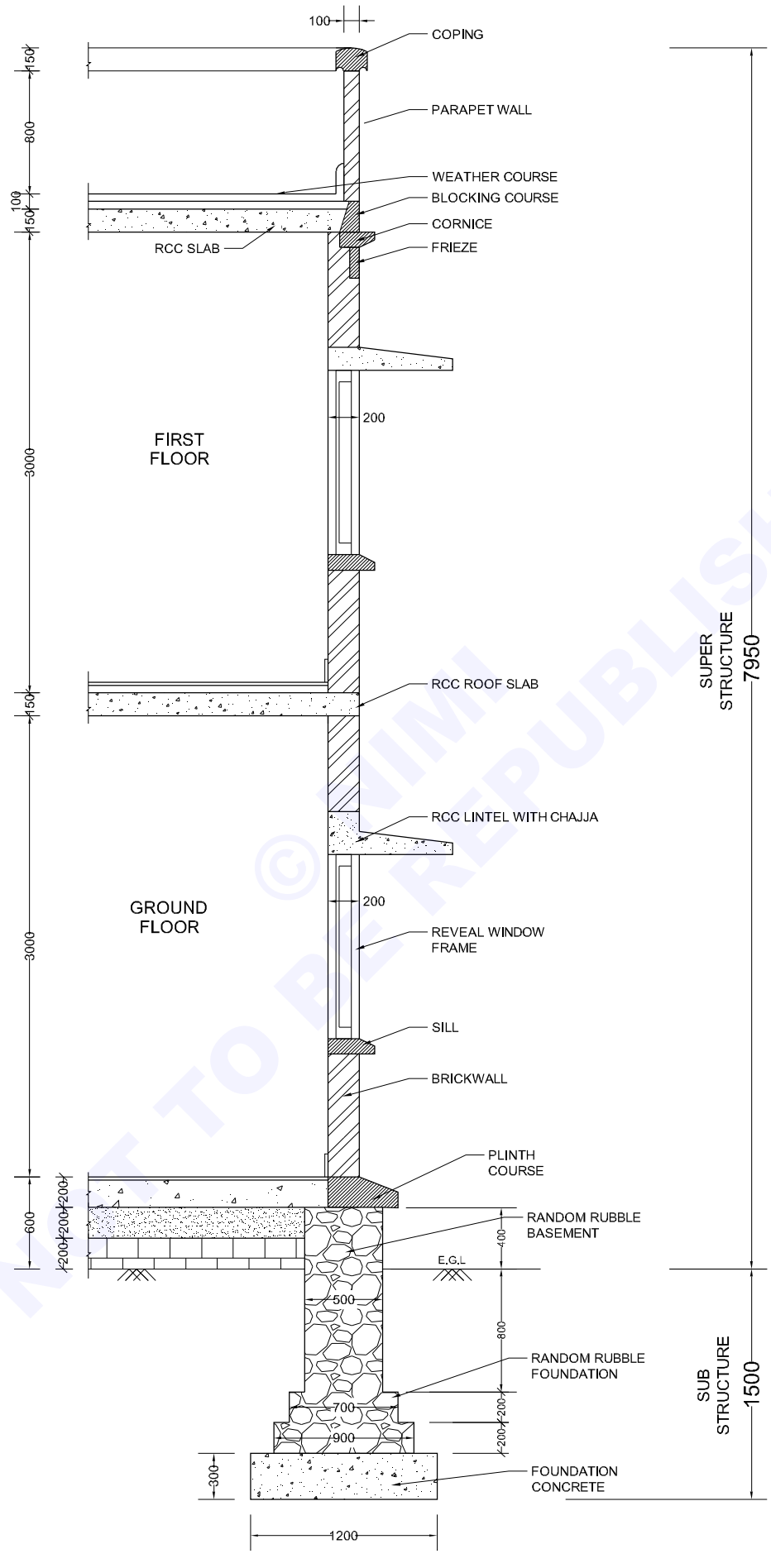
6 Prepare roof thickness

7 Prepare parapet wall,coping.

8 Complete cross section of aload bearing wall.

Note: Instructor should be guide to the trainees in developing the required lines.

Fig 1



LOAD BEARING WALL

AD20N1974H1

RCC framed structure

Objective: At the end of this exercise you shall be able to
- **draw a framed structure.**

Requirements			
Tools/Instruments/Machines		**Materials**	
• Computer with CAD	- 1 No.	• A3 size paper	- 1 No.
• Printer	- 1 No.		

PROCEDURE

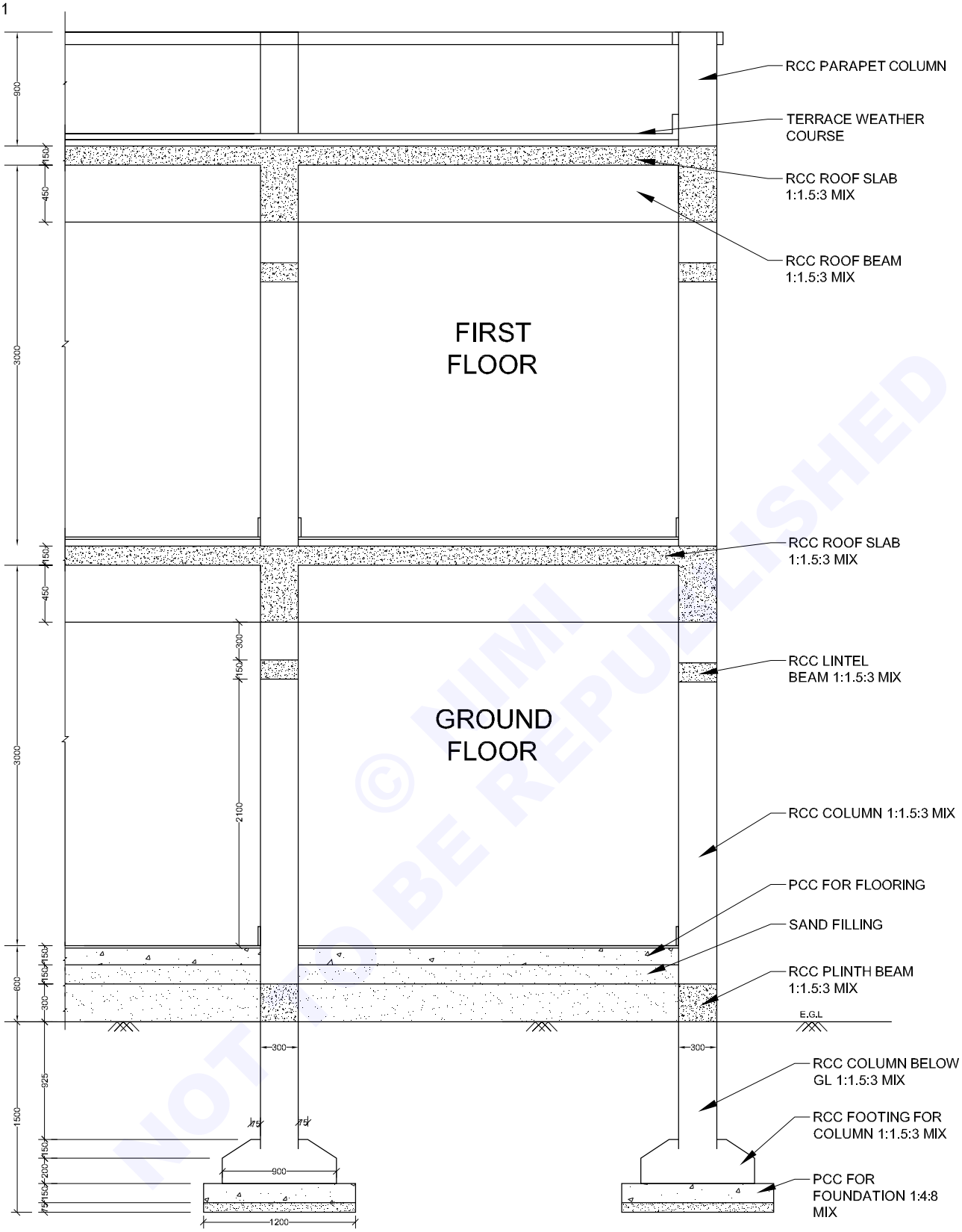
TASK 1: **Draw a framed structure**

DATA	
Size of column	-300 x 300 mm
Clean span between column	- 3000 mm
Height of column	- 3000 mm each floor
Size of bed concrete footing	- 900 x 900 mm
Depth of Bed concrete	- 200 mm
Depth of foundation	- 1500 mm
Thickness of sand filling	- 75 mm
Thickness of PCC	- 150 mm
Thickness of sloped footing	- 150 mm
Offset from column surface	- 75 mm
Roof slab thickness	- 150 mm
RCC. Beam size	- 300 x 450 mm

1 Select scale 1:50
2 Layout of drawing sheet of framed structure.
3 Prepare substructure.
4 Prepare substructure with Column, Beam,Roof
5 Complete framed structure.

Note: Instructor should be guide to the trainees in devloping the require line.

Fig 1



TYPICAL VERTICAL SECTION OF TWO STORIED FRAMED STRUCTURE

Advanced Auto CAD commands

Objective: At the end of this exercise you shall be able to
- **plotting drawings.**

Requirements

Tools/Instruments/Machines

- Computer with CAD - 1 No.

PROCEDURE

TASK 1: **Printing or plotting of a drawing can be done by using a printer or a plotter**

Print or plot command

Various input facilities are available for printing a drawing. Facilities like key board, menu bar or tool bar with mouse are explained below. (Fig 1)

1 **Printing a drawing by using key board :** Type print or plot at the command prompt area using key board and press the enter key. Now the command prompt area appears as shown below:

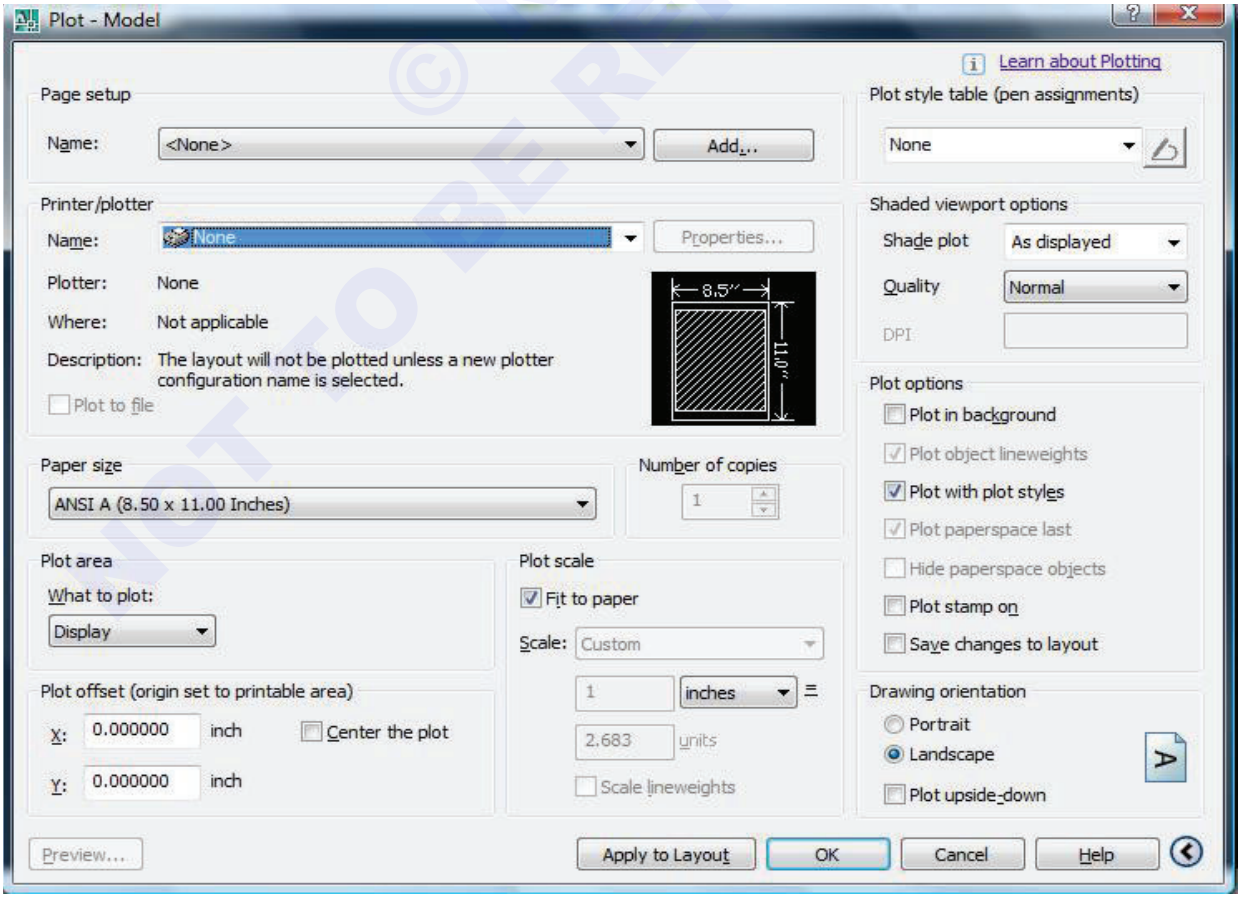
Command : PRINT or PLOT

Shortcut : Ctrl + p

Now a dialogue box namely plot appears on the screen.

2 **Printing a drawing by using menu bar with mouse:** Pick file from menu bar and plot from pull-down menu. Now a dialogue box namely plot appears on the screen.

Fig 1



3 **Printing a drawing by using tool bar with mouse:** Pick the icon of plot, from standard toolbar. Now a dialogue box namely plot appears on the screen.

For printing a drawing, follow the procedure shown below:

1 Pick the plot device tab.

2 Select the printer name (Say, HP deskjet) from the combo box.

3 Pick plot setting tab.

4 Select a paper size (say, A4-210 x 297 mm) from the combo box provided against the paper size.

5 Pick the drawing orientation option (say portrait)

6 Then select the scale 1:1 from the combo box under plot scale.

7 Pick the window button under the heading plot area. Now, the cursor and drawing appears on the screen and command prompt area show, specify first corner: (Here, specify the first corner for the window on the screen).

Specify opposite corner: (Here, Specify the opposite corner for the window).

8 Pick the full preview button provided on the bottom left of the dialogue box.

9 Now the paper lay out with selected drawing appears on the screen.

10 Then click the right button of the mouse and pick exit from the button menu.

11 The dialogue box again appears on the screen.

12 Click OK button.

Now, the plotted drawing is obtained from the plotting device.

