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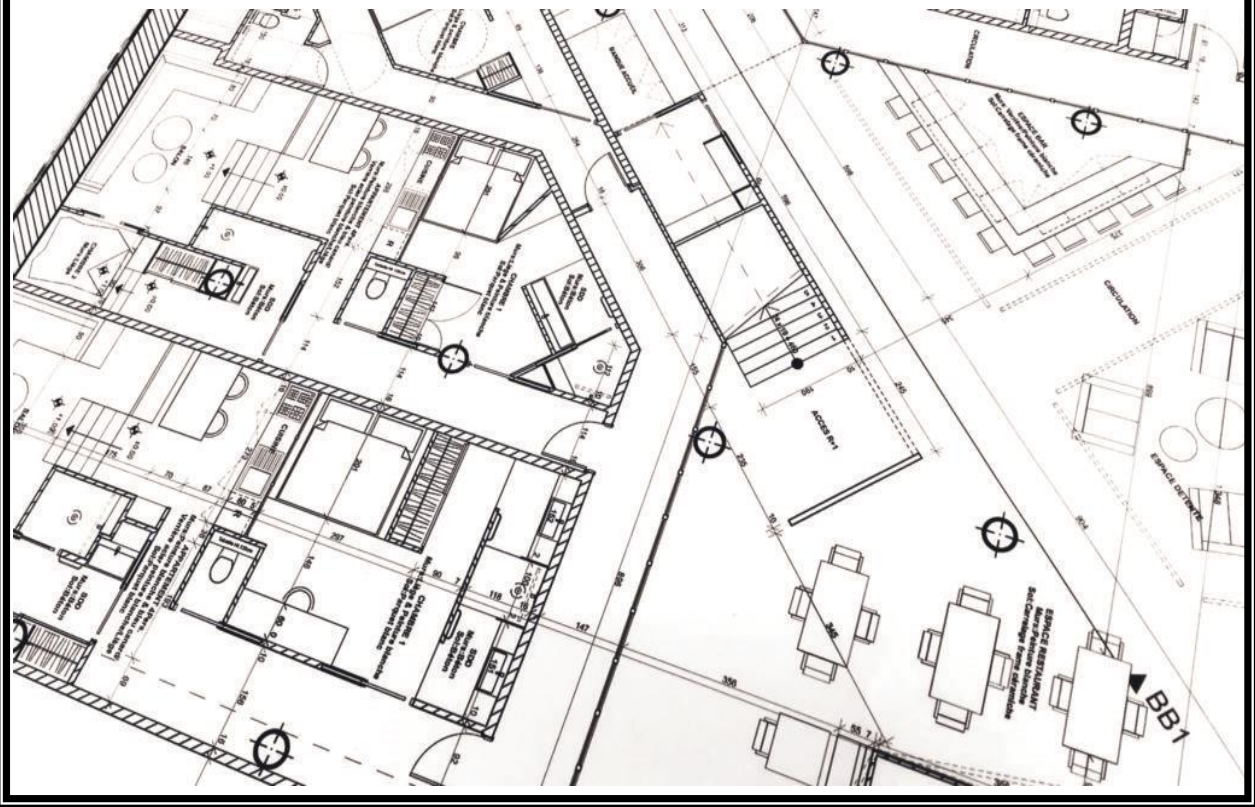
Ministry of Higher Education and Scientific Research
Mohamed Khider University of Biskra
Faculty of Sciences and Technology
Department of Architecture

Project Workshop 1

Courses and Exercises

For 1st Year Architecture Students

Architect : 1st Semester - Speciality : Architecture



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Introduction:

- Introduction:

The student architectural training program in the first year architecture (Architect), Specialization: Architecture consists of five basic stages distributed over first and second semester, according to the following:

- ✓ **The first semester:** It includes three stages:

- The first stage (preparatory): This stage introduces the student to all the fundamental rules of architectural drawing (hand drawing).

- The second stage: Focuses on mastering the tools and techniques used in architectural representation.

- The third stage: Technical reading of architectural documents or the technical stage related to reading, drawing, and other skills to enable the student to show his ideas to others.

- ✓ **The second semester:** It includes two important stages:

- The fourth stage: The stage of controlling the architectural structure, perceiving the architectural field, acquiring the ability of spatial imagination within the architectural framework, and understanding the dialectical relationship between form, function, and structure.

- The fifth stage: Phases and methodology of preparing the architectural project.

This handout details three phases of the first semester program for the first year Architecture, Specialization: Architecture.

The first stage (preparatory) of the first semester program for the first year of a bachelor's degree aims to equip the student with all the rules in force in architectural drawing (hand drawing), as hand drawing gives the student the opportunity to create and develop talents in drawing, and to make initial ideas, so the novice student must learn hand drawing first, to develop his creative skills.

The second stage aims to train the first-year student of the Bachelor of Architecture in the skills of using drawing tools, in addition to developing his abilities to understand geometric projection, how to use drawing scales, and learning the basics of architectural drawing.

The third stage aims to qualify the student practically on how to prepare architectural documents for the architectural project, such as architectural plans, sections, facades, architectural and construction details...etc.

The handout of project material 1 includes three chapters, where the first chapter reviews preparatory lessons related to what is architecture who is the architect and what are his tasks, in brief. Lessons related to all the means and tools used in architectural drawing, in addition to the rules in force in architectural drawing, such as: preparing the drawing, organizing the spaces of the drawing paper (organizing the page), and how to draw lines by free hand, etc.

As for the practical exercises of this chapter, they are related to the exercises of control in drawing lines and geometric shapes "two-dimensional drawing" and the exercises of control in proportions (drawing objects and drawing sizes) "three-dimensional drawing" and finally the exercises of control in gradient in colours.

The second chapter discusses lessons related to the principles of geometric drawing, showing how to draw using drawing tools, and how to draw various lines also using tools. This chapter also reviews the spreadsheet, global drawing scales, types of lines and where to apply them, in addition to technical writing in geometric drawing. This chapter deals with the geometric projection from views (projections) and sections, and finally to perspective and Axonometric.

As for the applied exercises for this chapter, they relate to exercises for the application of geometric rules related to vertical projection (views and sections), exercises for the application of geometric rules related to geometric drawing (geometric shapes), and finally to technical writing exercises "Lettrine".

The third and final chapter deals with lessons related to architectural project documents, by addressing the site plan, block plan, various floor plans, roof plan, sections, facades, architectural and structural details drawings, shop drawings, and finally how to prepare architectural models.

This chapter also reviews the architectural survey, the tools used in architectural survey, the stages of preparing the architectural survey of the building, and finally the architectural survey techniques of the plans, sections, facades and architectural details.

As for the practical exercises for this chapter, they are related to exercises to represent the pillar of the table, such as the details of a technical element of the architectural structure "the window and the door", and other practical exercises for the architectural survey of the workshop hall, the staircase and the house, and finally a comprehensive practical exercise consisting of enlarging a project given by one or more documents "missing data".

Finally, this work will contribute to enriching the library of the Department of Architecture in Biskra, in this field of knowledge, as it will add new information to our students in architecture, to fill the shortage of references, and will be a reference for the novice student who needs to simplify this difficult subject.

CHAPTER I:
PREPARATORY PHASE
"RULES APPLICABLE IN ARCHITECTURAL DRAWING - HAND DRAWING"

- Introduction:

The preparatory stage includes a set of topics for the benefit for the Bachelor of Architecture student:

- It relates to the nature of architecture, the architect and his tasks, simply and briefly.

- Lessons that provide the student with all the applicable rules in architectural drawing (hand drawing) such as: organizing the page, the means used in drawing, fixing the drawing paper on the table and the appropriate position for drawing, paper sizes, etc., which he uses in architectural drawing.

I - Preparatory phase lessons:

1- Architecture and Architect:

1-1) What is Architecture:

The field of architecture is known as the science and art of building construction according to aesthetic rules. It is concerned with the creativity of architectural building designs by conducting architectural drawings and designs. Therefore, an architecture student should have a good drawing ability and the ability to imagine.

1-2) Definition of an architect:

The architect is the one who conceives, creates and designs the building based mainly on aesthetic dimensions, and relying on the cultural, economic and social data characteristic of the construction completion site.

1-3) Tasks of an architect:

One of the tasks of an architect is to:

- Attention to drawing and building design.
- Attention to aesthetics in buildings.
- Bringing the portrait painted in the architect's imagination to life.
- Familiarity with all aspects of the building in terms of architectural design, construction, ventilation, movement ...etc.
- Lack to cover the accounting aspects of the technical matters of foundations and concrete in construction (the civil engineer is the one who takes care of these aspects).

- Completion of architectural projects, and directing contracting institutions to complete these projects, as he is primarily responsible for the architectural project.

2- The means and rules applicable in architectural drawing:

2-1) Tools used in architectural drawing:

The means or tools used in drawing are many and varied and differ from each other in importance. Identifying them is very important for the architecture student. These tools are used hand and technical drawing. Among these most commonly used tools are the following:

2-1-1) Pencils:

Pencils are generally used in drawing and writing, and are divided into two types of pencils:

2-1-1-1) Wooden pencils:

There are three types of wooden pencils (Figure 1-1):

a) Sharp pens (H):

Type (H) pens are sharp pens ranging from (6H) to (H), and are used in technical drawing.

b) Intermediate pens (HB):

Pens of type (HB) are medium pens in terms of sharpness and softness, and they are frequently used.

c) Soft pens (B):

Pens of type (B) are soft pens ranging from (B) to (6B), and they are used in drawing with the free hand, as their lines are more prominent and clearer.

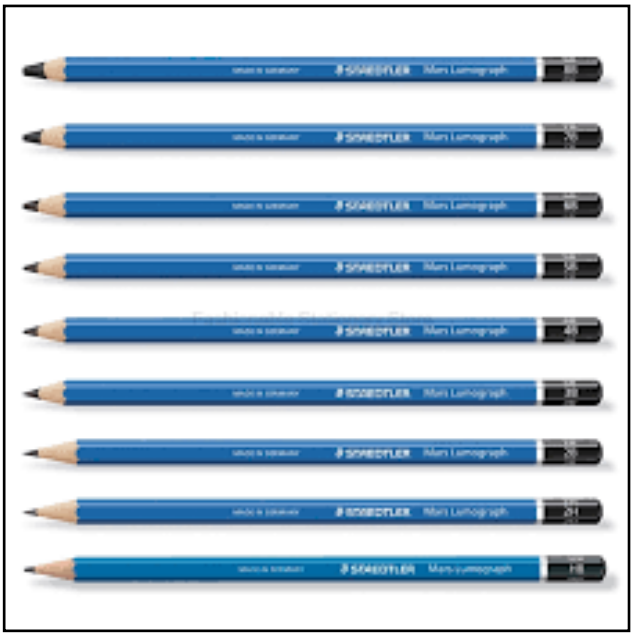


Figure 1-1: Wooden pencils

2-1-1-2) Mechanical pencils:

Mechanical pencils are precision pencils (Figure 1-2), in which the tooth is placed instead of pencils.

Figure 1-2: Mechanical pencils

2-1-2) Eraser and sharpener:

The eraser is used to erase traces of pencils in order to erase drawing errors and remove redundant drawing lines, taking into account that the erasure should be without

excessive pressure and on one side whenever possible (Figure 1-3). The sharpener is used to keep the pen bullet in a position suitable for drawing (Figure 1-3).

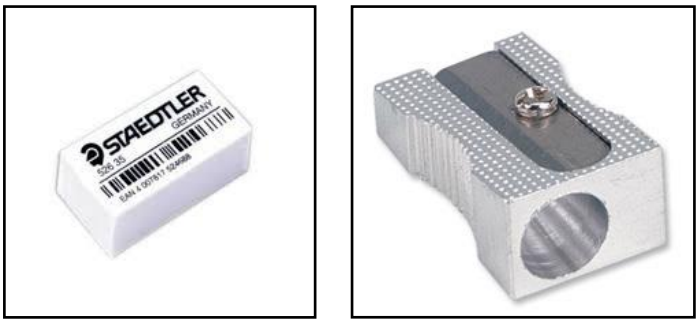


Figure 1-3: Eraser and Sharpener

2-1-3) Ruler (T):

The ruler uses the letter T in drawing long parallel horizontal lines along the drawing paper, and the "triangles" are based on them to draw the oblique and vertical lines accurately, and they vary according to length. There are T rulers with 60 cm, 80 cm, and 120 cm, and they consist of two parts: the long part (the body), and the ruler's head, which is perpendicular to the previous section, and is made of different materials such as transparent plastic, wood and aluminium (Figure 1-4).

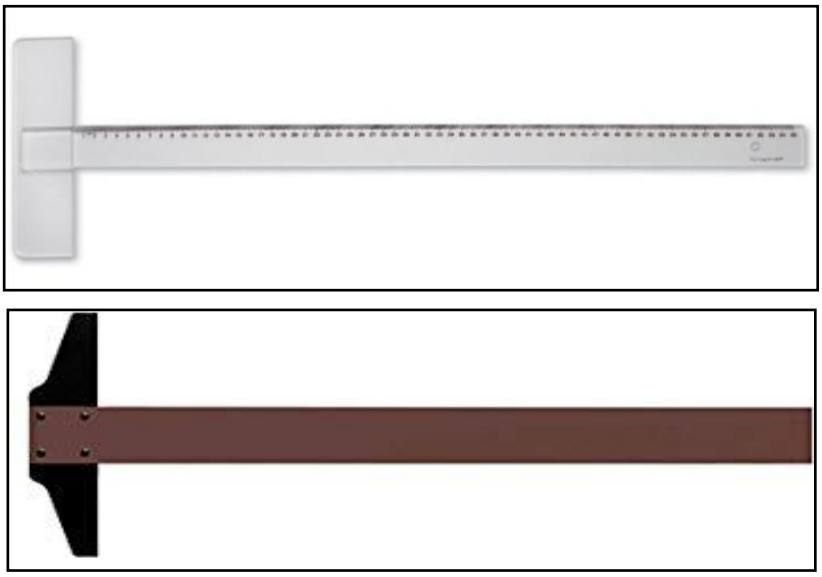


Figure 1-4: T Rulers

2-1-4) Normal rulers:

Regular rulers are used to draw straight lines, and they are used to measure drawings and lengths of straight lines, and they are in various sizes of 30 cm and 60 cm... etc.

Ordinary rulers are made of different materials such as plastic, aluminium and iron (Figure 1-5).

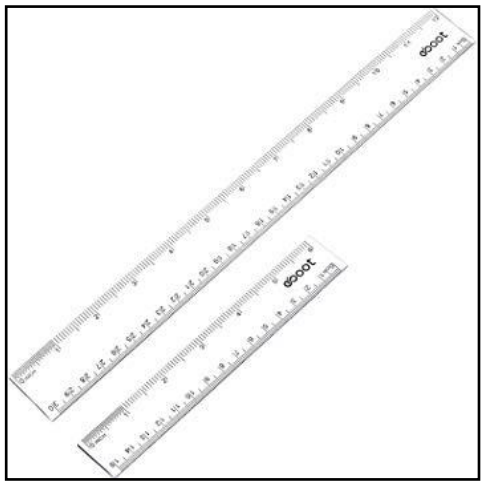


Figure 1-5: Normal rulers

2-1-5) Triangles:

Triangles are used to draw different oblique and vertical lines, and they vary according to their constituent angles. There are triangles with angles of 30°, 60° and 90° (called a 30° / 60° triangle), and angles of 45°, 45° and 90° (called a 45° triangle), and they also vary according to size and are made of different materials such as wood, or transparent plastic... etc. (Figure 1-6).

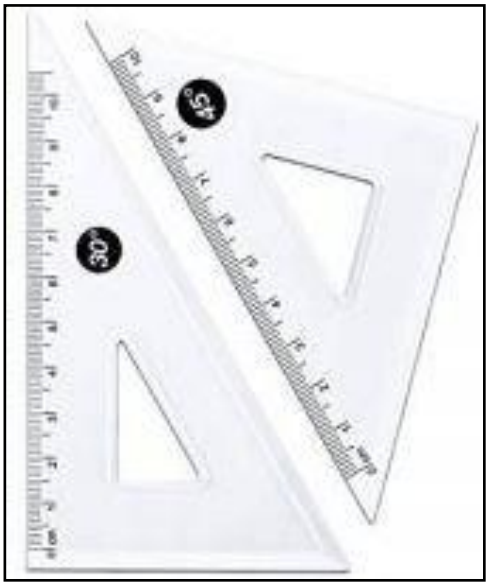


Figure 1-6: Triangles (30° - 60° / 45°)

2-1-6) Protractor:

The protractor is used in geometric drawing, and it is used to measure angles, draw angles, and determine angles that are difficult to determine using triangles, and it

is in two forms: the first is a 180° semi-circular protractor, and the second is a 360° circular protractor, and it is usually made of transparent plastic (Figure 1-7).

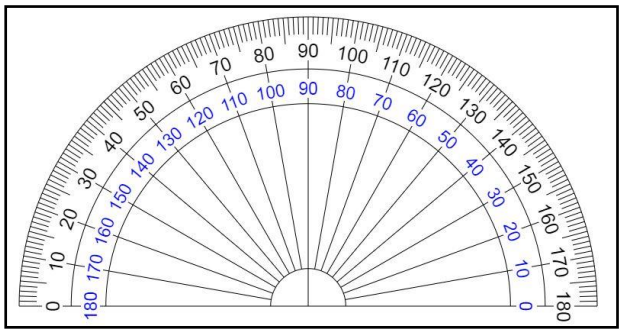


Figure 1-7: Protractor

2-1-7) Scale rulers (Kutsch):

Scale rulers are used to draw diagrams and directly multiply them. They are also used in direct measurement from the diagrams. These rulers have three aspects. On each side, there are two scales of the drawing (Figure 1-8). Among the scales represented in these rulers are:

- 1/500, 1/1000, 1/1250, 1/1500, 1/2000, 1/2500.
- or 1/100, 1/200, 1/250, 1/300, 1/400, 1/500.
- or 1/20, 1/25, 1/50, 1/75, 1/100, 1/125 ... etc.

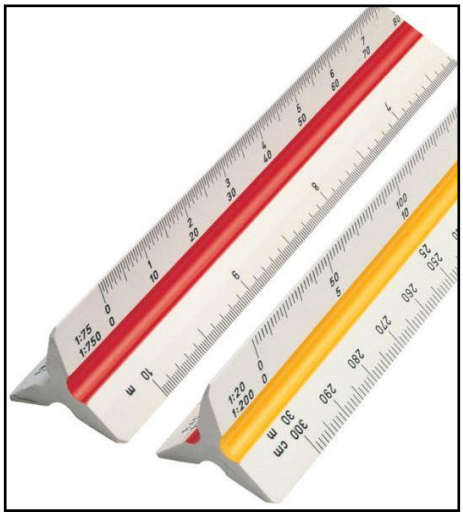


Figure 1-8: Scale rulers (Kutsch)

2-1-8) Curve rulers:

Curve rulers are used to draw different curves and arcs of unknown radii, and consist of three different curve shapes in size, usually made of transparent plastic (Figure 1-9).

Figure 1-9: Curve rulers

2-1-9) Rulers of geometric shapes, letters and numbers symbols:

Symbol rulers are plastic rulers with many geometric symbols, letter symbols, and punched numbers, such as the graduated circle, squares, triangles, oval shapes, and others.

For example, the rulers of circle symbols are used to draw circles and small brackets, and the rulers of numbers and letters are used to draw numbers and letters with universally recognized dimensions (Figure 1-10).

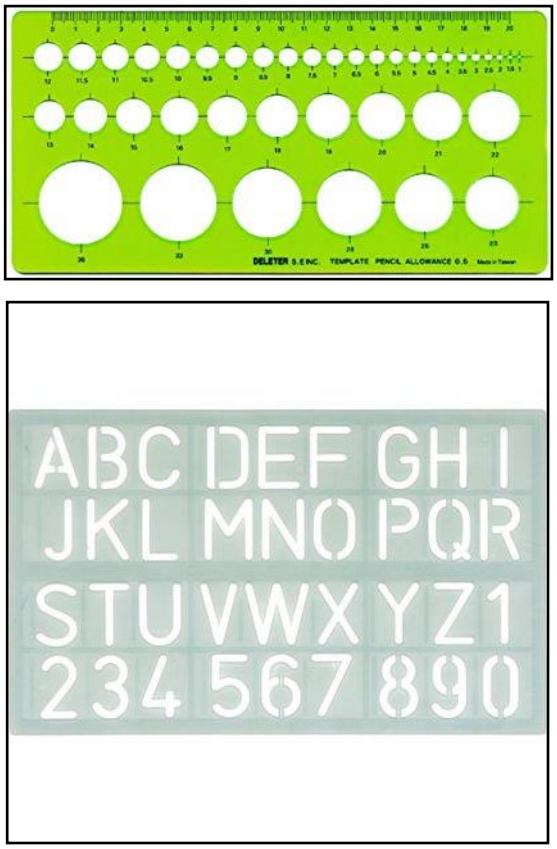


Figure 1-10: Rulers of geometric shape symbols, letters, and numbers

2-1-10) Compass:

The compass is used to draw arcs and complete circles of different diameters, and it has several shapes, scales and sizes. There is a compass to draw circles with medium dimensions and a compass to draw large circles and a small compass to draw circles with small diameters (Figure 1-11). Its main parts are:

- Grand compass: It can be used to draw circles.
- A compass consists of two primary components: a fixed metal point, which is positioned on the paper, and a movable pencil point.

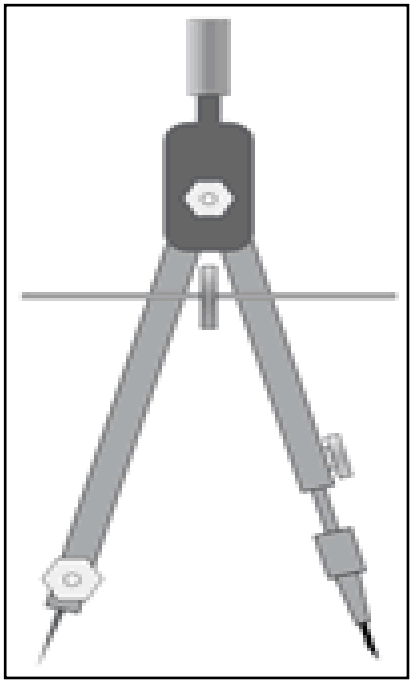


Figure 1-11: Compass

2-1-11) Inking pens (Rotting):

Ink pens are used instead of pencils, especially in technical drawing, and are used to draw a set of lines of different thicknesses, according to sizes ranging from 0.1 mm to 2 mm, where the size is recorded on each pen, and there is a colour on the head of each pen, which is clear evidence of its measurement (Figure 1-12). The ink pen consists of the top, head, ink tank and holder:

- The ink pen head is a cylinder with a small inner diameter.
- The top of the ink pen is the front end of the pen.
- The ink tank connects to the other end of the pen, filling whenever needed.
- The holder is the one that holds the ink tank.

Figure 1-12: Ink pens (Rotring)

2-1-12) Drawing papers:

In the drawing, we use thick white papers, with different dimensions according to the required drawing, and there are global measurements in the drawing papers, where by dividing the paper into two equal parts, the smallest size can be obtained (Figure 1-13), and these measurements are attached to the following table (Table 1-1):

Table 1-1: Dimensions of drawing boards

Brevity code	SIZE
A0	841 x 1189
A1	594 x 841
A2	420 x 594
A3	297 x 420
A4	210 x 297
A5	148 x 210 mm

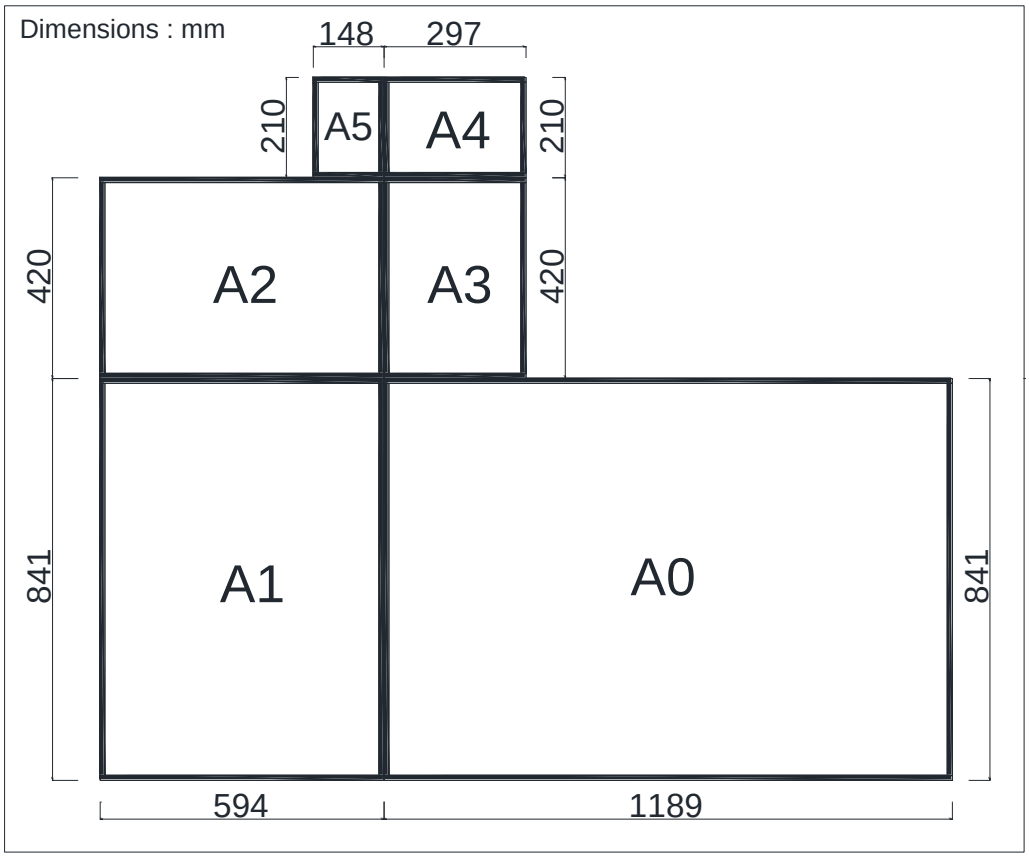


Figure 1-13: Dimensions of drawing boards

Source: Researcher

2-1-13) Drawing board (Drawing table):

The drawing table is considered the appropriate floor to install the drawing paper on it; and it is of an appropriate height to facilitate its use while standing and has a suitable inclination (Figure 1-14).

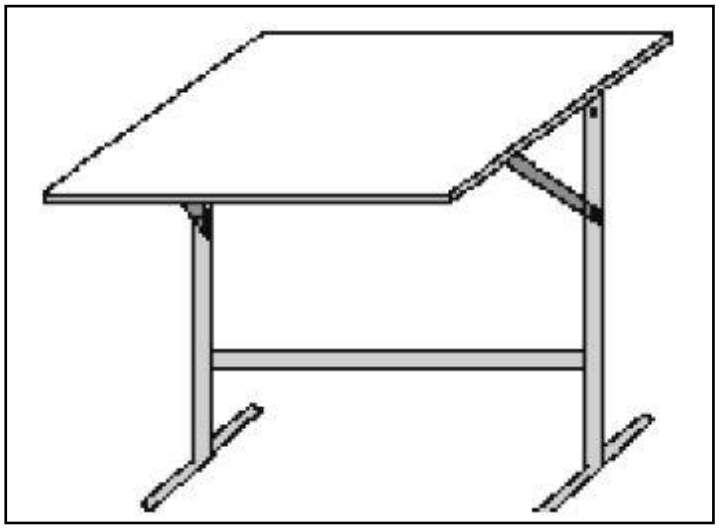


Figure 1-14: Drawing board (drawing table)

2-2) Principles of freehand drawing:

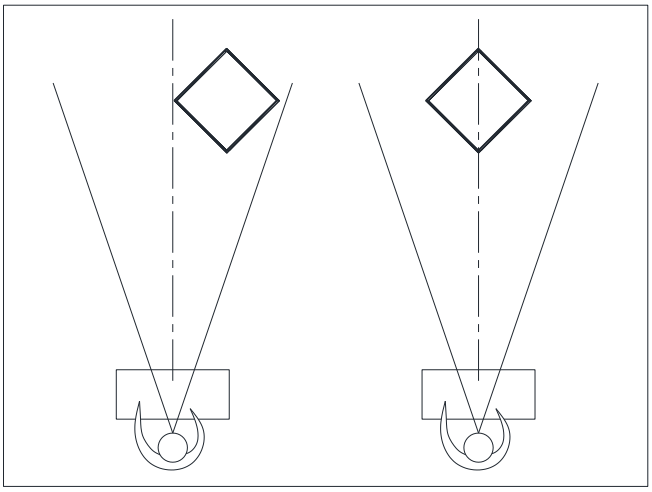
2-2-1) Definition of freehand drawing (freehand drawing):

Hand drawing is done by free hand, using a pencil to easily erase errors and the possibility of controlling the pencil, and without engineering drawing tools. This type of drawing is considered an initial stage of drawing with tools to ensure the validity of the drawing before implementing it on the drawing board.

2-2-2) Drawing preparation:

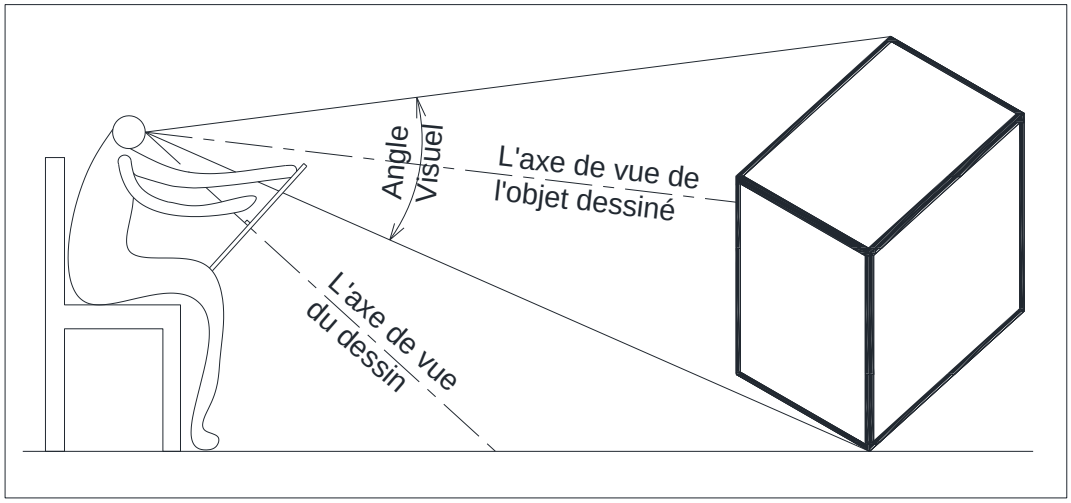
The architecture student is required to prepare the drawing by:

- Choosing the correct position of the painter about the painted shape.
- Place the drawn figure at the center of the painter's angle of vision (Figure 1-15).



Wrong position (the figure does not exist at the center of the painter's angle of vision)

Correct posture (the drawn figure is at the center of the painter's vision angle)



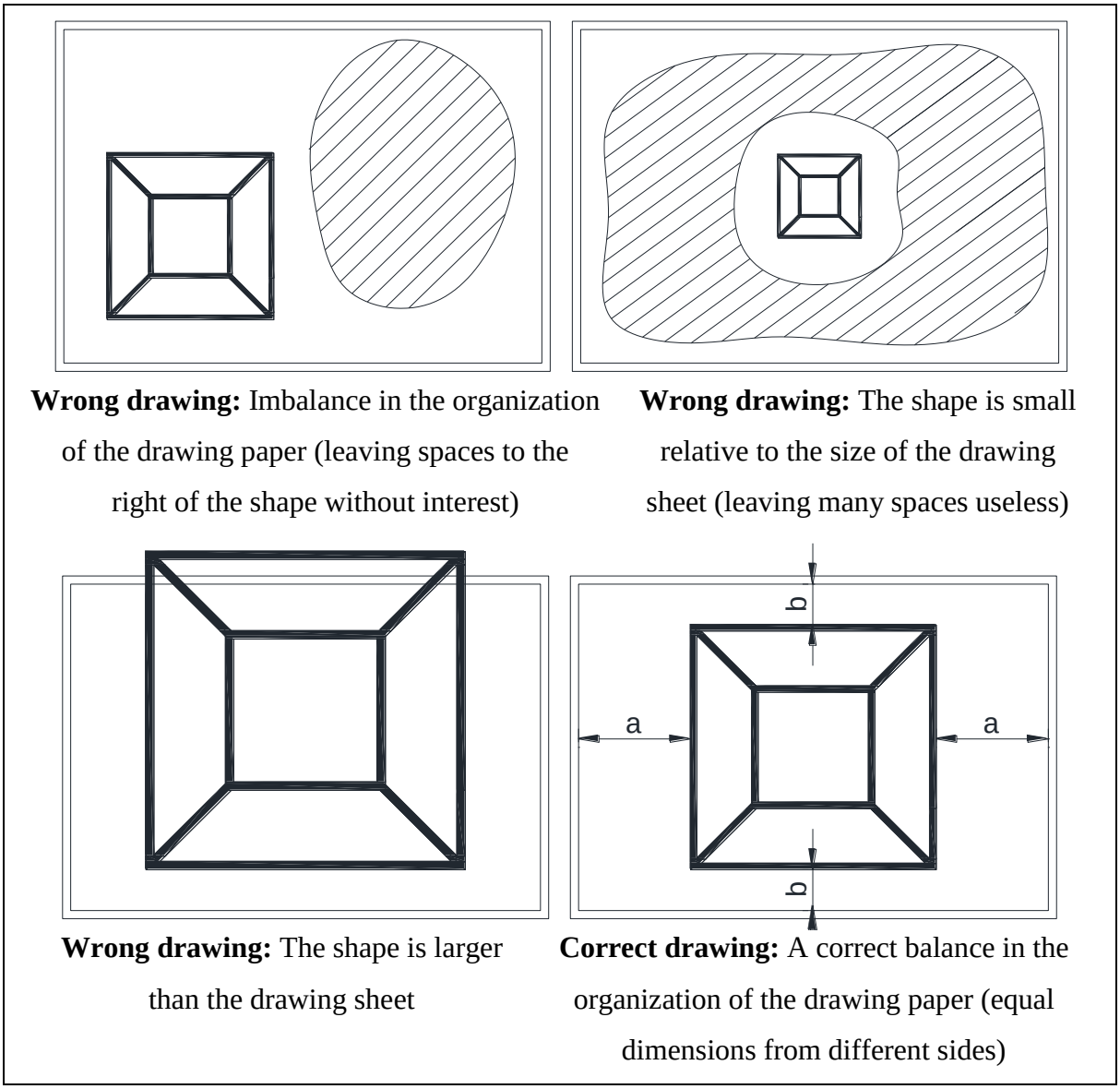
The painter's viewing angle shall be perpendicular to the drawing plate and include the shape drawn

Figure 1-15: The correct position of the painter about the drawing board and the drawing shape - Source: Researcher

2-2-3) Organizing the spaces of the drawing sheet (page organization):

One of the important things for an architecture student while drawing shapes in various sizes for drawing papers is to pay attention to the organization of the drawing paper (Figure 1-16) by:

- Do not leave the blanks in the drawing sheet useless.
- Do not draw a small or large shape that does not fit the size of the drawing paper.
- Draw a shape that fits the size of the drawing paper by maintaining the balance of the paper (equal dimensions from different sides).



Wrong drawing: Imbalance in the organization of the drawing paper (leaving spaces to the right of the shape without interest)

Wrong drawing: The shape is small relative to the size of the drawing sheet (leaving many spaces useless)

Wrong drawing: The shape is larger than the drawing sheet

Correct drawing: A correct balance in the organization of the drawing paper (equal dimensions from different sides)

Figure 1-16: The correct way to organize the spaces of the drawing sheet

Source: Researcher

2-2-4) Drawing lines by free hand:

Horizontal, vertical, or oblique lines are drawn in the correct way using a pencil, by drawing several lines once from right to left, and without interruption to obtain a thick final line drawing (Figure 1-17).

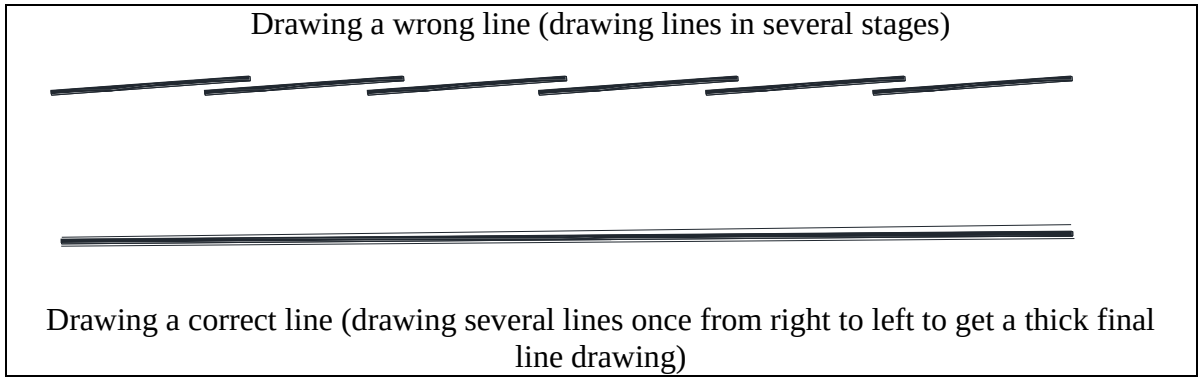


Figure 1-17: The correct way to draw lines with the free hand

Source: Researcher

2-2-4-1) Drawing horizontal lines with free hand:

Horizontal lines are drawn with the free hand, by moving the pencil from left to right (Figure 1-18).

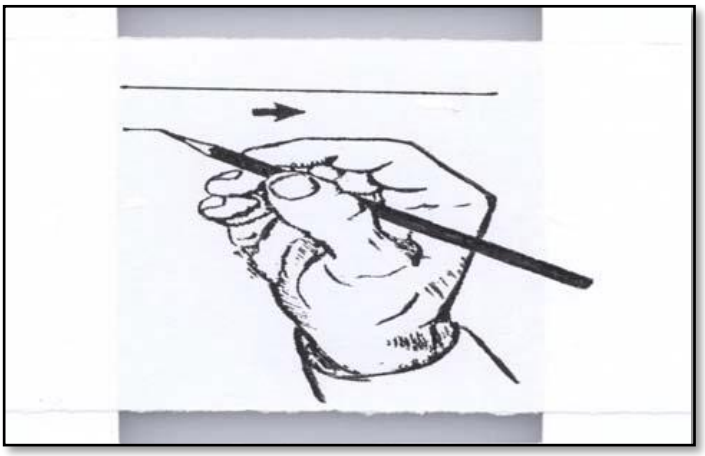


Figure 1-18: The correct way to draw horizontal lines with the free hand

Source: (Public institution for technical education and vocational training "Spatial drawing – 1", 1429 AH, 08)

2-2-4-2) Drawing vertical lines by free hand:

Vertical lines are drawn with the free hand, by moving the pencil from the bottom up (Figure 1-19).

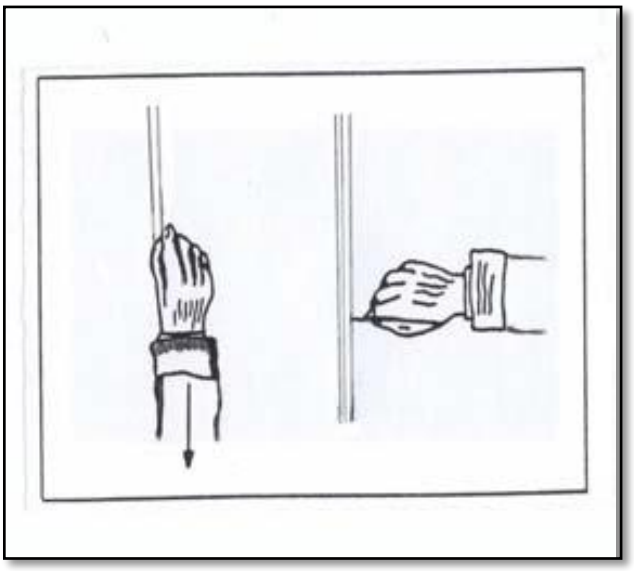


Figure 1-19: The correct way to draw vertical lines with the free hand

Source: (Public institution for technical education and vocational training "Spatial drawing – 1", 1429 AH, 09)

2-2-4-3) Drawing inclined lines by free hand:

The oblique lines are drawn with the free hand, by moving the pencil from the bottom up (Figure 1-20).