Convert to PDF

1 At the Plotting Window Select Name of Priner/Plotter To DWG TO PDF

2 Select paper size. Example: A3 (420.00X297.00 MM), If the drawing is in portrait orientation then select the same size as A3 (297.00 X 420.00 MM)

3 Go to Plot area, Select What to plot as “window”

4 Now the drawing area will appear, Specify the first corner and opposite corner of the layout you drawn

5 Make sure to draw the layout as the same size of the paper we are going to print

6 Click the checkbox “Center the Plot”, (the preview will show in red if the drawing area exceeds the printing layout

7 Select the plot scale. Example 1:100

8 Select the drawing orientation as landscape or portrait

9 Click preview and check for any correction and then click Plot or OK

Layers

Objective: At the end of this exercise you shall be able to
- **draw layers**.

TASK 1: **Draw layers**

Layers

1 An Auto CAD drawing can be constructed over several layers. A layer is like a transparent sheet of paper which holds drawing objects. For example, a drawing of the plans of a house could be constructed as follows: the walls would occupy a layer called 'walls', the doors and windows would be placed on a layer called 'fittings' etc.

2 When the drawing is structured in this way you have control over numerous aspects of the work. Auto CAD supplies you with one default layer named 0.

3 Any other layer must be created by the user, although you can assign as many layers as you like to a drawing. (Fig 1)

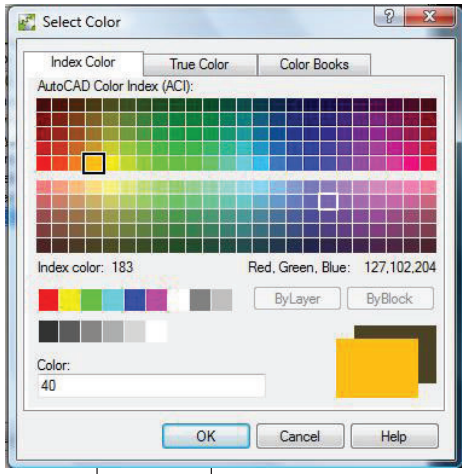
Setting up a new layer

1 Here we will set up two layers called hatch and fittings. To create a new layer first issue the layer command.

2 Pull down menu: Format, Layer

3 Command line: Layer, LA (Fig 2)

Fig 2

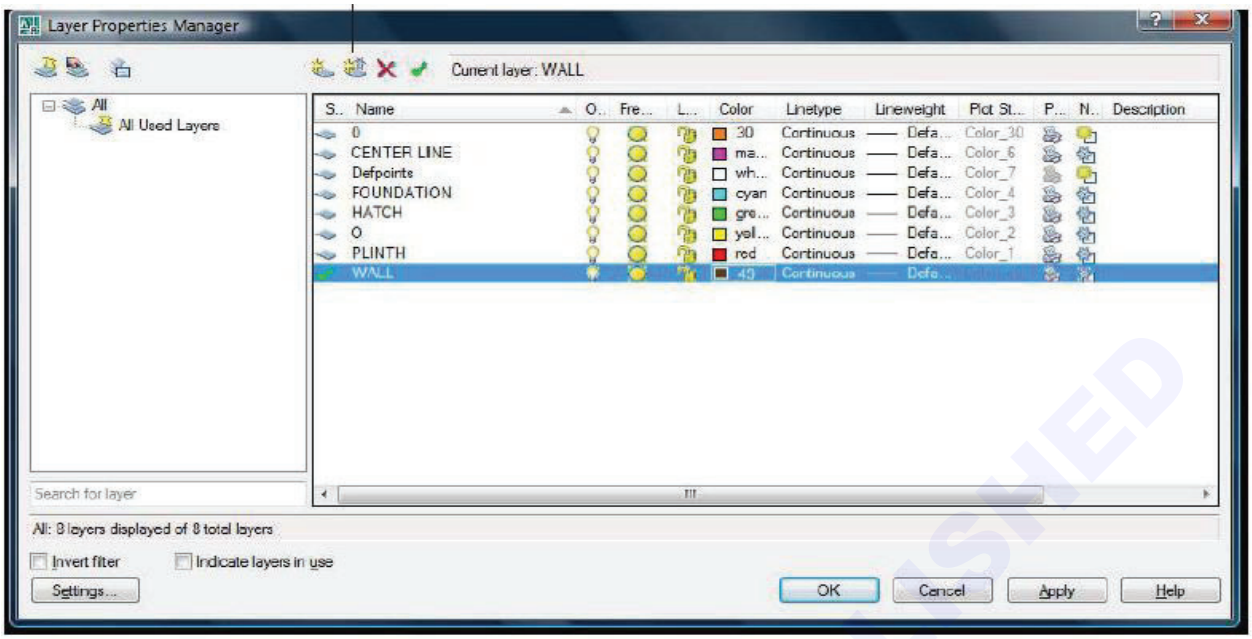


click ok

Click on the colour for the hatch colour in the select colour dialogue box

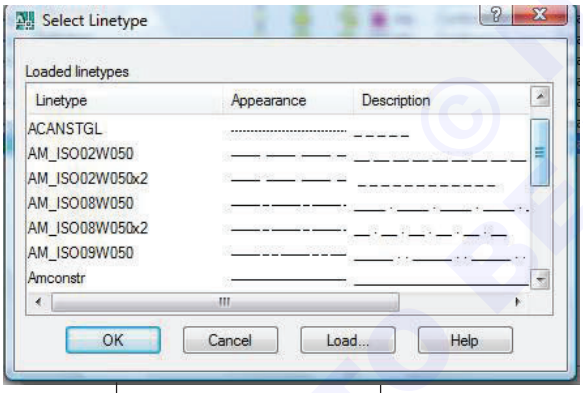
In the layer properties dialogue box, click on new

Fig 1



Click on line type (Fig 3)

Fig 3



click ok

select line type

Click on line weight

Click on apply m click on ok on the layer properties manager dialogue box

Making a layer current

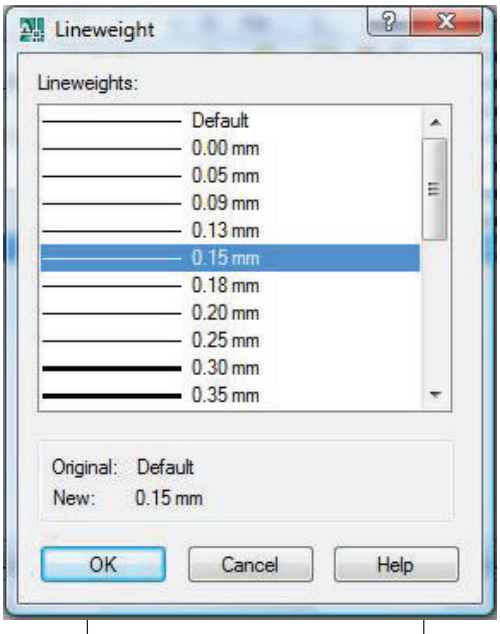
A layer must be current before you can draw on it. To make the layer (hatch) current, carryout the following easy steps

i Click on the layer name in the layer properties manager dialogue box, then click on the current button.

ii Click ok to return to the drawing editor.

iii The object properties toolbar at the top of the screen (see below) will show the name of the current layer and its colour. Try drawing something it will appear in colour 53. (Figs 2 to 4)

Fig 4

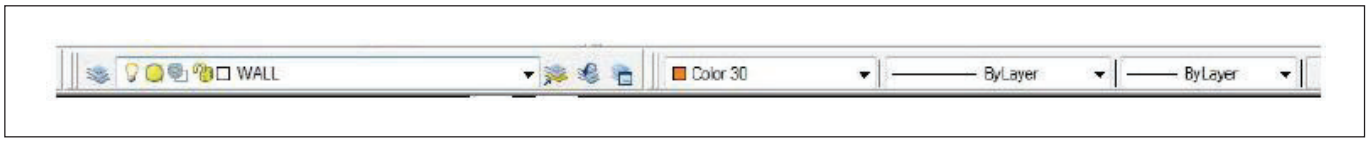


click ok

select line weight

Alternatively, to make a layer current from within the Drawing editor.

Click on the drawing editor any where.



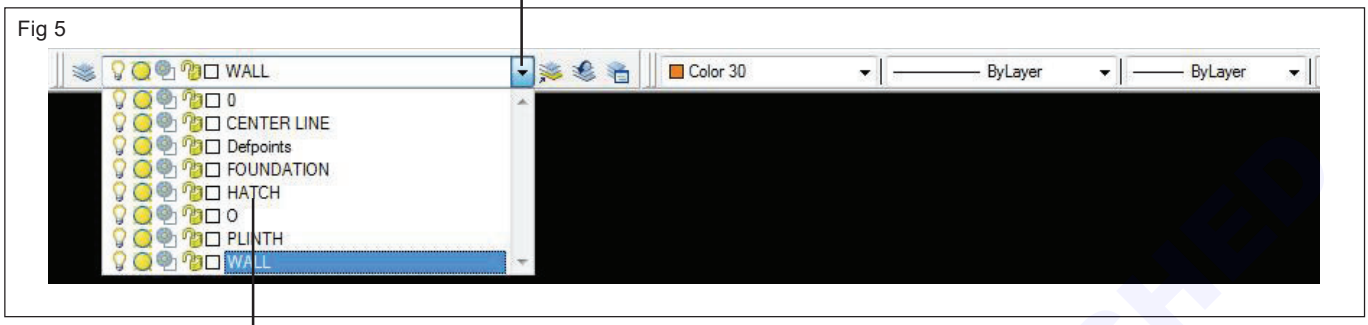
layers icon

current layer and color

Making layer visible or invisible (Figs 5 & 6)

Click here

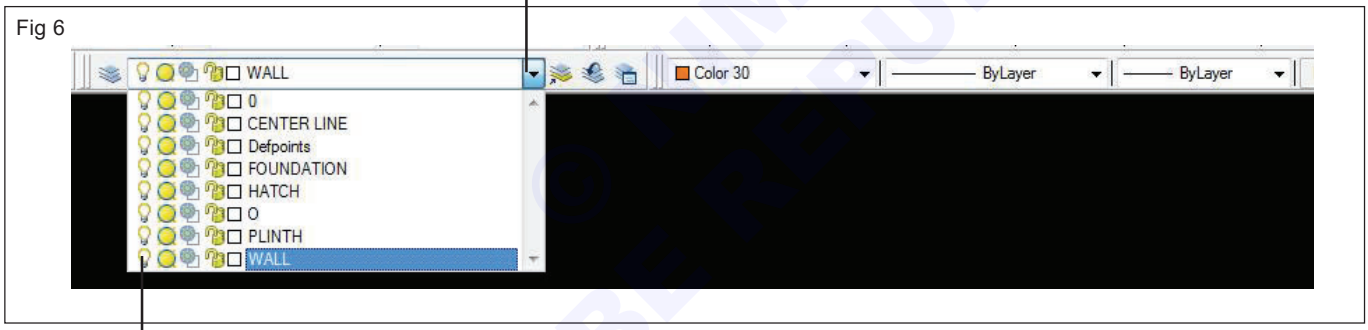
Fig 5



Click here near the layer name

Click here

Fig 6



Click here on the light bulb

Complex drawings may become cluttered, when can make it difficult to select objects for editing or drawing. This clutter may be reduced by making a layer invisible if you are not working on it. When layer is made invisible, the objects drawn on it disappear from the screen, but they still exist and are part of the drawing. Layers which are invisible are not click out on the drawing editor anywhere.
Clickout on the drawing editor anywhere.

Several layers can be made invisible if required. The icon for visible is a glowing light bulb. Invisibility is shown by a dull light bulb.

Practice 1 : Instructions (Fig 7)

1 Start a New file and select 1 workbook helper. dwt

2 Draw the LINES below using:

Draw / Line

Ortho (f 8) ON (to help you draw horizontal lines)

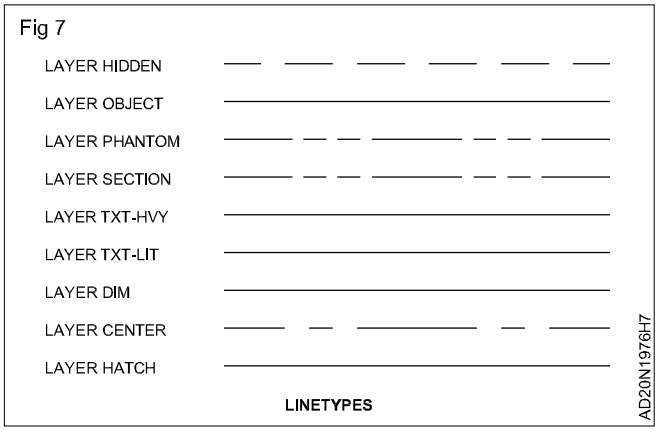
Increment snap (f 9) ON

3 Change to the appropriate layer before drawing each line.

4 Save this drawing using:

File / Save as / (File name)

Fig 7



Practice 2 : Instructions (Fig 8)

1 Start a New file and select 1 workbook dwt

2 Change the GRID SPACING to .40 and SNAP to .20

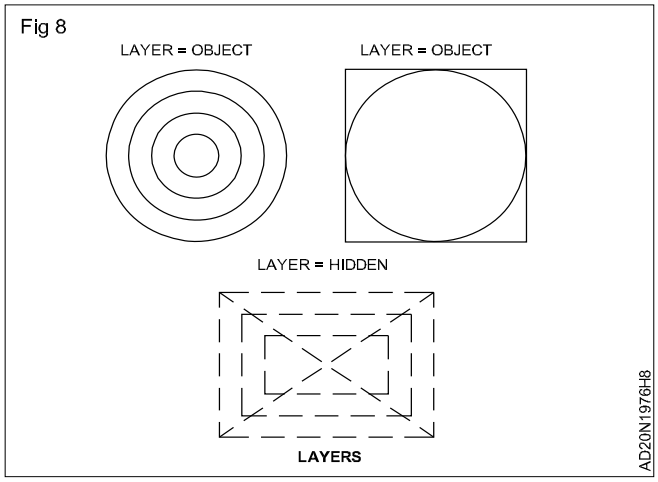
Using: TOOLS/DRAFTING SETTINGS

3 Draw the objects below, use the layers indicated.

4 Save this drawing using:

File/Save as/ (File Name)

Fig 8



2 Draw the 4 circles with the following Radii: 1,2,3, & 5 (use Object snap "Center" so all Circles have the same center).