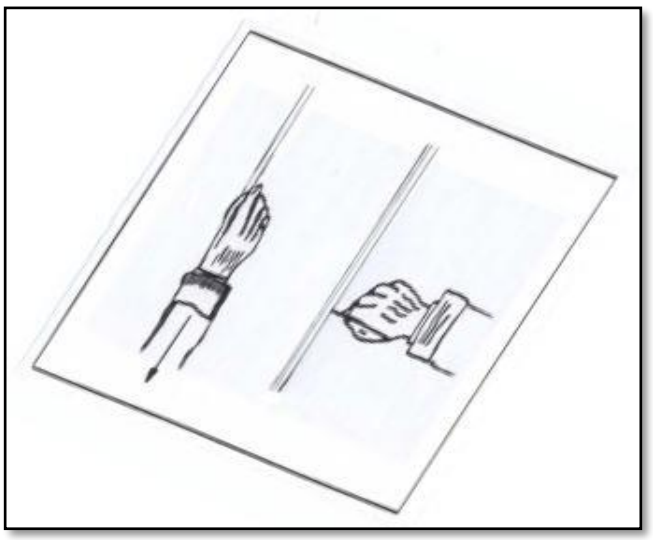


Figure 1-20: The correct way to draw italicized lines with the free hand

Source: (Public institution for technical education and vocational training "Spatial drawing – 1", 1429 AH, 10)

2-2-4-4) Drawing the shape of the squares by free hand:

The shape of the square is drawn by free hand, by following the stages shown in (Figure 1-21):

First, by drawing a vertical line (1), then secondly by drawing a horizontal line at the bottom (2), then thirdly by drawing another horizontal line at the top (3) parallel to the horizontal line at the bottom, and finally by drawing another vertical line (4) parallel to the first vertical line, thus completing the shape of the square.

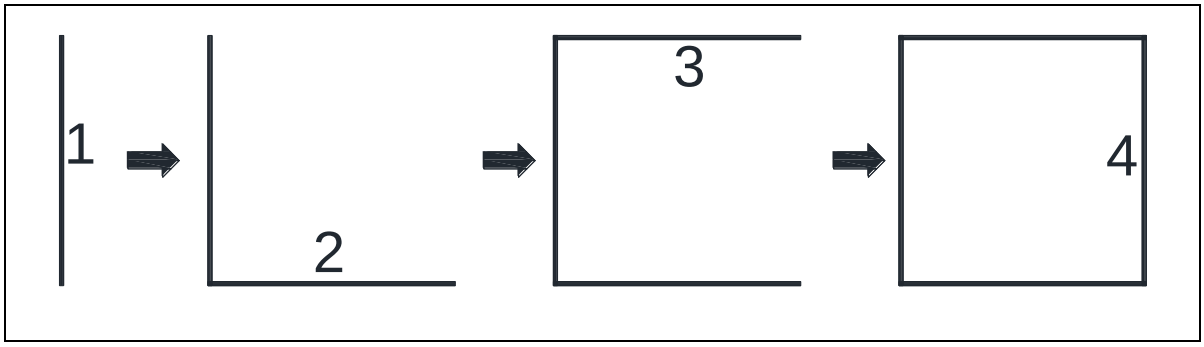


Figure 1-21: The correct way to draw the shape of squares with the free hand

Source: Researcher

2-2-4-5) Drawing the shape of circles by free hand:

The shape of the circle is drawn by free hand, by following the stages shown in (Figure 1-22):

First, by drawing two perpendicular lines (1) (vertical line and horizontal line), second, by drawing two perpendicular and oblique lines (2), third, by drawing the circumference of the circle with dashed lines (3), and finally, by connecting the dashed lines to get the shape of the circle.

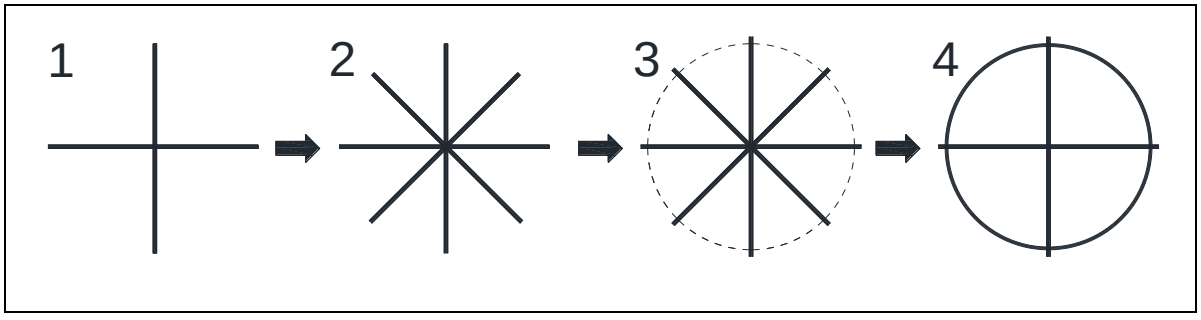


Figure 1-22: The correct way to draw the shape of circles by free hand

Source: Researcher

II- Practical exercises for the preparatory phase:

The preparatory phase of the subject program includes a set of applied exercises, including:

* Line exercises and their shapes: The exercises include drawing lines of different directions and dimensions by free hand (hand drawing), adjusting the rates of a discrepancy between them and their thickness with the naked eye and without the use of a ruler or eraser so that the student can correct his mistake himself or at the behest of the professor.

* An exercise in which the student tries to draw the things he sees in front of him in the workshop, even if they are stereoscopic, while always maintaining proportions and not using technical means, prompting the student to use the concept of proportions in taking measurements from those things and translating them on paper.

* Exercises through which the student is directed to draw the things he sees in front of him from nature, in addition to the architectural forms outside the workshop to be returned to the workshop to be corrected every week.

* Control exercises in drawing sizes: Assigning students to form a set of sizes (the heel, the pyramid, the cylinder) given in appropriate dimensions and accomplished outside the workshop for the student to use and apply the principles of drawing by free hand and the third dimension, through the different positions of those sizes individually and then form them in the form of combinations with the professor, to try to shape the student's imagination by making him touch the volumetric geometric shape that he accomplishes and then translate it alive on the paper by drawing.

* Colour gradient control exercises: The exercises involve drawing geometric shapes and one of the elements of nature by free hand (hand drawing), while maintaining as much as possible the gradient in colours (Ton) and the proportions in geometric shapes.

1- Line drawing control exercises “2D drawing”:

1-1) Practical exercise 01 (Lines):

All students are required to do the following (Figure 1-23):

1) Fix the drawing paper (A4) on the drawing table.

2) Frame the drawing paper (A4) from each side of the drawing paper in equal dimensions and using only pencil.

3) Draw **horizontal**, **vertical** and then **oblique** lines with the full width of the drawing paper (A4), with equal and spaced dimensions (3 times) and then with equal and close dimensions (3 times) using only the pencil.

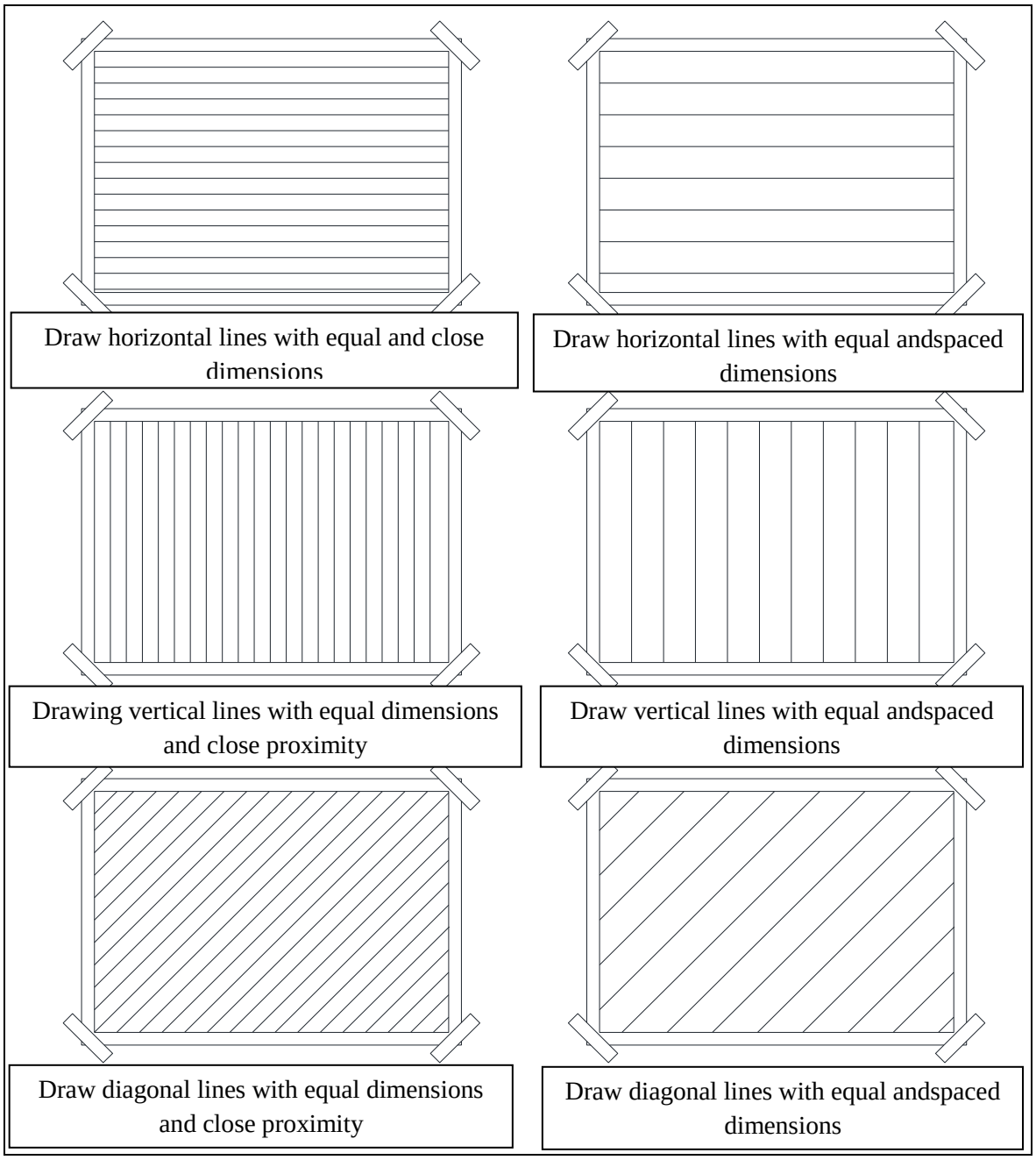


Figure 1-23: Practical exercise 01 "Controlling the drawing of lines – size (A4)"

Source: Researcher

1-2) Practical exercise 02 (Lines):

All students are required to do the following (Figure 1-24):

1) Fix the drawing paper (A3) on the drawing table.

2) Frame the drawing paper (A3) from each side of the drawing paper in equal dimensions and using only pencil.

3) Draw **horizontal**, **vertical** and **diagonal** lines with the full width of the drawing paper (A3), with equal and spaced dimensions and then with equal and close dimensions (retry 3 times) using only the pencil.

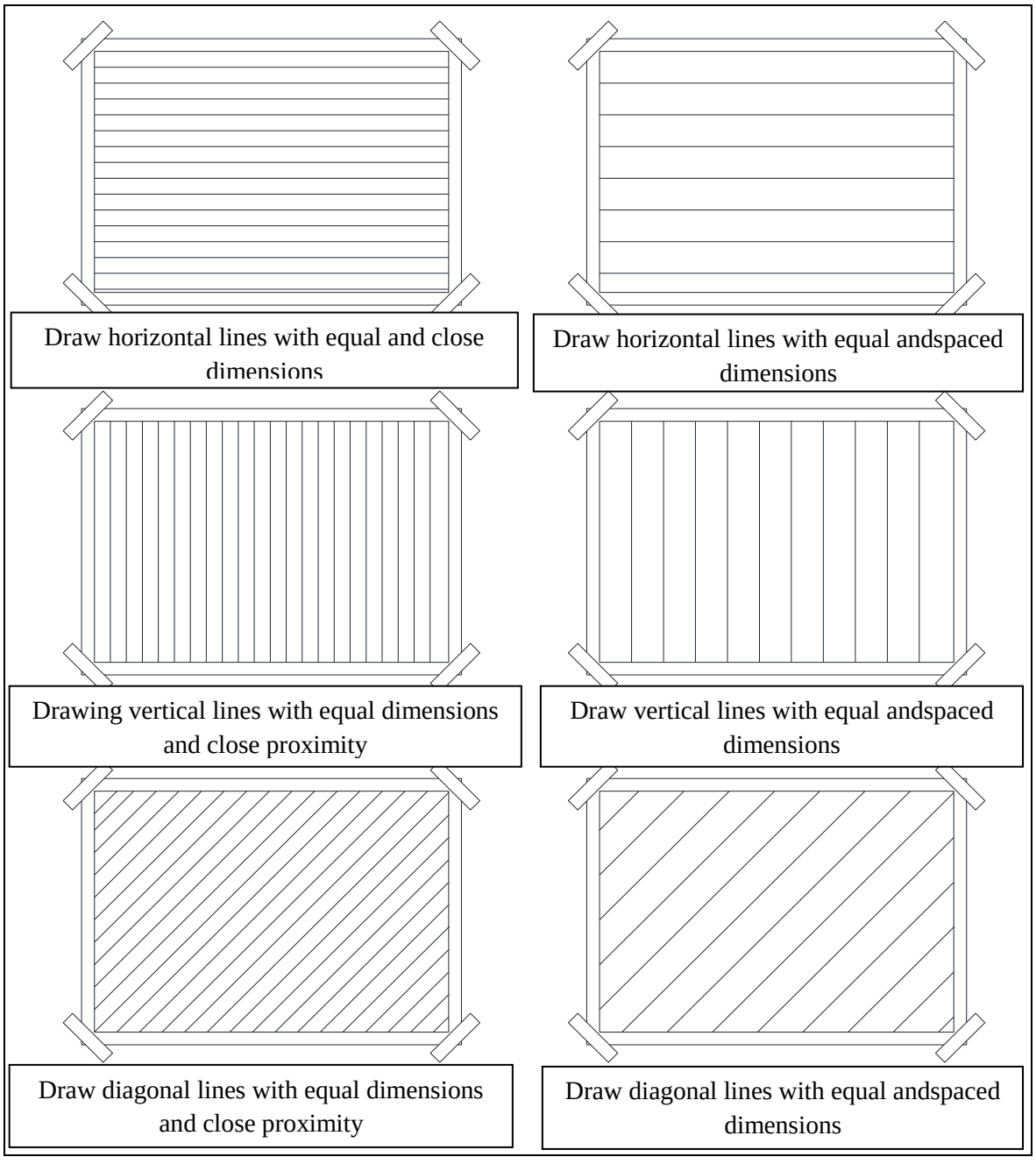


Figure 1-24: Practical exercise 02 "Controlling line drawing – size (A3)"

Source: Researcher

1-3) Practical exercise 03 (Lines):

All students are required to do the following (Figure 1-25):

1) Fix the drawing paper (A3) on the drawing table.

2) Frame the drawing paper (A3) from each side of the drawing paper in equal dimensions and using only a pencil.

3) Draw six squares with **horizontal**, **vertical,** and oblique lines evenly distributed on the drawing paper (A3), and in equal, spaced, and close dimensions using only the pencil (retry 3 times).

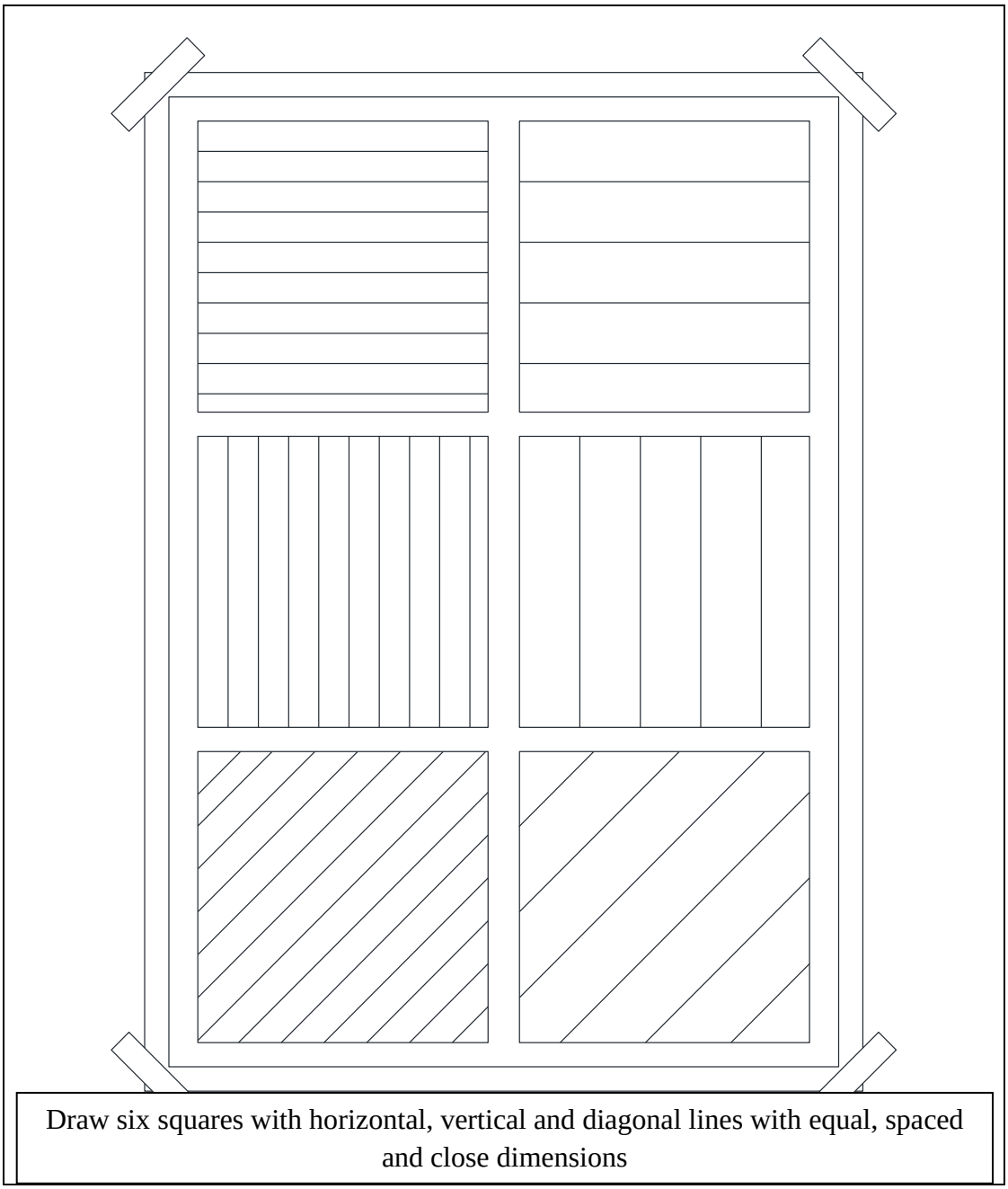


Figure 1-25: Practical exercise 03 "Controlling line drawing – size (A3)"

Source: Researcher

1-4) Practical exercise 04 (Lines):

All students are required to:

1) Draw thick **horizontal** lines on drawing paper (A4) with the free hand and using a pencil, and with the naked eye divide these lines in the middle with a small and thin line (Figure 1-26).

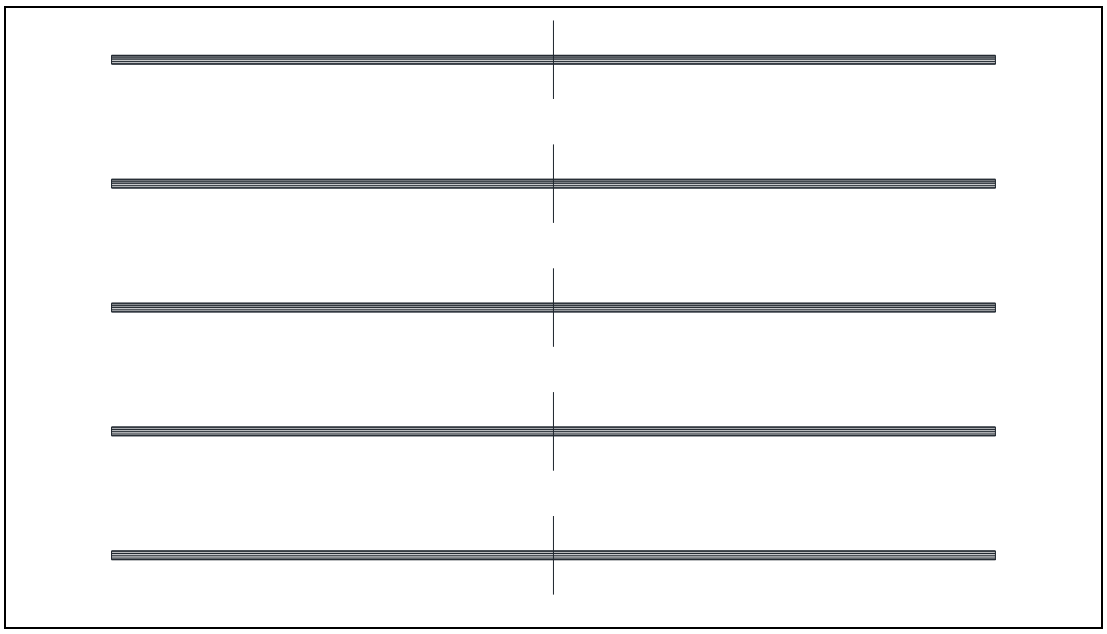


Figure 1-26: Practical exercise 04-1 "Controlling line drawing – size (A4)"

Source: Researcher

2) Draw **horizontal** lines on the drawing paper (A4) with the free hand and using a pencil, and with the naked eye draw other **horizontal** lines next to the first lines and with measurements equal to them (Figure 1-27).

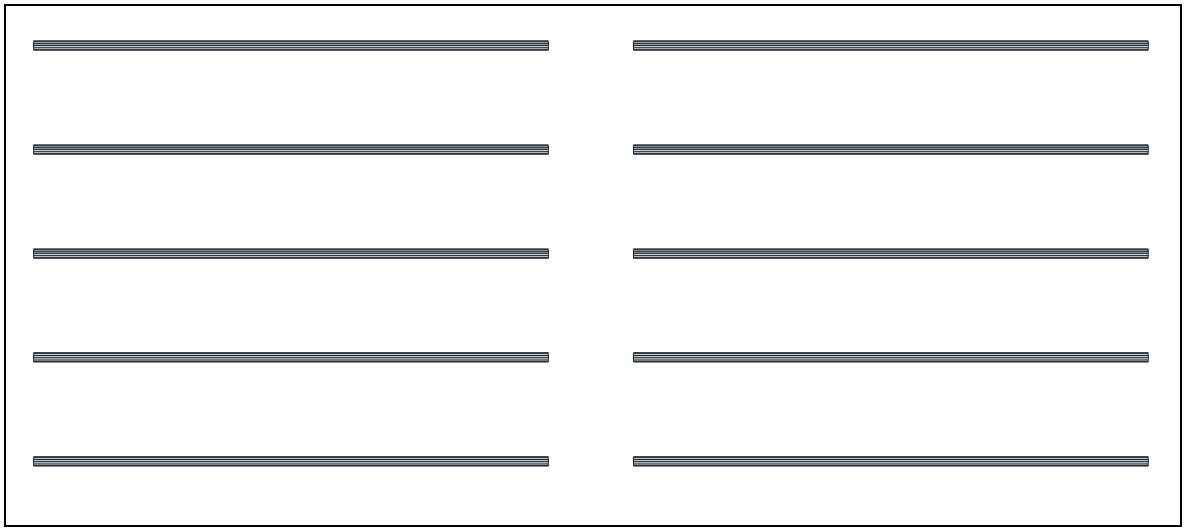


Figure 1-27: Practical exercise 04-2 "Controlling line drawing – size (A4)"

Source: Researcher

3) Draw a **horizontal** line on the drawing paper (A4) with the free hand and using a pencil, and with the naked eye draw two **vertical** lines equal to the horizontal line (retry 5 times) (Figure 1-28).

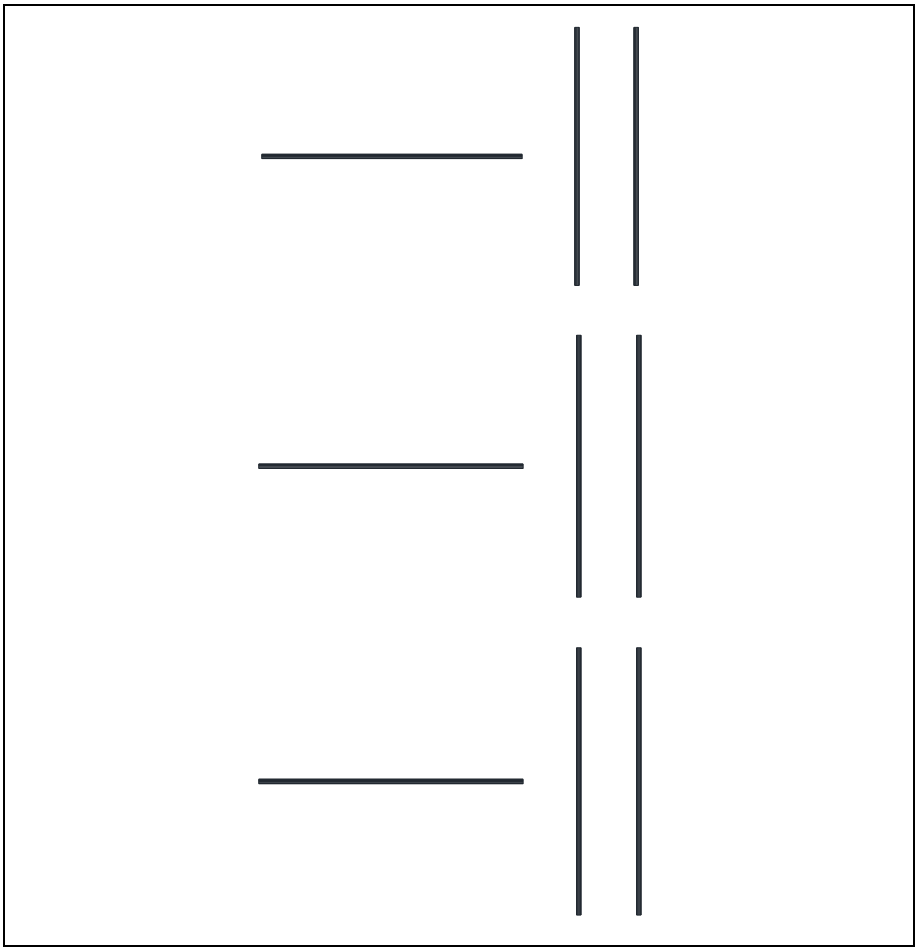


Figure 1-28: Practical exercise 04-3 "Controlling line drawing – size (A4)"

Source: Researcher

4) Draw the square shape on the drawing sheet (A4) with the free hand and using the pencil, extract all the lines forming the square, by following all the stages shown in (Figure 1-29) (Retrying 5 times).

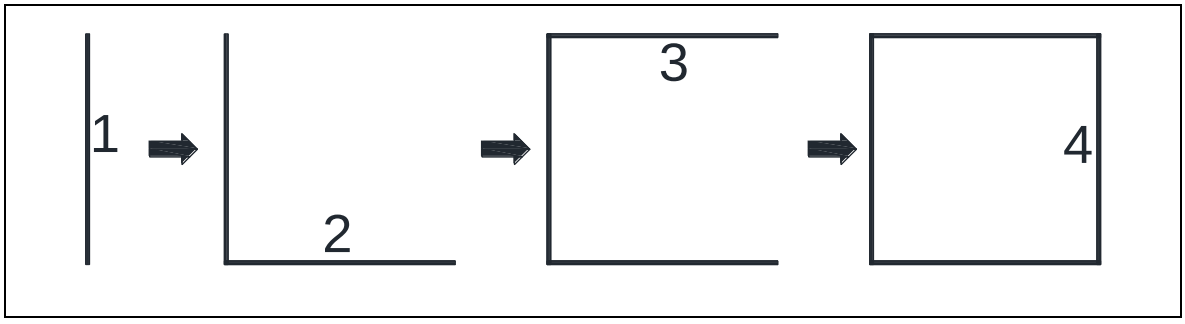


Figure 1-29: Practical exercise 04-4 "Controlling the drawing of lines (Box) – size (A4)" -

Source: Researcher

1-5) Practical exercise 05 (Lines):

All students are required to:

1) Re-draw (Figure 1-30) on the A4 drawing sheet with the free hand and using a pencil (retry 3 times).

2) Then re-draw (Figure 1-30) on the drawing sheet (A3) with the free hand and using the pencil "enlarge drawing" (retry 3 times).

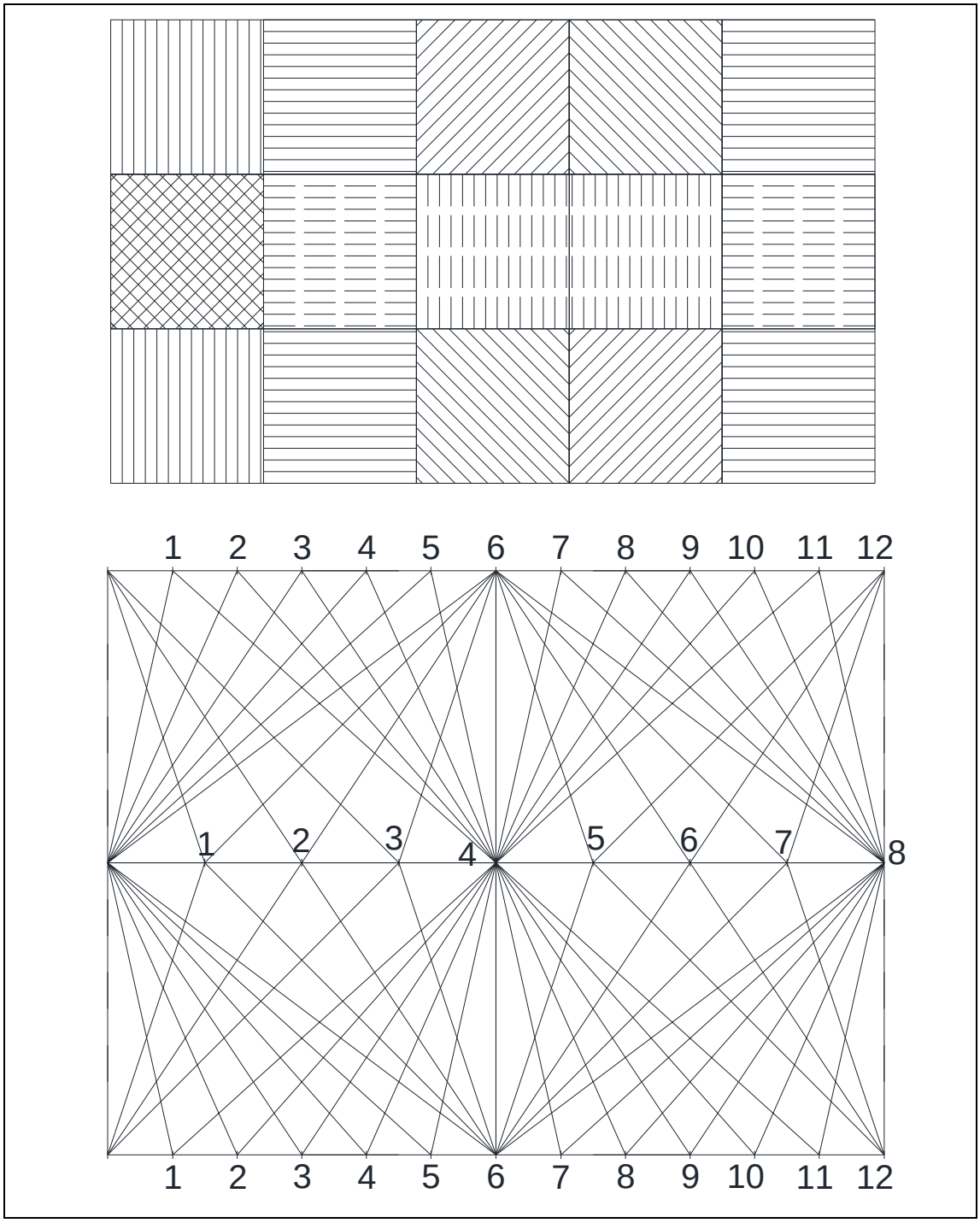


Figure 1-30: Practical exercise 05 "Controlling line drawing – size (A4-A3)"

Source: Researcher

2- Control exercises in drawing geometric shapes "two-dimensional drawing":

2-1) Practical exercise 01 (Figures):

All students are required to:

1) Re-draw (Figure 1-31) on the drawing sheet (A4) with the free hand and using a pencil (retry 3 times).

2) Then redraw (Figure 1-31) on the drawing sheet (A3) with the free hand and using the pencil "enlarge drawing" (retry 3 times).

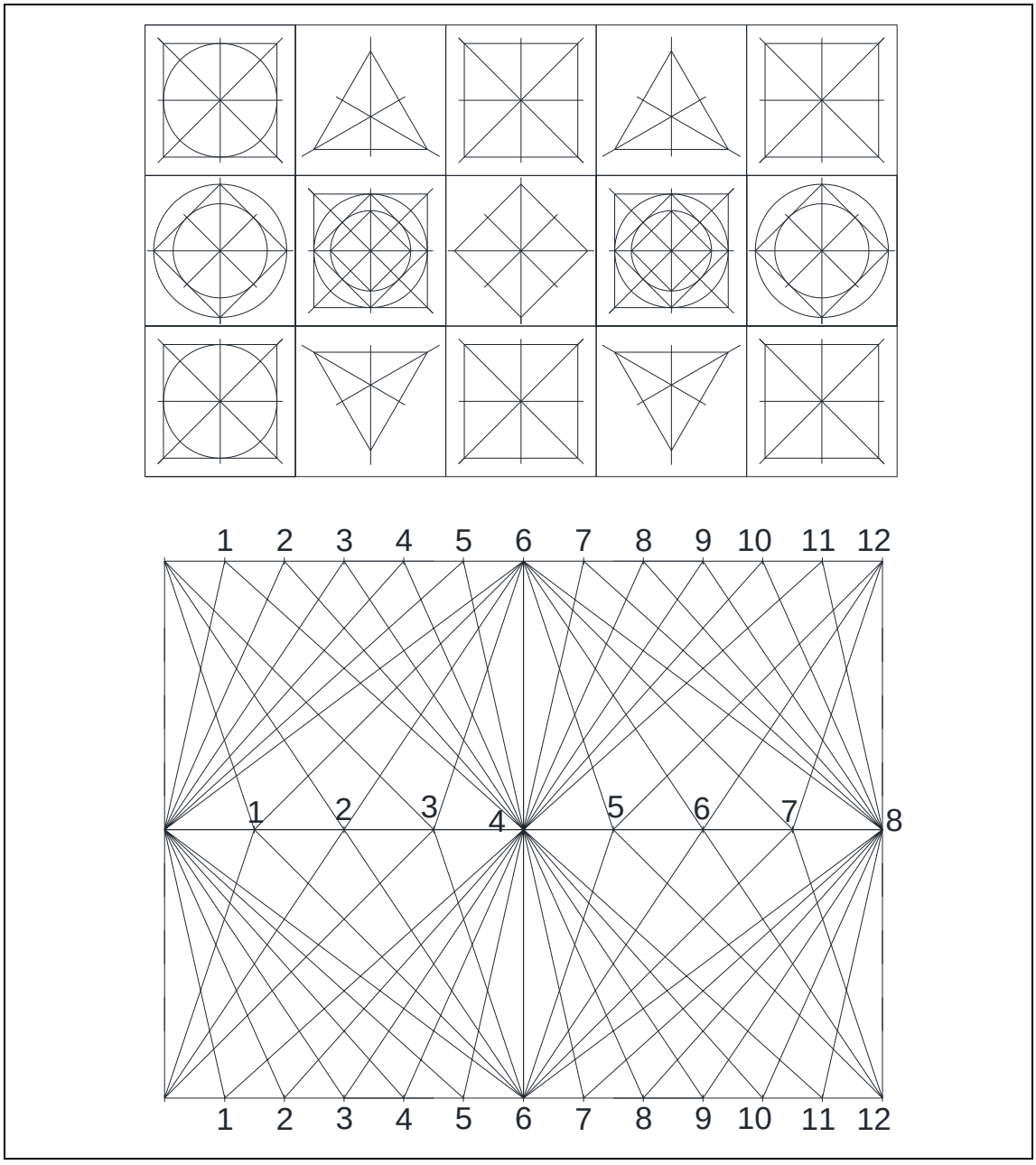


Figure 1-31: Practical exercise 01 "Controlling the drawing of lines (geometric shapes) – size (A4-A3)" - Source: Researcher

2-2) Practical exercise 02 (Construction lines for figures):

All students are required to:

1) Redraw (Figure 1-32) on the drawing sheet (A4) by free hand and using a pencil, showing the construction lines of those geometric shapes, by following the stages shown in (Figure 1-32).

2) Then redraw (Figure 1-32) on the drawing paper (A3) by free hand and using a pencil, showing the construction lines of those geometric shapes, by following the stages shown in (Figure 1-32) "Enlarge the drawing".