3 Draw the lines using.

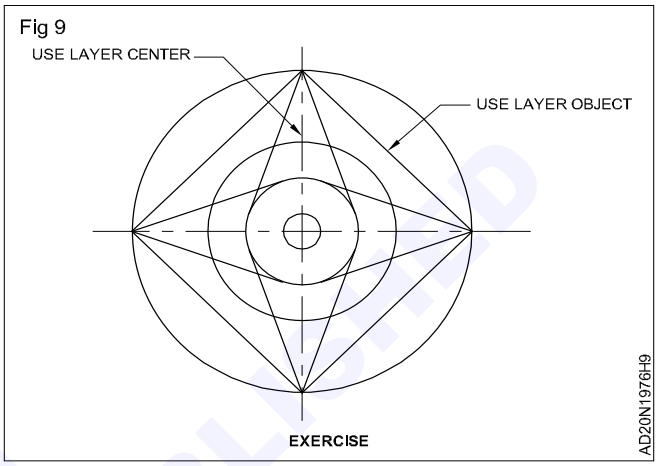
DRAW/LINE

ORTHO and SNAP = OFF

OBJECT SNAP = QUADRANT and TANGENT 4. Use Layers: Object and Center

5 Save this drawing as (File name).

Fig 9



Practice 3 : Instructions (Fig 9)

1 Start a New file and select 1 workbook dwt.

Dimensioning and text

Objectives: At the end of this exercise you shall be able to
- **draw dimensioning**
- **draw text and text style.**

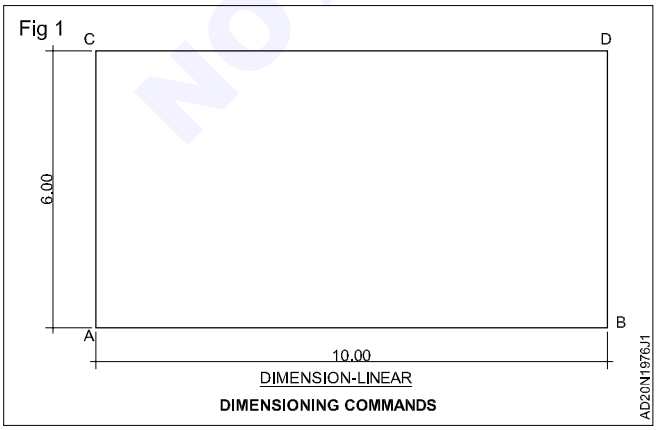
TASK 1: **Dimensioning commands**

1 While manufacturing an object, the drawing must contain size description such as the length, width, height, angle, radius, diameter and location of the object.

2 These are added to the drawing with the help of dimensioning.

1 Dimension - linear (Fig 1) : This command is used to measure horizontal and vertical dimensions between two points.

Fig 1



Tool bar : Dimension, Linear

Pull Down : Dimension, Linear

Command : DIM LIN /DLI

Example

Command : DIM LIN / DLI

1 Specify first extension line origin of : Selection point A.

2 Specify second extension line original : Select point B.

3 Specify dimension line location or

4 [Mtext/Text/Angle/Horizontal/Vertical/Rotated]: Mouse click on the position where the dimension is to be placed.

5 Dimension text = 6.00

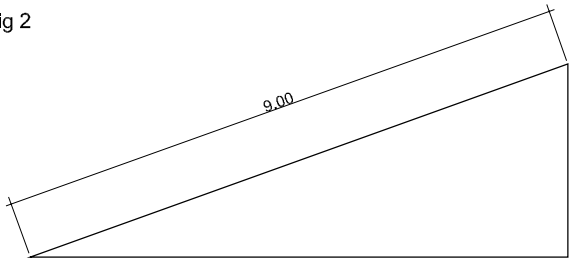
2 Dimension - aligned (Fig 2) : This command is used to measure inclined dimension between two points.

Tool bar : Dimension, Aligned

Pull down : Dimension, Aligned

Command : DIM ALI /DAL

Fig 2



DIMENSION-ALIGNED

DIMENSIONING COMMANDS

AD20N1976J2

Example

Command : DIM ALI/DAL

1 Specify first extension line origin or : Select point A

2 Specify first extension line origin : Select point B

3 Specify dimension line location or

4 [Mtext/Text/Angle/Horizontal/Vertical/Rotated]: Mouse click on the position where the dimension is to be placed

5 Dimension text = 9.00

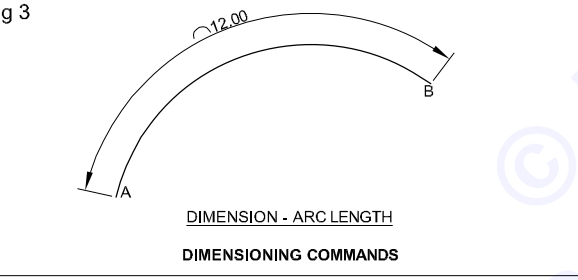
3 Dimension - ARC length (Fig 3) : This command is used to measure the length of an arc.

Tool bar : Dimension, Arc length

Pull Down : Dimension, Arc length

Command : DIMARC/DAR

Fig 3



DIMENSION - ARC LENGTH

DIMENSIONING COMMANDS

AD20N1976J3

Example

Command : DIM ARC / DAR

Command : DAR DIMARC

1 Select arc or polyline arc segment

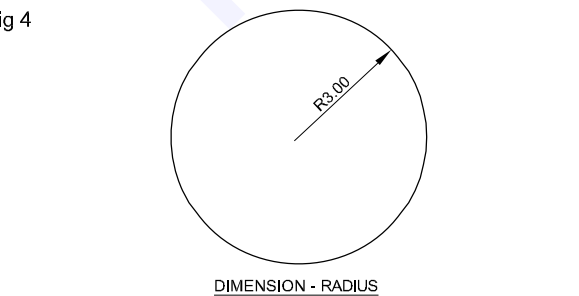
2 Specify arc length dimension location,

3 Or [Mtext/Text/Angle/Partial/Leader]: Mouse click on the position where the dimension is to be placed

4 Dimension text = 12.00

4 Dimension - radius (Fig 4) : This command is used to measure the radius of an arc or circle.

Fig 4



DIMENSION - RADIUS

DIMENSIONING COMMANDS

AD20N1976J4

Tool bar : Dimension, Radius

Pull Down : Dimension, Radius

Command : DIM RA/DRA

Example

Command : DIM RA / DRA

Select arc or circle : Select the circle

Dimension text : 3.00

Specify dimension line location or [Mtext /Text/Angle]

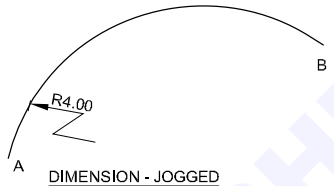
5 Dimension - jogged (Fig 5)

Tool bar : Dimension, Jogged

Pull Down : Dimension, Jogged

Command : DIM JO/DJO

Fig 5



DIMENSION - JOGGED

DIMENSIONING COMMANDS

AD20N1976J5

Example

Command : DIM JO/DJO

Select arc or circle : Select the circle

1 Specify center location override: Select center

2 Dimension text = 4.00

3 Specify dimension line location or [Mtext /Text/Angle]

4 Specify jog location: Mouse click on the position where the dimension is to be placed.

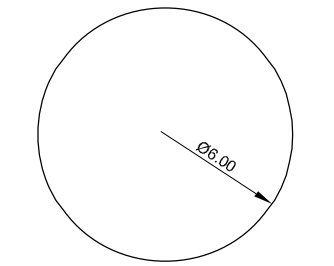
6 Dimension - diameter (Fig 6): This command is used to measure the Diameter of a circle.

Tool bar : Dimension, Diameter

Pull Down : Dimension, Diameter

Command : DIM DIA/DDI

Fig 6



DIMENSION -DIAMETER

DIMENSIONING COMMANDS

AD20N1976J6

Example

Command : DIM DIA/DDI

Select arc or circle : Select the circle

Dimension text = 6.00

Specify dimension line location or [Mtext /Text/Angle]
Mouse click on the position where the dimension is to be placed.

7 Dimension - Angular (Fig 7) : This command is used to measure the Angle between two non parallel straight lines.

Tool bar : Dimension, Angular

Pull Down : Dimension, Angular

Command : DIM ANG/DAN

Example

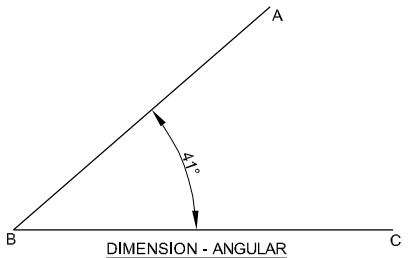
Command : DIM ANG/DAN

1 Select arc, circle, line, or <specify vertex>: Select AB

2 Specify dimension line location or [Mtext /Text/Angle]: Mouse click on the position where the dimension is to be placed.

3 Dimension text = 41

Fig 7



DIMENSION - ANGULAR

DIMENSIONING COMMANDS

AD20N1976J7

8 Dimension - continue (Fig 8) : This command is used to continue dimensioning after the first dimensioning has been executed.

Tool bar : Dimension, Continue

Pull Down : Dimension, Continue

Command : DIM CON/DCO

Example

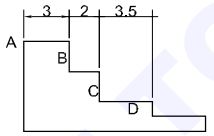
Command : DIM CON/DCO

1 Specify a second extension line origin or [Undo/Select] <Select>: Select C

2 Specify a second extension line origin or [Undo/Select] <Select>: Select D

3 Specify a second extension line origin or [Undo/Select] <Select>: Cancel

Fig 8



DIMENSION - CONTINUE

DIMENSIONING COMMANDS

AD20N1976J8

9 Dimension - base line (Fig 9): This command is used to give dimension when number or dimensions of a part have a common datum.

Tool bar : Dimension, Base line

Pull Down : Dimension, Base line

Command : DIM LEA/LE

Example

Command : DIM LEA/LE

1 Specify first leader point, Select point A

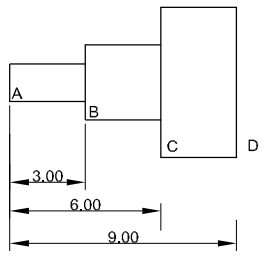
2 Specify next point: Select point B

3 Specify next point:

4 Specify text width <0.0000>:

5 Enter first line of annotation text <Mtext>: WOODEN BLOCK

Fig 9



DIMENSION -BASELINE

DIMENSIONING COMMANDS

AD20N1976J9

10 Dimension - leader (Fig 10) : This command is used to give leader lines i.e. used to describe some features in the drawing.

Tool bar : Dimension Leader

Pull Down : Dimension Leader

Command : DIM LEA/LE

Example

Command : DIM LEA/LE

1 Specify first leader point, Select point A

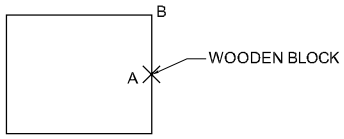
2 Specify next point: Select point B

3 Specify next point

4 Specify text width <0.0000>

5 Enter first line of annotation text <Mitest> WOODEN BLOCK

Fig 10



DIMENSION - LEADER

DIMENSIONING COMMAND

AD20N1976JA

11 Dimension - style (Fig 11 to 16)

Tool bar : Dimension, Dimension style

Pull Down : Dimension, Dimension style

Command : D

1 This command is used to select or change the properties of a dimension. When you enter this command the dimension style manager dialogue box will be displayed.

2 This dialogue box provides various options for modifying the dimension. Click on modify and give the new values.

Dimension sytle

1 Pull down menu: Dimension, Dimension style

2 When you select this, a dimension style manager dialogue box will appear on the screen.

3 A dimension style is a saved set of dimension settings defining the appearance and behaviour of the dimensions.

4 By creating dimension styles. You can set all relevant dimension system variables and control the layout and appearance of all dimesions within a drawing.

Fig 11

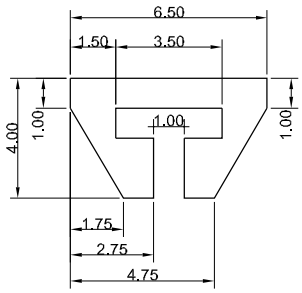


Fig 12

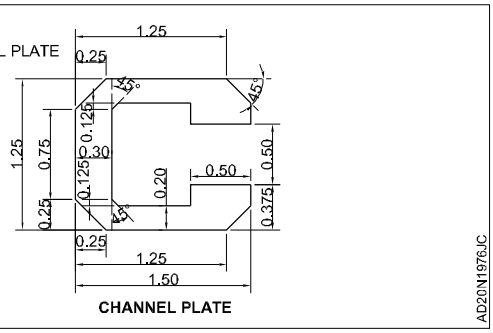


Fig 13

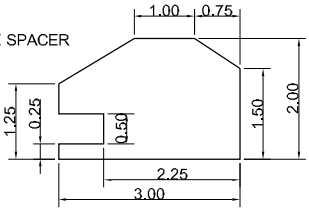


Fig 14

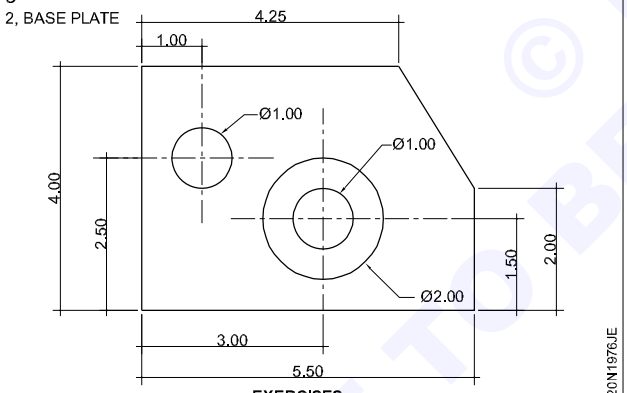


Fig 15

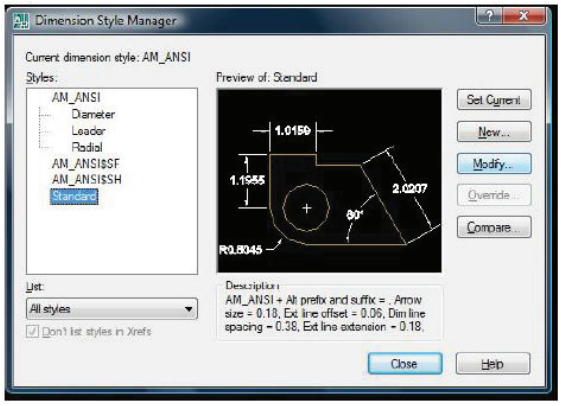
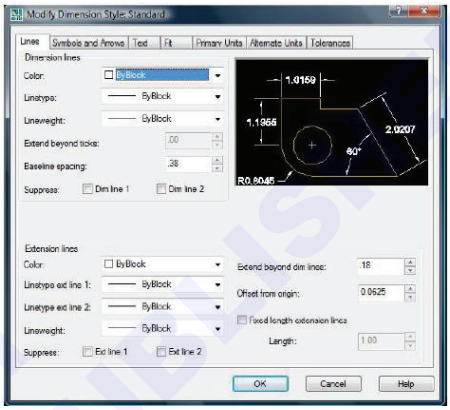
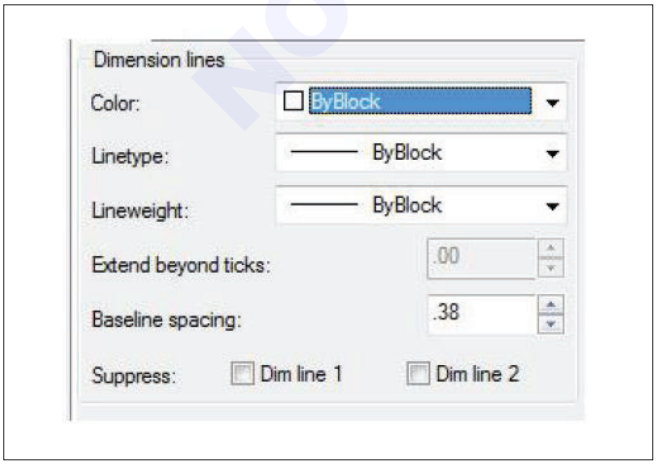


Fig 16



Description



Sets the dimension line properties

1 Colour displayed and sets the colour for dimension line.

2 Line type sets the type of the dimension line.

3 Line weight sets the line weight of the dimension line.

4 Extend beyond ticks specifies a distance to extend the dimension line past the extension line when you use oblique, architectural, tick, integral, and no marks for arrow heads.