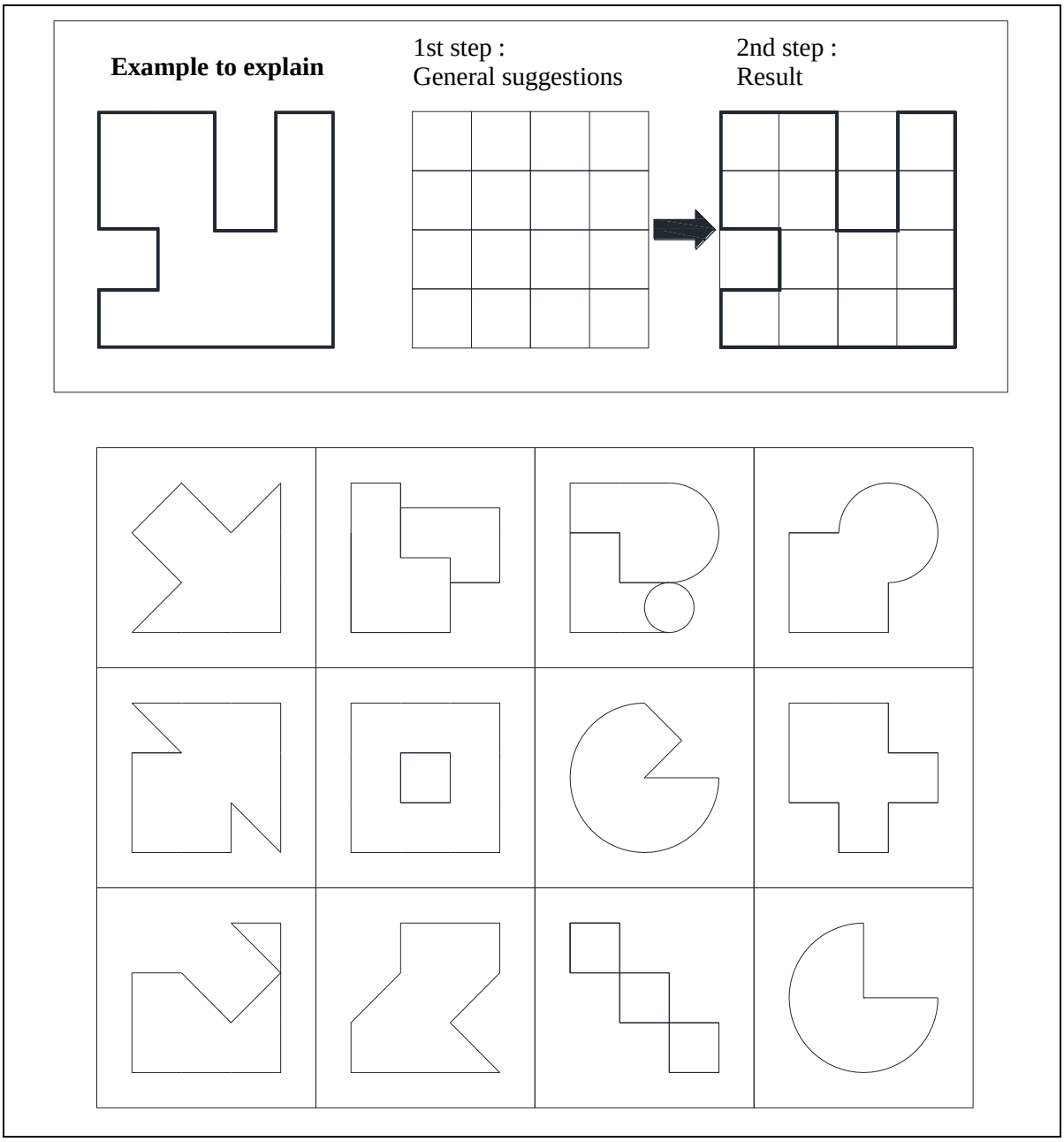


Figure 1-32: Practical exercise 02 "Controlling line drawing (geometric shapes) – size (A4-A3)" - Source: Researcher

3- Ratio control exercises "Drawing things - 3D drawing":

3-1) Practical exercise 01 (Drawing table pillar):

All students are required to draw the drawing table (Tréteau) on drawing paper size (A4) and then size (A3), while maintaining proportions and not using technical means (Figure 1-33):

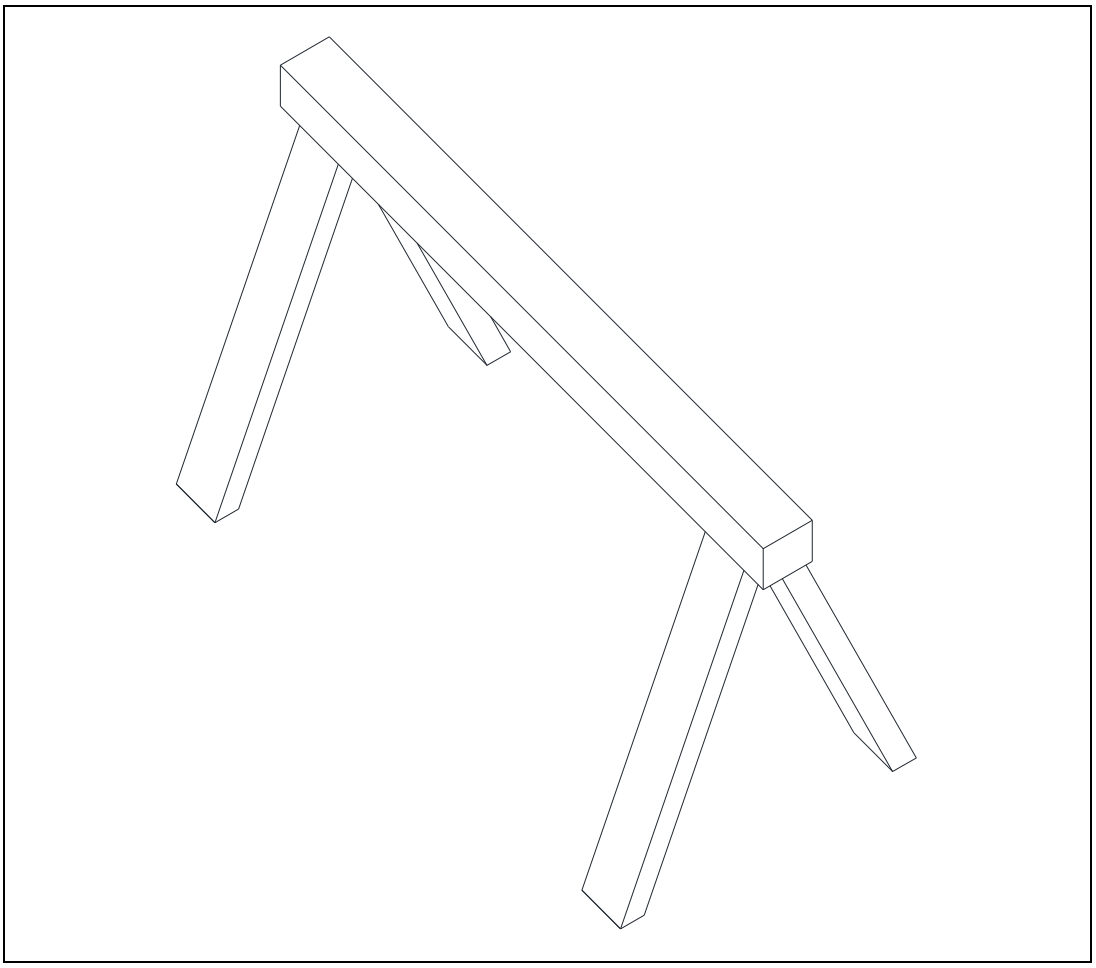


Figure 1-33: Practical exercise 01 "Ratio control (table pillar) – size (A4-A3)"

Source: Researcher

3-2) Practical exercise 02 (Drawing table):

All students are required to draw the drawing table on drawing paper size (A4) and then size (A3), while maintaining proportions and not using technical means (Figure 1-34):

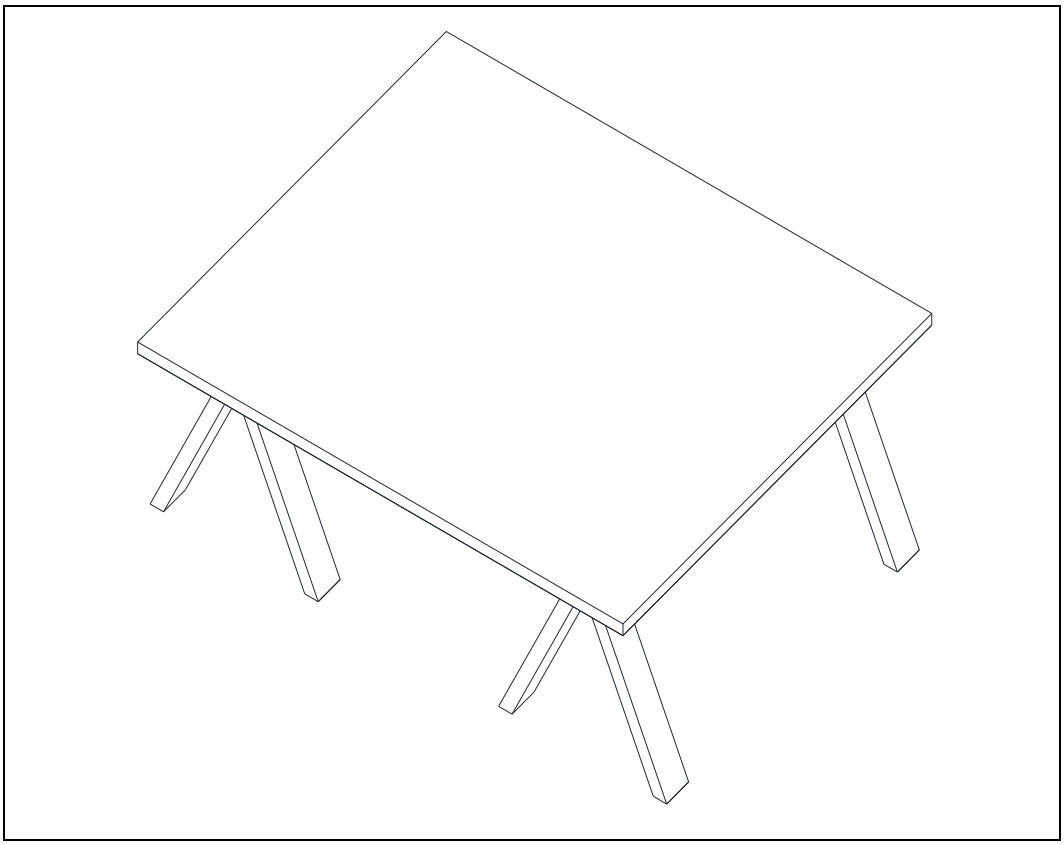


Figure 1-34: Practical exercise 02 “Ratio control (drawing table) – size (A4-A3)”

Source: Researcher

3-3) Practical exercise 03 (Nature):

All students are required to draw the objects in (Figure 1-35) on drawing paper size (A4) and then size (A3), while maintaining proportions and not using technical means.

Figure 1-35: Practical exercise 03 “Ratio control (nature) – size (A4-A3)”

Source: Researcher

3-4) Practical exercise 04 (Architectural figures):

All students are required to draw the objects in (Figure 1-36) on drawing paper size (A4) and then size (A3), while maintaining proportions and not using technical means.

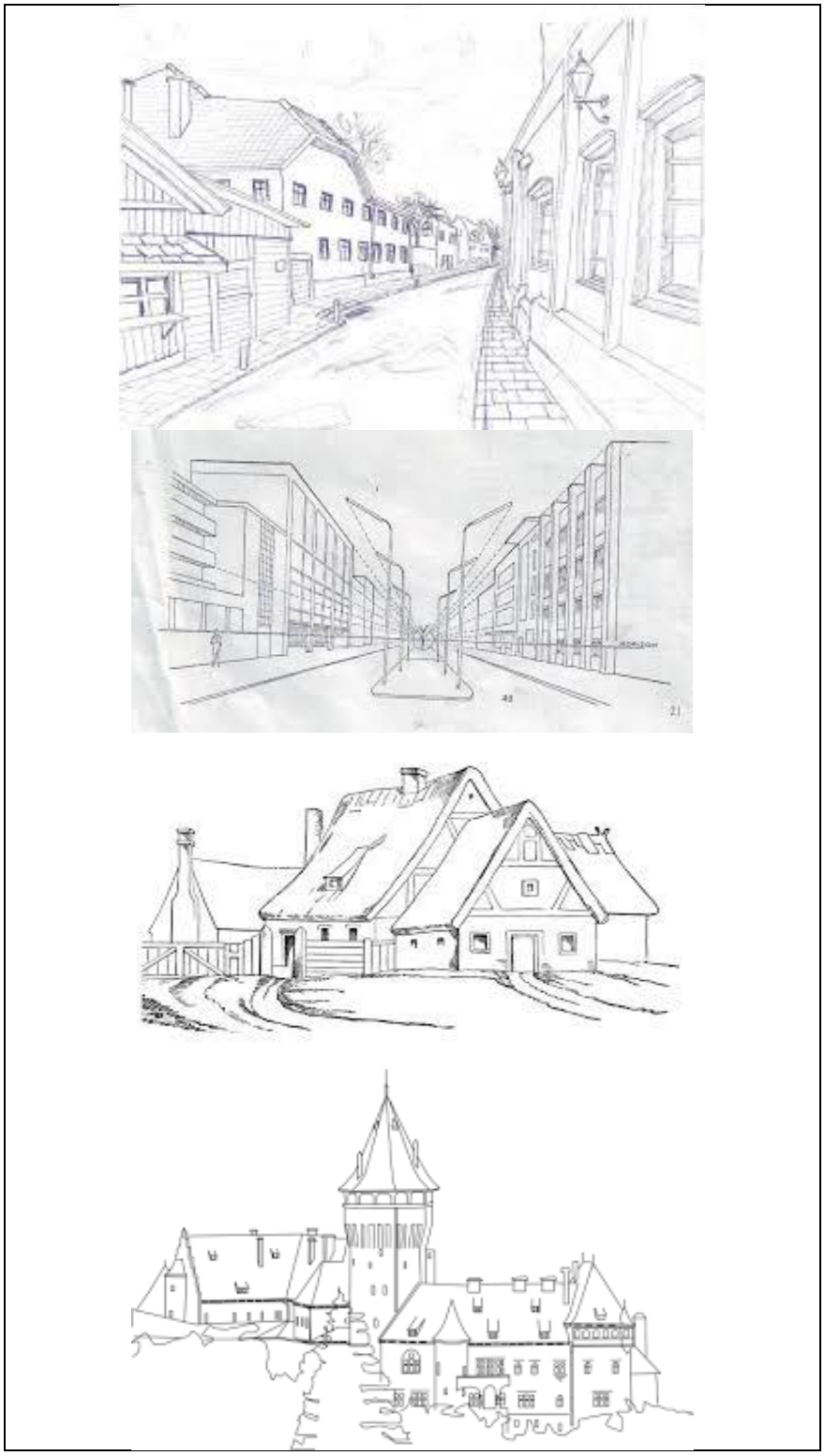


Figure 1-36: Practical exercise 04 "Ratio control (geometric shapes) – size (A4-A3)"

Source: Researcher

4- Volume drawing control exercises "3D drawing":

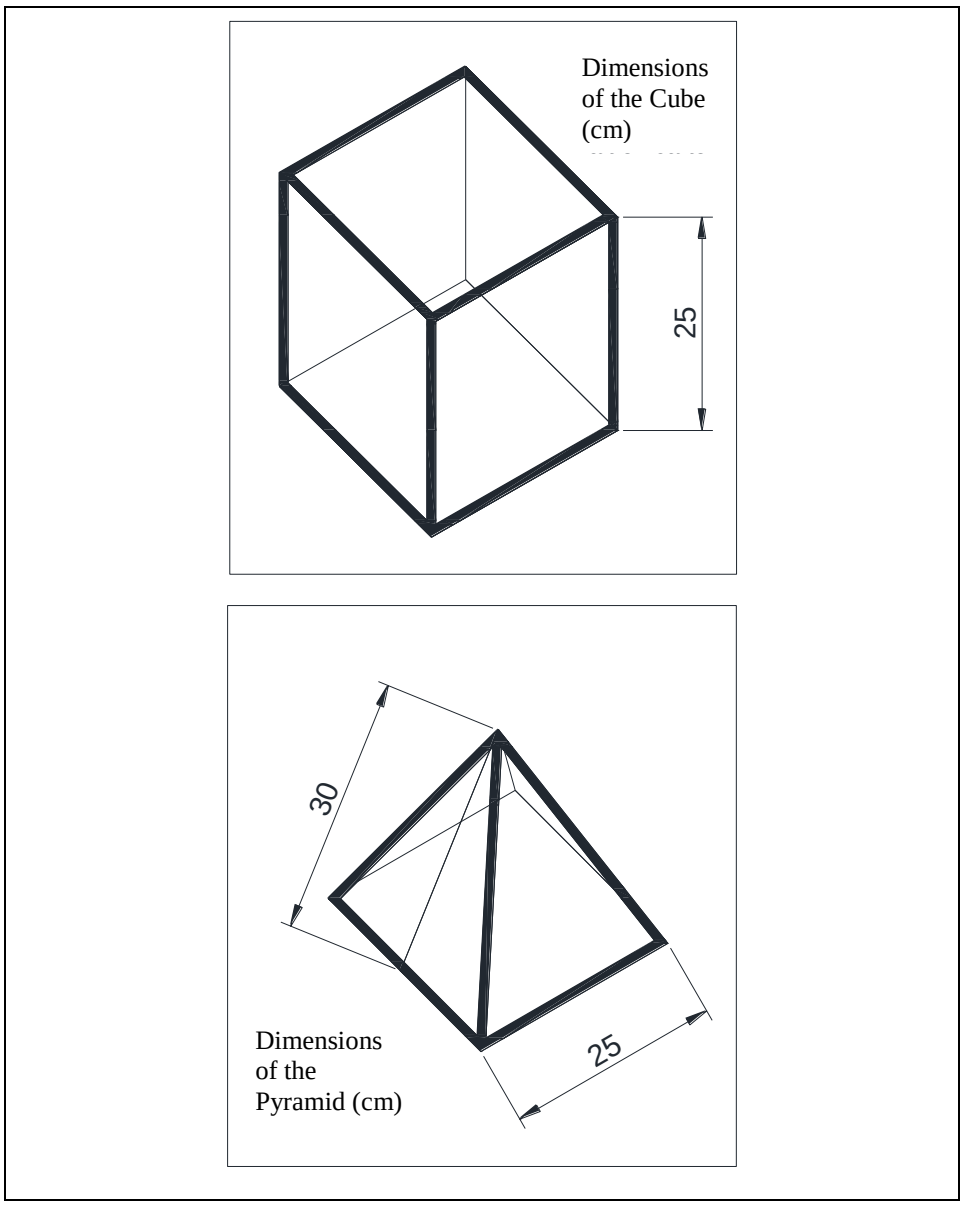
4-1) Practical exercise 01 (Sizes):

All students are required to:

1) The completion of three different sizes (cube, pyramid and cylinder) of cardboard, while maintaining the measurements shown in (Figure 1-37).

2) Secure the **(**A3) paper to the drawing board and frame it with a pencil, ensuring equal margins on all sides.

3) Draw the sizes separately on the drawing paper (A3), with the free hand and using only the pencil, while maintaining all the dimensions shown in (Figure 1-37) (re-drawing the sizes 3 times).



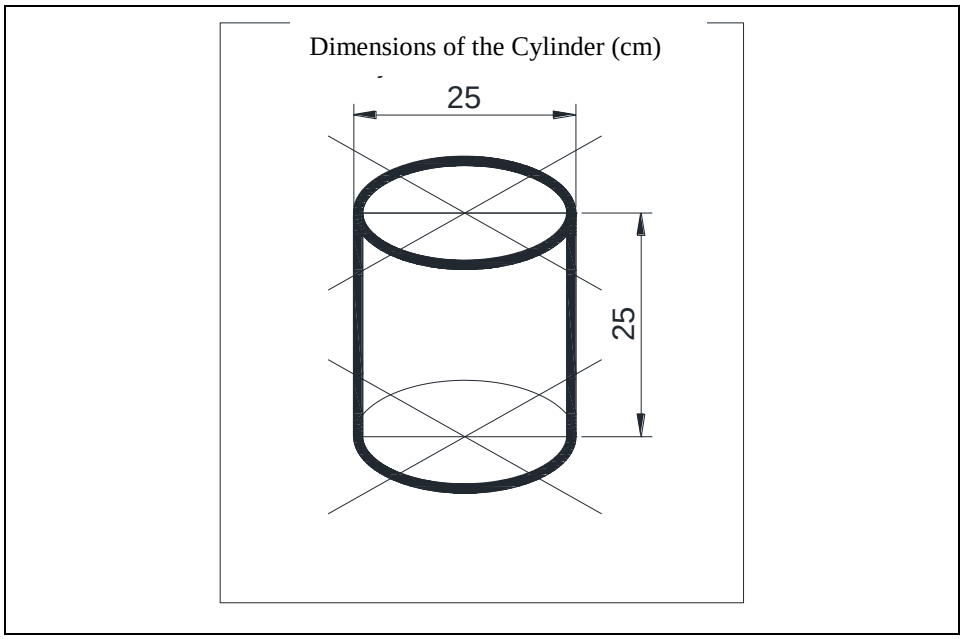
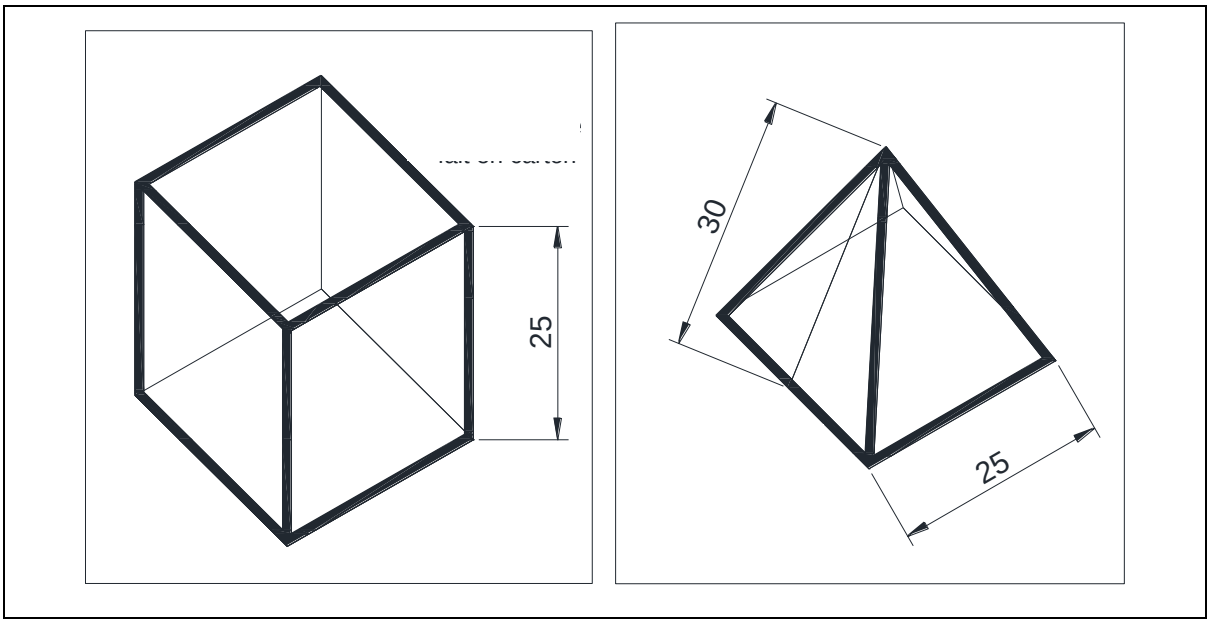


Figure 1-37: Practical exercise 01 "Volume drawing control – size (A3)"

Source: Researcher

4-2) Practical exercise 02 (Perspective: sizes):

All students are required to draw the sizes separately (cube, pyramid and cylinder) in different positions, on A3 drawing paper, by free hand and using pencil only, by following the example shown in (Figure 1-38) (re-drawing the sizes 3 times).



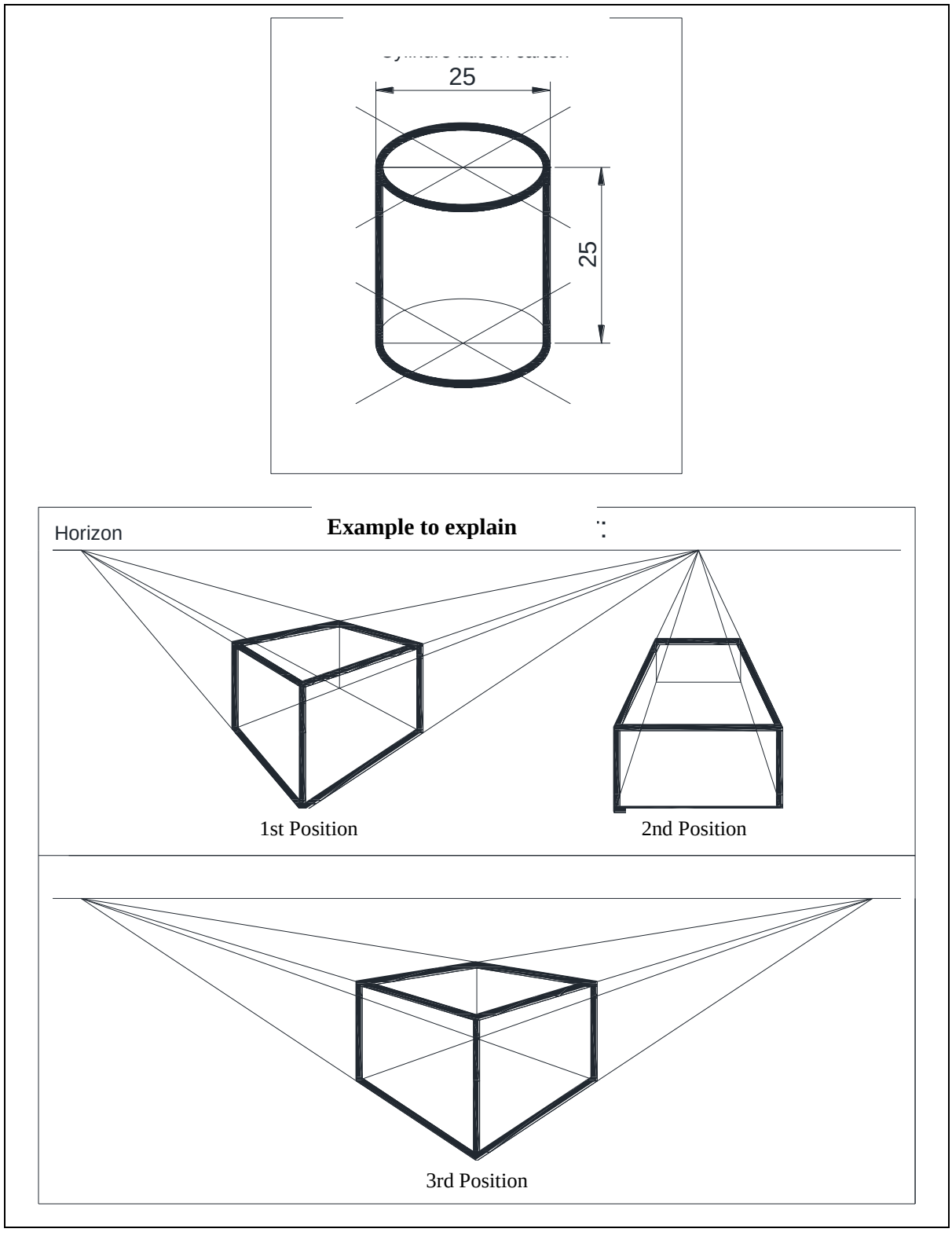
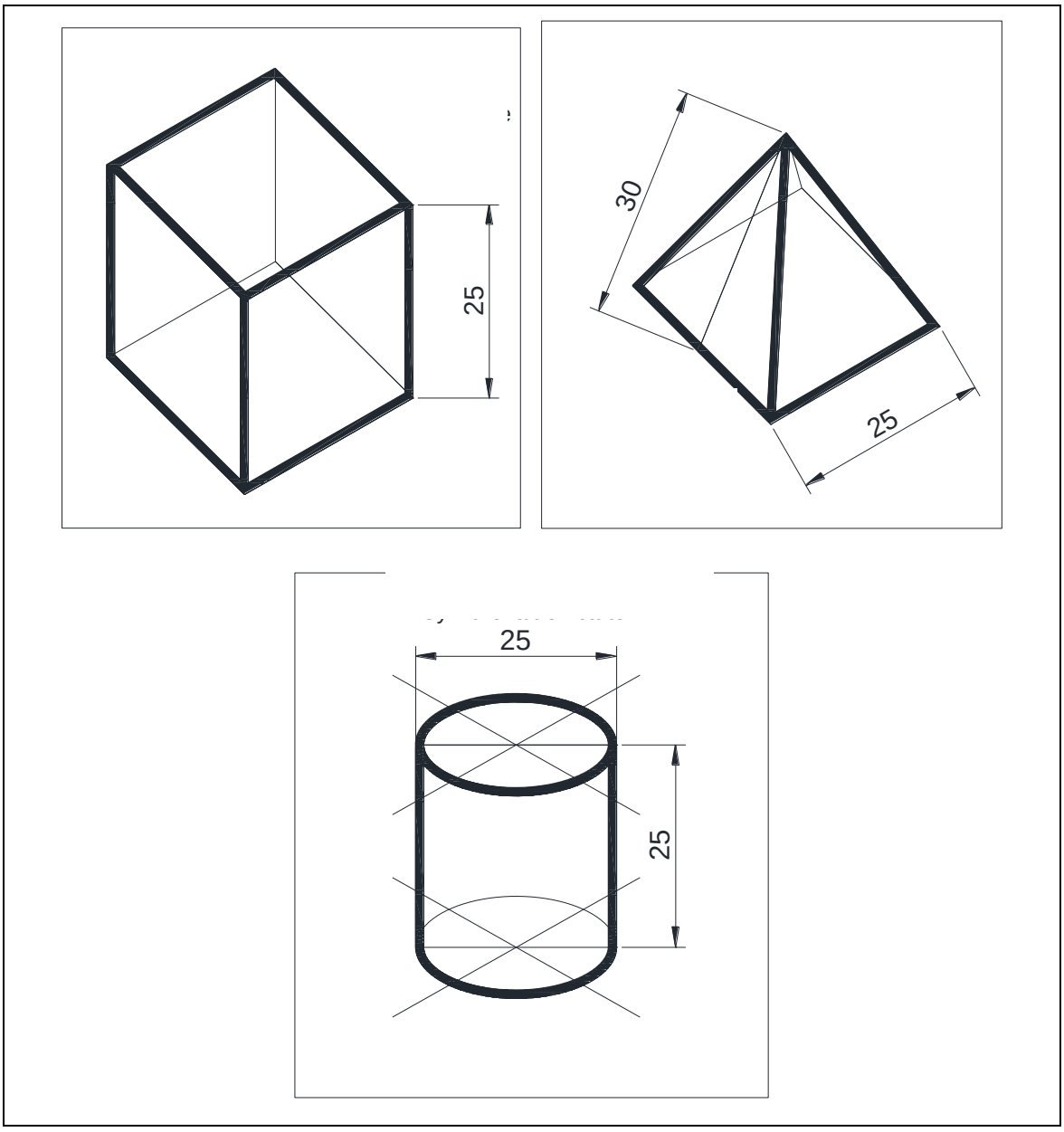


Figure 1-38: Practical exercise 02 "Controlling drawing sizes (perspective) – size (A3)"

Source: Researcher

4-3) Practical exercise 03 (Perspective: different positions for size combinations):

All students are required to draw ten different positions for the combinations of the three sizes together (cube, pyramid and cylinder), on A3 drawing paper, by free hand and using only a pencil, by following the example shown in (Figure 1-39).



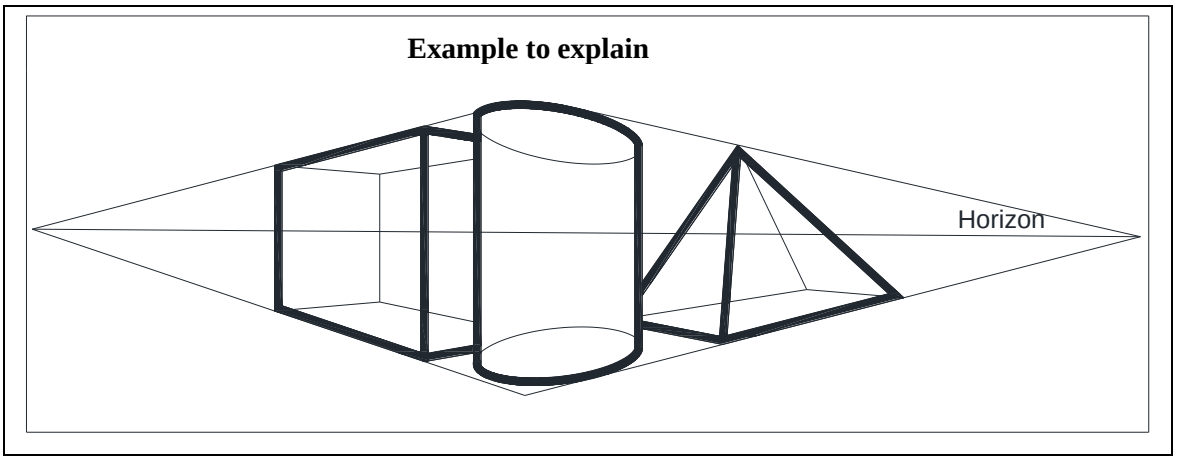


Figure 1-39: Practical exercise 03 "Controlling drawing sizes (perspective) – size (A3)"

Source: Researcher

5- Colour gradient control exercises :

5-1) Practical exercise 01 (Figures – Ton) :

All students are required to:

1) Re-draw all the colours on the drawing paper (A4) by free hand and using a pencil, and try as much as possible to maintain the gradient in colours and proportions in geometric shapes (Figure 1-40).

2) Repeat the same exercise on the drawing sheet (A3).

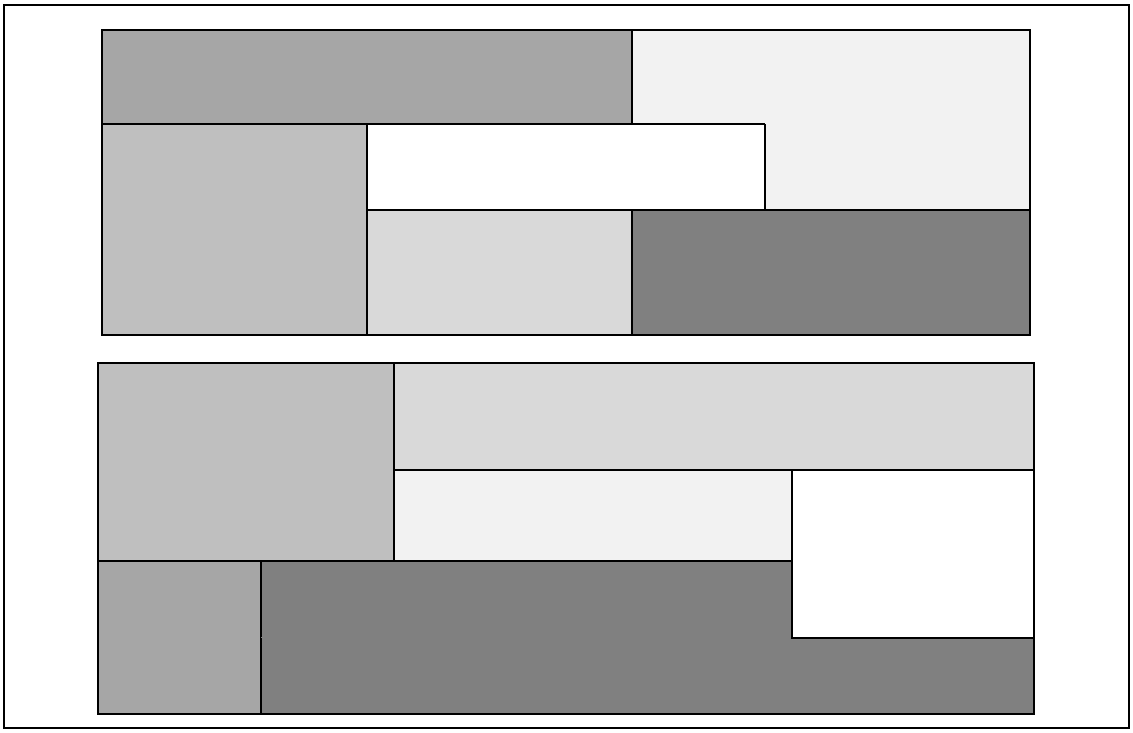


Figure 1-40: Practical exercise 01 "Controlling the gradient in the colours of geometric shapes - Ton" – size (A4 - A3)"- Source: Researcher

5-2) Practical exercise 02 (Natural elements – Ton) :

All students are required to:

1) Draw the hue of one of the elements of nature (tree) on the drawing paper (A4) by free hand and using a pencil, and try as much as possible to maintain the hue of the element of nature (Figure 1-41).

2) Repeat the same exercise on the drawing sheet (A3).

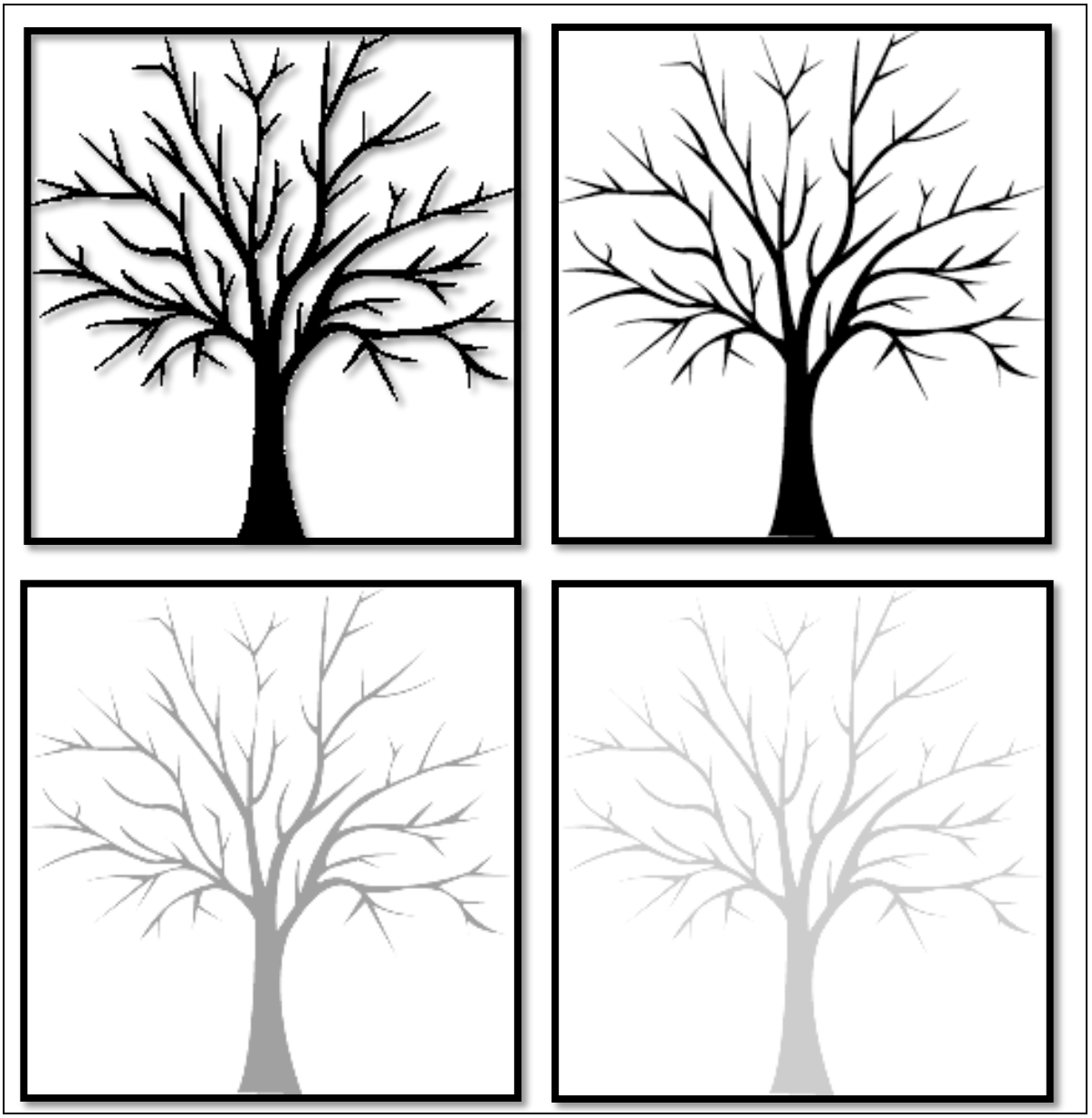


Figure 1-41: Practical exercise 02 "Controlling the gradient in the colours of natural elements - Ton" – size (A4 - A3)"- Source: Researcher

CHAPTER II:
PHASE TWO
"ARCHITECTURAL DEMONSTRATION"

- Introduction:

The second phase of the project workshop material program includes a set of lessons according to which the student can control the technical presentation (engineering in his reference) and then the architectural presentation (techniques related to the specialization of architecture in drawing).