5 Base line spacing sets the spacing between the dimension lines of a base line dimension. Enter a distance.

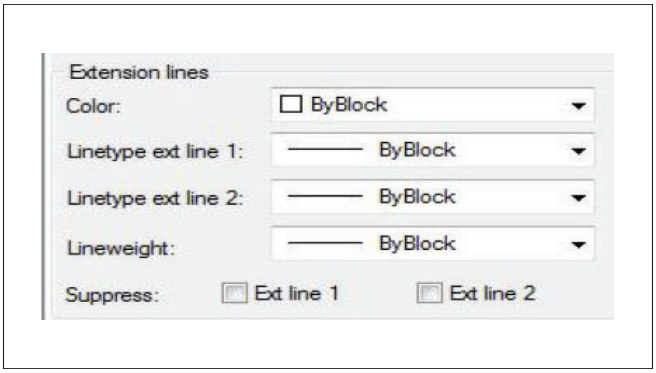
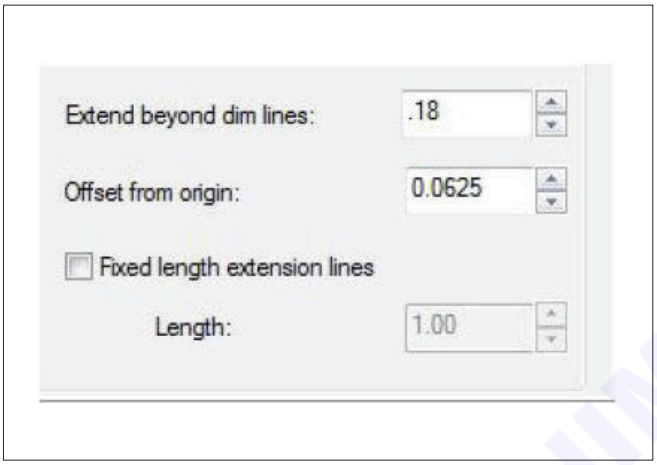
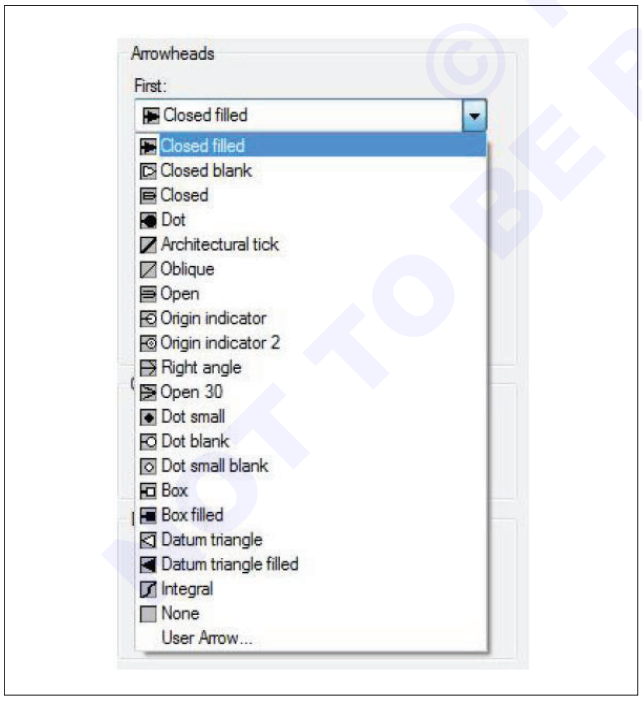
	6 Suppress suppresses display of dimension line when they are outside.
	**Set the extension line properties (Fig 17)** 1 Colour displayed and sets the colour for extension line. 2 Line type sets the type of the extension lines. 3 Line weight sets the line weight of the extension lines. 4 Suppress suppresses display of extension lines.
	1 External beyond dim lines specifies a distance to extension lines from the origin points that define the dimension. (Fig 18) 2 Offset from origin specifies the distance to offset the extension lines from the origin points that define the dimension. 3 Fixed length extension lines, set the length of the extension line.
	1 Here you can set the types of arrow heads. 2 Arrow size sets the size of arrow.

Fig 17

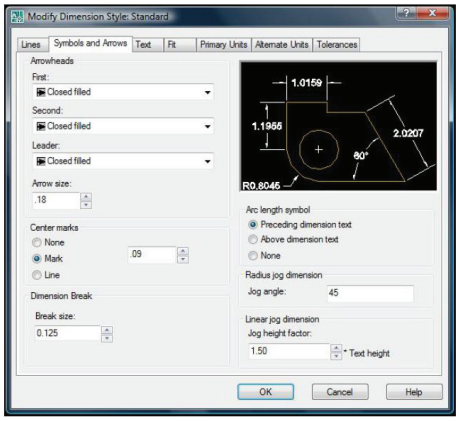
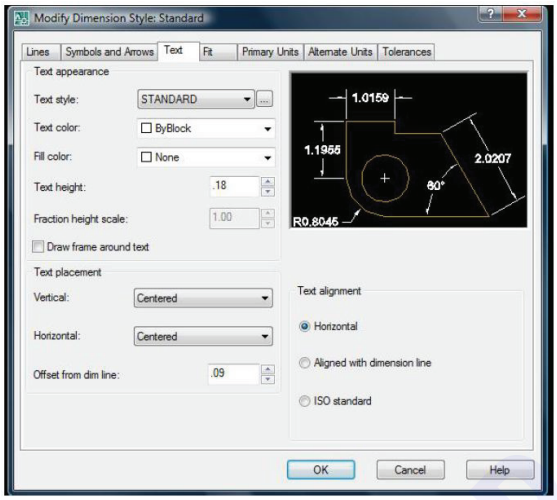
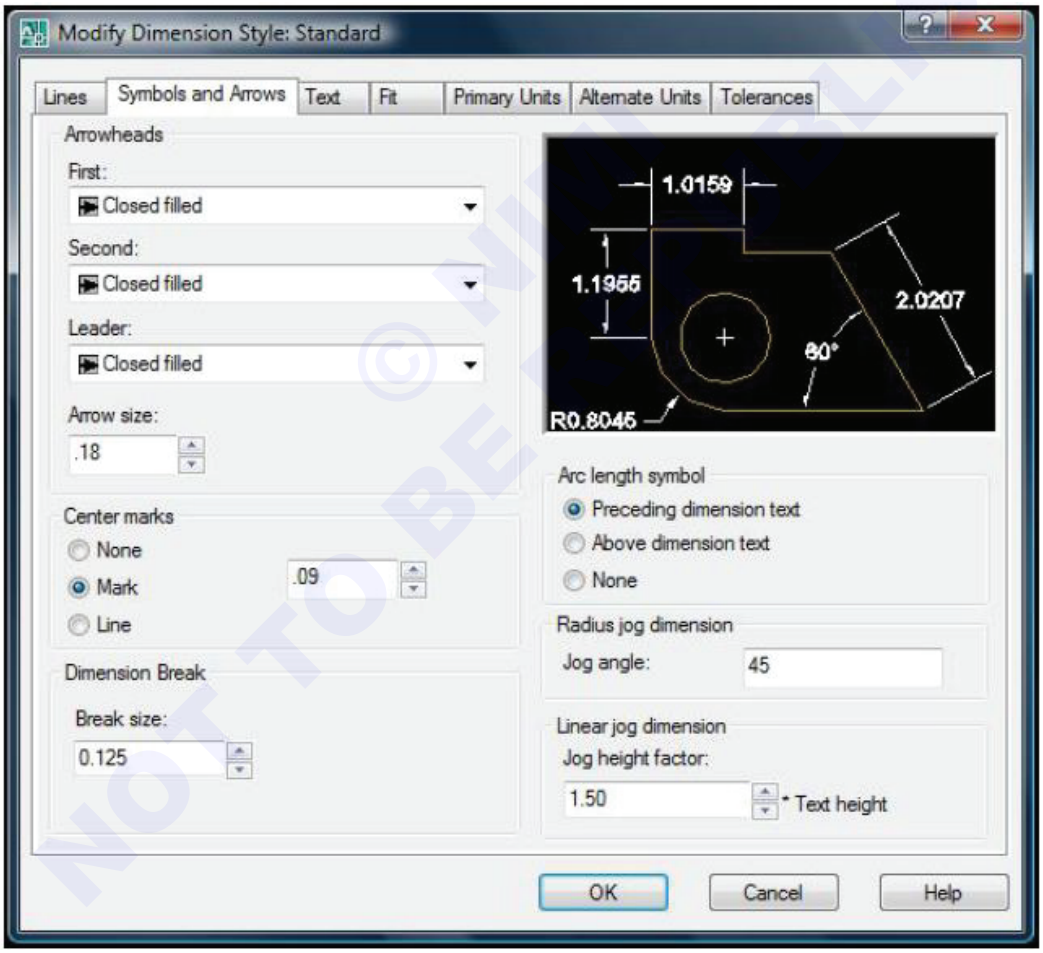


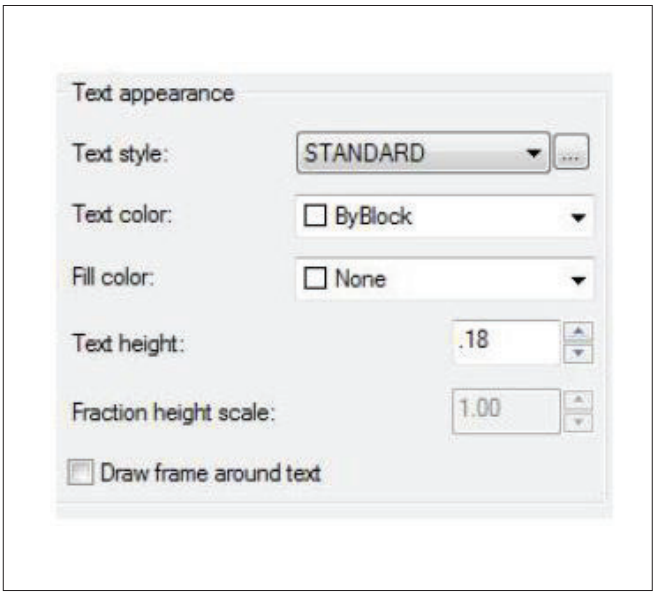
Fig 18



Symbols and arrows tab (Fig 19)

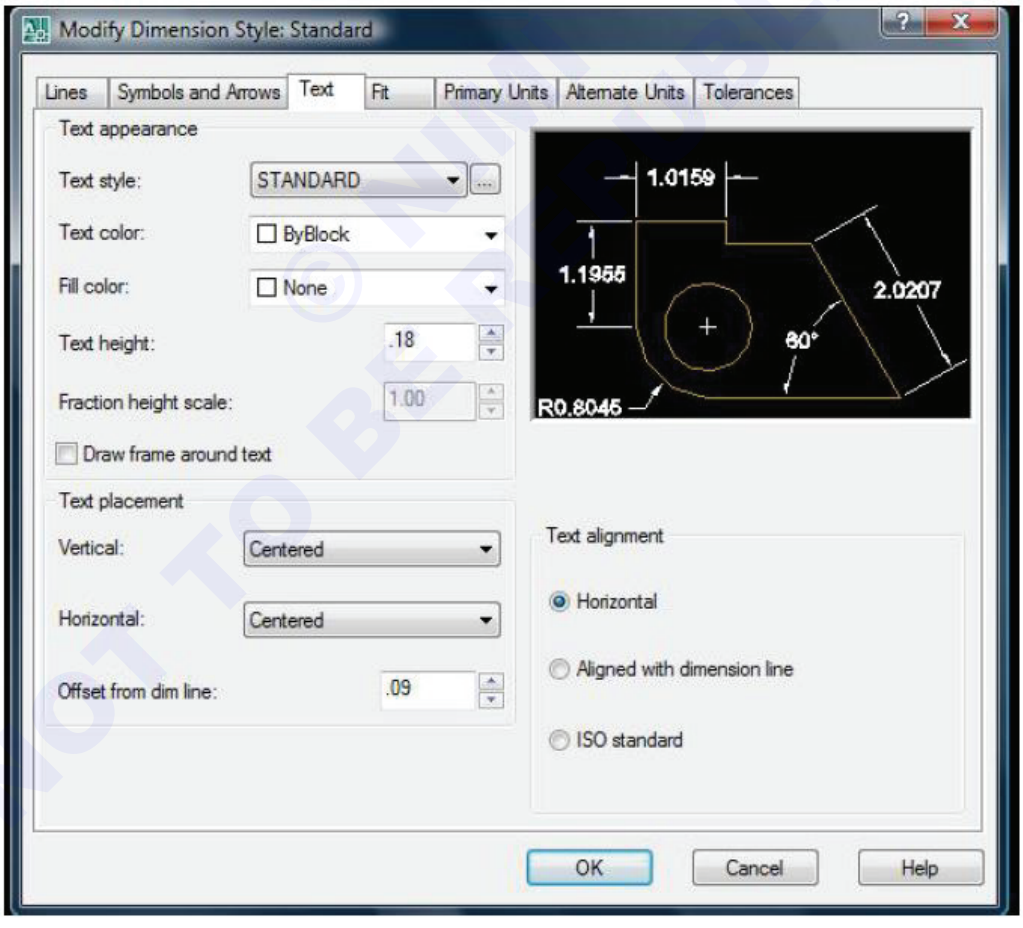
Fig 19



Description	
	1 Text style button displays the text style dialogue box, which you can use to define or modify text styles. 2 Text colour displays and sets the colour for the dimension text. 3 Text height displays and sets the current dimension text style. 4 Draw frame around text draws a frame around dimension text.

Text tab (Fig 20)

Fig 20



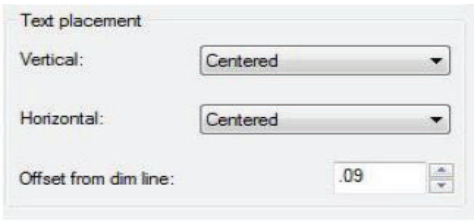
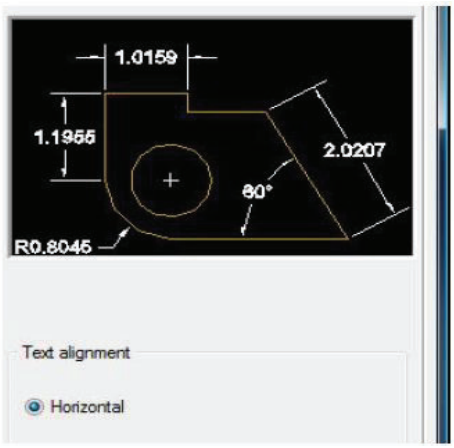
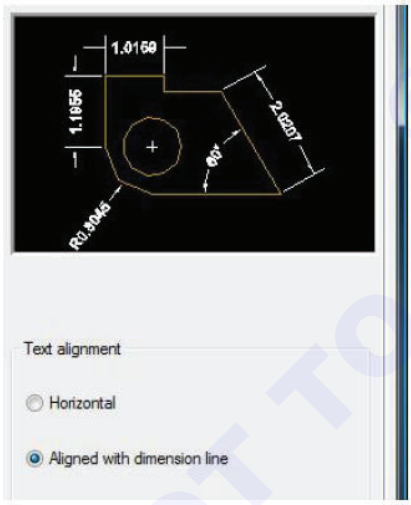
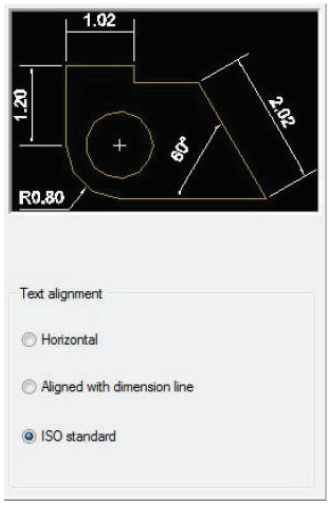
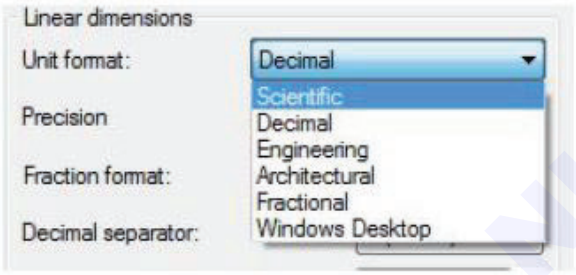
Description	
	1 Vertical position controls the vertical justification of dimension text along the dimension line. 2 Horizontal position controls the horizontal justification of dimension text along the dimension line and extension line. 3 Offset from dimension line displays and sets the current text gap, which is the distance around the dimension text when the dimension line is broken to accommodate the dimension text.
Fig 21 	1 Horizontal places text in a horizontal position. (Fig 21)
Fig 22 	2 Aligned with dimension line aligns text with the dimension line. (Fig 22)

Fig 23



3 ISO standards aligns text with the dimension line when the text is inside the extension lines, but aligns horizontally when text is outside the extension lines. (Fig 23)

Primary units tab



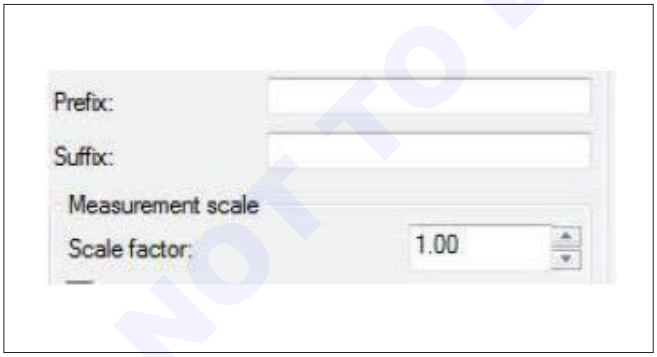
Description

1 Unit format sets the current for all dimension types accept angular. Options to select from include scientific, decimal, engineering, architectural, fractional etc.

2 Precision displays and sets the number of decimal places in the dimension text.

3 Fractional format sets the format for fractions. Options to select from include diagonal, horizontal, and not stacked.

4 Decimal separator sets the separator for decimal formats. Options to select from include period (.), comma (.), or space.



1 Prefix includes the prefix you enter in the dimension text. You can enter text or use control codes to display special symbols. For example, entering the control code % %c displays the diameter symbol.

2 Suffix includes the suffix you enter in the dimension text. You can enter text or use control codes to display special symbols.For example,entering the text mm results in the dimension text similar to that shown in the illustration.

3 Measurement scale defines measurements scale options as follows: Linear scale factor sets a scale factor for linear dimension measurements for all dimension types except angular.

Control code % displays the diameter symbol.

Primary units tab

Dimensioning: Create the following exercise using CAD commands.

Text

1 This command is used for entering the related details on a drawing. Text is used for entering details in the title blocks, for labelling the parts of drawing.

2 For giving specifications and for making annotations etc. There are two types of text used in Auto CAD.

i Single line text or D text.

ii Multiline text or M text.

i Single line text or D text (Fig 24)

Pull down : Draw, TEXT, single line text

Command : TEXT or DT

Current text style : "Standard"

Text height : 0.2000

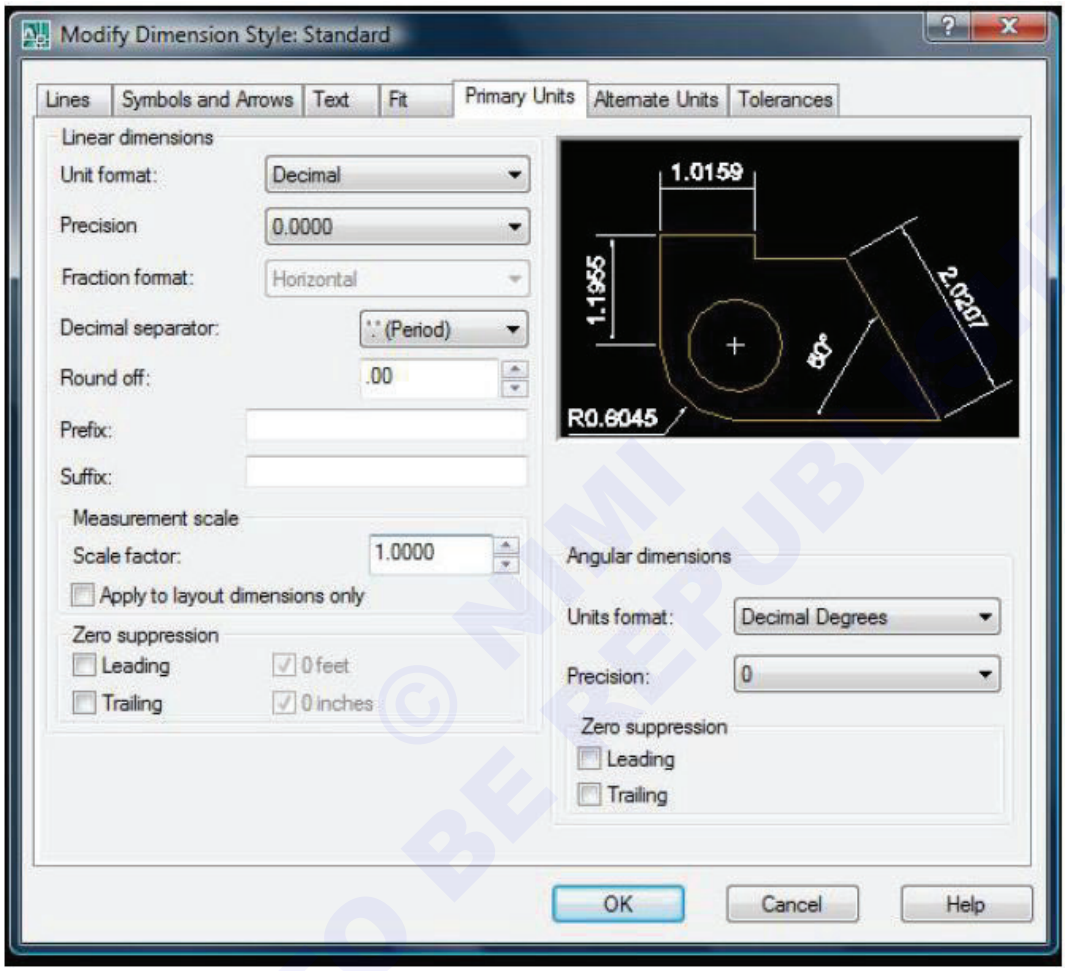
1 Specify start point of text or [Justify/Style]: Select start point.

2 Specify height<0.2000>: 25

3 Specify rotation angle of text <0>

4 Type on the screen: TEXT

Fig 24



ii Multiline text or M text

Pull down : Draw, Text, Multi line text

Command : MText or MT

Current text style : " Standard"

Text height : 0.2000

Specify first corner : Click on the first corner

Specify opposite comer or [Height/Justify/

1 Line spacing /Rotation/Style/Width]: click on the second corner Give text height, type, style, etc.

2 Enter the text, And press button OK.

Text style (Fig 27)

1 This command is used to change the text style.

2 After giving changes click on apply.

3 Computer aided drafting (Figs 25 & 26)

Plotting drawings

Printing or plotting of a drawing can be done by using a printer or a plotter.

Print or plot command

Various input facilities are available for printing a drawing. Facilities like key board, menu bar or tool bar with mouse are explained below.

Fig 25

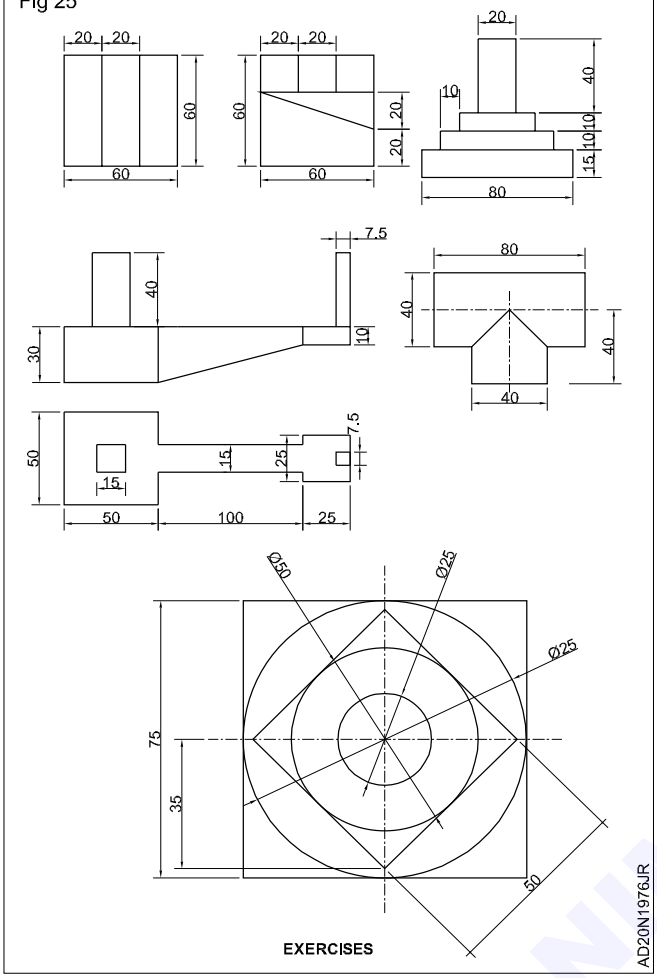


Fig 26

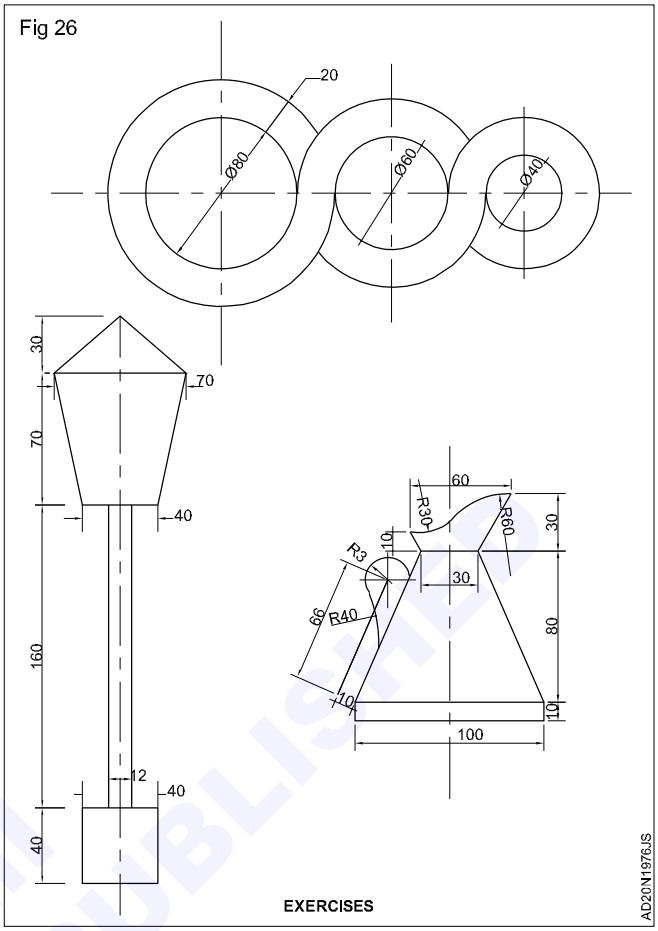
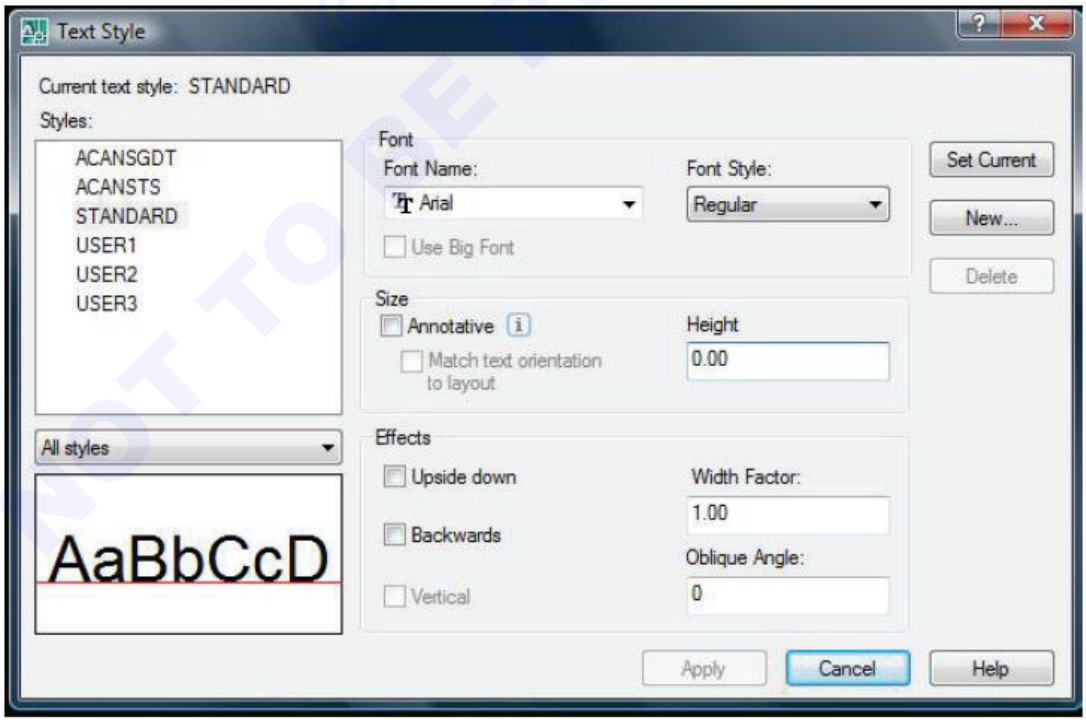