It mainly takes the geometric projection that is manifested as the beginning of the trainee in the so-called landscapes, and lessons on the geometric rules related to the geometric projection, and on global agreements on architectural manifestation.

Other lessons provide the architecture student with everything related to technical drawing such as spreadsheets, drawing scale, lines and their types and places of application, technical writing, perspective, and extrinsic.

I – Phase II lessons (Architectural demonstration):

1- Principles of engineering drawing:

1-1) Definition of engineering drawing:

Engineering drawing is done using drawing tools of all kinds. It is a good way to transfer ideas between the architect and the implementer clearly and shortly. The student of architecture must use drawing tools correctly (Figure 2-1), to draw all lines in all their forms perfectly, and it will be clarified how to use drawing tools in drawing different lines according to the following:

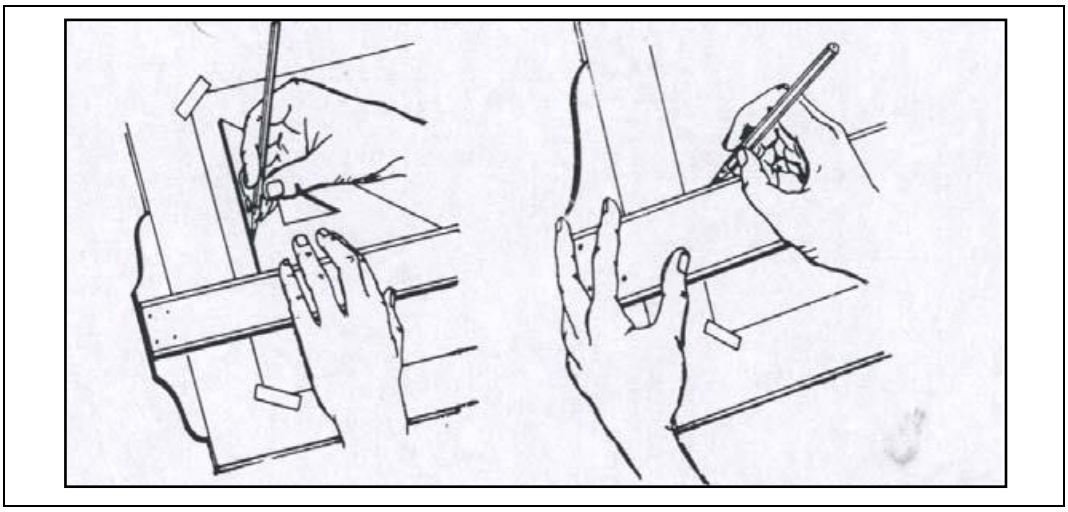


Figure 2-1: Method of developing and using drawing tools - Source: (Public institution for technical education and vocational training "specialization of architectural technology – architectural drawing", 1429AH, 16)

1-2) Create horizontal lines using drawing tools:

Horizontal lines are drawn using a T-rule, by fixing a T-rule with the left hand and using the right hand to draw horizontal lines by moving the pencil from left to right (Figure 2-2).

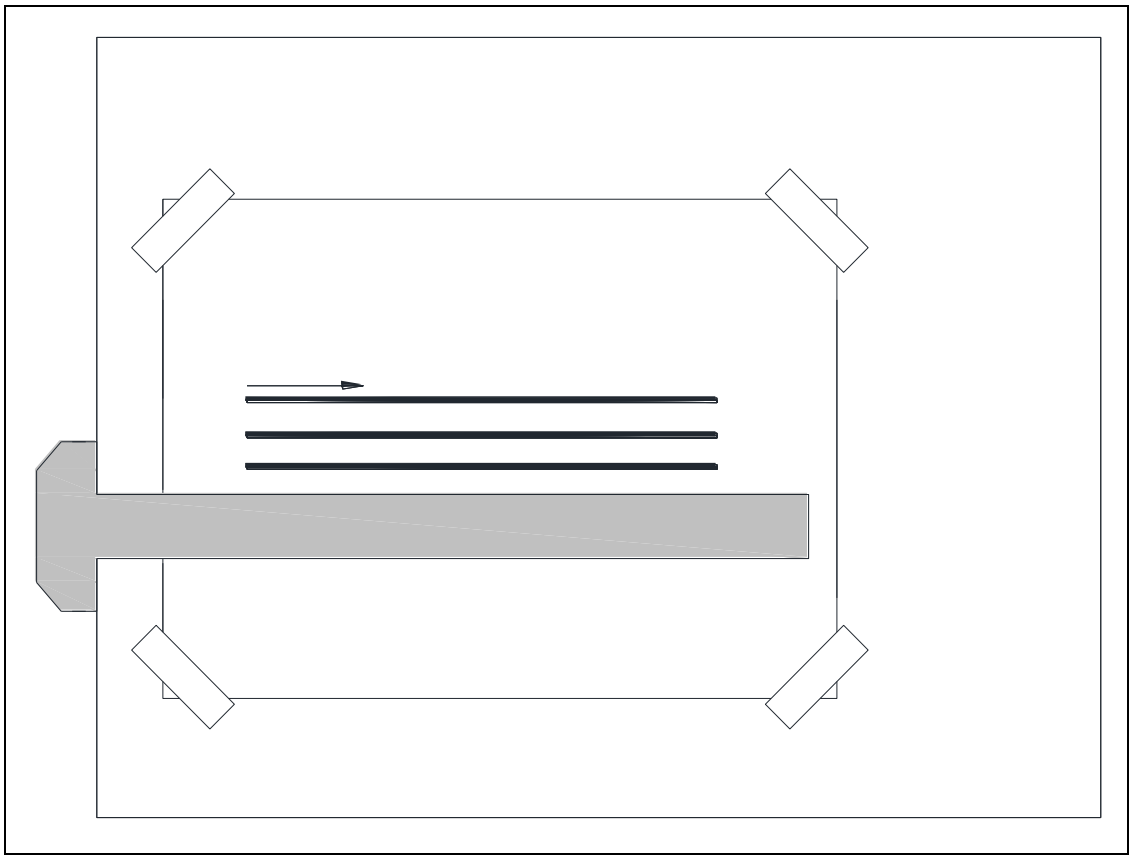


Figure 2-2: Create horizontal lines using drawing tools (T ruler)

Source: Researcher

1-3) Create vertical lines using drawing tools:

Vertical lines are drawn using a T-rule and one of the triangles (30° - 60 ° or 45°), by fixing the triangle and the T-rule with the left hand and using the right hand to draw the vertical lines by moving the pencil from the bottom to the top (Figure 2-3).

1-4) Create italics using drawing tools:

Oblique lines are drawn using a T-rule and one of the triangles (30° - 60 ° or 45°) or both triangles together, by holding the triangle and the T-rule with the left hand, and using the right hand to draw the 60° oblique lines, for example, by moving the pencil from the bottom to the top, while drawing the 30° oblique lines is done by moving the pencil from the top to the bottom (Figure 2-4).

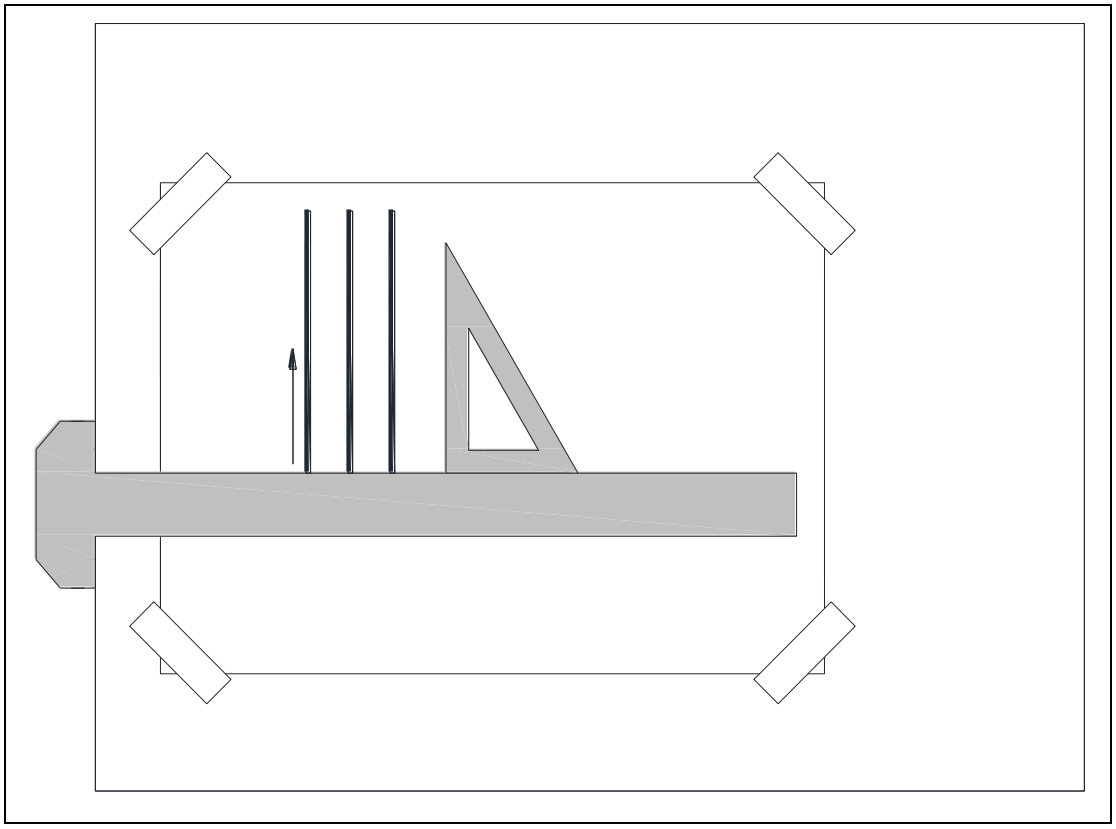


Figure 2-3: Create vertical lines using drawing tools (T ruler and triangle)

Source: Researcher

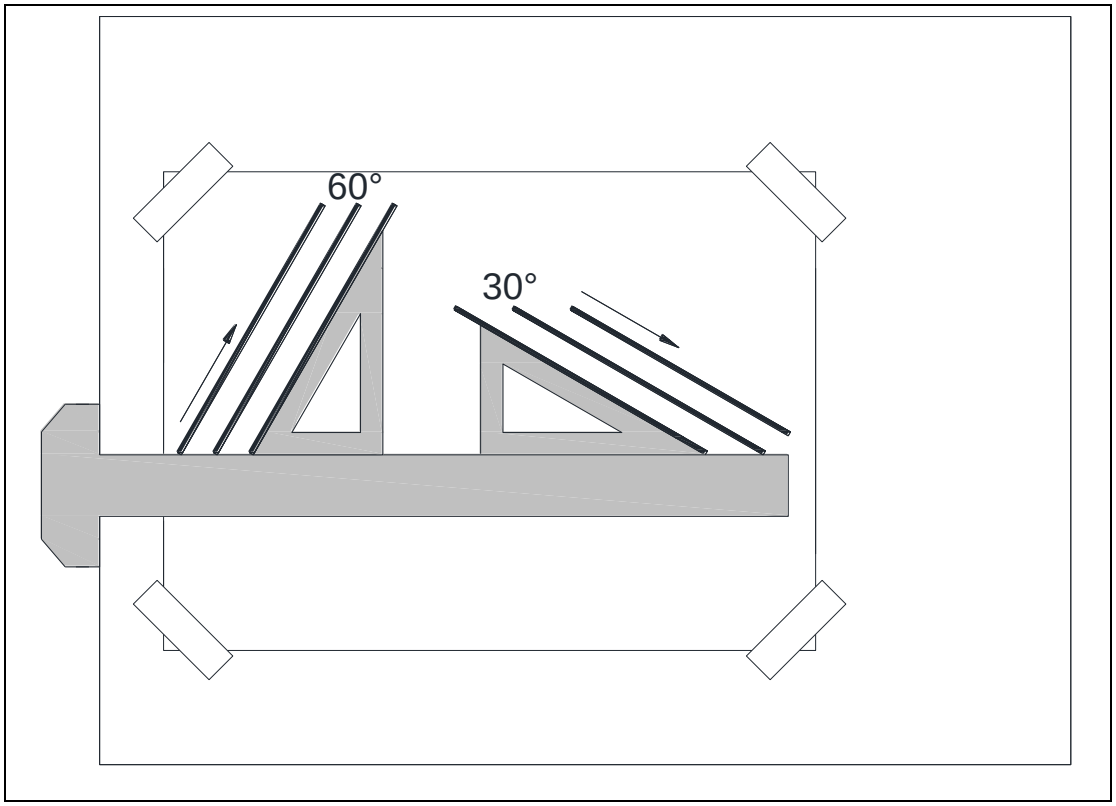


Figure 2-4: Create italics using drawing tools (T ruler and triangle)

Source: Researcher

2- Data table:

2-1) Data table definition:

A spreadsheet is a rectangle drawn in the lower right corner of an engineering drawing sheet, and each drawing sheet contains a spreadsheet whose dimensions vary from sheet to sheet (Figure 2-5):

- The dimensions of the spreadsheet for drawing sheet A2 size is: 18 cm x 09 cm.
- The dimensions of the spreadsheet for drawing sheet A3 size is: 12cm x 06cm.

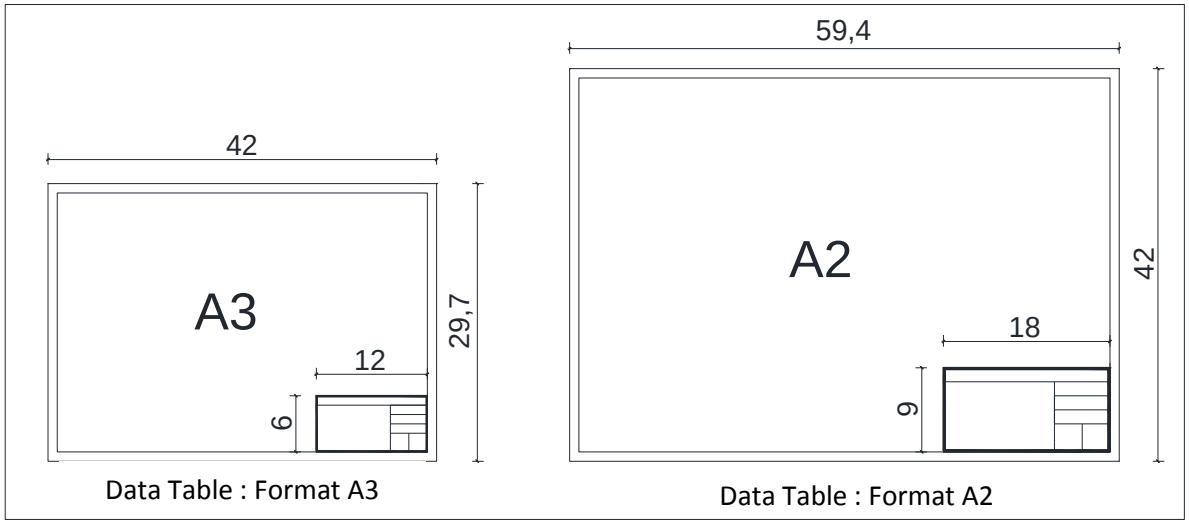


Figure 2-5: Data table for two sizes (A2-A3) - Source: Researcher

2-2) Spreadsheet information:

The data table contains some important data related to the drawing, such as: the name and surname of the student, the title of the drawing, the scale of the drawing, the date of implementation of the drawing, the cohort number, the teaching year and the academic year, and the dimensions of all these data are shown in the figure below (Figure 2-6).

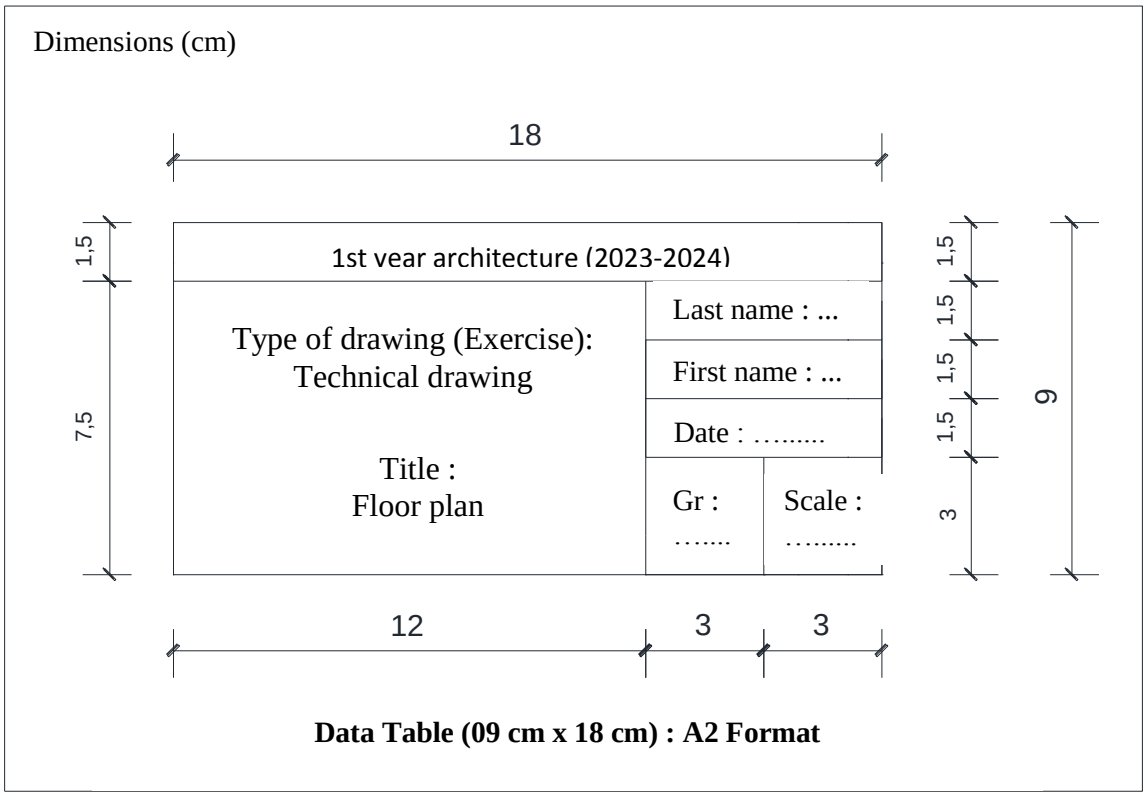


Figure 2-6: Information and dimensions attached in the spreadsheet for size (A2)

Source: Researcher

3- Drawing scale:

It is difficult to draw plans for any facility or building with its real dimensions in nature, so we resort to drawing these real dimensions in a certain percentage, enabling us to draw the building and make the required plans on the drawing paper, and this percentage of miniaturization is known as the drawing scale.

3-1) Definition of Drawing Scale:

The scale of the drawing is the ratio between the distance between two points on the drawing and the distance between the two points on nature, that is: the scale of the drawing = the dimension drawn on the drawing sheet/the real dimension in nature.

3-2) Objective of the drawing scale:

The goal of the drawing scale is to replace the real dimensions of any facility or building with dimensions that can be drawn on the drawing sheet.

3-3) Drawing scales:

The following table (Table 2-1) shows the various drawing scales recognized by the dimensions of the building in nature (the real dimensions) and the corresponding dimensions drawn on the drawing sheet:

Table 2-1: Common drawing scales

Common drawing scales	Length on drawing sheet	True length in nature
1/10000	1 cm in drawing	100 meters in nature
1/5000	1 cm in drawing	50 meters in nature
1/2000	1 cm in drawing	20 meters in nature
1/1000	1 cm in drawing	10 meters in nature
1/500	1 cm in drawing	5 meters in nature
1/200	1 cm in drawing	2 meters in nature
1/100	1 cm in drawing	1 meter in nature
1/50	1 cm in drawing	0.5m in nature
1/20	1 cm in drawing	0.2m in nature
1/10	1 cm in drawing	0.1m in nature
1/5	1 cm in drawing	0.05 m (5 cm) in nature
1/2	1 cm in drawing	0.02 m (2 cm) in nature
1/1	1 cm in drawing	0.01 m (1 cm) in nature

3-4) Drawing scales and architectural drawings:

The following table (Table 2-2) shows the various drawing scales agreed to be approved for architectural drawings at the various stages in the project:

Table 2-2: Drawing scales and architectural drawings

Common drawing scales	Architectural plans
1/10000, 1/5000, 1/2000	Site plan
1/1000, 1/500, 1/200	block plan
1/1000, 1/500, 1/200, 1/100	Omnibus plan
1/200, 1/100	Outline
1/50	As-built drawings
1/20, 1/10, 1/5, 1/2, 1/1	Construction details

4- Lines:

4-1) Line definition:

Line is considered one of the most important means of expression in architectural drawing, used to facilitate reading and understanding of drawing, and it is divided into several types restricted by universally agreed rules. These fonts differ from each other in shape and thickness.

4-2) Types of calligraphy fonts:

According to the scales, we find three main types or varieties of fonts: the bold font, the medium font, and the thin font.

The thickness of the line is chosen according to the type and size of the drawing, the thickness of the thin line is equal to half of the medium line, and a quarter of the thick line.

4-3) Nature of lines:

The nature of the line can be continuous, intermittent or mixed:

- Continuous line: A regular continuous line.
- Dashed line: A line consisting of short or long equal parts separated by empty fields.
- Mixed line: A line consisting of alternating long and short segments separated by empty spheres.

4-4) Applications of lines:

The following table (Table 2-3) shows the various places of application of the lines in the architectural plans, sections and facades:

Table 2-3: Lines application positions in architectural plans, sections and facades

Nature of the font	Font	Representation	Item	Use
Continuous line	Thick		0.35 − 1.40	- The edges of the cut parts. - Ground-level.
	Median		0.18 – 0.70	- The edges of the visible characters. - Main level curves.

	Thin	———————	0.18 – 0.50	- Level of pieces and types of furniture. - Staking and marking lines.
Dashed line	Thick	- - - - - - -	0.35 – 1.40	- The parts of the building that will be demolished.
	Median	– – – – – – – – –	0.18 – 0.70	- The edges of the invisible parts.
	Thin	----------	0.18 – 0.50	- Fake hidden edges.
Mixed line	Thick	—·—·—·—·—	0.35 – 1.40	- Cutting level line.
	Median	—·—·—·—·—	0.18 – 0.70	- The axes of the building parts.
	Thin	–·–·–·–·–·–	0.18 – 0.50	- The perimeter of adjacent pieces. - Initial lines.

The following table (Table 2-4) shows the type of fonts and their relationship with the drawing:

Table 2-4: Font type and graphic typefaces

Drawing scale	**Bottom thick line**	**Median line**	**Thin line**
	0.35 – 1.40	**0.18 – 0.70**	**0.18 – 0.50**
1/1	1.40	0.70	0.50
1/5	1.00	0.50	0.35
1/10	1.00	0.50	0.35
1/50	0.70	0.35	0.25
1/100	0.50	0.25	0.18
1/200	0.35	0.18	0.18

5- Technical writing in engineering drawing:

In engineering drawing, written details are used, letters and numbers are written regularly, and this is done by international rules and specifications.

5-1) Writing in Arabic letters:

Writing in Arabic letters in geometric drawing is characterized by the presence of several models of geometric writing fonts in Arabic letters, and one of the models adopted in technical writing in geometric drawing is the Kufic model.

5-2) Writing in Latin letters:

Writing in Latin letters in the geometric drawing is characterized by international standards, as it was adopted to choose one of the standard scales to choose the height of the nominal letter (mm) about the dimensions of the drawing and the type of written data (Table 2-5) and (Figure 2-7).

Among the international standards adopted for the height of the nominal letter of the capital letter of the Latin letters according to the size of the drawing, we find: h (mm) = 2,5 – 3,5 – 5 – 7 – 10 – 14 – 20

Table 2-5: Approved global standards for nominal letter height of Latin letters

Character specifications		**Nominal letter height h (mm)**					
Height of uppercase letters and numbers **h (mm)**	10/10 h	2,5	3,5	5	7	10	14
Lower case height **c (mm)**	7/10 h	1,8	2,5	3,5	5	7	10
Writing font thickness	1/10 h	0.25	0.35	0,5	0,7	1	1,4
Smallest spacing between lines **b (mm)**	14/10 h	3,5	5	7	10	14	20
Word spacing **e (mm)**	6/10 h	1.5	2.1	3	4.2	6	8,4
Smallest space between characters **a (mm)**	2/10 h	0,5	0,7	1	1,4	2	2,8

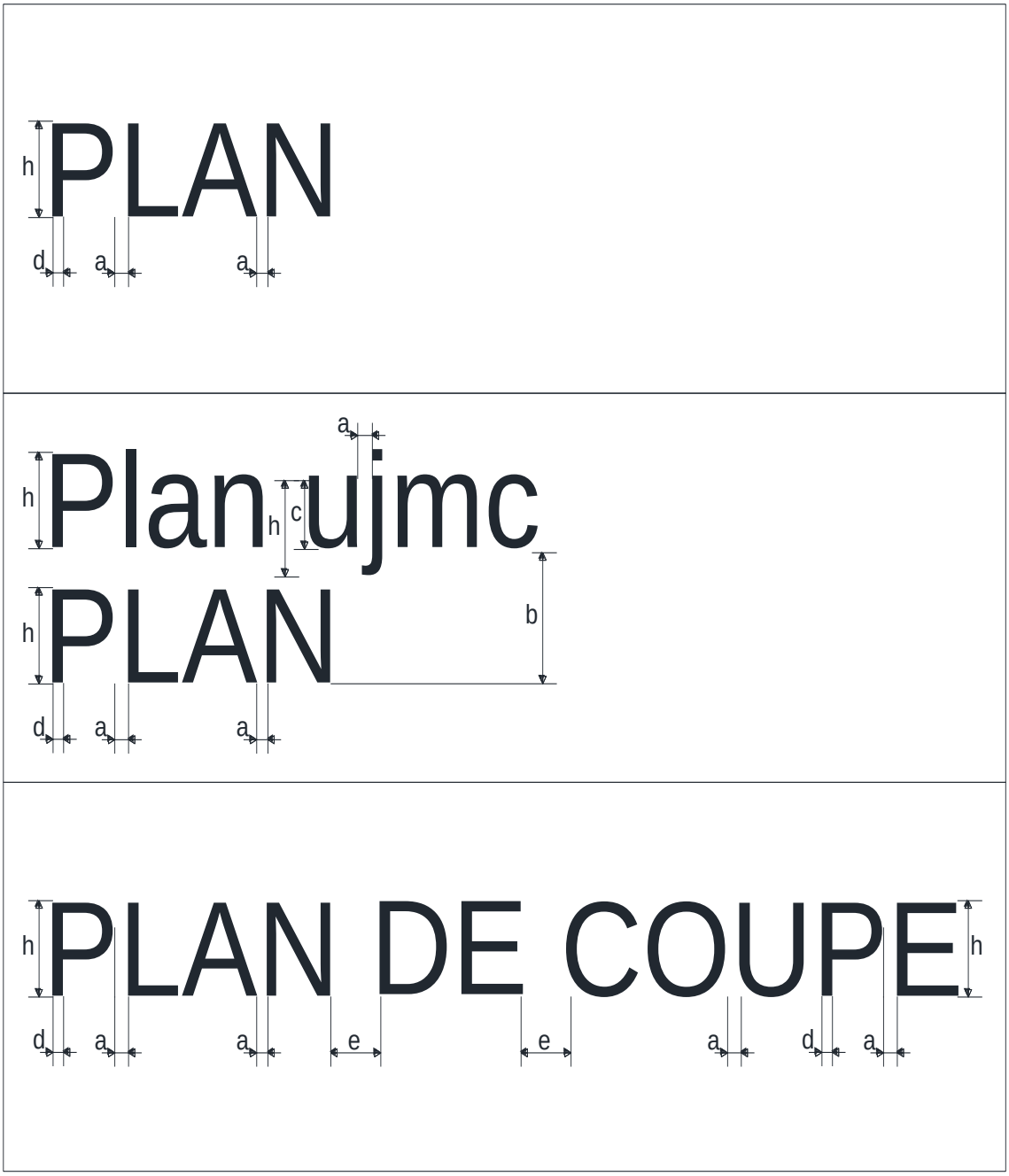


Figure 2-7: Specifications of Latin characters in technical writing

Source: Researcher

6- Geometric projection:

Geometric projection is used to represent three-dimensional geometric objects on a two-dimensional flat surface (Figure 2-8). These capabilities are characterized by descriptive geometry that decomposes volumes into surface shapes on two-dimensional levels. The horizontal projection is one of the basic means of architectural representation, as it aims to show the different components of the building.

6-1) The scenes (projections):

6-1-1) Definition of the view (projection):

A view or projection is a perpendicular projection of an object on a plane that is perpendicular to the direction of view and parallel to the object (Figure 2-8), which assumes parallel and infinitely linear rays of view.

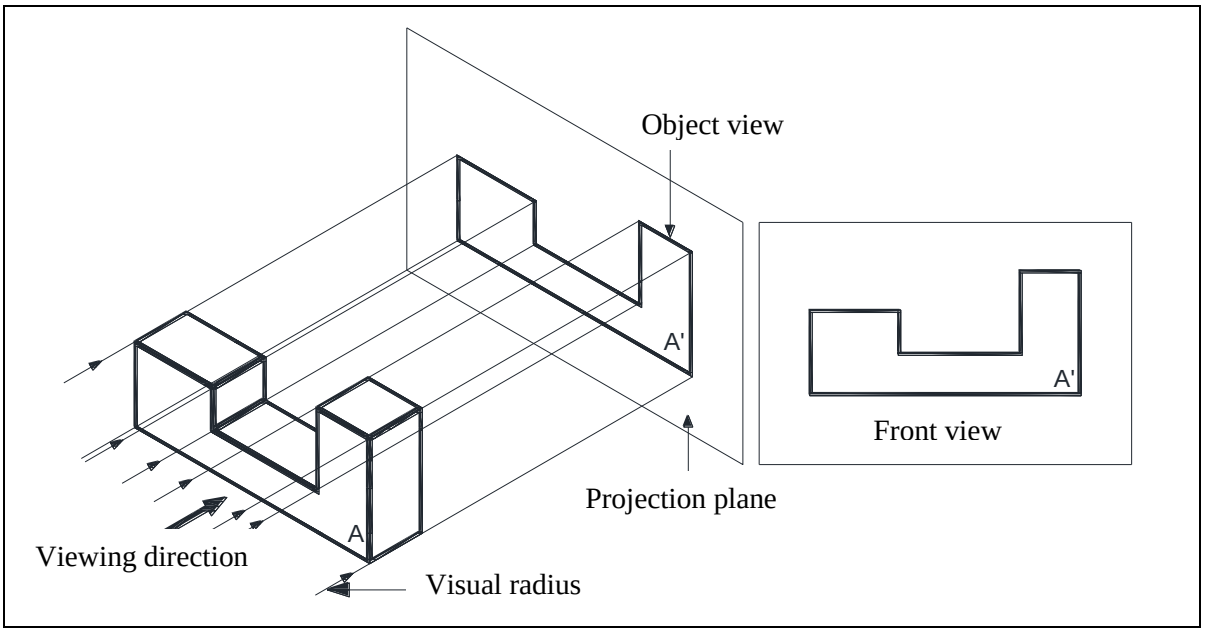


Figure 2-8: Vertical projection method - Source: Researcher

6-1-2) Geometric rules related to geometric projection:

The three-dimensional object is fully and accurately represented according to the rules of descriptive geometry, which leads us to choose a base or reference system.

6-1-2-1) Selecting the reference system:

The object whose symmetry is to be projected into a parallelogram or cube is inserted in its normal position. The object is placed inside the reference cube and its important faces are parallel to the faces of the cube, and the cube is oriented in a way that four of its faces are perpendicular and the back face represents the front level corresponding to the level of the drawing paper (Figure 2-9). The directions of view

are perpendicular to the faces of the cube or the reference parallelogram, from these directions we get six views of the body. Vertical projection is done according to the different aspects of the reference system.

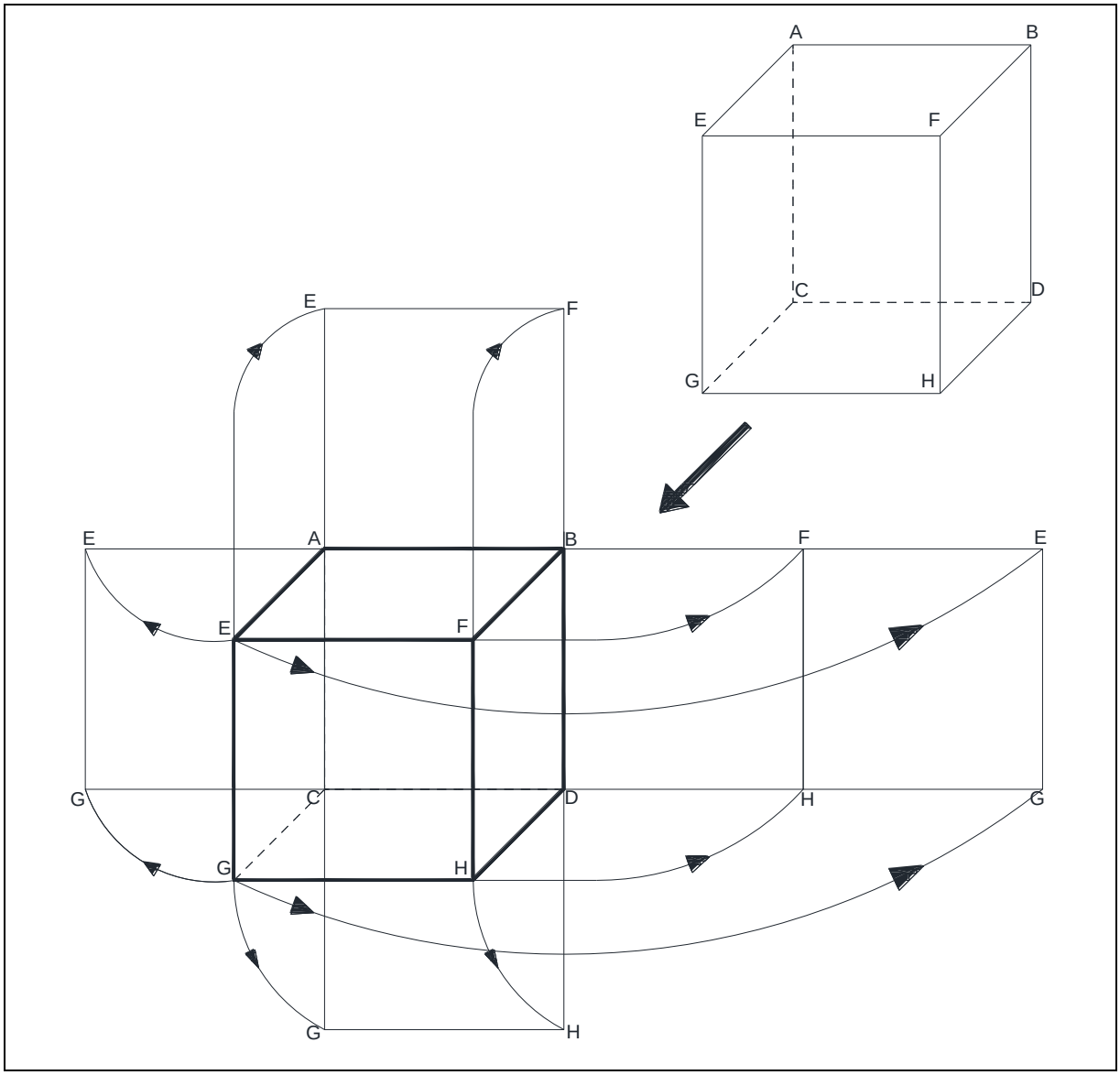


Figure 2-9: Reference system selection (reference cube deployment)

Source: Researcher

6-1-2-2) Nomenclature of the counterparts:

The names of the views are according to the direction of view (Figure 2-10) as follows:

- The beholder looks in front of the body, which is called the front view (Front View).
- The beholder moves to the left of the body, to see: the left view (Left View).

- The beholder moves to the right of the body, to see: the right view (Right View).
- The beholder moves behind the body, to see: the posterior view (Posterior View).
- The beholder moves to the top of the body, to see: the upper view (Upper View).
- The beholder moves down the body, to see: the lower view (Lower View).

6-1-2-3) The position of the views within the borders of the drawing sheet:

Each view represents an object in a perpendicular projection method on the face of the opposite and parallel reference cube, and after we deploy the reference cube on the opposite back level that contains the front view and matches the drawing sheet, the position of the six views within the borders of the drawing sheet (Figure 2-10) is as follows:

- The front view (Front view) is fixed in the middle.
- The left view (Left view) is to the right of the front view.
- The right view (Right view) to the left of the front view.
- The rear view (Rear view) is to the right of the left view.
- The top view (Top view) is below the front view.
- The Bottom view (Bottom view) above the front view.

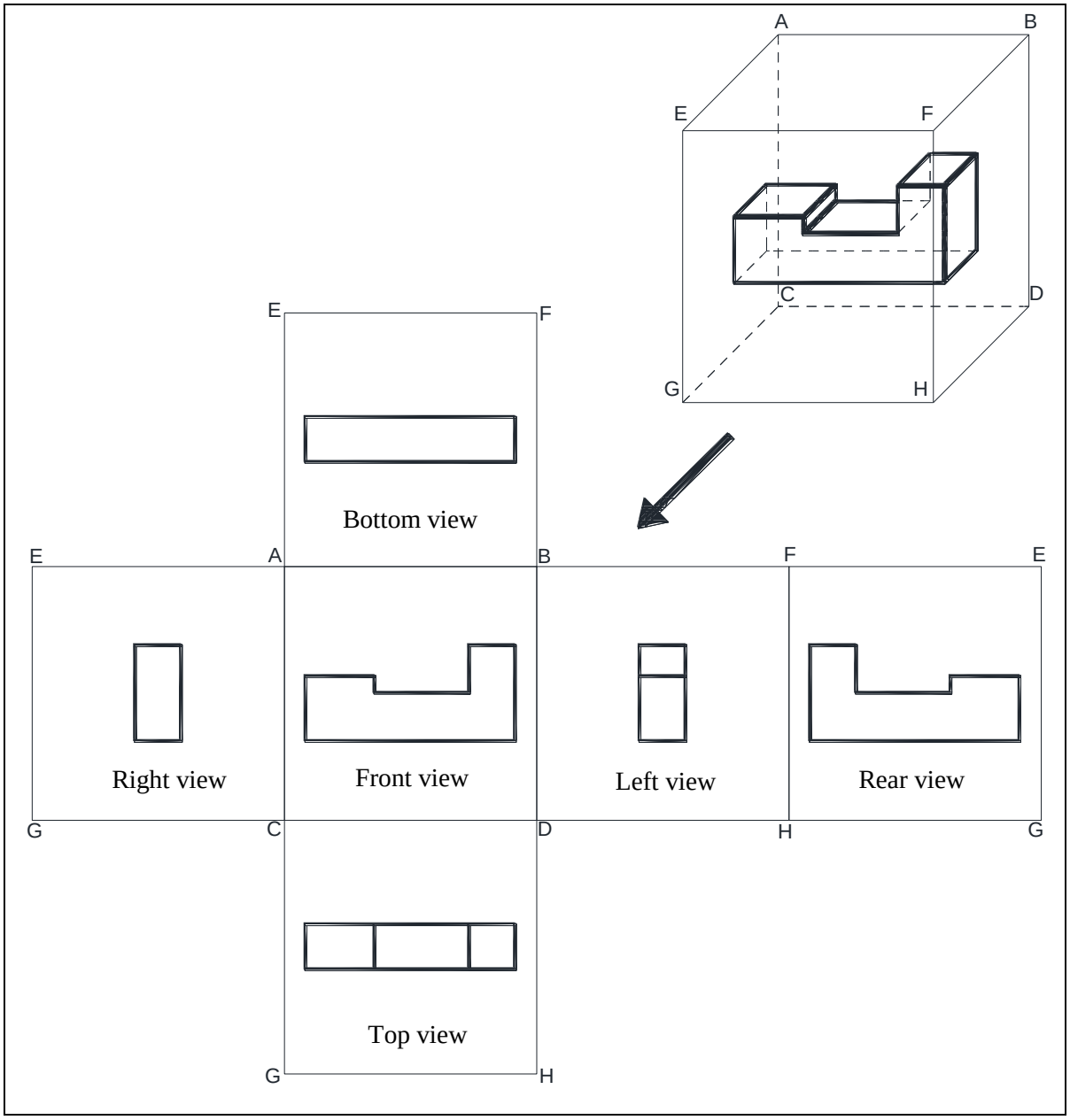


Figure 2-10: Selecting the reference system and the position of the views within the borders of the drawing paper - Source: Researcher

6-2) Sections:

6-2-1) Section Definition:

The clip is an imaginary cut at the level of a vertical cut of an object, where we delete the tip of the cut object (Figure 2-11 Part 2 and 3) in front of the cutting level and represent what is contained in the level and what is behind it in a way of perpendicular projection on a level parallel to the cutting level where (Figure 2-11 Part 4): The borders of the cut parts are drawn with thicker lines, and the cut parts are scattered with thin lines, while the visible parts are drawn with thin lines.