Fig 27



Properties and blocks

Objectives: At the end of this exercise you shall be able to
- **match properties**
- **identify line weight**
- **practice block.**

TASK 1: **Match properties**

1 This command is used to copies the properties from one object to one or more objects.

2 Pull down menu: Modify, match properties

3 Command: Match properties, MA

4 Select the source object: Pick the object whose property to be matched.

5 Select destination object(s) or [settings]: Select the object to which properties are to be copied or press

6 Select destination object(s) or [settings]

Change the properties (Fig 1)

1 Command: CHPROP

2 When you select an object in the drawing area, the object properties window displays all the properties they have in common.

3 The properties that are in grey cannot be modified.

Line type

Pull down menu : format, line type

Command : L type

After invoke this command a 'Line type manager' dialogue box will appear on the screen.

Click here

Click ok

Select line type from here

Click ok in the 'line type manager' diallog box.

Object snaps (Figs 2 to 6)

Suppose you want to draw a line from the center of the circle to the middle of the vertical line you extended earlier. AutoCAD has a feature that makes this very easy. These are the object snaps (or Osnaps "Oh-Snaps"). Type os <ENTER>. You will see this dialog box appear.

Fig 1

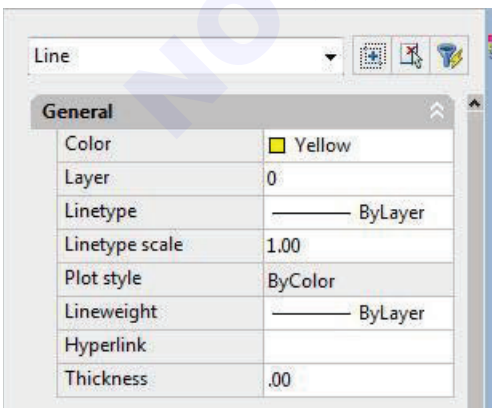


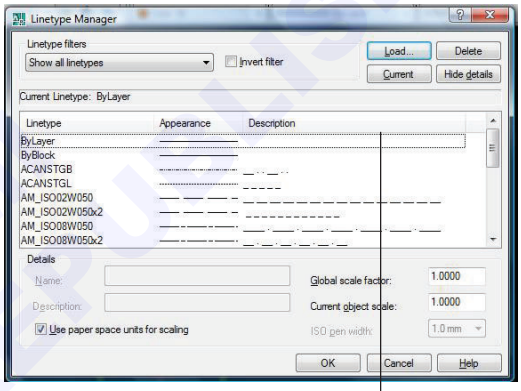
Fig 2

ICON	SETTING	ICON	SETTING
/	Endpoint	□	Insertion Point
/	Midpoint	⊥	Perpendicular
.	Center	○	Tangent
.	Node	⁄	Nearest
◇	Quadrant	×	Apparent Intersection
×	Intersection	//	Parallel
--	Extension	M2P	Midpoint between 2 points

OBJECT SNAP COMMAND

ADN1979Y2

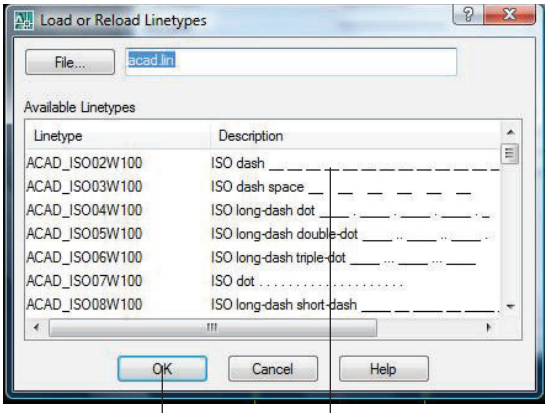
Fig 3



click here

Block: This is used for storing a part of drawing or entire drawing or symbols that are needed in the same drawing or for other drawing. This is stored with a desired scale factor. All the objects inside a block considered as a single object.

Fig 4



Click ok

Select line type from here

Fig 5

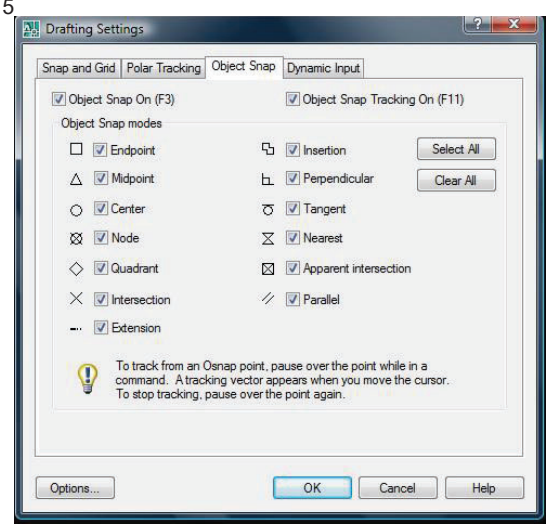


Fig 7

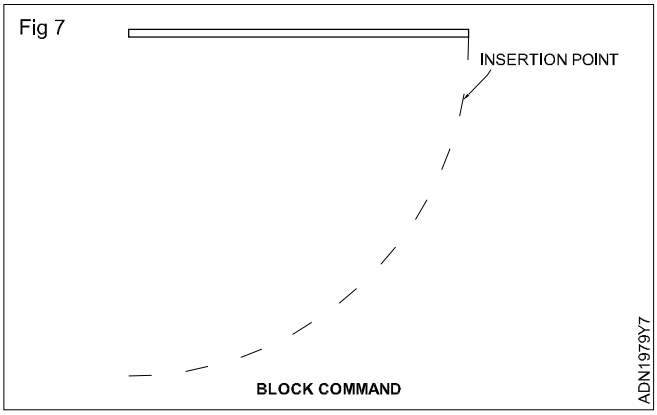
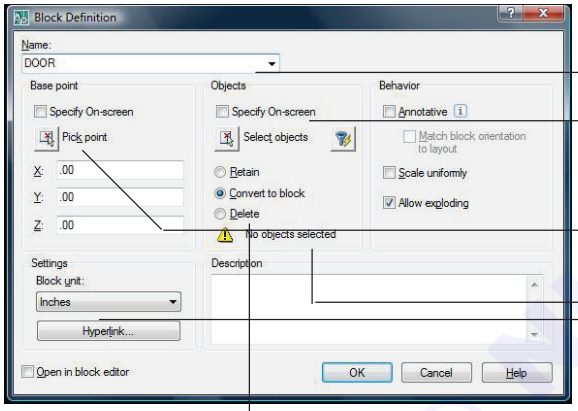


Fig 6



3 Type the name in this area, door.

4 Click on select objects. AutoCAD hides the dialogue box. Pull a selection window around the door and press enter. The dialogue box will return.

5 Click here and pick an insertion point, use object snap.

6 Select.

7 Unit offered here are the drawing units.

8 Click on ok

Tool bar : Draw block, make

Pull down menu : Draw, block, make

Command : Block or B

When you invoke the command BLOCK a block definition dialogue box is displayed.

1 Draw a door. (Fig 7)

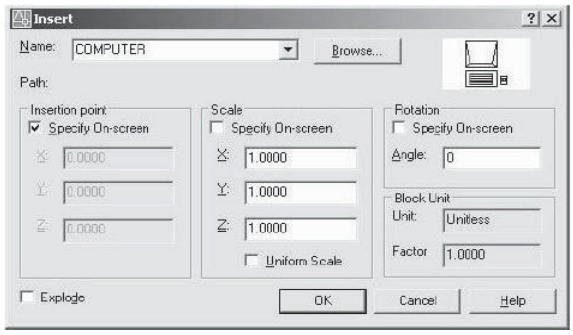
2 Click on draw pull down menu, click on block, click on make.

Insert block (Fig 8)

Once the block has been created you may insert it in the drawing.

- Click on the insert menu
- Click on block
- The insert dialogue box will appear
- Click on the down arrow all the blocks created in the current drawing will be listed. Select the block name.
- At this point you are returned to the drawing with the block attached to the cross hairs at the insertion point you defined.

Fig 8



- Move the block in to position on the screen. The command line asks for the insertion point and lists several options.[Scale, X/Y/Z/Rotate/Pscale/PX/PY/PZ/PRotate].

  These options refer to the scaling and rotation of the block. If you simply pick a point on the screen the block will be inserted without being scaled (at the size it was drawn).

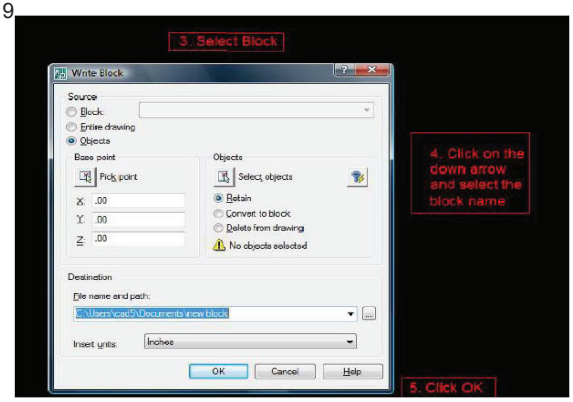
- The block is now locked in to position in the drawing.

Write block (Fig 9)

If a block is converted in to a drawing file then you can use it in any other drawing.

- Type WBLOCK at the command line and press enter.

Fig 9



- The write block dialogue box appears.
- Select block
- Click on the down arrow and select the block name.

At this stage AutoCAD takes the block and converts it to a drawing. This drawing can be treated like Aito CAD drawing You can open it as a separare drawing, explode it, edit & draw in the usual way.

Group

This command creates and manage saved sets of objects called groups. by default, selecting any member of a group selectd all the objects in that group. The difference between blocks and Groups are basically blocks are copies that will change if you change one. Groups will not they are unique.

Command: Group, G

Select objects or (Name Description): Select the objects and Enter

Divide

This command is used to divide a line or arc or circle in to number of parts.

Command : Divied, div

Select object to divide: Select the line AB

Enter the number of segments: Enter a number Ex: 3

A _____ B

Before divide

A——x——x——— B

After divide

If you cannot see the division on the screen, change the point style.

Measure

Command: Measure, ME

Select the objects to measure: Select the object

Specify Length of segment: Type the Length of a segment and Enter

Design center

Browses, finds and previews content and insert content, which include blocks,hatches and x- rays.

Command: DESINCENTER, DC

Design center is the inbuilt library of AutoCAD blocks which can be used to access frequently used blocks for your projects.

Point style (Fig 10)

Pull down menu: Format, point style

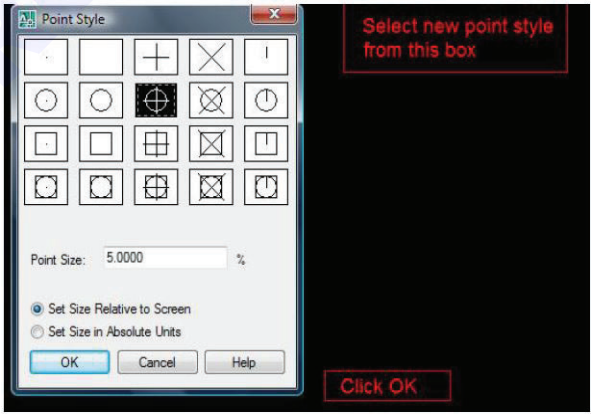
Select new point style from this box

Click OK

Then the points are visible clearly.

Command: P - type

Fig 10

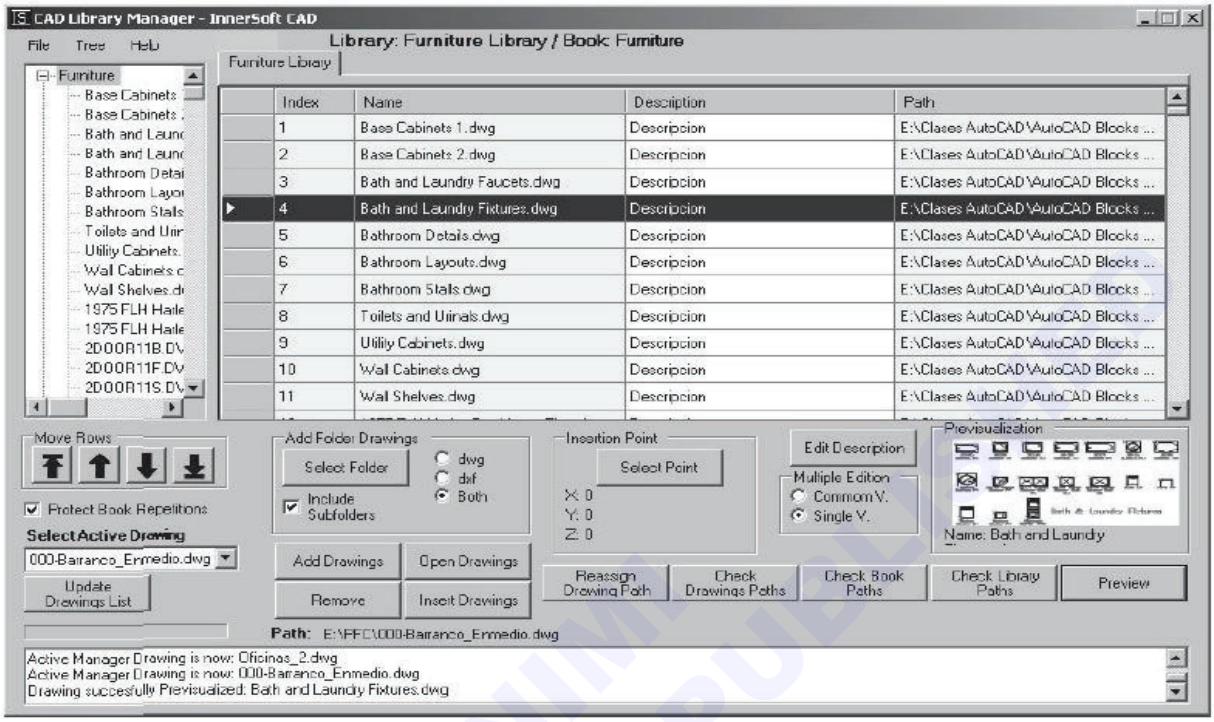


Preparing library folder by creation blocks of prepared drawings

Objective: At the end of this exercise you should able to
- **prepare a library folder for the drawing created by you.**

TASK 1: **A sample library folder is given study the folder - with refering to the given folder (Fig 1)**

Fig 1



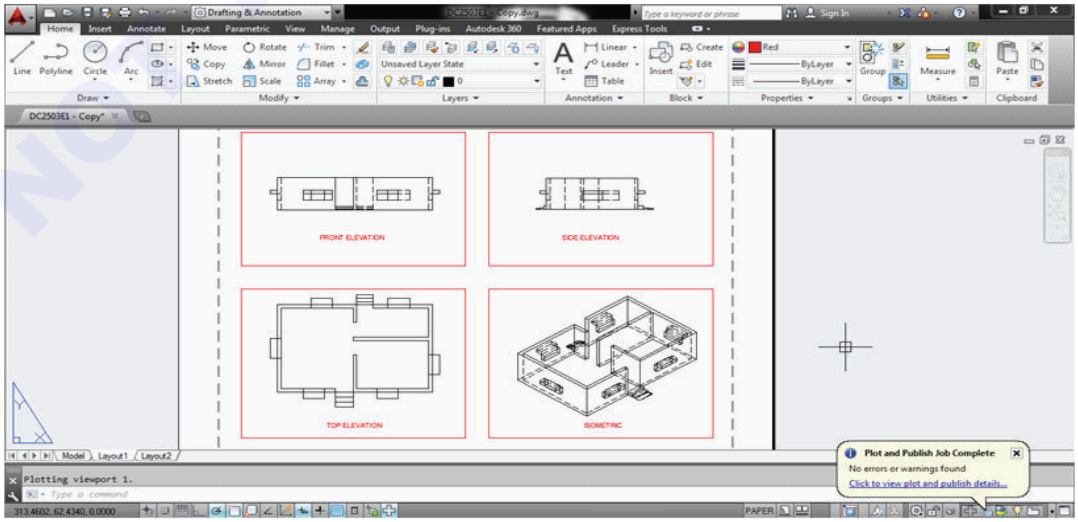
Create and use model space view ports

Objective: At the end of the exercise you shall able to
- **creating view ports for a model.**

TASK 1: **Create and use model space port (Fig 1)**

- Create the elevations and plan as per the given commands.
- Follow the given commands as per creating view ports.
- Create and model space viewport.

Fig 1



Create a standard engneering layout

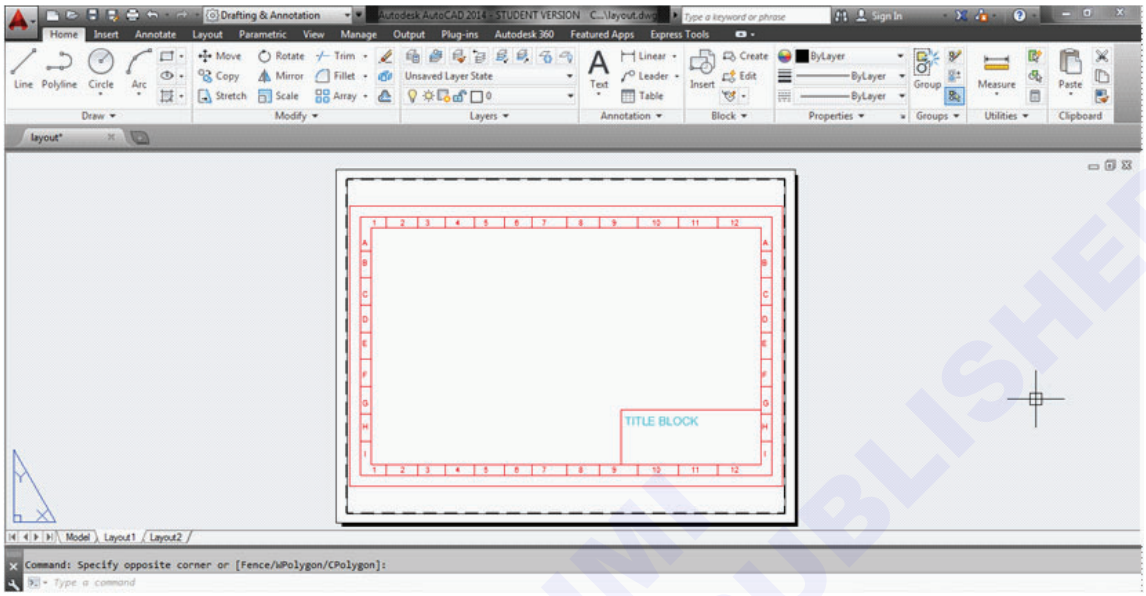
Objective: At the end of this exercise you shall be able to
- **creating a engineering layout.**

TASK 1: **Creating a engineering layout (Fig 1)**

1 Follow the CAD commands and complete the lay out as give in Fig 1.

2 Create a standard engineering layout.

Fig 1



Architectural Draughtsman - DPC, History of Architecture - I and final design in Auto CAD

Final design

Objectives: At the end of this exercise you shall be able to

- **final floor plan showing living room, kitchen, bed room, toilet in logical order and other details including furniture using CAD**
- **prepare dwv schedule.**

Requirements

Tools/Instruments/Machines		Materials	
• Computer with CAD	- 1 No.	• A3 size paper	- 1 No.
• Printer	- 1 No.		

PROCEDURE

TASK 1: **Draw the floor plan showing using CAD the living room, kitchen, bed rooms, toilet in logical order from the main entrance. Basic area with furniture, gargage, drive way, pedestrian ways levels, north line and section line (Fig 1)**

Organization of interior space

1 Print the premilinary drawn ground floor plan

2 Economic utilisation of space is very important in designing interior.

3 Where should be minimum circulation area and best use of avilable space for the activity to be performed.

4 Minimum number of doors and partitions should be considered for free flow of space and spacious look.

5 To get a spacious look select limited variaty of position. textures, patterns and colours.

6 The Interior activity diagram should be drawn showing the division of interior spaces with proper circulation.

7 Where should be acoustical and visual barries between area, which includes the bathing area. In well-planned entry and private area.

8 While designing seating for living room L-shaped or U-shaped seating makes the most economical use of space because it can accomodate a large group of people, leaving ample circulation space.

9 Do not clutter a small space with more items than needed.

10 Low seating helps in making the room look larger.

11 The dining table could be circular or rectangular.

12 Work Triangles consists of the three essential elements in the kitchen; the clean up or sink area, the cooking centre, the mixing centre and the refrigeration centre.

13 Width of the kitchen plat form should be 600mm

14 The position of the bed depends on a number of factors. The window should be parallel to the bed position.

15 The window should not be over the head.

16 The toilet can be divided into two types of areas-the dry area including the sink and the toilet and a wet area, which includes the bathing area.In well-planned toilets, you must separate these two areas.

17 Some cabinets or open shelves must be placed in the bathroom for storage.

18 With all consideration of furnitures and fixtures complete the sketch of organisation of space planning as Fig 1 in CAD.

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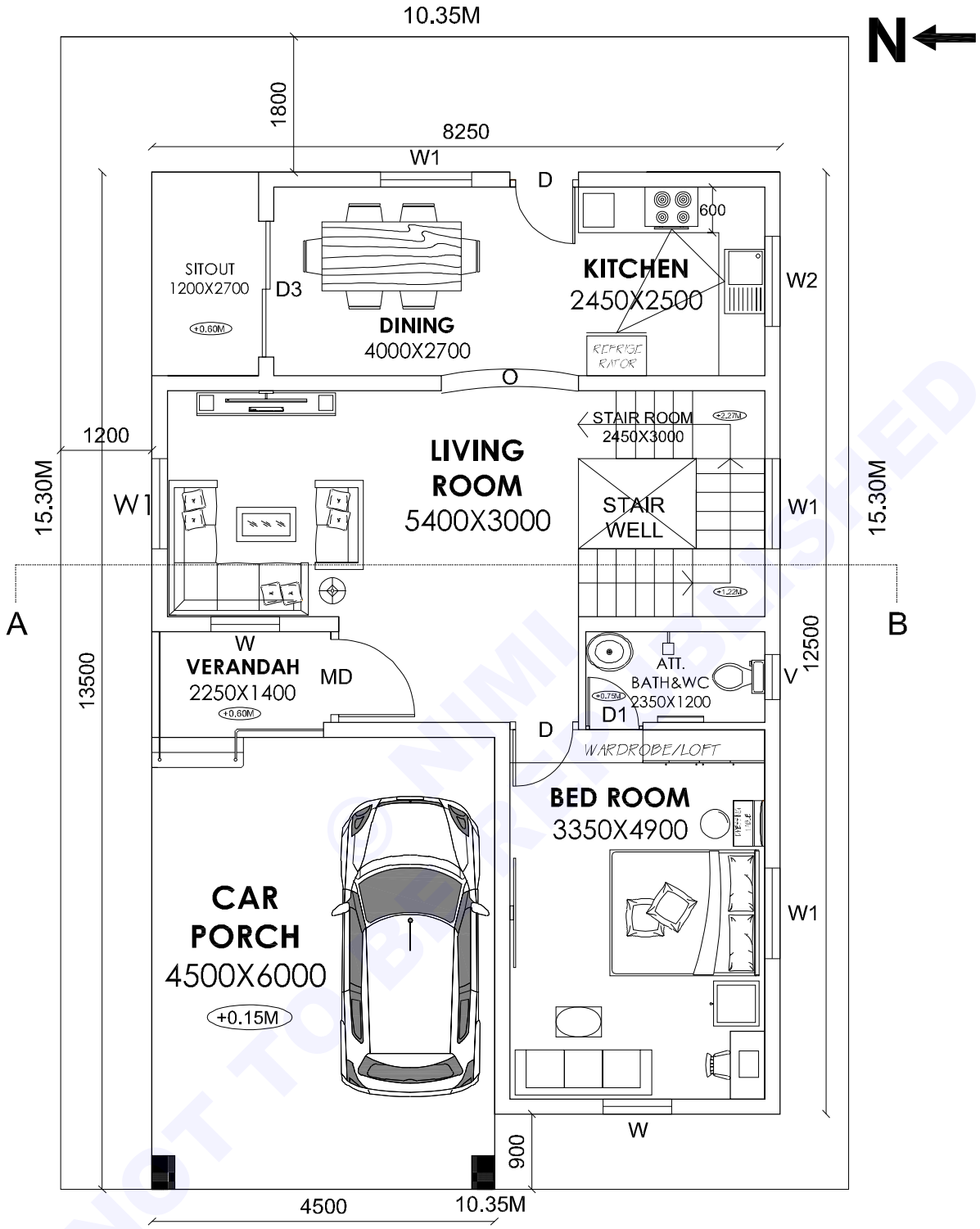
TASK 2: **Prepare joinery details and area statement**

Fig 1



JOINERY DETAILS		
MARK	ITEM	SIZE
MD	MAIN DOOR	1200X2100
D	DOOR	900X2100
D1	PVC DOOR	750X2100
D2	SLIDING DOOR	1800X2100
W	WINDOW	900X1200
W1	WINDOW	1200X1200
W2	KITCHEN WINDOW	1200X600
O	OPEN ARCH	1800X2100

AREA STATEMENT	SQ.M	SQ.FT
OWNER'S SITE AREA	158.35	1704.51
GF BUILTUP AREA	107.63	1158.51
VACANT AREA	50.72	546.00

AD20N1977H1

Front elevation with all heights and level of building

Objectives: At the end of this exercise you shall be able to
- **draw a designed plan of building**
- **draw the front elevation of building as per standard.**

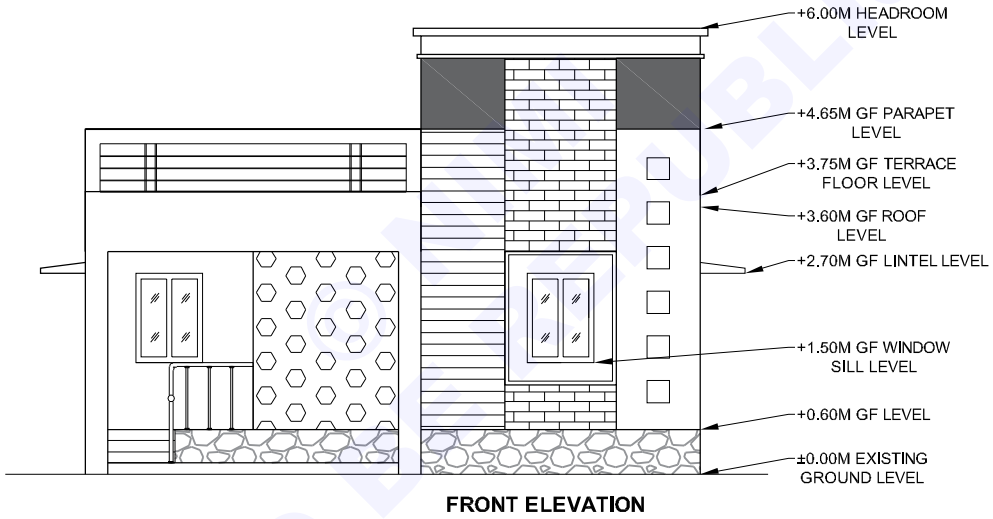
Requirements

Tools/Instruments/Machines		Materials	
• Computer with Auto CAD	- 1 No.	• A3 size paper	- 1 No.
• Printer	- 1 No.		