The syllables are used because different body views are not sufficient to fully define the body.

6-2-2) Naming Sections:

Sections should be named by the letters marked in the line of the cutting level (Figure 2-11 Part 4), for example: Section A – A or Section B – B ... etc.

6-2-3) Cutting Level:

The section drawing is an imaginary plane (Figure 2 - 11 part 1 and 2), which passes through the object to be cut, and selects the section drawing in the place that provides the most information possible, indicated by the section drawing line with thick ends placed on the top view, and marked with two symmetrical letters to label the syllable and arrows representing the direction of view (Figure 2-11 part 4).

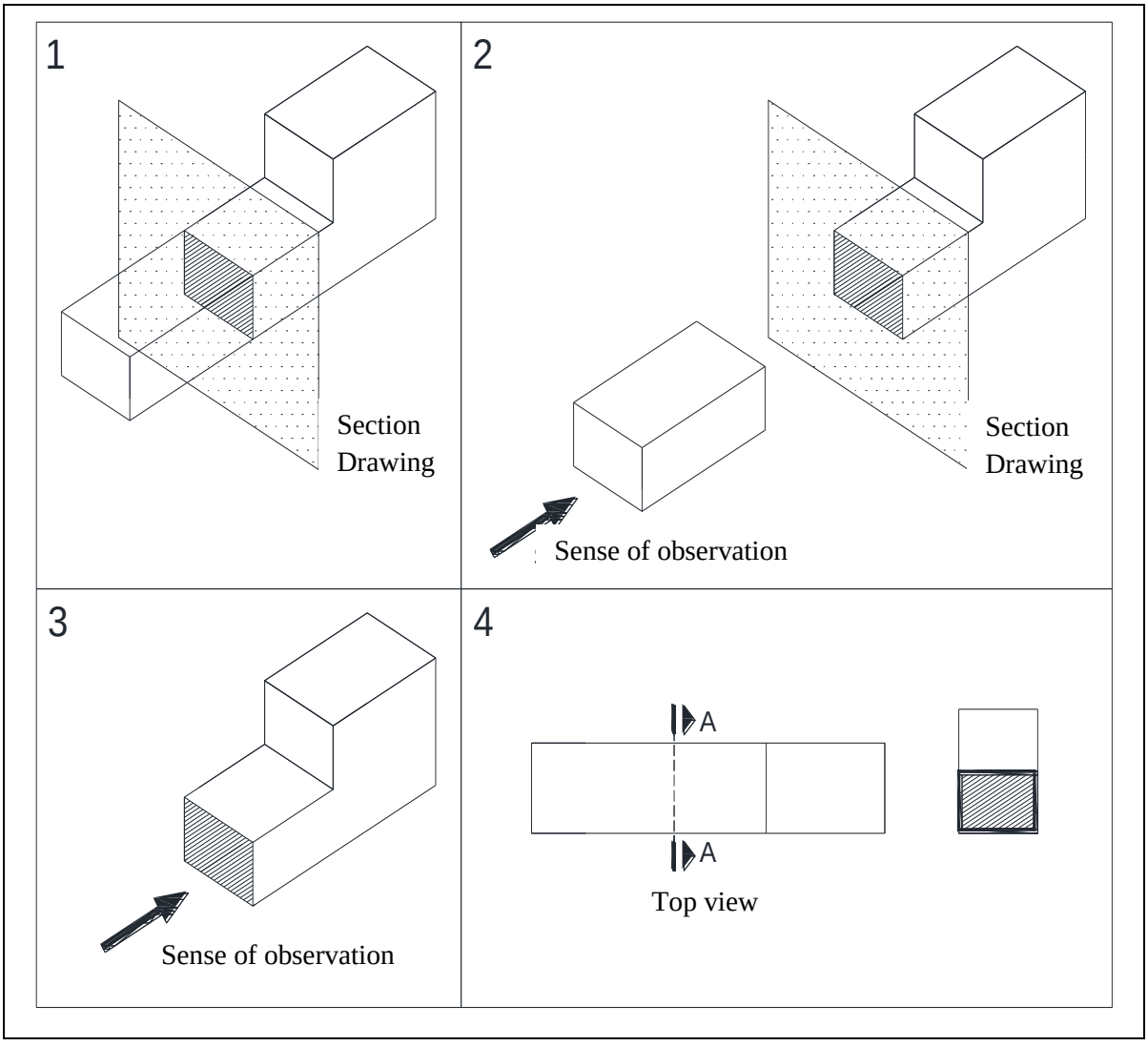


Figure 2-11: Stages of completion

Source: Researcher

7- Perspective:

7-1) Definition of perspective:

Perspective is one of the methods of geometric presentation, in which the object is represented in space in its three dimensions, to give a general image or idea of the object. It depends on the laws of human sight, and perspective makes nearby objects appear larger and clearer than distant objects and makes parallel lines of the body appear as if they tend to meet at a point.

7-2) Perspective levels:

- A perspective that is at the level of sight, and the line of sight is 130-150 cm away.
- A perspective that is above the level of sight, that is, above the line of sight (line of sight).
- A perspective that is below the level of sight, that is, below the line of sight (line of sight).

7-3) The most important basic concepts used in the perspective:

7-3-1) Landline:

The ground line is a straight horizontal line, which comes below the eye of the beholder at a distance of the eye's height from the ground surface (1.60 m and1.75 m), and is the line resulting from the intersection of the image level with the ground level, and is used as a measuring line to transfer dimensions.

7-3-2) Horizon line:

The horizon line is the line that defines the height of the eye of the beholder from the surface of the earth, and it is at an altitude between 1.60 m and 1.75 m. The center of the base of the vision cone is located on it, as is the vanishing point of the horizontal lines (vertical and oblique) at the level of the image.

7-3-3) Vanishing point:

The vanishing point is the point towards which all parallel lines are heading. This apparent direction of parallel lines is called natural fading, and there are parallel lines that fade towards the vanishing point one towards the right and one towards the left from the stopping point.

7-4) Method of drawing the internal and external perspective:

7-4-1) Internal perspective:

- Interior perspective is drawn with a single vanishing point (Figure 2-12), such as drawing a room from the inside, or drawing the front façade of a building when it is facing the viewer.
- Drawing and assigning the horizon line, by drawing a straight horizontal line to define the horizon, the horizon line is what determines the distance of what the beholder can see according to the surface and the distance of the beholder from the ground.
- Choose a vanishing point, often in the middle of the page horizontally along the horizon line.
- Name the lines that start near the position of vision and move away from the viewer, heading to the vanishing point.

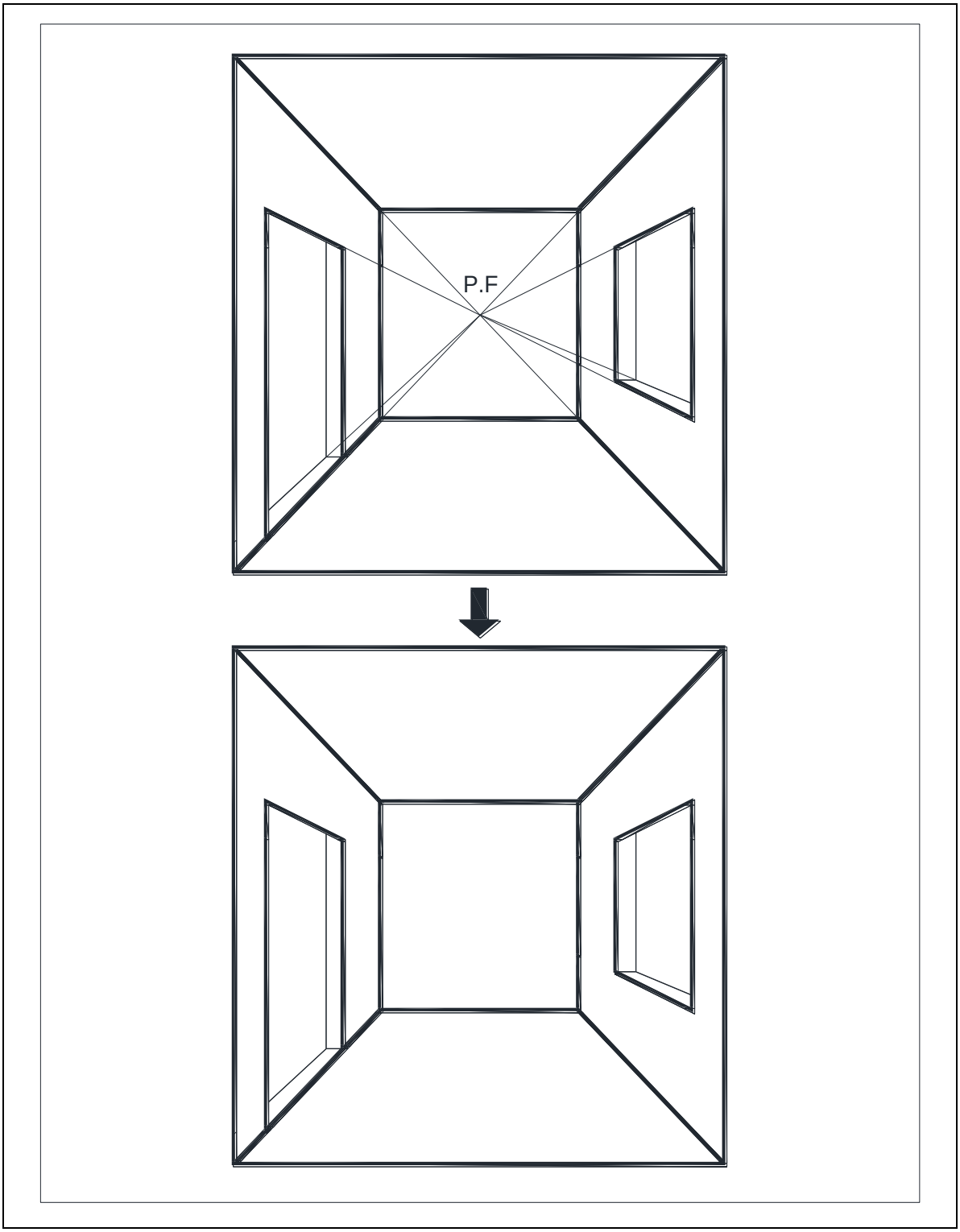


Figure 2-12: Method of drawing the internal perspective

Source: Researcher

7-4-2) External perspective:

- The exterior perspective is drawn with two vanishing points (Figure 2-13), as drawing the exterior faces of a building.
- Identify and draw a straight horizontal line, which is the “horizon line”.

- The location of the vision, which is the approximate place of the eye of the beholder to draw.
- The boundary of the vanishing T-points is on the same line of sight, one on the right and the other on the left.
- Draw all parallel lines that go left on the horizontal projection (of the building) should go towards the left vanishing point.
- Draw all the parallel lines that go towards the right on the horizontal projection (of the building) should go towards the right vanishing point.

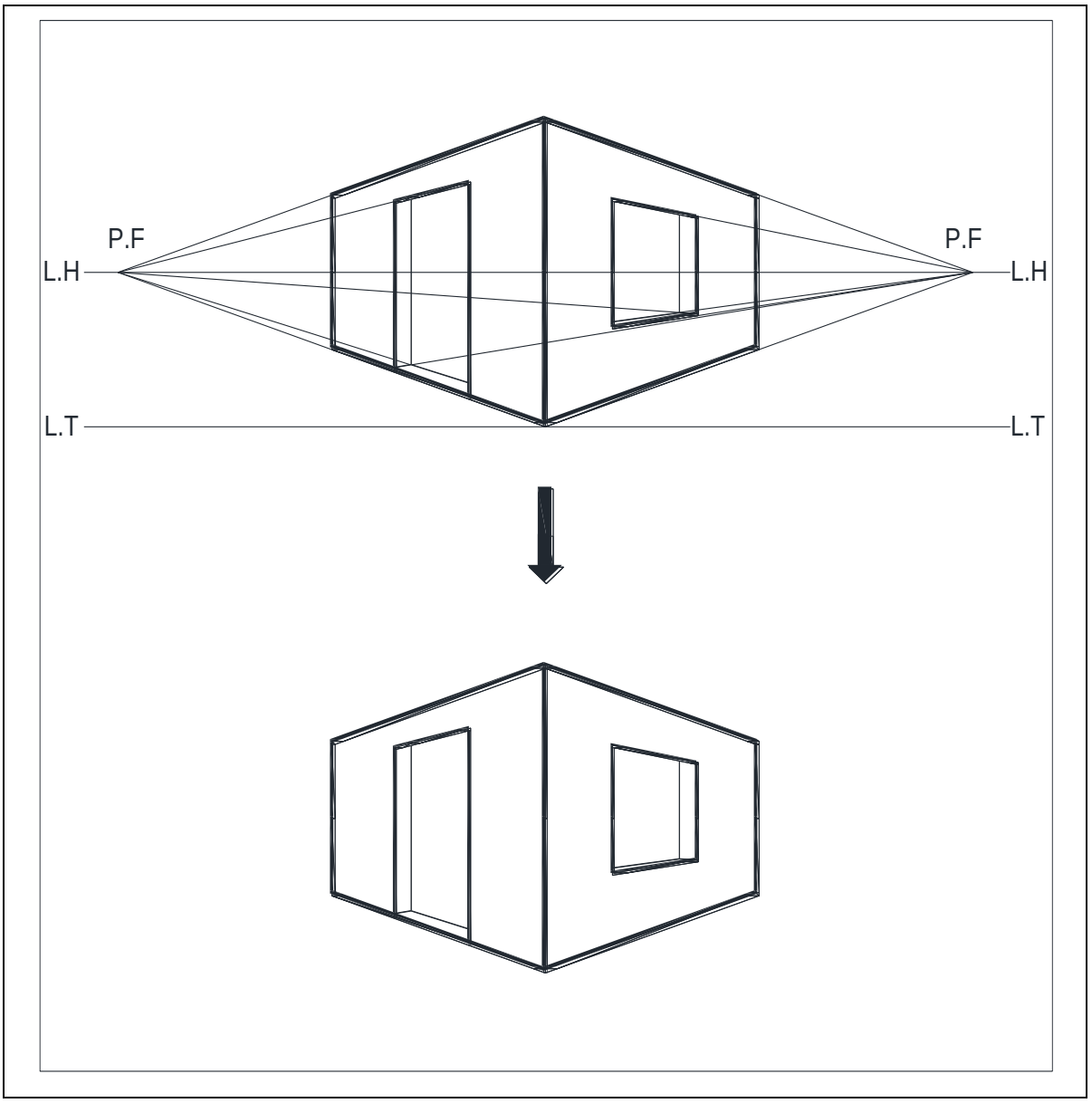


Figure 2-13: Method of drawing the external perspective

Source: Researcher

8- Axonometric:

8-1) Axonometric definition:

Axonometric is one of the methods of geometric presentation, in which the body is represented in its three dimensions, to give a clearer perception of the body to the non-specialist in architecture.

8-2) Types of axonometric:

8-2-1) Axonometry: “Isometry”:

The Isometry axonometry is the representation of the body in its three dimensions, with two fixed inclination angles of 30° each with the line of sight, so that its three visible faces appear equal to the body.

The Isometry axonometry has the advantage that the lines of its three faces are drawn in their real dimensions (x 1) (Figure 2-14).

8-2-2) Axonometry: “Cavaliere dimetry”:

Cavalier Axonometry is the representation of the body in its three dimensions, so that one of the faces of the body appears in its real form and parallel to the line of sight, and the other faces appear extended back and tilted at an angle of 45°.

The Cavalier Axonometry has the advantage that the lines of the front face are drawn with their real dimensions (x 1), while the top and side faces are drawn with their real dimensions (x 1), and the oblique lines are drawn at half their value (x 0.5) and at an angle of 45° (Figure 2-14). This type of axonometric is commonly used in facade illustrations.

8-2-3) Axonometry: “Military dimetry”:

The military axonometric is the representation of the body in its three dimensions, with two fixed inclination angles of 45° each with the line of sight, so that the projection of the diagram appears in its true dimensions.

The axonometric military is characterized by the fact that the lines of the top face (striped) are drawn with their real dimensions (x 1), while the front and side faces are drawn with their vertical lines at half their value (x 0.5), and the diagonal lines are drawn with their real dimensions (x 1) and at an angle of 45° (Figure 2-14). This type of axonometry is commonly used in illustrations of the interiors of buildings.

8-2-4) Axonometry: “Trimetry”:

The axonometry Trimetric is the representation of the body in its three dimensions, with two different inclination angles, the first 45° with the horizon line and the second 15° with the horizon line as well, so that all faces of the body appear in their non-real dimensions.

The axonometric Trimetric (Figure 2-14) is characterized by:

- The vertical lines of the body faces are drawn with dimensions multiplied by a coefficient (x 0.86).
- Oblique lines of the body face at an angle of 45° with the horizon line, drawn with dimensions multiplied by a coefficient (x 0.56).
- The oblique lines of the body face at an angle of 15° with the horizon line, drawn with dimensions multiplied by a coefficient (x 0.92).

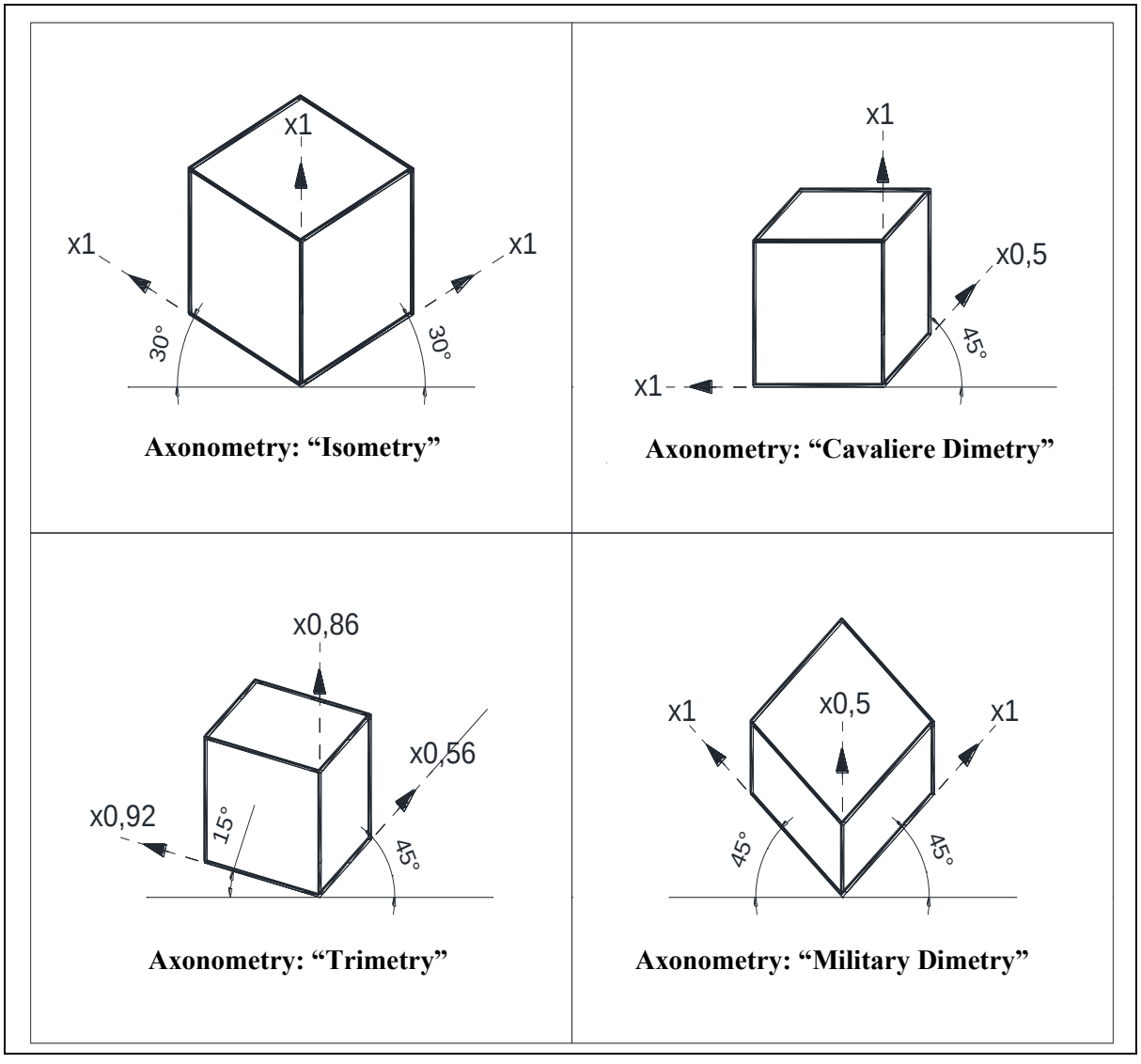


Figure 2-14: Axonometric species - Source: Researcher

II- Practical exercises for phase II (Architectural demonstration):

The second phase of the subject program includes a set of Practical exercises, including:

- An exercise in which the application of geometric rules related to the geometric projection to draw the view in the first stage, and then draw the section in the second stage after the completion of what we call the living pieces on the sizes, and the aim of this is to enable the student to use the geometric rules to control the drawing of the projections that are the geometric base of the architectural documents, and here the concept of the view (View) and not the interface (Facade) is used, and this exercise is done with technical drawing (by drawing by technical means).

Teaching the student how to use the existing ruler (T ruler) and the triangle, and its relationship to the table, all to enable the student to access the subsequent part of the exercise that paves the way for him to enter the subsequent stage, which is the stage of technical drawing.

- Practice writing in Latin and numbers by drawing, technical means and following the different proportions of the same Latin letter or number.

- An exercise to apply the foundations of perspective and axonometric drawing-by-drawing different positions for individual sizes and problem compositions, by drawing by technical means.

1- Exercises to apply engineering rules related to vertical projection:

1-1) Practical exercise 01 (Vertical projection – sizes):

All students are required to:

1) Fix the drawing paper (A3) on the drawing table, then frame the drawing paper (A3) 01 cm away from each side of the drawing paper, using the drawing tools.

2) Insert the spreadsheet (12 cm x 06 cm) in the lower right corner of the drawing sheet (A3), containing all the information about the student and the exercise.

3) Completion of all six projections:

(Front view / Right view / Left view / Rear view / Top view / Bottom view)

For the three sizes (cube, pyramid, and cylinder) using drawing tools, according to the example (vertical projection of the cube) shown in (Figure 2-15), it is also required to maintain the measurements shown in the figure.

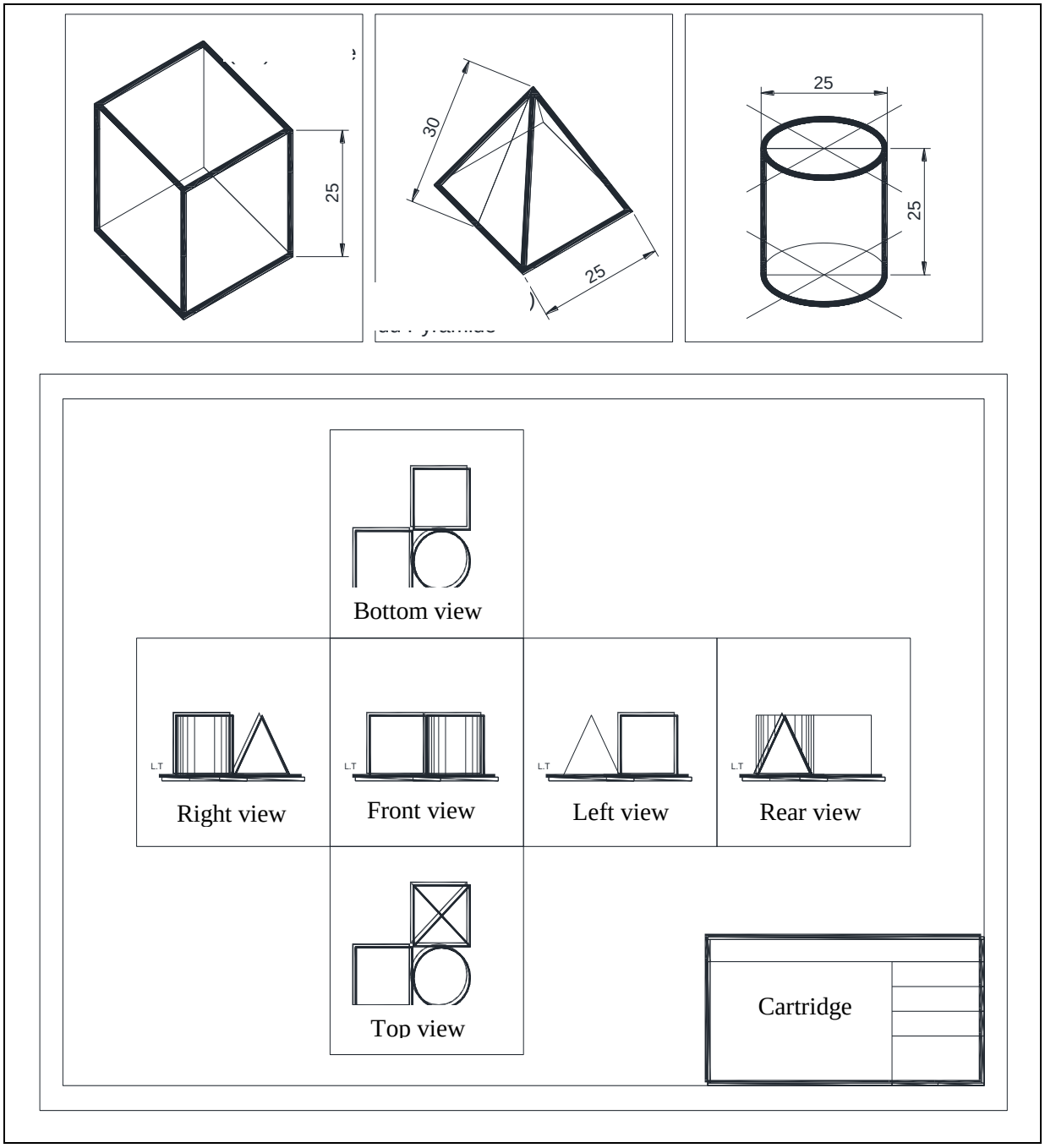


Figure 2-15: Practical exercise 01 "Vertical projection of the cube – size (A3)"

Source: Researcher

1-2) Practical exercise 02 (Vertical projection – volume composition):

All students are required to:

1) Fix the drawing paper (A3) on the drawing table, then frame the drawing paper (A3) 01 cm away from each side of the drawing paper, using the drawing tools.

2) Insert the spreadsheet (12 cm x 06 cm) in the lower right corner of the drawing sheet (A3).

3) Completion of all six projections: (Front view / Right view / Left view / Rear view / Top view / Bottom view).

For ten different positions of the combinations of the three sizes together (cube, pyramid, and cylinder), using drawing tools, according to the example (vertical projection of the composition 01) shown in (Figure 2-16), it is also required to maintain the measurements shown in the figure.

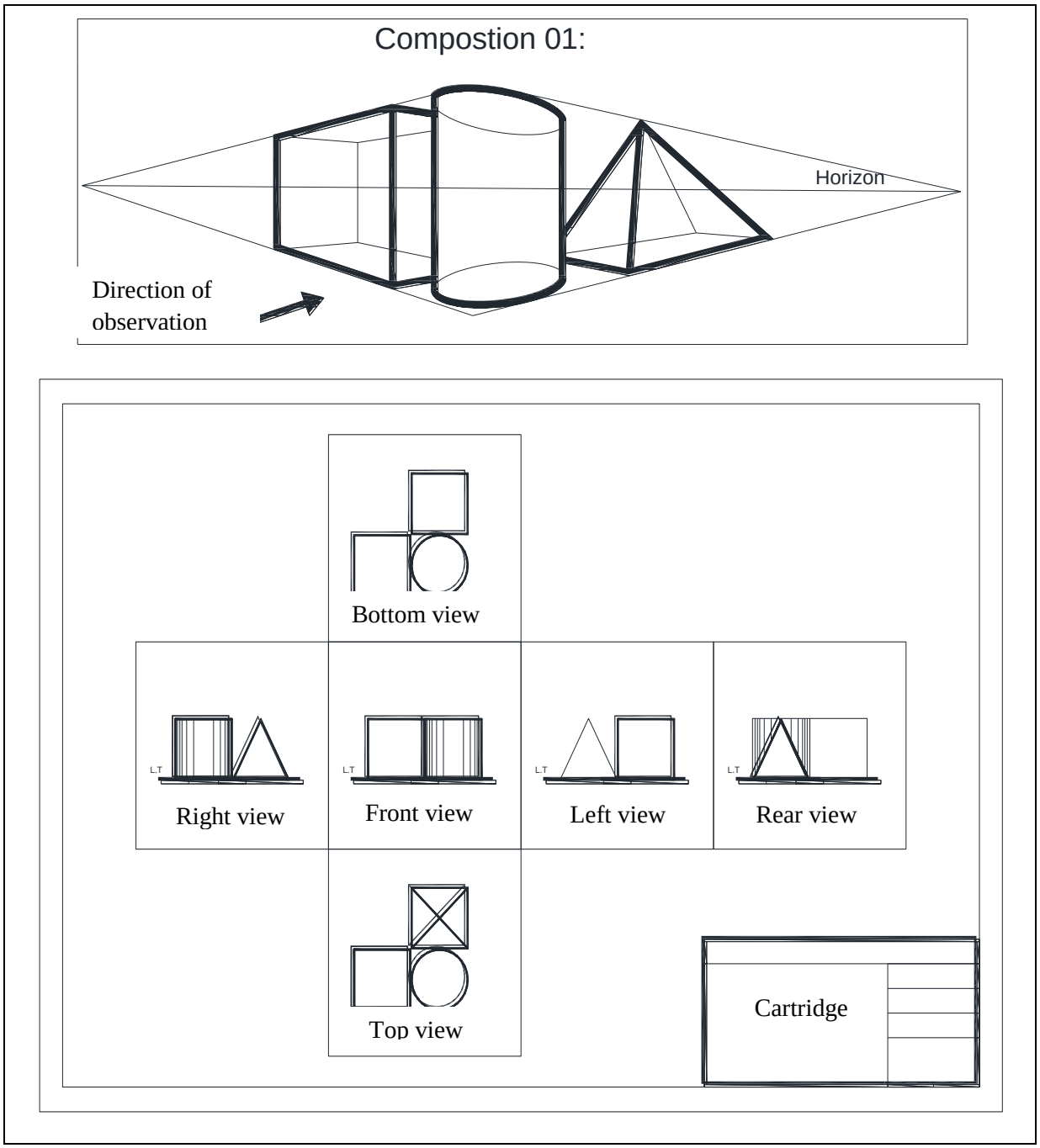


Figure 2-16: Practical exercise 02 "Vertical projection of formula sizes – size (A3)"

Source: Researcher

2- Exercises to apply engineering rules related to vertical projection (sections):

2-1) Practical exercise 01 (Vertical projection – sizes):

All students are required to:

1) Following the same stages of the previous exercises (fixing the drawing sheet (A3) on the drawing table, then making a frame for the drawing sheet (01 cm) and then inserting the spreadsheet in the lower right corner of the drawing sheet).

2) Complete the extracted sections of the completed pieces on the three sizes (cube, pyramid, and cylinder), and then complete all six projections of the cut part: (Front view / Right view / Left view / Rear view / Top view / Bottom view)

Using drawing tools is also required to maintain the measurements shown in (Figure 2-17).

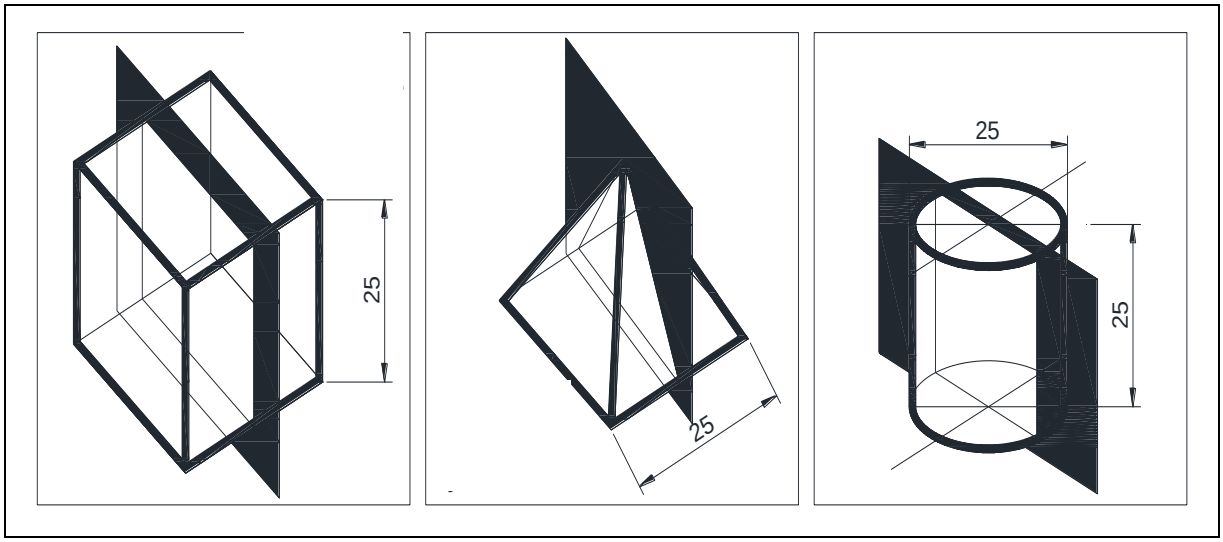


Figure 2-17: Practical exercise 01 "Vertical projection and sections for sizes – size (A3)"

- Source: Researcher

2-2) Practical exercise 02 (Vertical projection – volume composition):

All students are required to:

1) Following the same stages of the previous exercises (fixing the drawing sheet (A3) on the drawing table, then making a frame for the drawing sheet (01 cm) and then inserting the spreadsheet in the lower right corner of the drawing sheet).

2) Completing the extracted sections of the completed pieces on the ten different positions of the three size combinations (cube, pyramid, and cylinder), using drawing tools, as required to maintain the measurements shown in (Figure 2-18), and then completing all six projections of the cut part:
(Front view / Right view / Left view / Rear view / Top view / Bottom view).

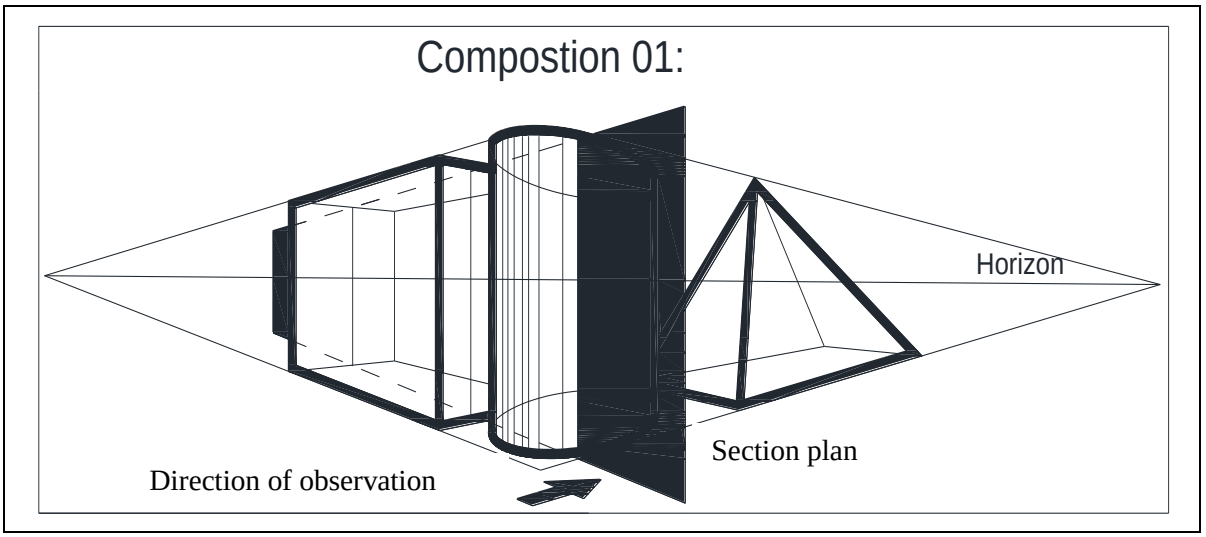


Figure 2-18: Practical exercise 02 "Vertical projection and clips for a size combination (A3)" - Source: Researcher

3- Exercises to apply engineering rules related to vertical projection (views and sections):

3-1) Practical exercise 01 (Vertical projection – figures):

All students are required to:

1) Fix the drawing paper (A2) on the drawing table, then frame the drawing paper (A2) 02 cm from each side of the drawing paper, using the drawing tools.

2) Insert the spreadsheet (18 cm x 09 cm) in the lower right corner of the drawing sheet (A2).

3) Completion of all six projections : (Front view / Right view / Left view / Rear view / Top view / Bottom view).

For the sizes shown in (Figure 2-19), using drawing tools, and is also required to maintain the measurements shown in the figure.

4) Complete a cutting diagram in the middle of those sizes shown in (Figure 2-19), and then complete the extracted sections of the pieces done on those sizes, using the drawing tools, as required to maintain the measurements shown in (Figure 2-19).

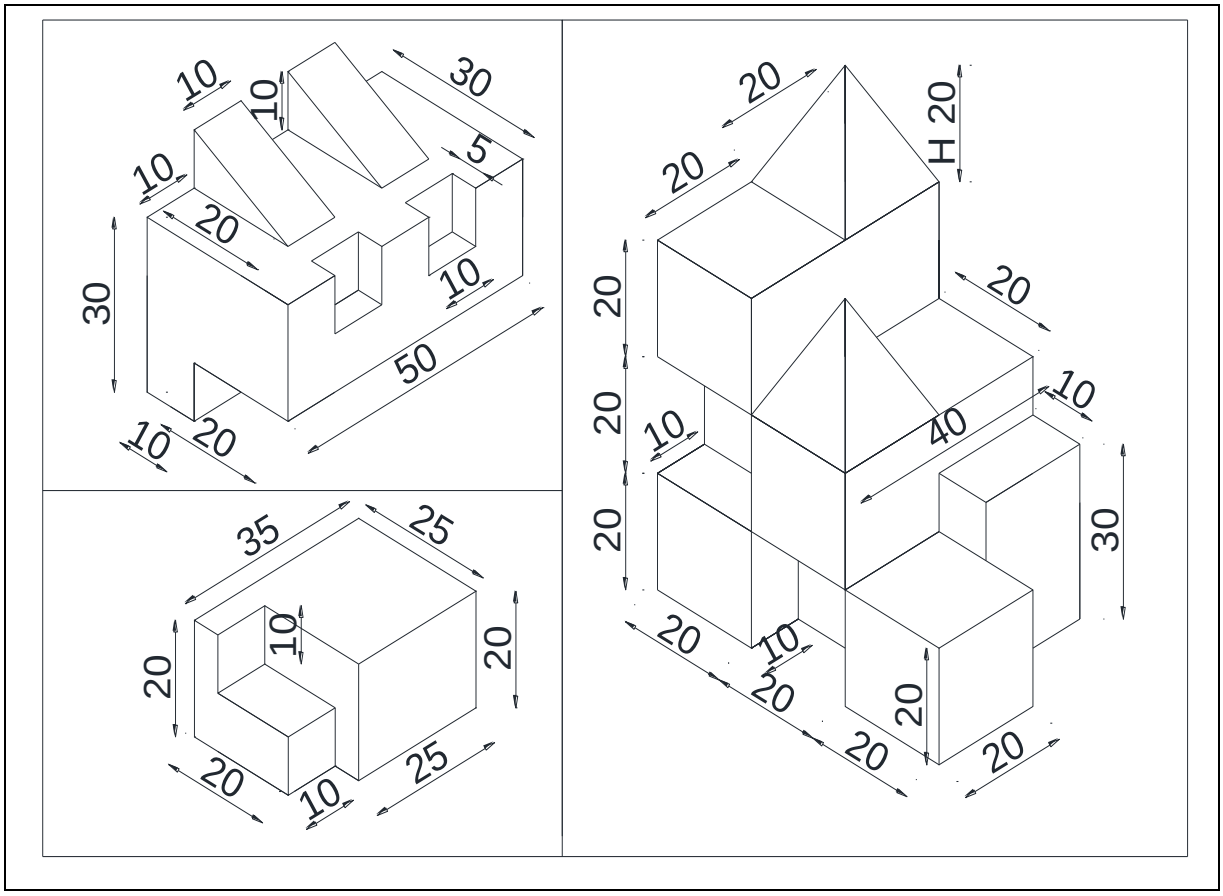


Figure 2-19: Practical exercise 01 "Vertical projection and sections of figures – size (A2)" - Source: Researcher

3-2) Practical exercise 02 (Vertical projection – figures):

All students are required to:

1) Fix the drawing paper (A2) on the drawing table, then frame the drawing paper (A2) 02 cm from each side of the drawing paper, using the drawing tools.

2) Insert the spreadsheet (18 cm x 09 cm) in the lower right corner of the drawing sheet (A2).

3) Completion of all six projections:

(Front view / Right view / Left view / Rear view / Top view / Bottom view)

For the sizes shown in (Figure 2-20), using drawing tools, and is also required to maintain the measurements shown in the figure.

4) Complete a cutting diagram in the middle of those sizes shown in (Figure 2-20), and then complete the extracted sections of the pieces done on those sizes, using the drawing tools, as required to maintain the measurements shown in (Figure 2-20).

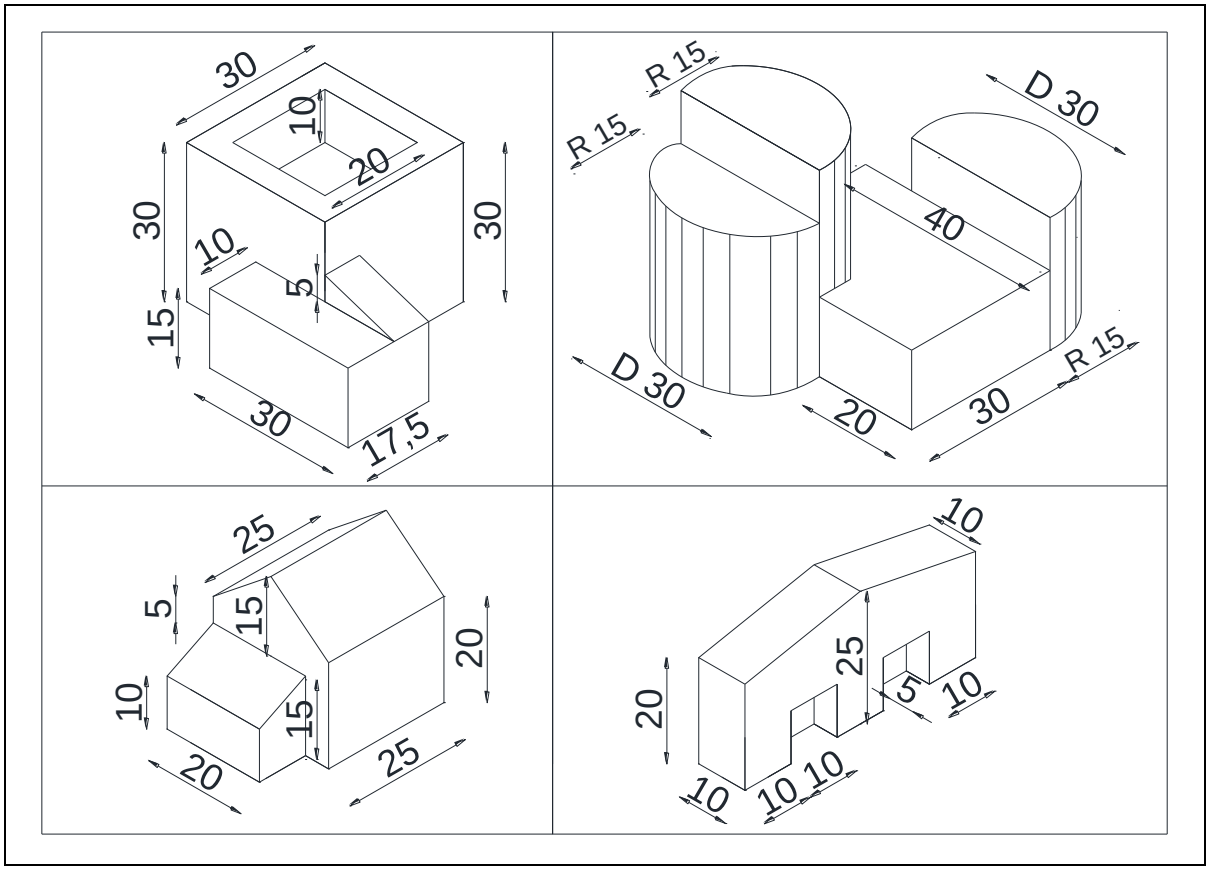


Figure 2-20: Practical exercise 02 "Vertical projection and sections of figures – size (A2)" - Source: Researcher

4- Exercises to apply engineering rules related to engineering drawing (geometric shapes):

4-1) Practical exercise 01 (Triangle – Square – Hexagon – Octagon):

All students are required to:

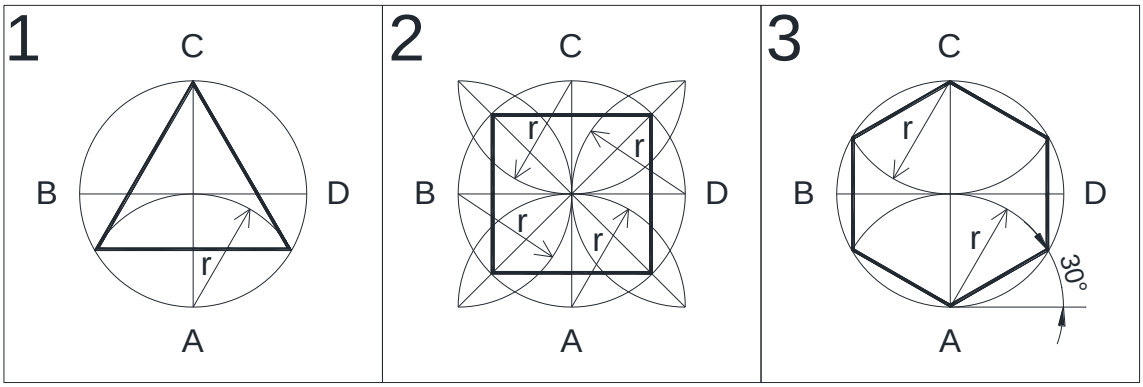
1) Install the drawing paper (A2) on the drawing table, then make a frame for the drawing paper that is 02 cm away from each side of the drawing paper, then insert the data table (18 cm x 09 cm) in the lower right corner of the drawing paper using the drawing tools.

2) Completion of all geometric shapes using all drawing tools, as required to maintain the measurements (circle diameter = 24 cm) shown in (Figure 2-21).

1- Triangle : Constructed using radius r.

2- Square : Constructed using radius r.

3- Hexagon : Constructed using radius r.



4- Triangle, Hexagon, divisions into two, four and eight parts and divisions into three, six and twelve parts constructed using radius r.

5- Hexagon : Constructed using the 60° square.

6- Square and Octagon : Constructed with inscribed circle.

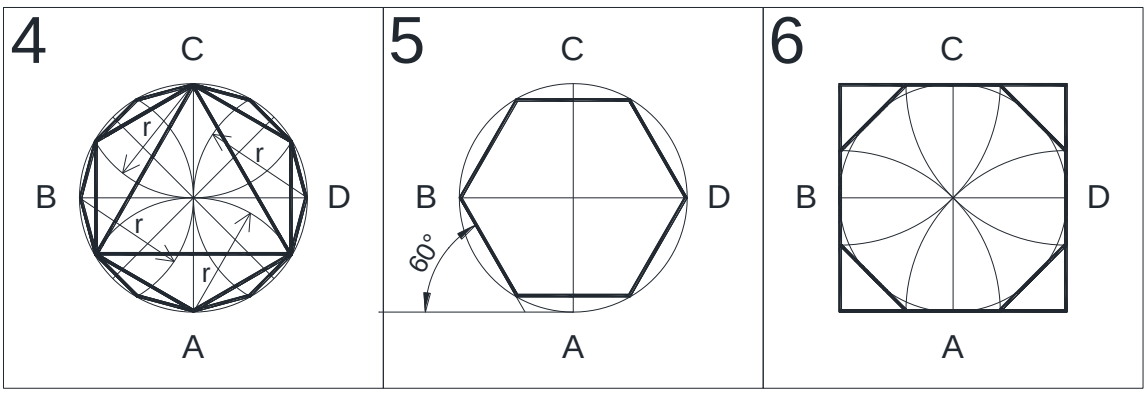


Figure 2-21: Practical exercise 01 "Completing geometric shapes using drawing tools – size (A2)" - Source: Researcher

4-2) Practical exercise 02 (Pentagon – Decagon – Heptagon – Enneagon – Polygon):

All students are required to:

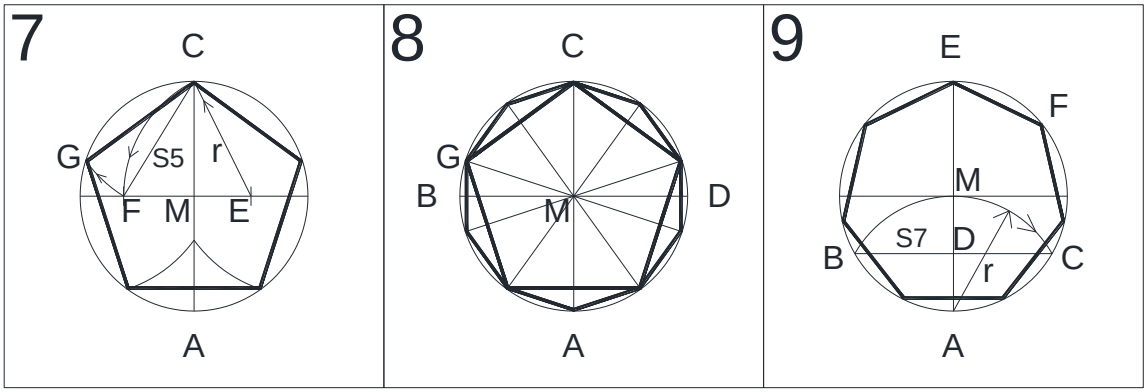
1) Install the drawing paper (A2) on the drawing table, then make a frame for the drawing paper that is 02 cm away from each side of the drawing paper, then insert the data table (18 cm x 09 cm) in the lower right corner of the drawing paper using the drawing tools.

2) Completion of all geometric shapes using all drawing tools, as required to maintain the measurements (circle diameter = 24 cm) shown in (Figure 2-22).

7- Pentagon : After dividing MD into two equal parts, the S5 side of the Pentagon is determined using the EC Circle. CF = CG.

8- Decagon : Connect the vertices of the Pentagon with M and extend.

9- Heptagon : Approximate division BD = Approximate S7 EF.



10- Enneagon : Using circles with centers B and A and radii r and r1, determine S9 = AC.

11- Eleven-rib polygon and other polygons : The segment AC is redivided into the desired number of equal parts. B and D are determined using circles with A and C as centers and AC as radius. The vertices of the Polygon are obtained by extending the straight lines connecting B and D to every other point of the division.

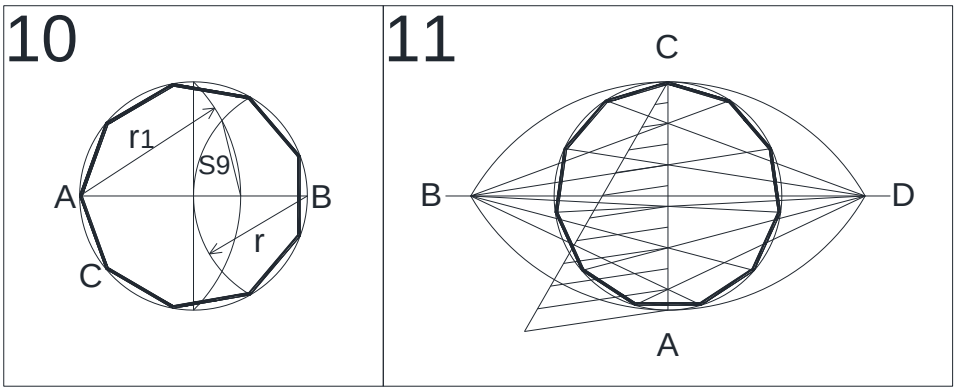


Figure 2-22: Practical exercise 02 "Completing geometric shapes using drawing tools – size (A2)" - Source: Researcher

5- Technical writing exercises (Lettrine):

5-1) Practical exercise 01 (Letters):

All students are required to:

- Draw the Latin letters on the drawing paper (A3) using the drawing tools, by following the different proportions of the same letter shown in (Figure 2-23).

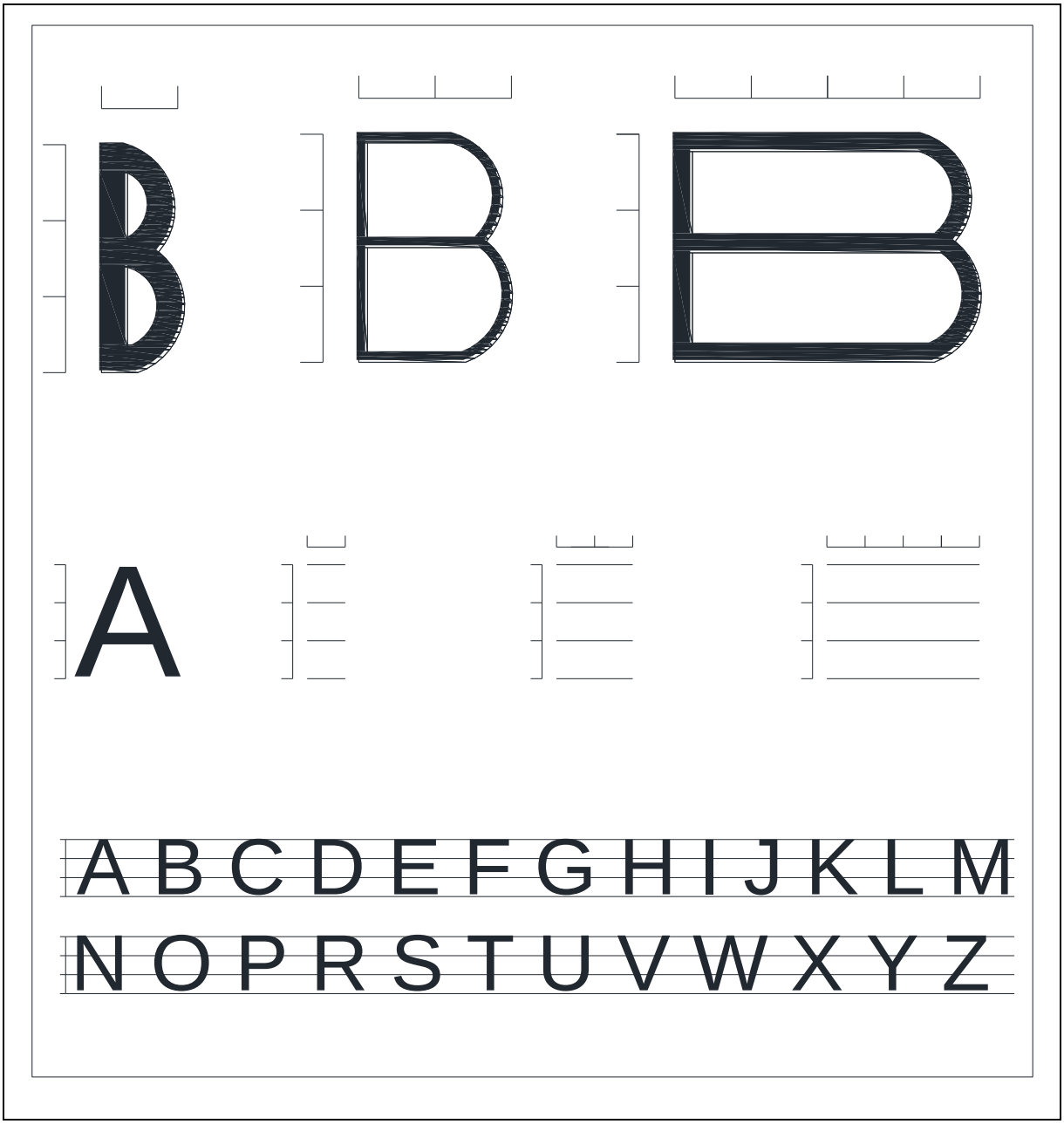


Figure 2-23: Practical exercise 01 "Controlling technical writing (Latin letters) – size (A3)" - Source: Researcher

5-2) Practical exercise 02 (Numbers):

All students are required to:

- Draw the numbers on the drawing paper (A3) using the drawing tools, by following the different proportions of the same number shown in (Figure 2-24).

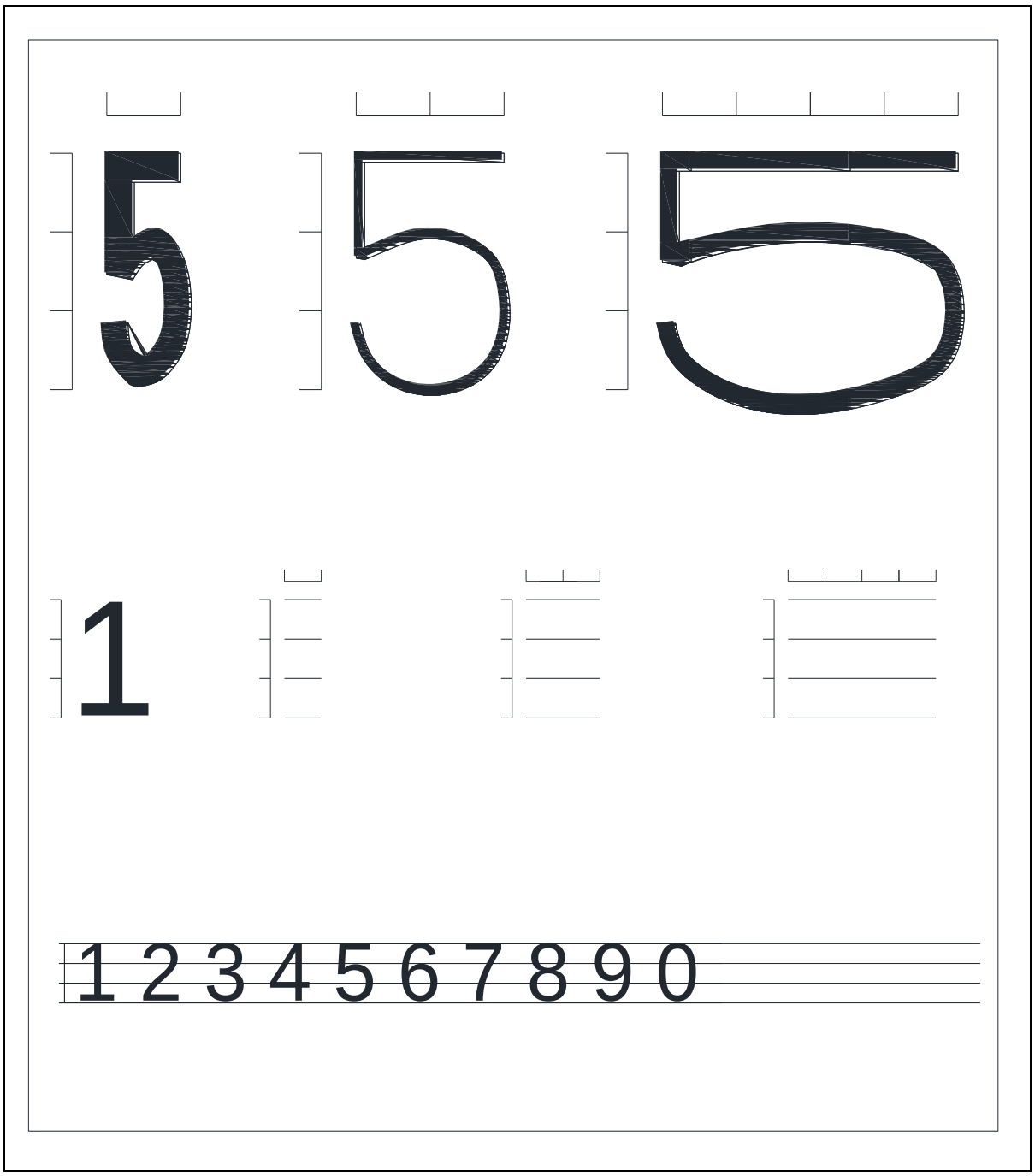


Figure 2-24: Practical exercise 02 "Controlling technical writing (numbers) – size (A3)"

- Source: Researcher

6- Exercises to apply perspective and axonometric:

6-1) Practical exercise 01 (Perspective - sizes):

All students must draw the internal and external perspectives of different positions of individual sizes (Figure 2-25) by drawing technically.

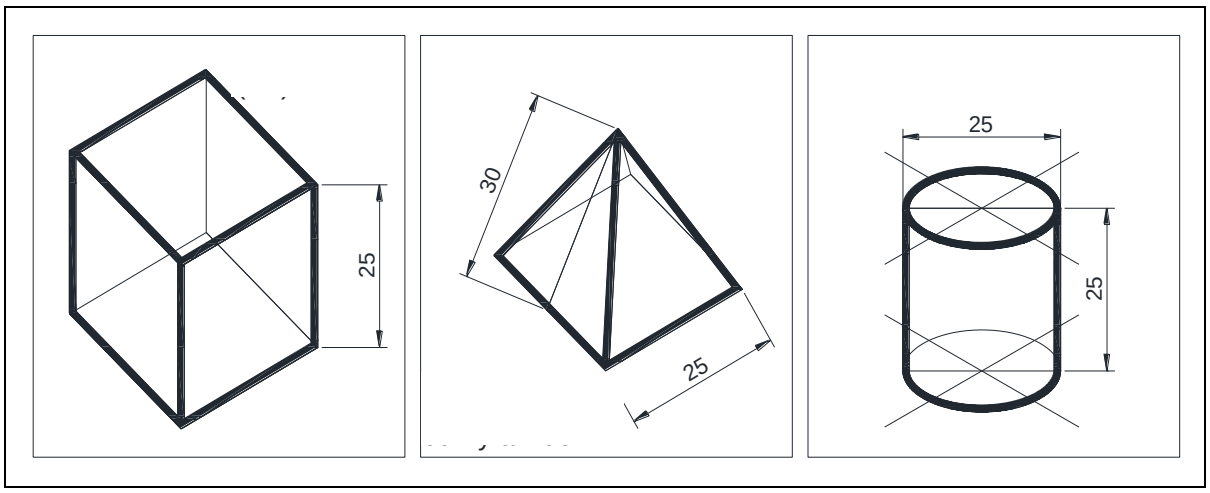


Figure 2-25: Practical exercise 01 "Applying perspective drawing (sizes) – size (A2)"

Source: Researcher

6-2) Practical exercise 02 (Perspective - volume composition):

All students are required to draw the internal and external perspectives of the different positions of the problem sizes in combinations (3 combinations) (Figure 2-26) by drawing by technical means.

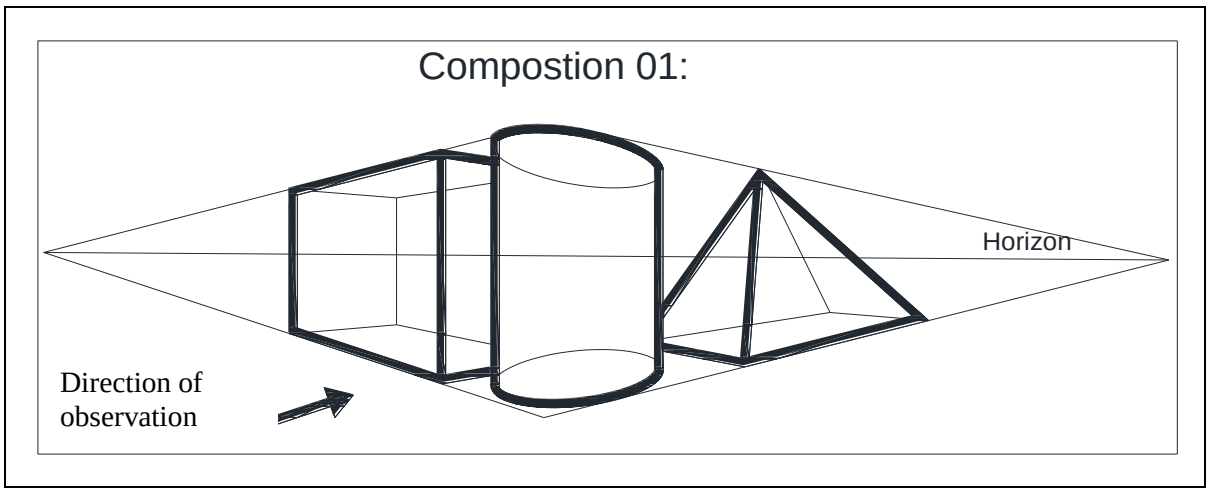


Figure 2-26: Practical exercise 02 "Applying perspective drawing (composition of sizes) – size (A2)" - Source: Researcher

6-3) Practical exercise 03 (Axonometric - sizes):

All students are required to draw all types of axonometric (Isometry axonometric, dimetric axonometric cavalier, dimetric axonometric militaries, and

trimetric axonometric) for different positions for individual sizes (Figure 2-27) by drawing by technical means.

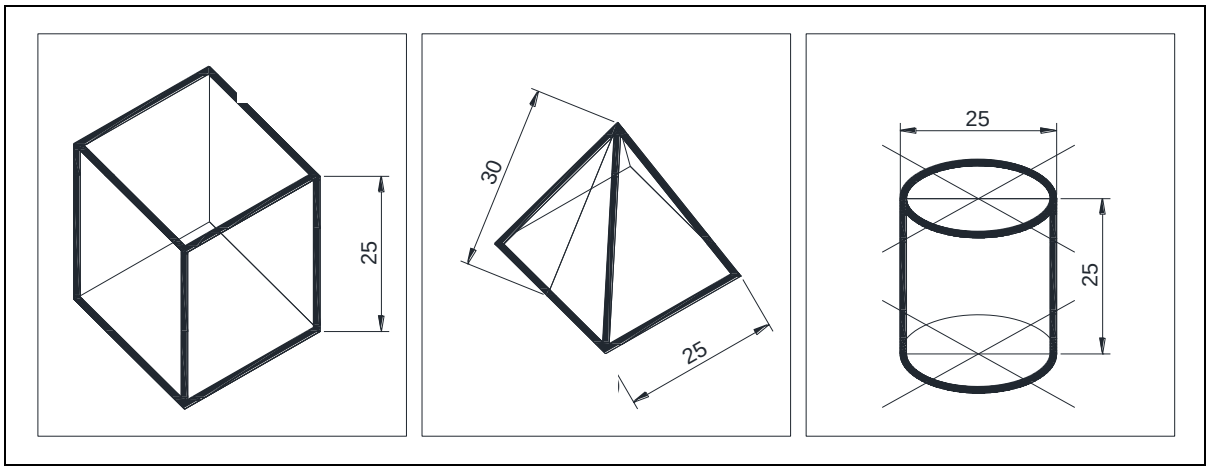


Figure 2-27: Practical exercise 03 "Application of axonometric drawing (sizes) – size (A2)" - Source: Researcher

6-4) Practical exercise 04 (Axonometric - models):

All students must draw all types of Axonometric (Isometry Axonometric, dimetric Axonometric, cavalier, dimetric and trimetric Axonometric) for the different positions of the models shown in (Figure 2-28) by drawing by technical means.

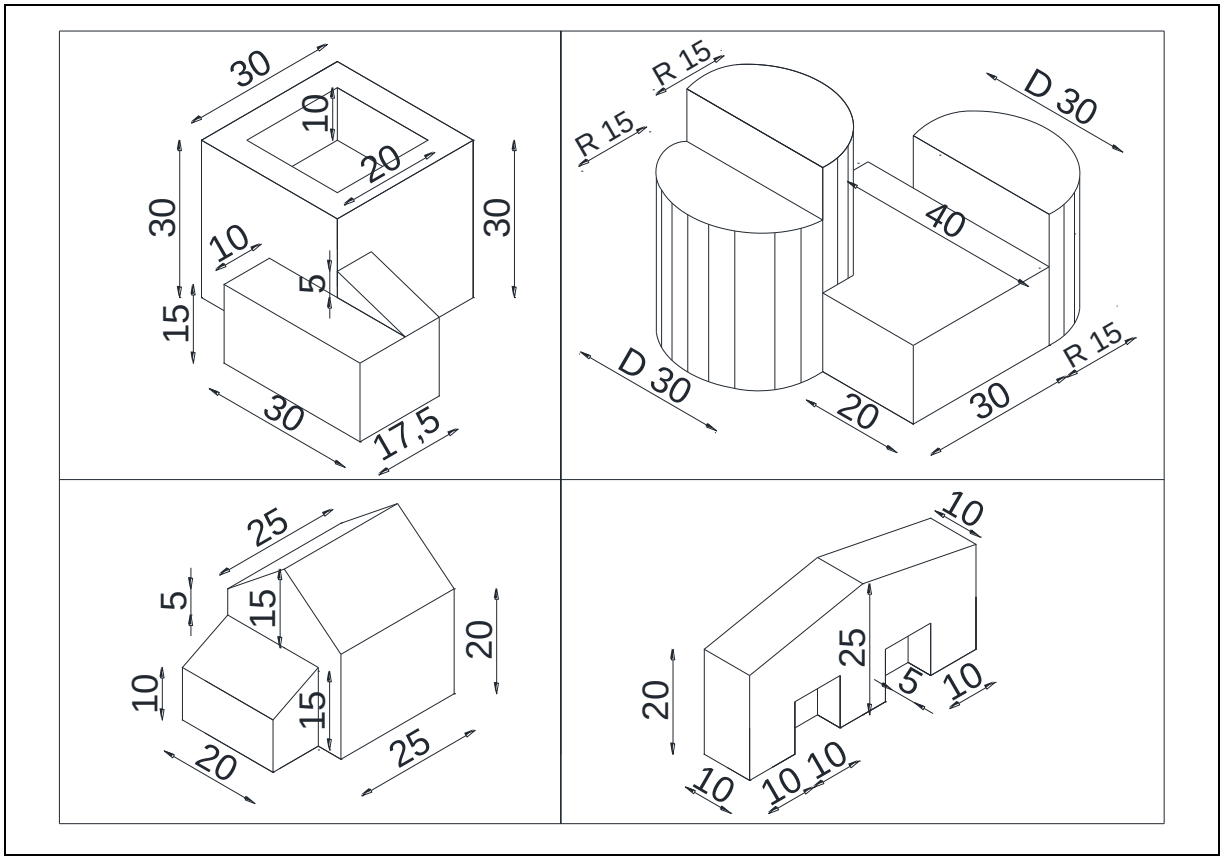


Figure 2-28: Practical exercise 04 "Application of axonometric drawing – size (A2)"

Source: Researcher

CHAPTER III:
PHASE THREE
"TECHNICAL READING OF ARCHITECTURAL DOCUMENTS"

- Introduction:

The third phase of the project workshop material program includes a set of lessons represented in:

- Architectural project documents: lessons with documents and a presentation to enable the student to touch those documents, namely: site plan, block plan, plan, section, facade, architectural and construction details, model, and techniques. These documents are known to the student for their content and their role in explaining the contents of the architectural project and its drawing standards and the institutions interested in them, and how to represent them using the agreed rules ...

- Architectural survey or upload: lessons that include the method of surveying or the method of taking measurements and how to transfer them on the paper and then translate them into the final documents, types of quotas...

I – Phase III lessons "Technical reading of architectural documents":

1- Architectural project

Architectural project documents are architectural drawings completed by the architect or master architect, to introduce the architectural project and are as follows:

1-1) Site layout:

1-1-1) Site plan definition:

A site plan is a plan that identifies the location of the project floor relative to the neighbourhood or city (Figure 3-1).

1-1-2) Site plan background:

- In the site plan, it is required to specify geographical north (north orientation).
- Require the presence of various main and secondary roads leading to the project in the site plan.
- The site plan shall contain the landmarks and points of indication indicating the location of the project.

1-1-3) Drawing scales used in the site plan:

The drawing scales used in the site plan are 1/10000, 1/5000, or 1/2000 (Figure 3-1).

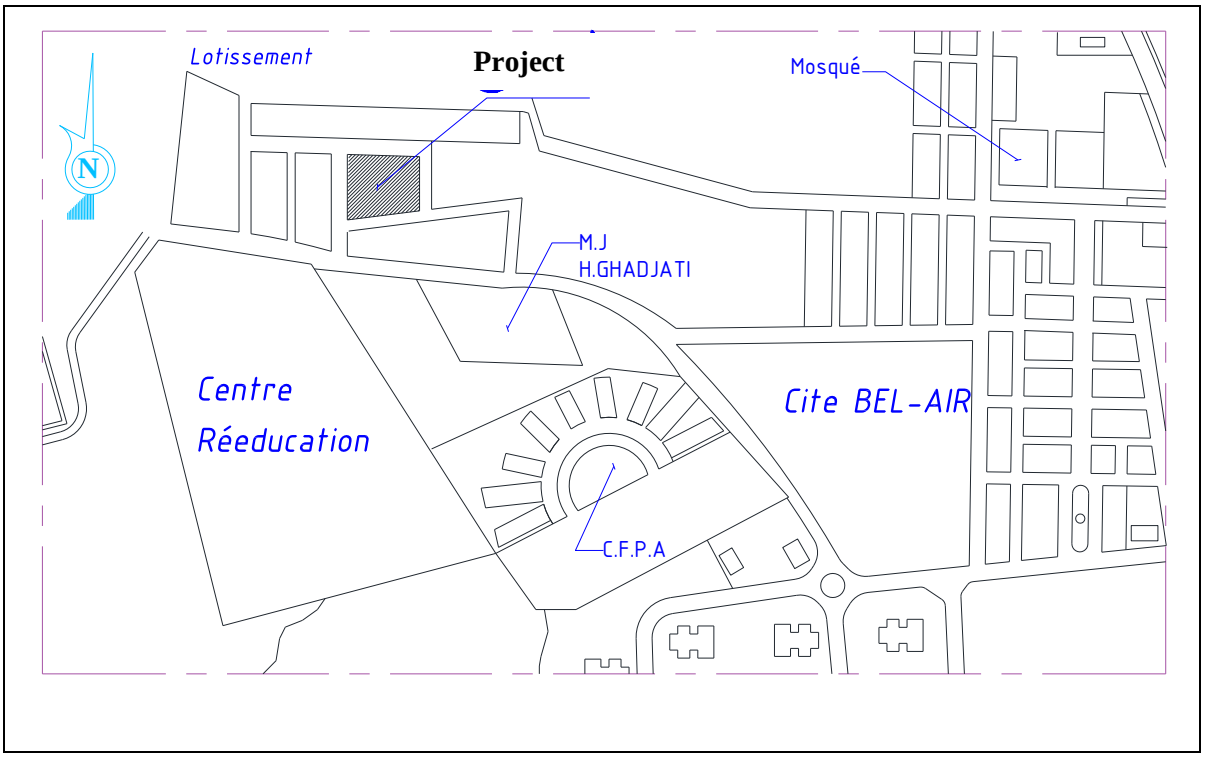


Figure 3-1: Example of a site plan on a scale of 1/1000 - Source: Researcher

1-2) Ground plan:

1-2-1) Ground plan definition:

The ground plan is a top view showing the position of the building on the floor, showing all the architectural elements surrounding it, up to the boundaries of the floor allocated to the building, and also showing the streets and roads surrounding the building and leading to it (Figure 3-2).

1-2-2) Basic information of the ground plan:

- In the ground plan, it is required to specify the geographical north (north orientation).
- Requirement to specify the places of entry and exit to and from the building.
- Inclusion of external dimensions (total dimension) of the building from all sides.
- Inclusion of other dimensions specific to sidewalks, roads, green spaces...etc.
- Place all levels of the different parts of the building and the floors in the block plan.

1-2-3) Drawing scales used in the ground plan:

The drawing scales used in the ground plan are 1/1000, 1/500, or 1/200 (Figure 3-2).

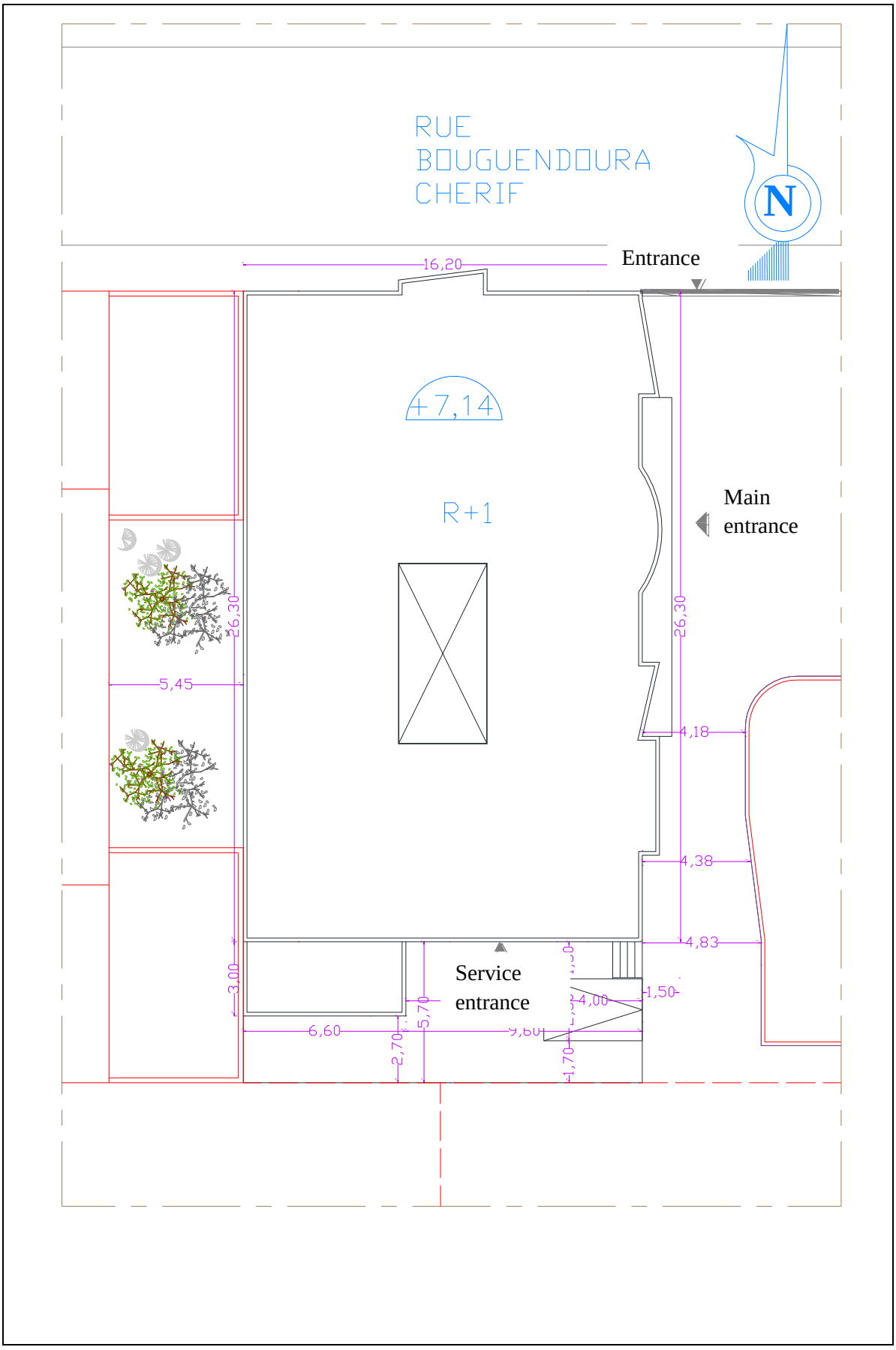


Figure 3-2: Example of a ground plan on a scale of 1/500 - Source: Researcher

1-3) Floor plans:

1-3-1) Definition of scheme:

The plan is a horizontal section of the building in which the building is cut at a hypothetical horizontal level 1 m above the level of the internal floor of the building. In special cases, the default horizontal cutting level is at a height greater than 10 cm above the base of the upper windows of the building. As for the ladders in the floor plans, the horizontal cutting level is at the level of the seventh step listed in the ladder (Figure 3-3).