PROCEDURE

TASK 1: **Reproduced the given plan by using CAD and draw front elevation of the standard size as per with the given plan (Fig 1)**

Fig 1



FRONT ELEVATION

One side elevation with all heights and levels mentioned

Objective: At the end of this exercise you shall be able to
- **draw one side elevation for the given plan by using CAD.**

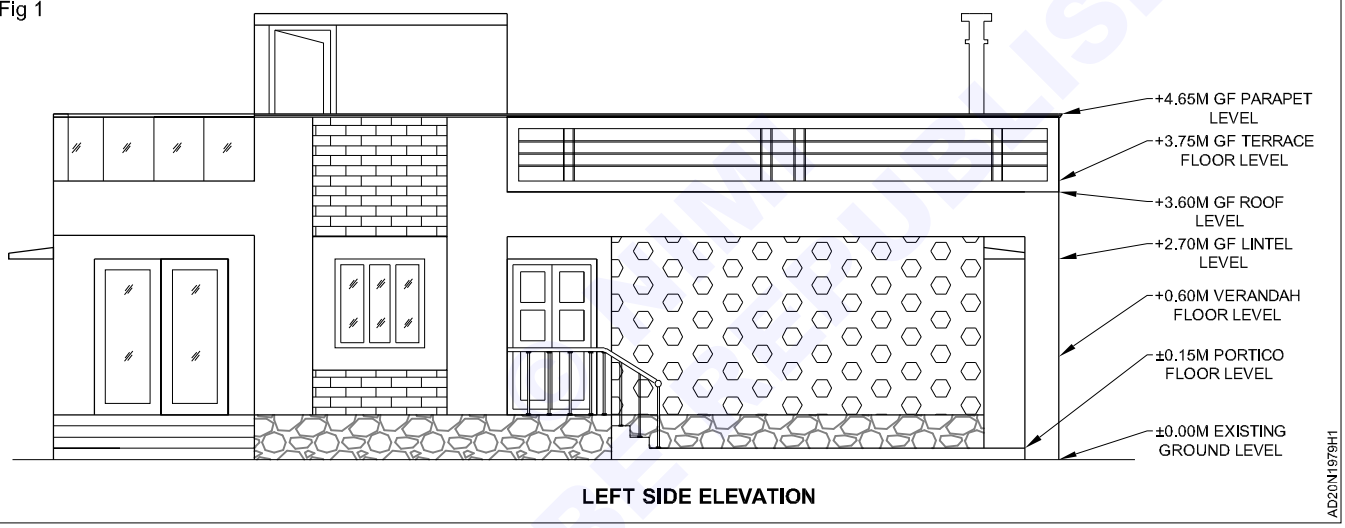
Requirements

Tools/Instruments/Machines		Materials	
• Computer with Auto CAD	- 1 No.	• A3 size paper	- 1 No.
• Printer	- 1 No.		

PROCEDURE

TASK 1: **Draw one side elevation for the given plan by using Auto CAD (Fig 1)**

Fig 1



LEFT SIDE ELEVATION

Project work of building drawing section through stair case/ toilet using Auto CAD

Objective: At the end of this exercise you shall be able to
- **prepare a building drawing section through stair case/ toilet.**

Requirements

Tools/Instruments/Machines		Materials	
• Computer with Auto CAD	- 1 No.	• A3 size paper	- 1 No.
• Printer	- 1 No.		

PROCEDURE

TASK 1: **Draw the building drawing and section through stair case/ toilet should be submitted at project work in spiral binding**

Note: Instructor should guide the trainees in the preparation of project work and the submitted the same as spiral binding.

— — — — — — — — —

Final site plan with landscape elements

Objective: At the end of this exercise you shall be able to
- **draw the site plan with land scape elements.**

Requirements

Tools/Instruments/Machines		Materials	
• Computer with Auto CAD	- 1 No.	• A3 size paper	- 1 No.
• Printer	- 1 No.		

PROCEDURE

TASK 1: **Prepare a site plan for a building with landscape elements**

1 Show the following aspects in the drawing scale - date - job no - address - phone no - North- South direction - sheet no - mentioned in all sheets.

2 The drawing preparation should be well readable and self explanatory submitted as spiral binding.

Note: Instructor should guide the trainees in the preparation of project work and the submitted the same as spiral binding.

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Development of surfaces of solids

Objectives: At the end of this exercise you shall be able to
- **draw the developments of regular objects bounded by plane surfaces - cube, prisms etc.,**
- **draw the developments of regular objects bounded by single or double curved surfaces - cylinder, cones, spheres**
- **development of regular objects with cut at some portions - frustrum of cone, frustrum of pyramid, cylinder/ prism with cuts.**

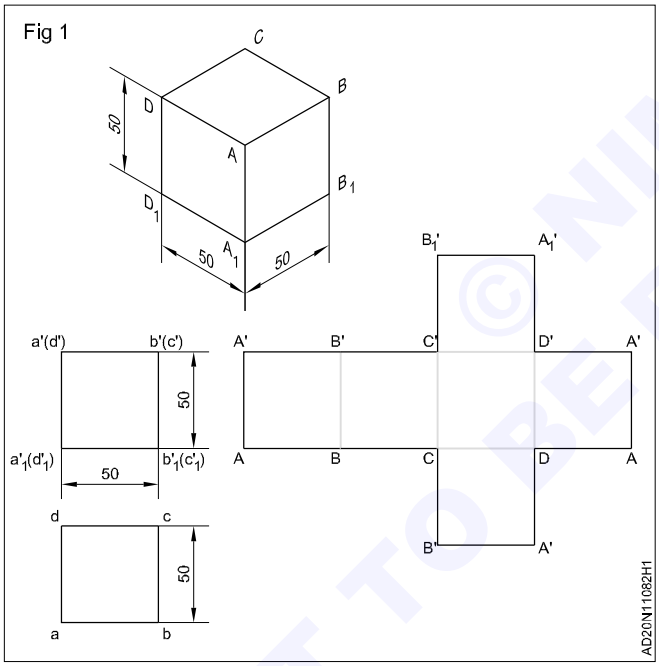
Requirements

Tools/Instruments/Machines

- Computer with Auto CAD - 1 No.

PROCEDURE

TASK 1: **Draw the development of the surfaces of a cube of side 50 mm (Fig 1)**



1 Draw the elevation and plan of the cube.

2 From the front view stretch out (Project) the line AA & A'A' from points b'_1 & b' horizontally.

3 Set off AB, BC, CD & DA equal to 50 mm each (side of square).

4 From C & D draw perpendiculars and mark off /CB' & DA' equals to 50 mm.

5 Similarly erect perpendiculars from points C' & D' such that $C'B'_1$, & $D'A'_1$ equals to 50 mm.

6 Darken the lines as shown in Fig 1 to get the required development of the cube.

— — — — — — — —

TASK 2: **Draw the development of the surface a rectangular prism of size 50 mm x 30 mm and height 70 mm by parallel line method (Fig 1)**

1 Draw a rectangle of length equals to the perimeter of the prism. Length = 2 (l + b) = 160 mm and height equals to the height of prism (70 mm).

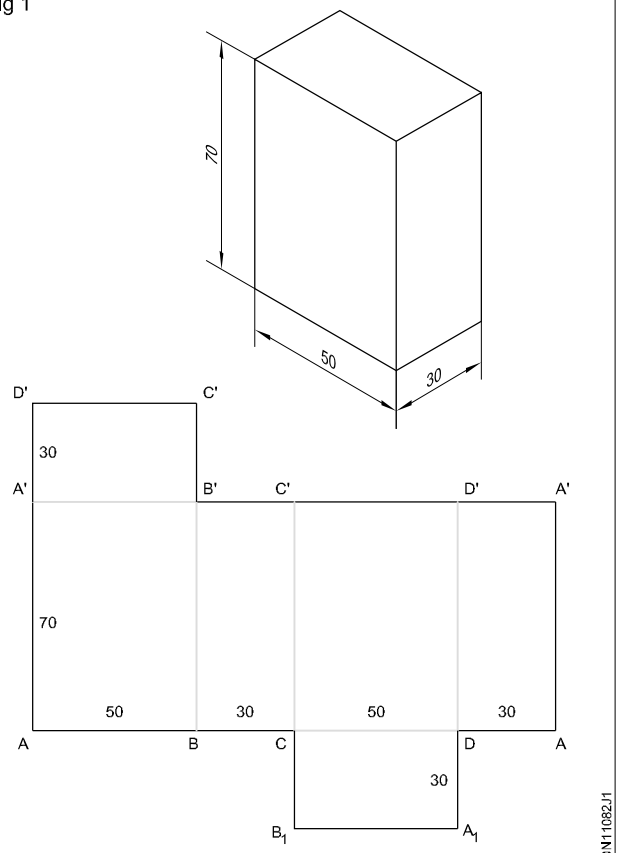
2 Mark AB; BC; CD and DA equals to 50, 30, 50 & 30 mm respectively.

3 Draw perpendiculars from the points A,B,C,D and mark as A', B', C', D'.

4 Draw a rectangle A'B'C'D' on A'B' of size 50 x 30 mm.

5 Draw another rectangle CD A_1B_1 on CD of size to 50 x 30 mm, the end faces of the prism. Figure obtained is the development of the total prism.

Fig 1



DEVELOPMENT OF A RECTANGULAR PRISM

TASK 3: **Draw the development of the lateral surface of an open cylindrical drum of dia 40 mm and height is 60 mm (Fig 1)**

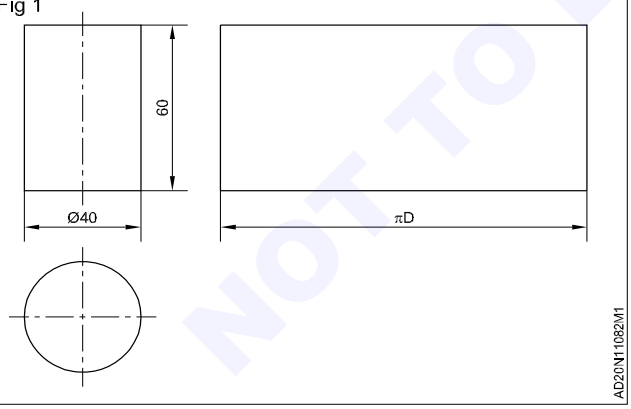
1 Draw the plan and elevation of the drum as stated.

2 Project the front view and draw the side view to a length of circumference of the base of the cylinder.

Circumference = πD = π x 40 mm = 125.6 mm

Rectangle thus formed is the development of cylinder.

Fig 1



TASK 4: **Draw the development of a cone of base 60 mm and height 40 mm (Fig 1)**

1 Draw the plan and elevation of the cone.

2 Divide the plan circle into number of equal parts (say 12 parts) and mark.

Development is more accurate if the number of equal parts are more.

3 Project these parts to the base of the cone.

4 Join these points to the vertex of the cone.

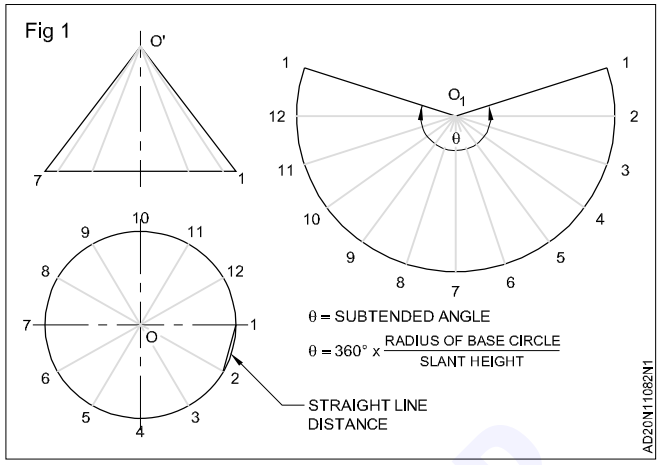
5 Locate O_1 vertex for the development of cone.

6 Draw an arc from the vertex as centre and length of slope as radius.

7 Set divider on the straight distance between two consecutive points on the plan.

8 Transfer the distance along the arc as many times according to the divisions on the plan.

9 Join points 1 O_1 1and complete the development.



This method is only an approximate method. The straight line distance taken is slightly smaller than the arc length. More accurate method is by calculating actual circumference and dividing it into number of segments.

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TASK 5: **Draw the development of the lateral surface of a square pyramid of base 40 mm and vertical height 60 mm (Fig 1)**

1 Draw the plan and elevation of the pyramid.

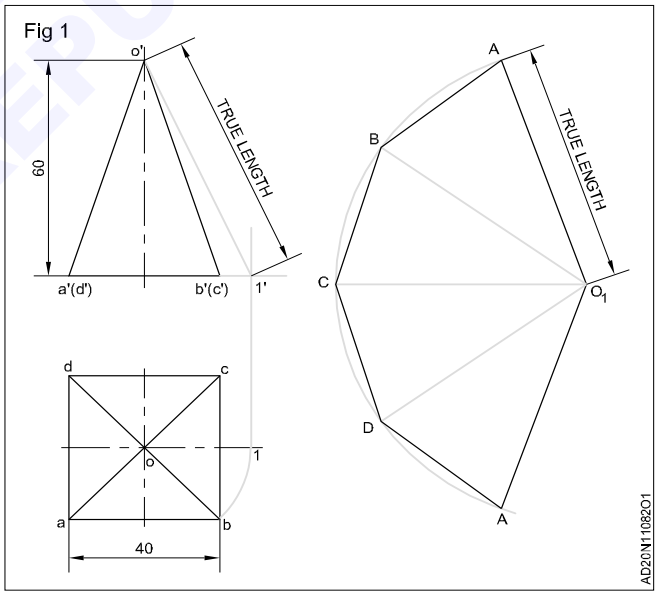
2 With `O' as centre in top view and ob as radius, draw an arc to meet the axis at 1. (O' - Vertex)

3 Project the point 1 to front view to meet the base line at 1'.

4 Join O'1' which is the true slant length of the pyramid.

5 With `O_1 'as centre and true length as radius draw an arc and set off the sides of the pyramid on the arc at A,B,C,D & A.

6 Join O_1A, B, C, D, AO_1 which is the required development.



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