1-3-2) Floor plans labels:

There are labels for each chart for a specific level:

- Basement Floor Plan.
- Ground Floor Plan.
- 1st Floor, 2nd and 3rd Floor. Etc. (depending on the number of floors of the building).

1-3-3) Representation of architectural elements in floor plans:

- Demonstrate the division of the various internal spaces of the building, their names, and their relationship to each other.
- Showing the internal and external walls with their thickness.
- Show the locations of the various openings (doors and windows) within these spaces.
- Show the locations of the various service items in the building (stairs, elevators, toilet ...etc.).
- Show the places of the structural elements in the plan of columns and supports.

1-3-4) Basic information on floor plans:

- In the floor plan, it is required to specify the geographical north (north orientation), which determines the original directions of the building and its facades.

- Draw the interior and exterior walls of the building through which the hypothetical horizontal cutting level passed with a continuous thick line of 0.6 mm or 0.5 mm thick.
- Draw the boundary of the concrete columns of the building on which the hypothetical horizontal cutting level has passed with a continuous thick line of 0.6 mm or 0.5 mm thick.
- Drop the hidden lines located above the default horizontal cutting level (stairs steps above the level of the seventh-grade menu, changes in the roof level of the building such as arches, ...Etc.), drawn with a thin dashed line 0.2 mm thick.
- The projection of the first seven steps of the ladder that fall below the hypothetical horizontal cutting level (the steps of the ladder are below the level of the seventh step list), is drawn with a thin continuous line of thickness of 0.2 mm.
- Representing doors open and windows closed, all door and window lines are drawn with a thin continuous line 0.2 mm thick.

1-3-5) External and internal stakes and levels in floor plans:

1-3-5-1) External quota in floor plans:

The external allocation of the building in the floor plans (Figure 3-3) shall be carried out through four allocation lines, namely:

1- Staking line for building facade details (voids and filled parts).
2- Staking line for pillar axles.
3- A quota line for the main parts of the building.
4- A quota line for the total dimension of the building.

All external quota lines are drawn with a thin continuous line of 0.2 mm thickness, and the distance between each quota line and the next is within 10 mm.

1-3-5-2) Internal allocation in floor plans:

The building's internal quota lines in the floor plans (Figure 3-3) shall show the following:

- The net internal dimension of each architectural void.
- Dimensions of the thickness of the external and internal walls of the building.

- Dimensions of all openings (doors and windows) in the building, showing the distance between the beginning of the openings (doors and windows) and the nearest adjacent wall.
- All internal ration lines are drawn with a thin continuous line 0.2 mm thick.

1-3-5-3) Levels in floor plans:

- Placing the various levels of the architectural spaces of the building within circles of an appropriate diameter.
- Placing levels at each floor level change, and at the beginning and end of stairs in the building.
- The number indicating the level is written inside a circle in its upper half.

1-3-6) Data in floor plans:

The data in the floor plans (Figure 3-3) are:

- The names of the various architectural voids within the building, which are written in the middle of the void.
- Write numbers for different models of doors and windows (when they differ in dimensions) within circles of an appropriate scale.
- Write the ladder numbers on all steps of the ladder, to know the number of steps of the ladder, and write in sequence from the lowest level to the highest level.
- Explanation of the Places of the Various Sections A-A and B-B...Etc. (longitudinal and horizontal throughout the building), with a thin dashed line of 0.2 mm thickness, with thick ends marked with two identical letters to label the section and arrows representing the direction of view.

1-3-7) Drawing scales used in floor plans:

The drawing scales used in floor plans are:

- Preliminary floor plans: 1/200 or 1/100.
- Executive floor plans: 1/50 (Figure 3-3).

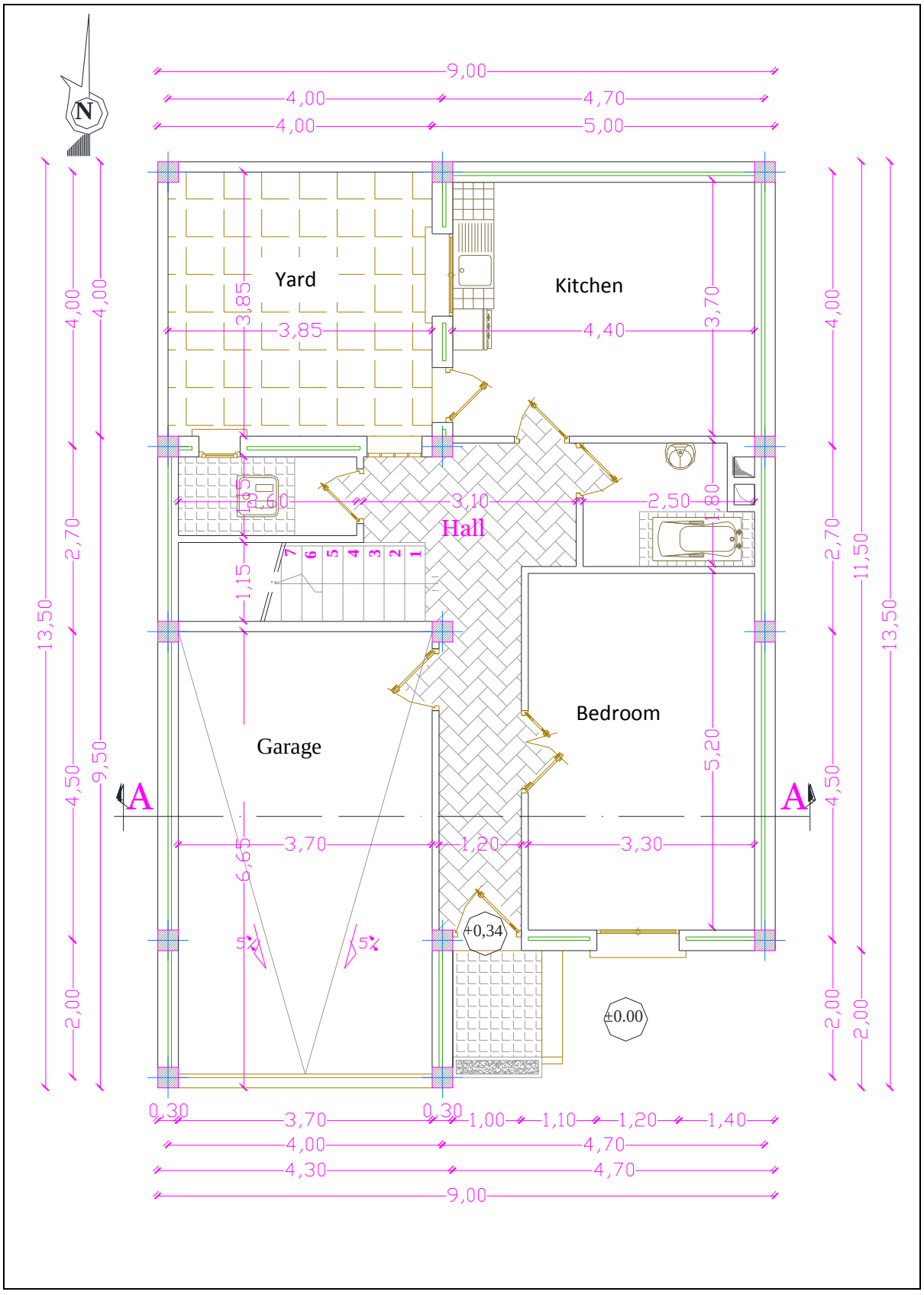


Figure 3-3: Example of a ground floor plan on a scale of 1/50 - Source: Researcher

1-4) Ceiling layout:

1-4-1) Ceiling layout definition:

The roof plan is a top view of the roof, showing all the architectural elements of the roof, and the roof can be tilted or levelled (Figure 3-4).

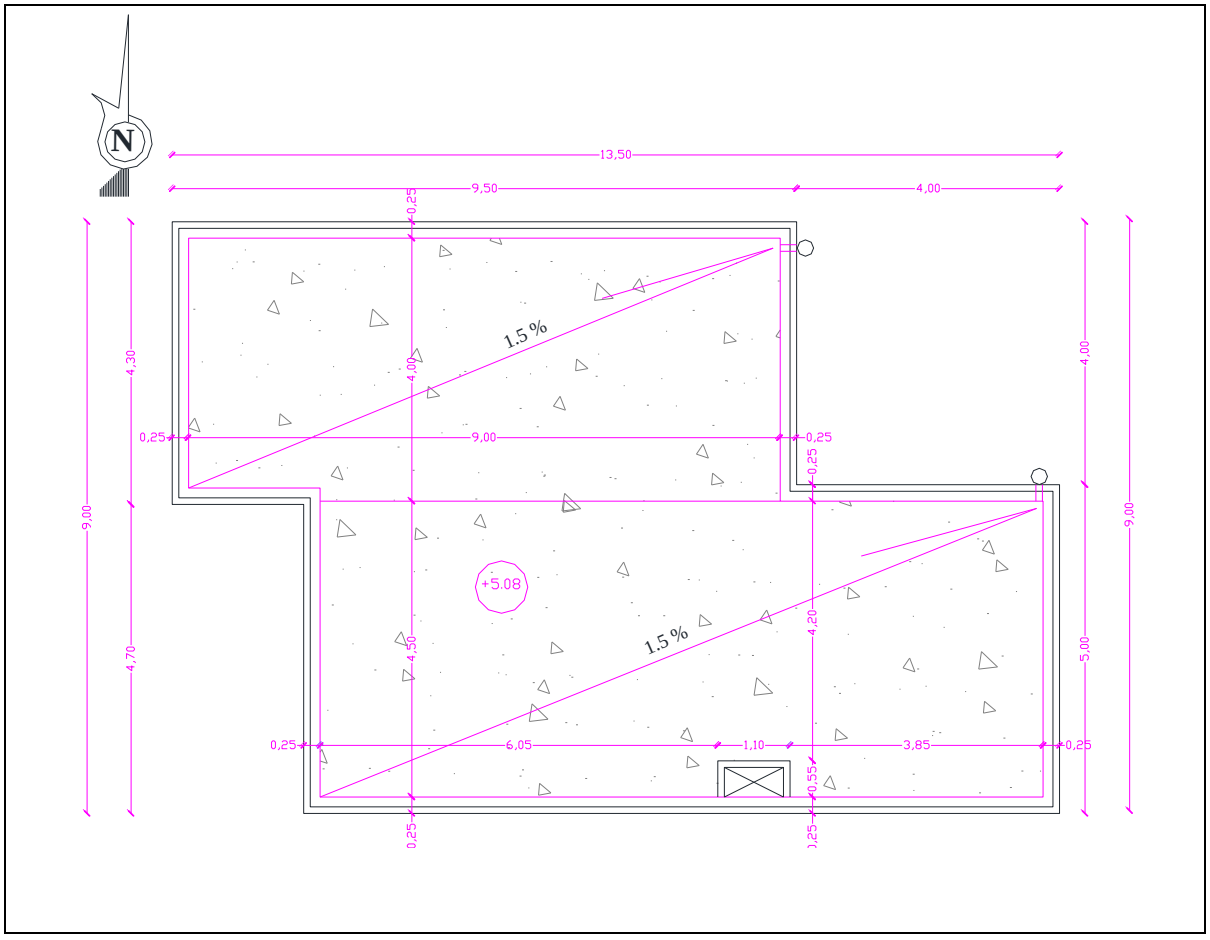


Figure 3-4: Example of a ceiling plan on a scale of 1/50 - Source: Researcher

1-4-2) Background of roof plan:

- In the roof plan, it is required to specify the geographical north (north orientation).
- Show the thickness of the "Acrotère" if the ceiling is level.
- Show the slope of the ceiling if the ceiling is tilted.
- Show the upper and lower points used for water drainage.
- Insert the external dimensions (total dimension) of the ceiling from all sides.
- Include interior dimensions of all roof-forming elements (chimneys, stairs ... etc.).
- Place all levels of the different parts of the roof.

1-4-3) Drawing scales used in the roof plan:

The drawing scales used in the ceiling plan are 1/200, 1/100, or 1/50 (Figure 3-4).

1-5) Sections:

1-5-1) Section definition:

The section is a fictitious section with a vertical cutting level of the building, in which the building is cut with a virtual vertical level passing through the building to show as much as possible the arrangements and vertical interior details of the building that are difficult to represent on floor plans and facades (Figure 3-5).

The selection of the levels of the virtual vertical parts of the building is in the appropriate places to give the most information on the vertical interior details of the building, and in general, the levels of the virtual vertical parts pass on the openings (doors and windows), on the stairs and all levels of the floor difference...etc.

The level of the virtual vertical building cut can change to several refracted levels, represented on the floor plan by a refracted line to go through as much vertical interior detail of the building as possible.

1-5-2) Section labels:

Sections are called by the letters marked in the plane line of the default vertical building segments found in the diagram such as:

- Section A – A (Coupe A-A).
- Section B – B (Coupe B-B) ... etc. (depending on the number of completed sections).

The letters marked at the end of the default vertical building cutting plane line are the same letter and are capitalized and repeated at the end of each cutting line. The cutting point is identified by arrows representing the direction of view.

1-5-3) Representation of interior architectural details in sections:

- Demonstrate the different heights between floors and different levels in the building and their relationship to the natural ground surrounding the building.
- Show the heights of the various openings in the building (doors and windows) in the external or internal walls of the building.

- Demonstrate the construction system used in the construction of the building (load-bearing walls, beam shaft system...etc.).
- Demonstrate the type of roofs used in the construction of the building (reinforced slabs, solid slabs...etc.).
- Show the types of building materials used in the construction of the building (brick, stone, marble ...etc.).
- Show the different interior architectural details found in the building (handrail, staircase ...etc.).

1-5-4) Basic information of the sections:

- Draw the interior and exterior walls of the building on which the default vertical cutting level has passed with a continuous thick line of 0.6 mm or 0.5 mm thick.
- Geometrically projecting the lines behind the virtual vertical cutting level that the cutting level did not pass through (all that is seen from the building from the walls and all architectural elements... etc..), drawn with a thin continuous line of 0.2 mm thickness.
- Representing doors and windows that have passed through the cutting level are closed in sections, and all door and window lines are drawn with a thin continuous line of 0.2 mm thickness.
- The projection of openings (doors and windows) through which the cutting level has not passed is a geometric projection, and it is drawn with a thin continuous line of thickness of 0.2 mm.

1-5-5) Vertical staking and levels in sections:

1-5-5-1) Vertical staking in sections:

The vertical staking of the building in the sections (Figure 3-5) shall be carried out through vertical dimensional lines that pass through the entire section and the following is required:

1- Building's Total Height:
2- The total height line of each floor of the building, and the thickness of the various ceilings formed for the building ...etc.

3- Vertical elevation line for various openings (door and window opening height) in the exterior or interior walls of the building.

4- The line of vertical elevations of the various architectural elements passed by the level of the pieces.

All vertical ration lines are drawn with a thin continuous line 0.2 mm thick.

1-5-5-2) Levels in sections:

- Placing the various levels of the building within circles of an appropriate diameter.
- Placing levels in sections at each change in the floor level of the floor or of the various floors of the building (finished floor).
- The value of the level is written inside a circle in its upper half.

1-5-6) Correspondence of floor plan data with section data:

The data in the floor plans must be taken into account with the data of the sections through the following:

- Taking into account the conformity of the flooring layers of the various architectural spaces in the sections with the same data of those spaces in the floor plans.
- Taking into account the matching of the positions of the walls and the ceilings of the various architectural spaces in the sections with the same data in the floor plans.
- Taking into account the conformity of the heights of the door and window openings and their positions with the same data of those openings in the floor plans.

1-5-7) Drawing scales used in the sections:

The drawing scales used in the sections are:

- Preliminary Drawing Sections: 1/200 or 1/100.
- Operational sections: 1/50 (Figure 3-5).

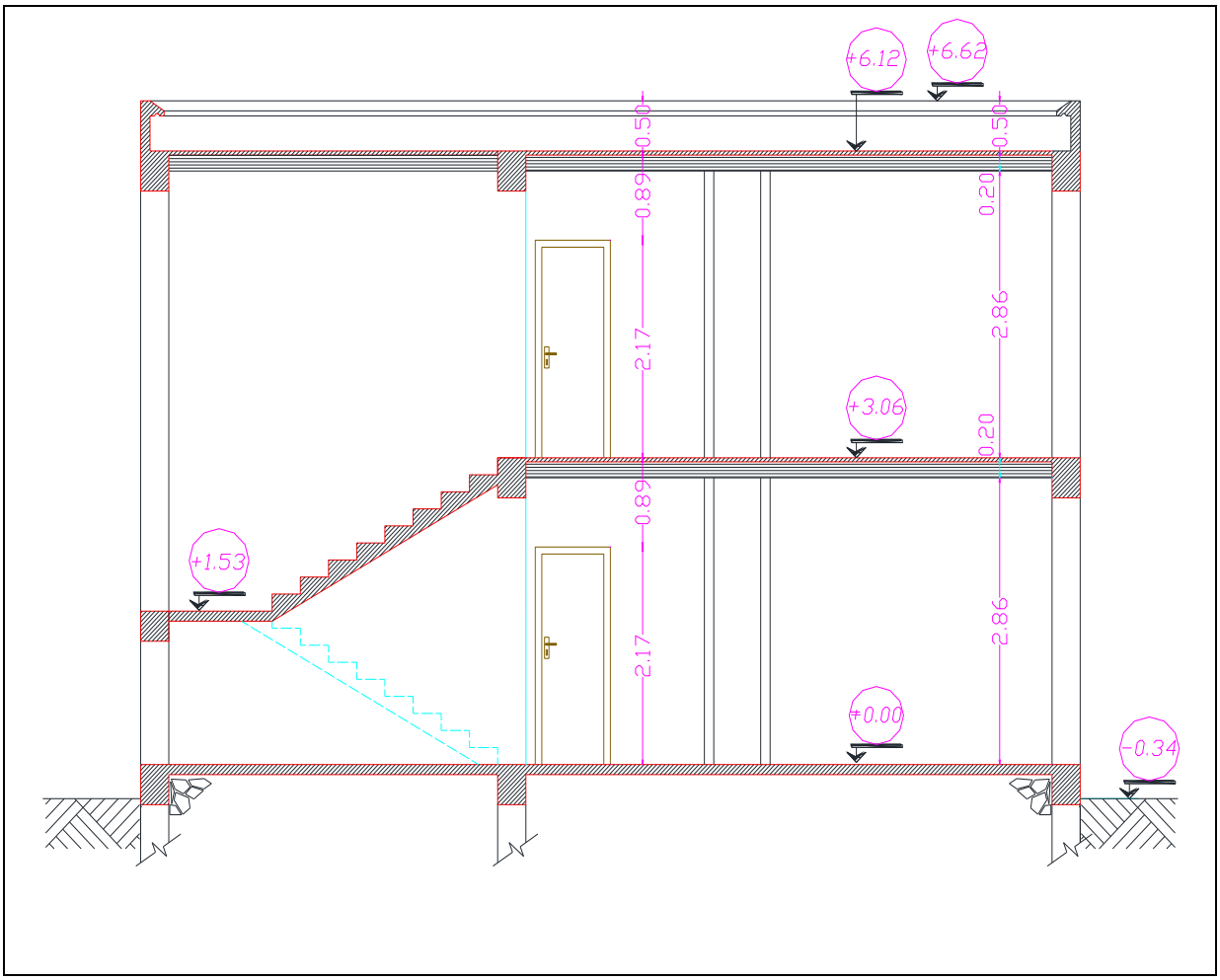


Figure 3-5: Example of section A-A on a scale of 1/50 - Source: Researcher

1-6) Facades:

1-6-1) Interface definition:

The facade is a vertical section outside the building in which the ground line is cut, with a virtual vertical plane passing outside the building, and the facade is drawn as a geometric projection of the building on a plane that is perpendicular to the direction of view and parallel to the building, to illustrate all the architectural elements in the facade of the building (Figure 3-6).

The ground line is a horizontal line whose level is zero, and the ground line can be multiple levels according to the ground levels outside the building. Conformity in the projection of facade lines with floor plan lines and section lines shall be taken into account.

1-6-2) Facade labels:

The facades of the building are called according to the geographical orientation of the facets of the building:

- The north-facing facade of the building is called: **North Facade.**
- The south-facing facade of the building is called: **South Facade.**
- The east-facing facade of the building is called: **East Facade.**
- The west-facing facade of the building is called: **West Facade.**

The facades of the building can be called as follows:

- The facade of the building to the northeast is called: **Northeast facade.**
- The facade of the building to the southeast is called: **Southeast facade.**
- The northwest facade of the building is called: **Northwest facade.**
- The facade of the building to the southwest is called: **Southwest facade.**

1-6-3) Representation of external architectural details in facades:

- Show the shapes and places of all the external architectural elements that are prominent inside the facade of the building.
- Show the shapes and places of all the different openings in the building (doors and windows) located in the external walls of the building.
- Building's Total Height:
- Show some natural elements such as trees and humans that give a benchmark for construction.

1-6-4) Basic information about the interfaces:

- Draw the ground line that the default vertical cutting level has passed through (the cutting level passes outside the building) with a 1.2 mm thick continuous line.
- Drop the pavement line, and draw a continuous line 0.4 mm thick.
- Drop the boundary lines of the blocks near the facade of the building, and draw a continuous line with a thickness of 0.4 mm. As for the boundary lines of the distal blocks of the facade of the building, they are drawn with a continuous line with a thickness of 0.3 mm.
- Drop lines of all outstanding external architectural elements and draw a continuous line 0.4 mm thick, and the interior draws a continuous line 0.3 mm thin.

- The slot lines (doors and windows) are geometric projections and are drawn with a thin continuous line of thickness of 0.2 mm.

1-6-5) Drawing standards used in facades:

The drawing standards used in the facades are:

- Preliminary Drawing Interfaces: 1/200 or 1/100.
- Executive interfaces: 1/50 (Figure 3-6).

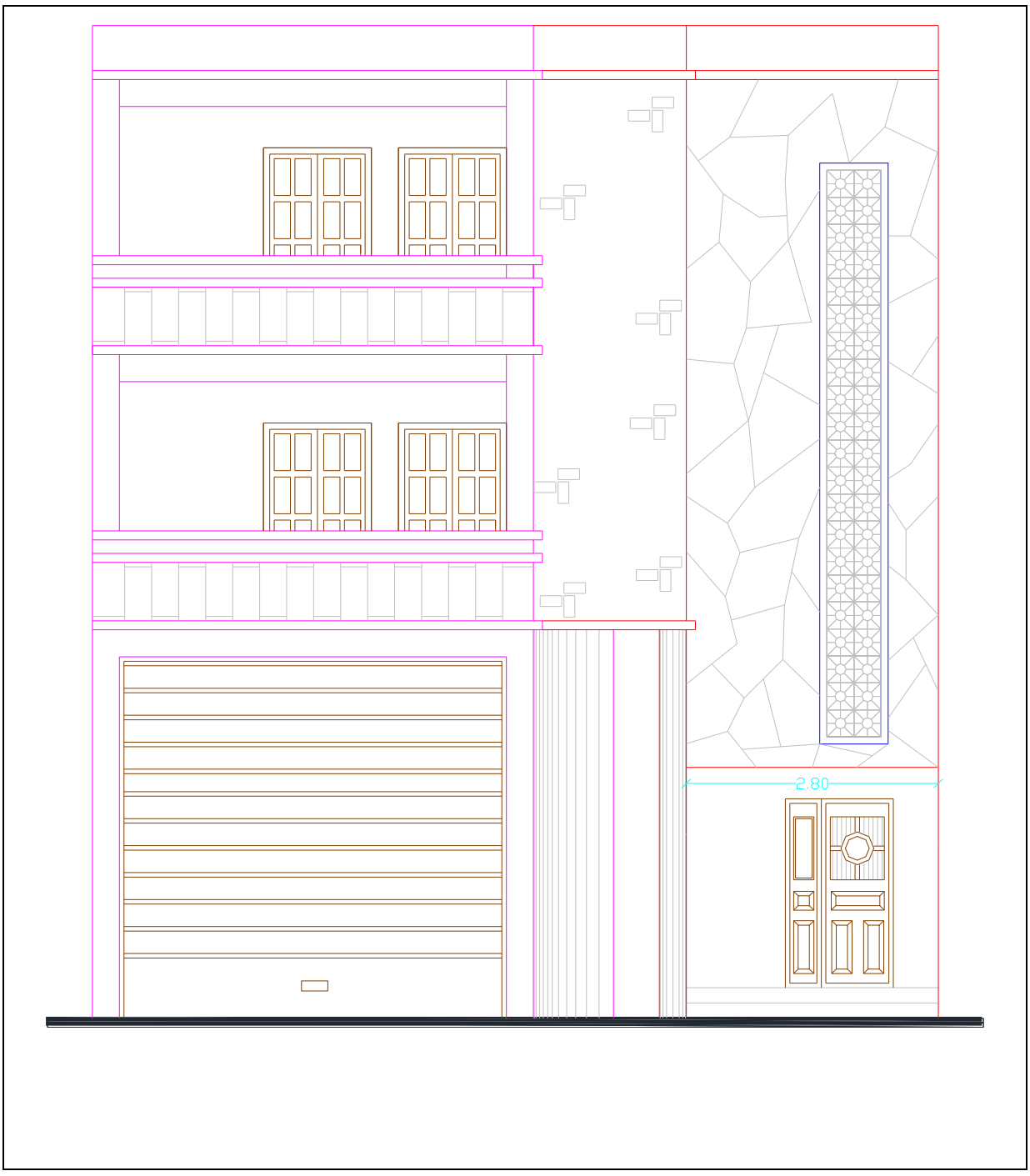


Figure 3-6: Example of the northern facade on a scale of 1/50 - Source: Researcher

1-7) Architectural and structural details drawings:

1-7-1) Definition of architectural and structural details drawings:

Architectural and structural detail drawings are engineering drawings of specific architectural elements in the building, architectural and structural details may be plans, facades, or sections and may all be together (Figure 3-7).

The drawings of the architectural and structural details are necessary to clarify some elements of the building that are not clear enough on the plans, sections, and facades of the entire building because the scale of the drawing itself is not sufficient for clarification, so the drawings of the architectural and structural details are on a drawing scale starting from 1/20 to 1/1 scale.

1-7-2) Detailed drawings in the architectural and structural details file:

- Show the details of the architectural element to access the method of implementation of the architectural element.
- Accurately show the dimensions and sizes of the architectural element that the architect needs for implementation.
- Show the structural elements used in the construction of the architectural element (brick, stone, wood, iron, reinforced concrete...etc.).
- Show details of openings (doors and windows).
- Show interior or exterior wall cladding details, to show how they are installed.
- Show details of building floor components.
- Show details of internal or external stairs.
- Show details of flat ceilings or sloped ceilings, to show how they are installed.
- Show building decoration details...etc.

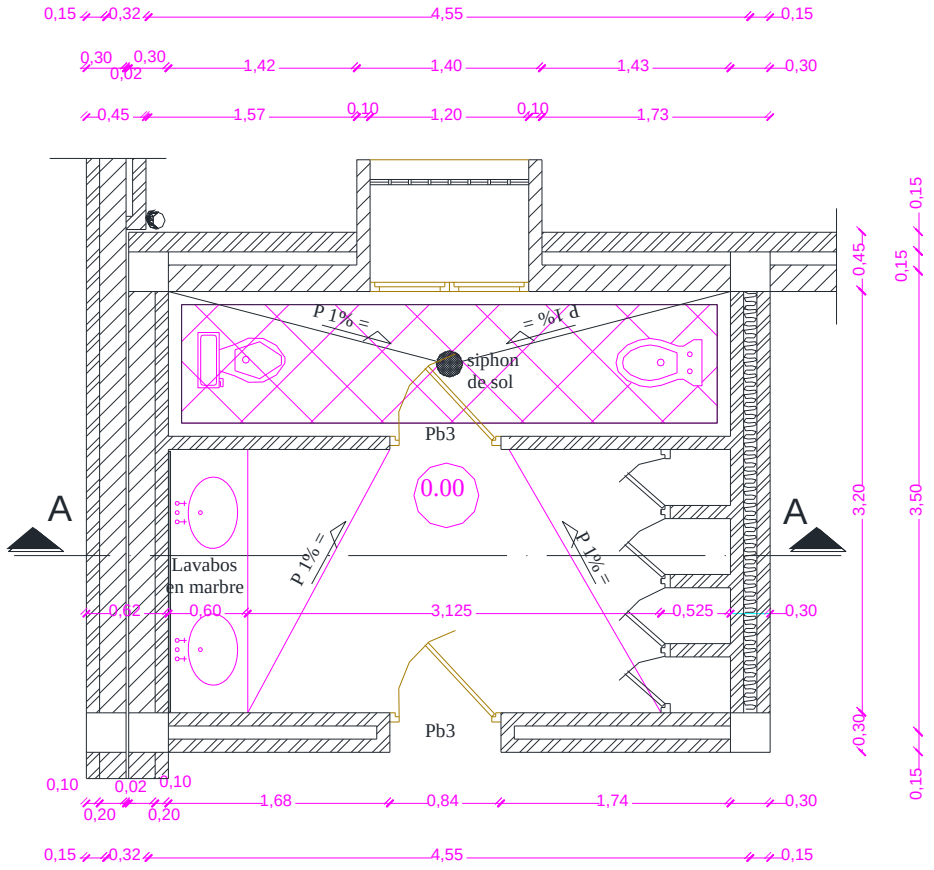
1-7-3) Basic information in architectural and structural details drawings:

- Draw the ground line in the detailed façade with a 1.2 mm thick continuous line.

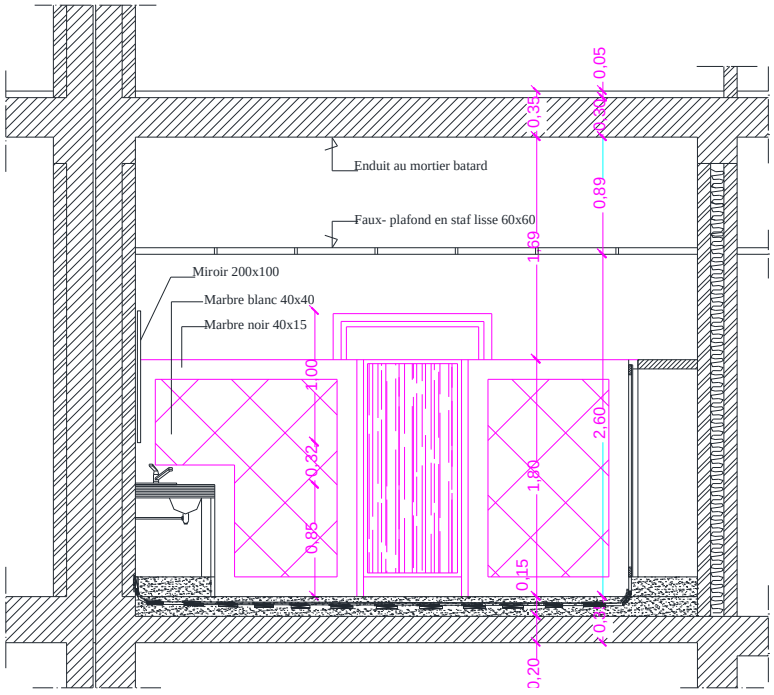
- Draw the marking lines of the building materials used in the building with a thin continuous line of 0.2 mm thickness.
- Draw the internal and external walls of the building cut in the drawings of the architectural detail with a continuous thick line of 0.6 mm or 0.5 mm thick.
- Draw the boundaries of the concrete columns of the building cut in the drawings of the architectural detail with a continuous line thick 0.6 mm or 0.5 mm thick.
- Include all the dimensions required for the implementation of the architectural elements whose architectural details are to be shown, whether in the detail section detail diagram or the architectural detail interface, whether the dimensions are vertical or horizontal, and are drawn in a thin continuous line with a thickness of 0.2 mm.

1-7-4) Drawing standards used in architectural and structural details drawings:

The drawing scales used in architectural and structural detail drawings are 1/20 (Figure 3-7), 1/10, 1/5, 1/2, or 1/1.



Ground floor plan (Sanitary) – Scale : 1/20



Section A-A – Scale : 1/20

Figure 3-7: Example of architectural and structural details (1/20 scale ground floor plan and section) - Source: Researcher

1-8) Shop drawings:

1-8-1) Definition of shop drawings:

Shop drawings are supplementary drawings for the completion and implementation of a building or project, and include several shop drawings, the most important of which are:

- **Reinforced concrete plans:** They are a section of the concrete structure of the building with a horizontal plane passing through the structural structure of the building, which are plans showing the concrete structure of the building.
- **Foundation drawings:** They are a section of the structural structure of the building with a horizontal plane passing through the columns of the building. They are drawings that show the position of the various foundations of the building (Figure 3-8).
- **Electricity, heating, and sanitary stacking plans:** It is a horizontal section of the building on which all electricity, heating, and sanitary stacking installations are shown.
- **Detailed drawings for carpentry of doors and windows:** These are detailed drawings (drawings, sections, and facades) necessary for the implementation of doors and windows in the building.

1-8-2) Drawing standards used in the shop drawings:

The drawing scale used in shop drawings is 1/50.

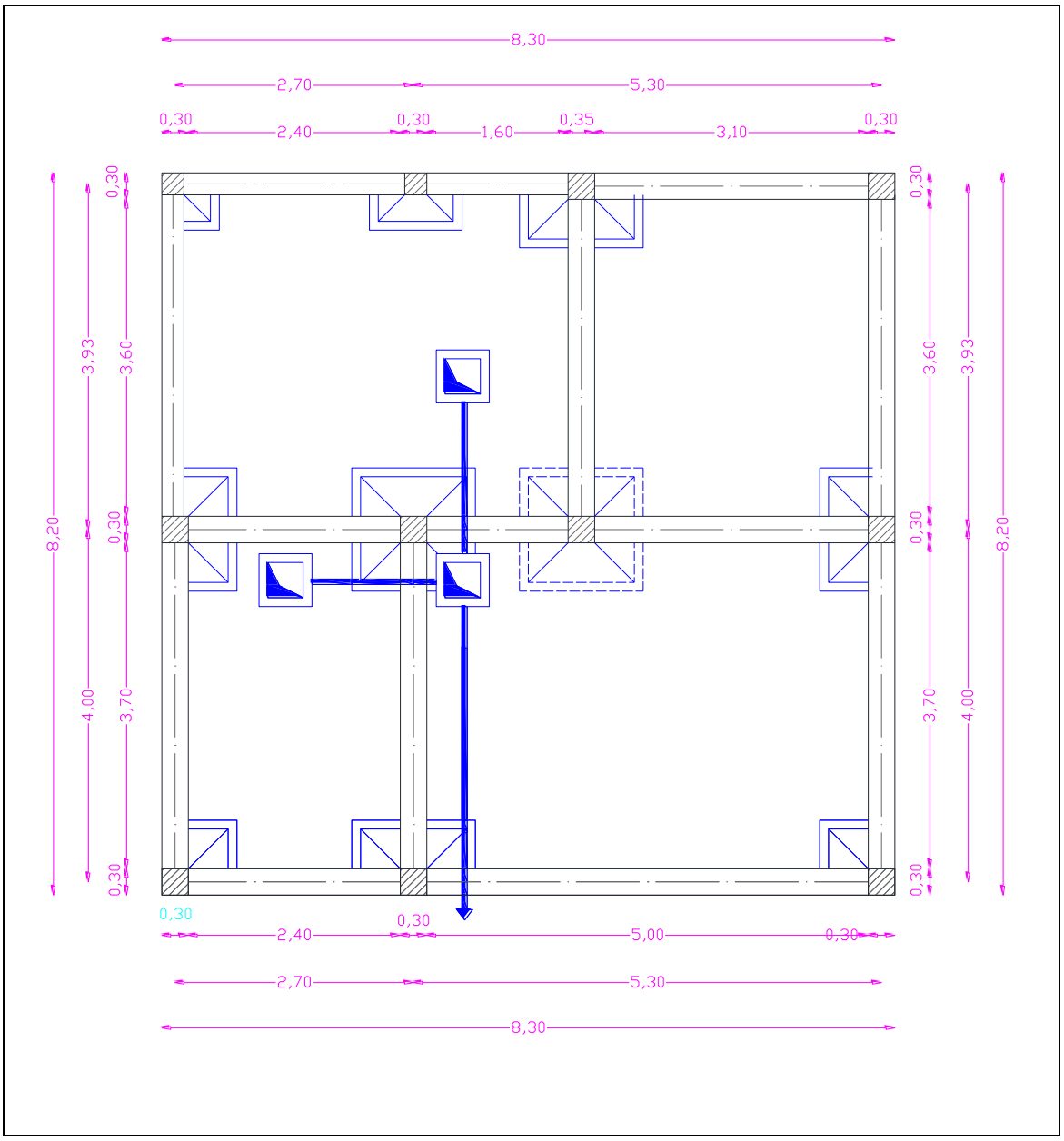


Figure 3-8: Example of a foundation diagram on a scale of 1/50 - Source: Researcher

1-9) Architectural figures:

1-9-1) Definition of the architectural model:

An architectural sculpture is a visualization of the architectural form that the project will have after its creation. The architectural model is one of the most important means of showing architectural projects because it is difficult for a person to imagine architectural drawings in two dimensions. These architectural drawings must be transformed into three-dimensional models to provide a clearer vision of the project (Figure 3-9).

1-9-2) Representation of architectural elements in architectural figures:

- Show the main building of the project.
- Show the streets surrounding the project building.
- Show the size of the project building and its relationship to the surrounding buildings.
- Show the integrated architecture of the building, including people, cars, and natural elements surrounding the project building.

1-9-3) Tools used in architectural models:

- Model paper (cardboard) is used to make the project model.
- Plastic is used to make models in which transparency is required.
- Glue and adhesives are used to adhere holographic paper and plastic.
- Scalpels (Cuter) are used to cut holographic paper and plastic.
- Models of architectural supplements for the building's surroundings such as people, trees, and cars at the appropriate scales...etc.

1-9-4) Steps to implement architectural models:

- Preparing tools and means used in architectural models.
- Preparing drawings from the facades of the project building and the drawings of the external walls and the ceiling by drawing them on holographic paper (cardboard), to clarify all dimensions of the project building.
- Preparing a solid base for the architectural model.
- Cutting and preparing walls.
- Cut and paste facades with each other.
- Cutting and installing the roof of the building from the top.
- Preparing models of architectural supplements for the building's surroundings such as people, trees, cars, roads, and streets.

1-9-5) Drawing scales used in architectural models:

The drawing scales used in architectural models vary according to the size of the architectural project (Figure 3-9).

Figure 3-9: Models for students of the department of architecture - Biskra

Source: Researcher

2- Architectural survey:

Architectural survey is a method of assessing the condition of existing buildings for operations such as restoration and rehabilitation, through technical processes that allow the building to be examined directly to complete a technical file of the building consisting of plans, sections, facades ...etc.

2-1) Definition of architectural survey:

Architectural survey is a technical drawing of a building that exists in reality, through which a technical file is completed for this building consisting of plans, sections and facades architectural details...etc.

The architectural survey of the building is resorted to in the absence of technical architectural documents for this building such as technical drawings of plans, sections, and facades.

2-2) Tools used in architectural survey:

The following tools are used in the architectural survey operations of the building:

- Measuring instruments of decametre and the like.
- Plumb thread (Fil à plomb).
- Equerry.
- Drawing board and its accessories of pencils and eraser ...etc.

2-3) Stages of preparing the architectural survey of the building:

2-3-1) Phase 1 (Building exploration):

During the first stage of the preparation of the architectural survey, the building is first explored and identified, by passing through it to form a comprehensive idea of the state of the building, its details and architectural spaces and their distribution ...etc.

2-3-2) Phase 2 (Completion of preliminary drawings):

In the second stage of the preparation of the architectural survey, comprehensive preliminary drawings of the building, from floor plans, sections, facades, and important architectural details, are completed manually (freehand drawing) with a pencil taking into account the proportionality between the parts of the building (Figure 3-10).

2-3-3) Phase 3 (Taking measurements and writing dimensions):

In the third stage of the preparation of the architectural survey, all measurements of the building are taken by triangulation technique, for example, and then all measurements and dimensions are written on the preliminary drawings previously completed (Figure 3-10).

2-3-4) Phase 4 (Completion of final technical drawings):

In the fourth and final stage of the preparation of the architectural survey, the final technical drawings of the building shall be completed at a certain drawing scale with precise drawing tools, drawing on the preliminary drawings completed in the previous stages.

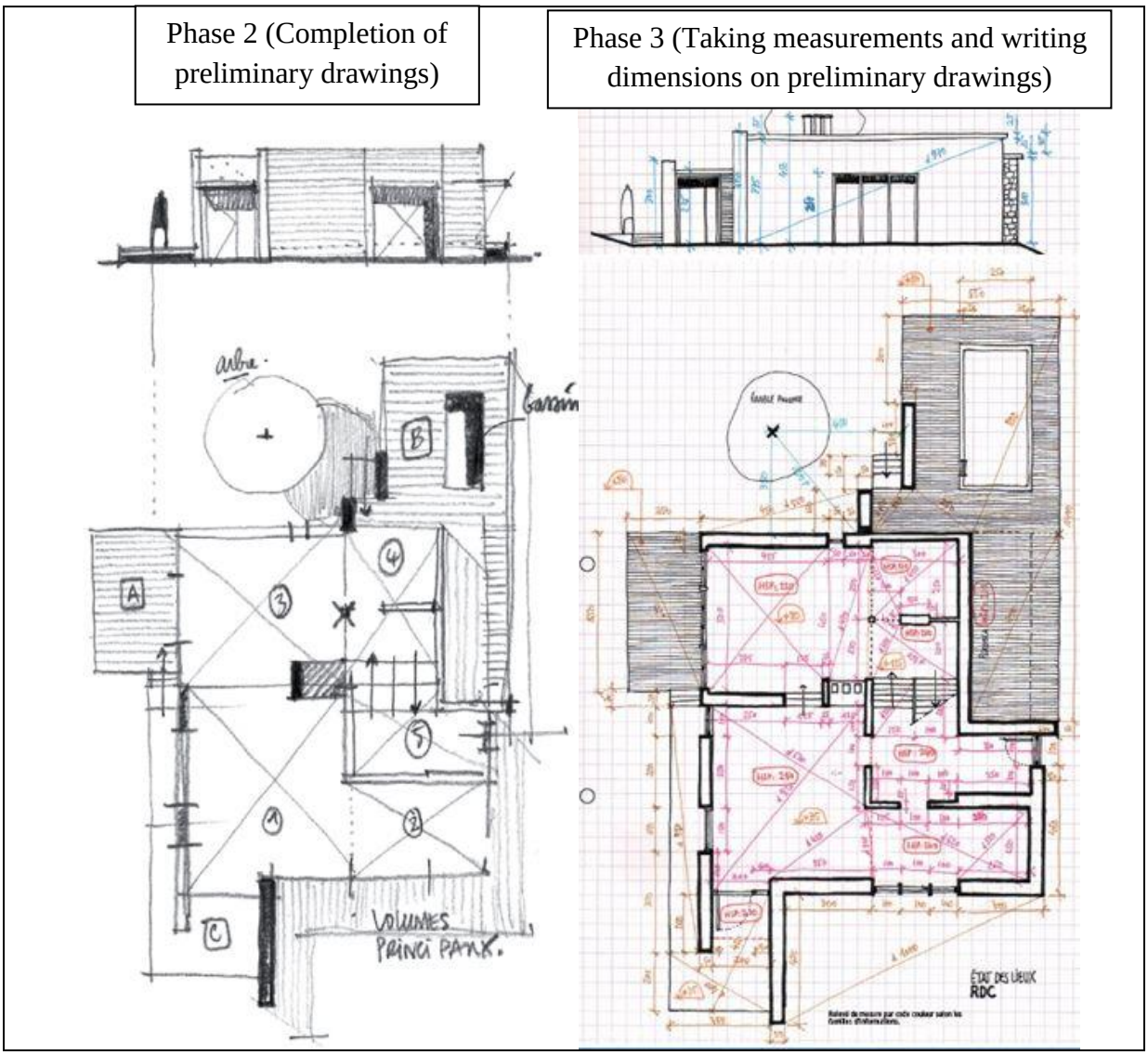


Figure 3-10: Illustrative examples of stages of building architectural survey preparation (Stage 2 & 3) - Source: (Esaab-nevers, technologie et sémiologie du design d'espace, bts design d 'espace et DSAA design – mention espace)

2-4) Architectural survey techniques for plans, sections, facades and architectural details:

2-4-1) Architectural survey technique for plans:

Architectural survey of the plans of the building in reality, is carried out based on the preliminary drawings of the completed plans, which must take into account as much as possible the proportionality between the parts of the building, and reflect the reality of the building very closely.

Due to the inability to measure the angles of the geometric shapes that form the architectural spaces of the building with ordinary measuring tools, we must resort to the use of measurements of the diameters of these geometric shapes, which divide them into triangles, and this is what we call the process of triangulation" (Figure 3-11), that is, the division of simple or complex shapes into triangles.

The full measurements of the building must be taken by triangulation technique, more accurately, and it must be ensured that some horizontal parts are perpendicular using plumb thread. Finally, we move to the completion of the final plans of the building at a specific drawing scale with accurate drawing tools.

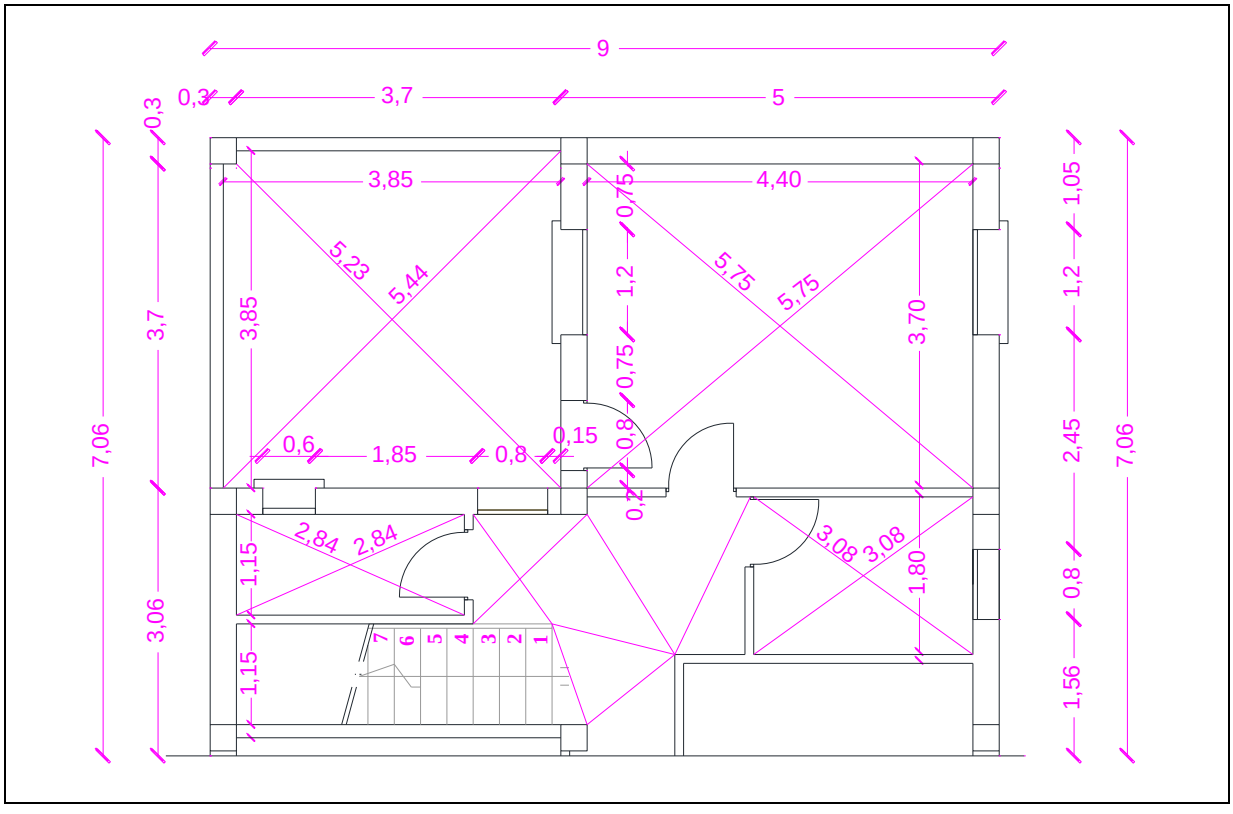


Figure 3-11: Architectural survey of part of a house plan (applying the "triangulation" process) - Source: Researcher

2-4-2) Architectural survey technique for sections and facades:

2-4-2-1) Information on the architectural survey of sections and facades:

- Before starting the process of taking measurements of the elevations of the sections, preliminary drawings of longitudinal and transverse sections in the building must be prepared, and it is important to ensure that the level of the pieces passes through the doors, windows, and stairs to provide as much form and standard information as possible.
- Taking measurements in the architectural survey of sections and facades, concerned with vertical measurements, related to vertical parts such as the heights of architectural spaces, windows and doors, and the vertical placement of windows in walls.
- In the case of survey clips, neither the quality of the construction materials nor the details of the clip must be highlighted. Here, only what is seen in the building is raised, and in special cases, and if it comes to the restoration and rehabilitation of the building, the nature of the construction materials must be known by digging to represent it in the clips.
- As for raising the facades, their representation is normal, and they can be deduced using drawings and sections.

2-4-2-2) Architectural survey techniques for sections and facades:

- **How to use the grid:** The painter first draws a grid with analogous dimensions at an appropriate scale and then draws the interface or section by installing each part of the interface or section on the grid in the appropriate reference (Figure 3-12). This technique is used to lift facades and high sections.
- **Photographic method:** where the painter first takes several successive images of the interface and then completes the technical drawings after determining the relationship of the magnification ratio between the images and the real interface. This technique is used for the double marine ladder or drawers if the facades are of great height. This technique is used when the

facades and sections are rich in ornaments that are difficult to access, especially if the facades and sections are of very high height.

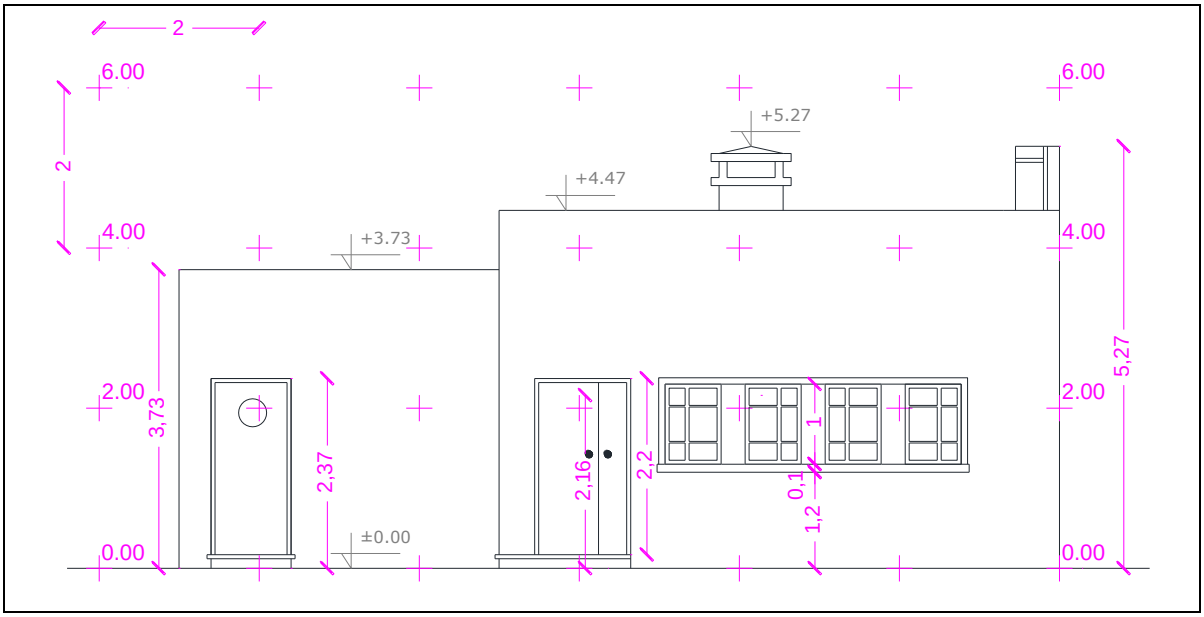


Figure 3-12: Architectural survey of the front of a house (how to use the network)

Source: Researcher

2-4-3) Architectural survey technique for architectural details:

The architectural survey of architectural details is similar to the survey of plans, facades, and sections. Here, the scale of the drawing is larger from 1/20 to 1/1, to show the important elements in the building (Figure 3-13), such as structural elements (columns, ceilings, bearing walls...etc.), stairs, doors, windows, chimneys ...etc., and the decorative elements present in the building.

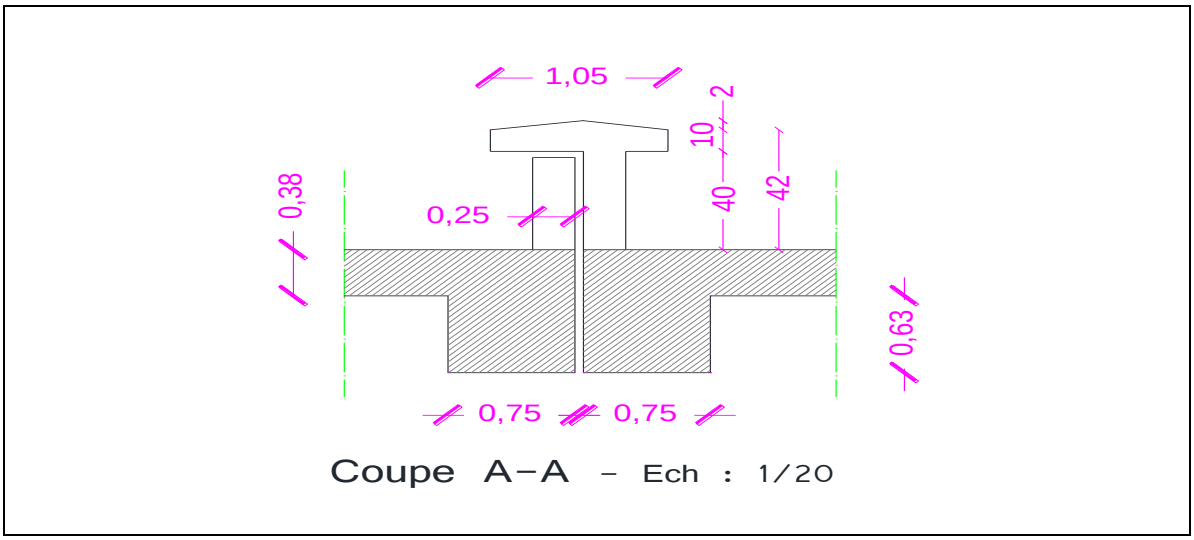


Figure 3-13: Architectural survey of architectural details on a scale of 1/20

Source: Researcher

II- Practical exercises for the third stage (Technical reading of architectural documents):

The content of the third phase of the project workshop material program can be embodied by sequential exercises according to its content as follows:

- An introductory exercise in which the student represents the pillar of his table (Trestle) after taking its measurements (as he touches it directly), through which he extracts various documents at an appropriate drawing scale, and applies the rules of architectural presentation.
- Followed by an exercise to evaluate the details of a technical element of the architectural structure "window and door, through which various documents are extracted at an appropriate drawing scale, and the rules of architectural presentation are applied
- An exercise in which the student is assigned to take measurements in the workshop with the staircase of the climb, through which the student embodies the architectural documents.
- The student is also assigned to the architectural lift, which we did not remove outside the workshop times, in which all architectural documents are indicated and returned after a period to be evaluated.
- This stage of formation is interspersed with a closed exercise, in which the student is instructed to redraw the initial drawing on a scale of 1/50, and then propose on the same scale the various remaining architectural documents.
- An exercise in which a given project is enlarged with one or more documents (missing data). The exercise includes the plan document and another document such as the facade with a scale of 1/100. The student works on enlarging it to a scale of 1/50 and completing the missing documents to reach the student with the full documents that enable him to read it, namely: the plan – the sections – the interfaces – the internal and external perspective – the Axonometric – some details (the window or door with a scale of 1/20) - the block plan - the site plan, and then finally its embodiment through the model to display.

1- Practical exercise 01 (Representation of the table pillar “Trestle”):

The instructor asks all students to do study of the pillar of his table (Trestle) after taking its measurements (Figure 3-14) on the drawing paper of size (A2), through which he extracts various documents with an appropriate drawing scale of 1/20, and applies the rules of architectural presentation:

- Plan.
- Sections A-A and B-B.
- Elevations.
- External Perspective.
- Axonometric.

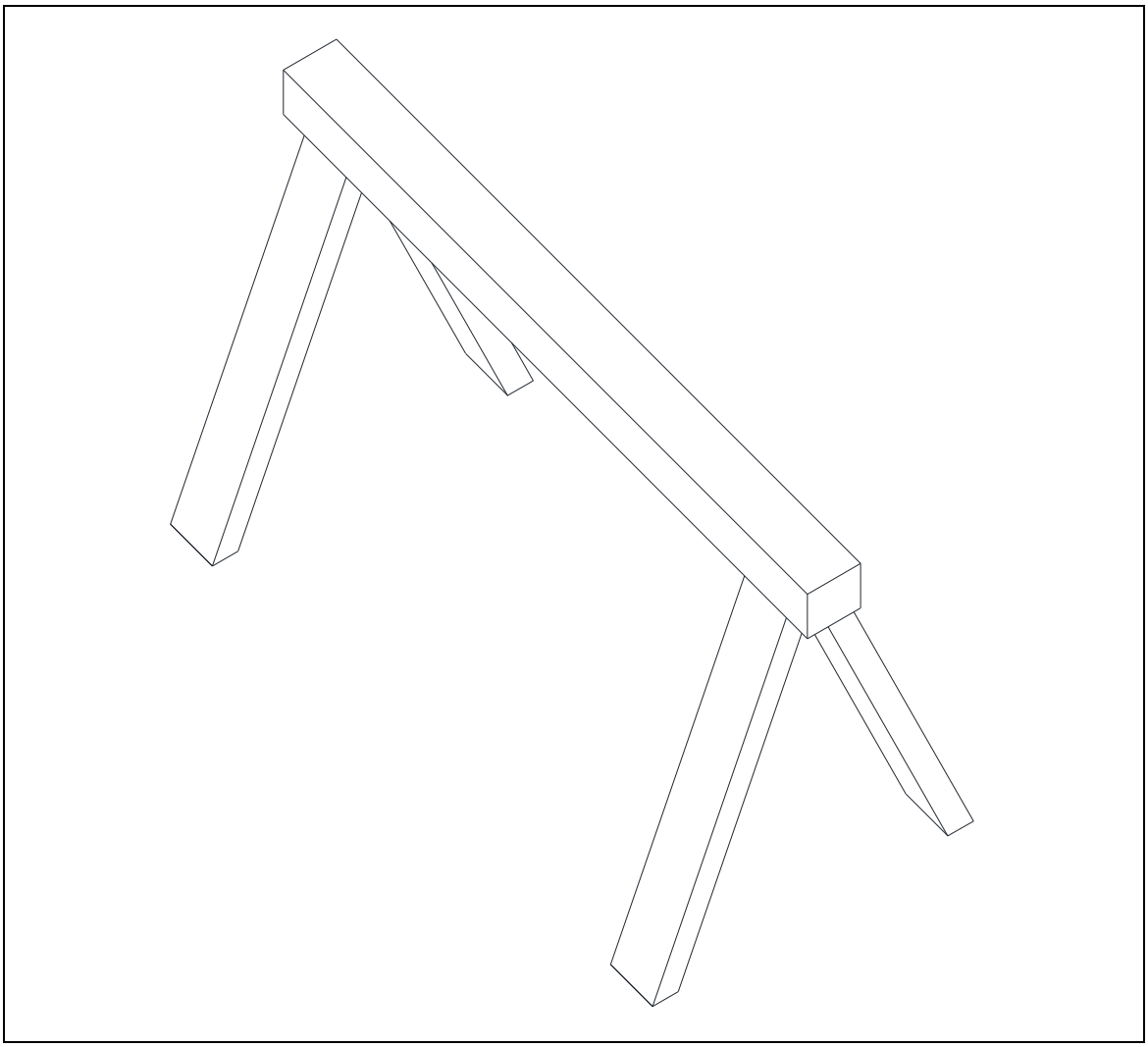


Figure 3-14: Practical exercise 01 "The use of various architectural documents (pillar of the table) – size (A2)" - Source: Researcher

2- Practical exercise 02 (Representing the details of a technical element of the architectural structure “Window and door”):

All students are required to provide details of a technical element of the architectural structure "window and door» (Figure 3-15) in the drawing paper size (A2), through which various documents are extracted with an appropriate drawing scale of 1/20, and the rules of architectural presentation are applied:

- Plan.
- Sections A-A and B-B.
- Elevations.
- External Perspective.
- Axonometric.

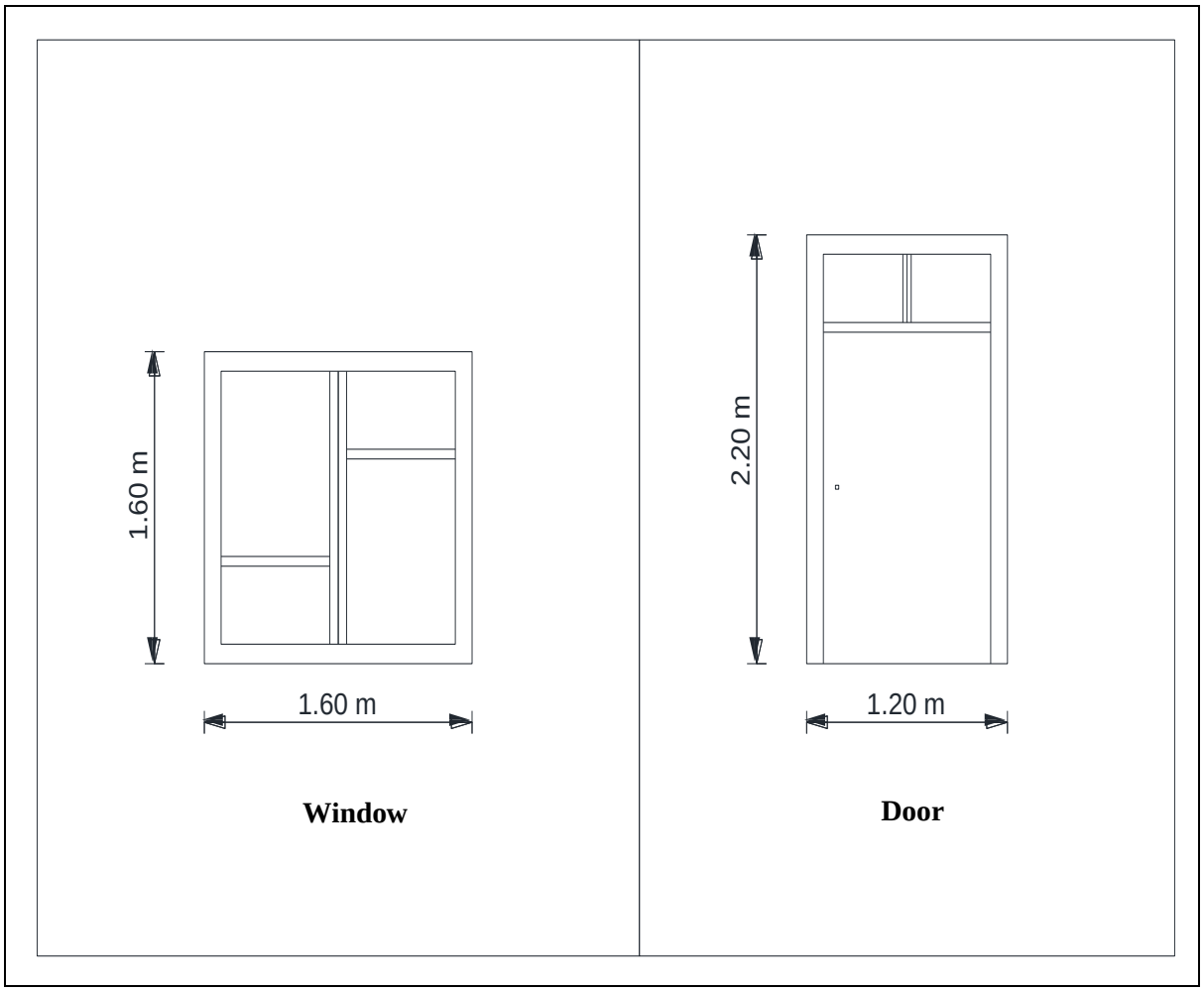


Figure 3-15: Practical exercise 02 "Exhaustion of various architectural documents (window and door) – size (A2)" - Source: Researcher

3- Practical exercise 03 (Architectural survey of the “Workshop”):

All students are required to survey or raise the workshop (take workshop measurements) (Figure 3-16), and then in the drawing paper (A2), through which various basic architectural documents are embodied with an appropriate drawing scale of 1/50:

- Plan.
- Sections A-A and B-B.
- Elevations.
- Internal perspective.
- Axonometric.

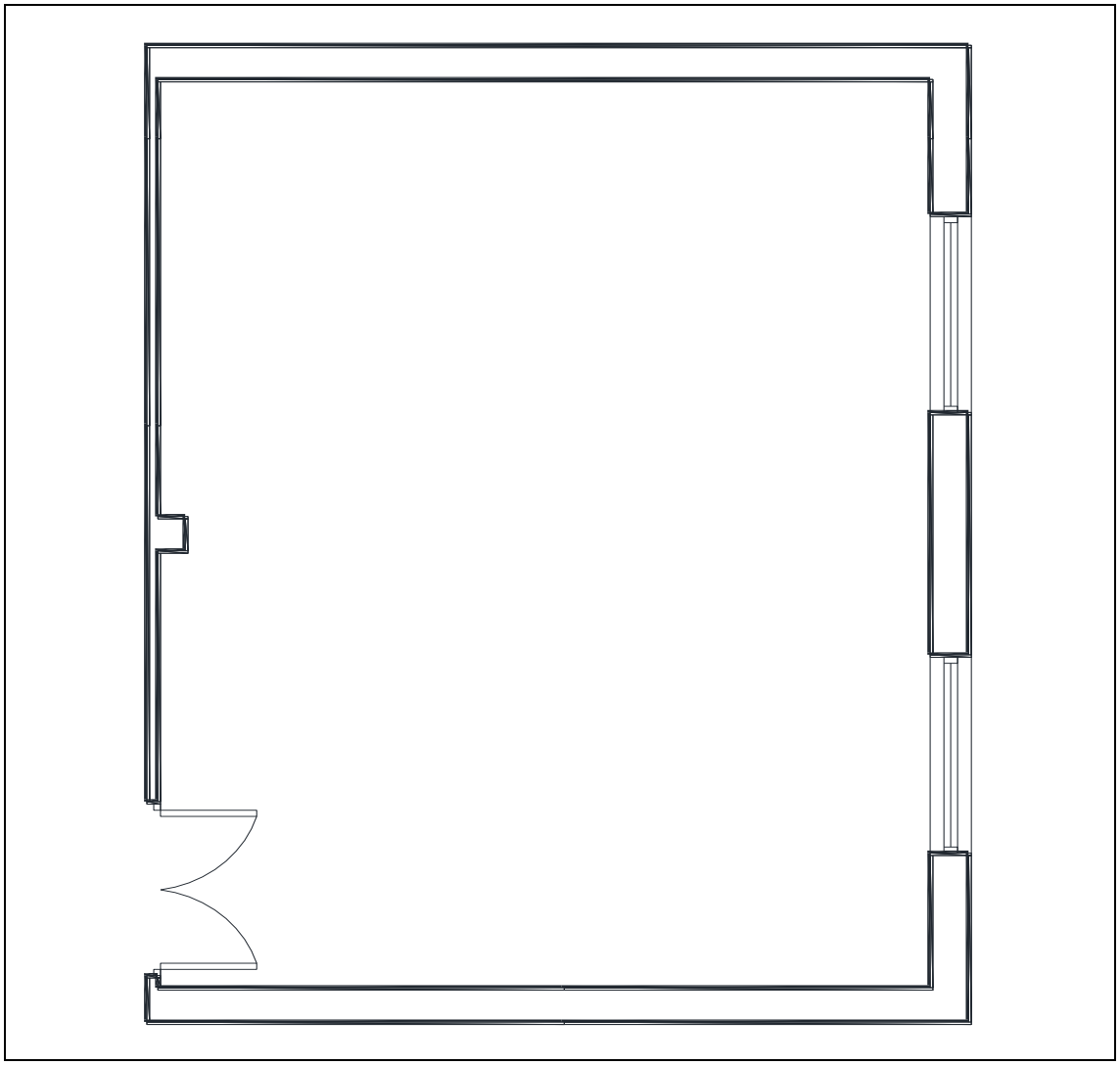


Figure 3-16: Practical exercise 03 "Various architectural documents (workshop) – size (A2)" - Source: Researcher

4- Practical exercise 04 (Architectural survey of the “Step Up”):

All students are required to scan or lift the staircase adjacent to the workshop (taking measurements of the staircase) (Figure 3-17), and then in the drawing paper (A2), through which various basic architectural documents are embodied with an appropriate drawing scale of 1/50:

- Plan.
- Sections A-A and B-B.
- Elevation.
- Internal perspective.
- Axonometric.

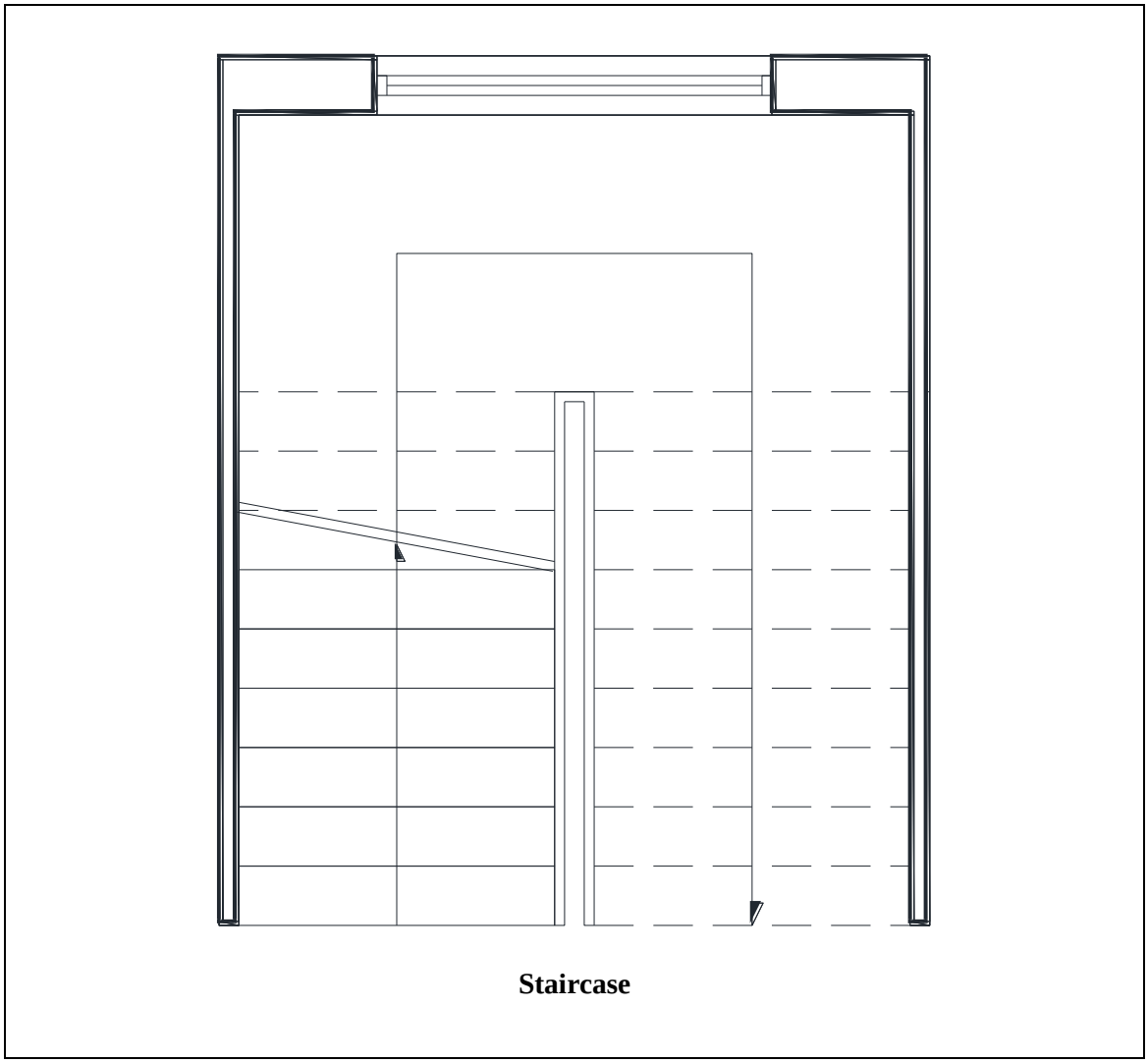


Figure 3-17: Practical exercise 04 "Extraction of various architectural documents (staircase) – size (A2)" - Source: Researcher

5- Practical exercise 05 (Architectural survey of the “Home”):

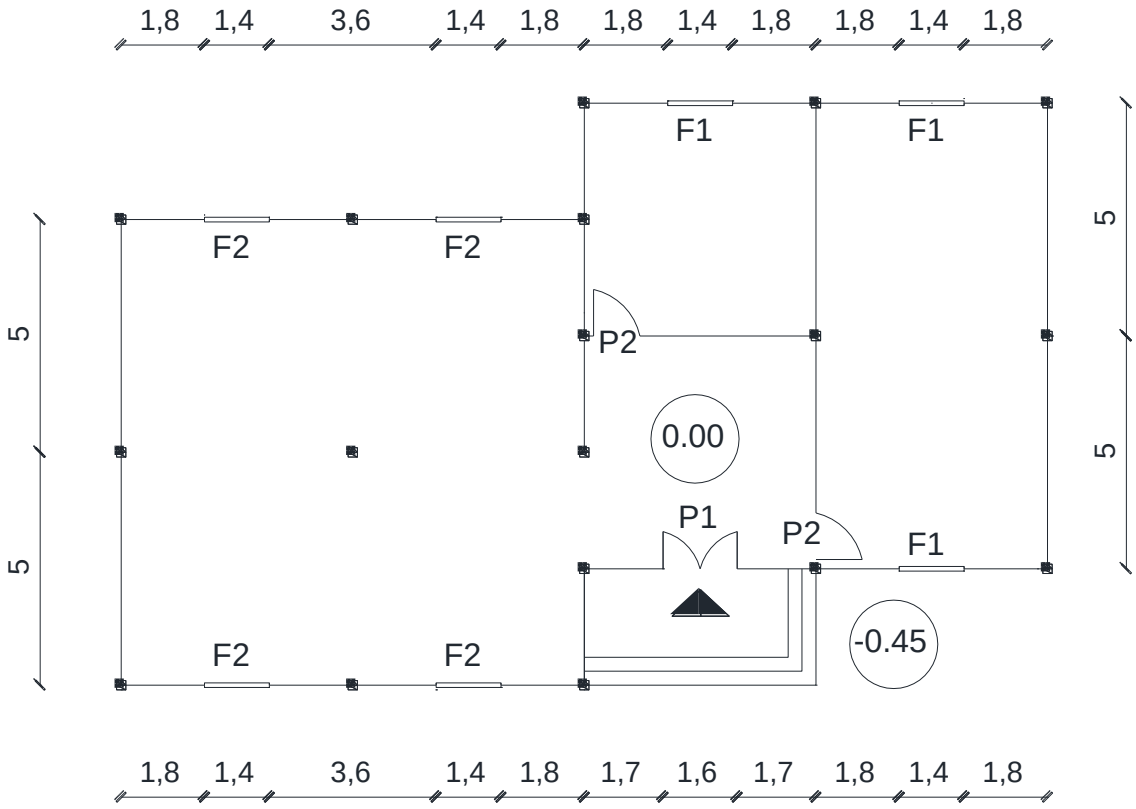
All students are required to survey or lift their house (take house measurements) outside the workshop, and then in the drawing paper (A2), through this, he embodies the various basic architectural documents with an appropriate scale of 1/50 drawing: site plan, block plan, floor plan (if any), two sections A- A and B-B, two facades, and an axiomatic perspective in addition to the external perspective (the exercise is repeated after a week).

6- Practical exercise 06 (Closed exercise “Loge”):

Starting with the initial drawing of the diagram (Figure 3-18), and in the drawing paper (A2), students are asked to redraw the initial drawing on a scale of 1/50, then propose on the same scale:

- 2 Sections.
- 4 Elevations.
- Mass Plan.
- Site plan.
- External Perspective.
- Axonometric.

The student must attach his work to all the required accessories : quota, write and spreadsheet ...



Data:

- Dimension (between axes).
- Posts 0.30 x 0.30.
- Beams 0.30 x 0.40.
- Exterior walls thickness = 0.30.
- Inside walls thickness = 0.10.
- Floor thickness = 0.30.
- Ceiling height = 3.00 m.
- Total height = 3.70 m.
- Door P1 = 1.60 x 2.40.
- Door P2 = 1.00 x 2.10.
- Window F1 = 1.60 x 2.40.
- Window F2 = 1.60 x 2.40.

Figure 3-18: Practical exercise 06 "Loge - size A2"

Source: Researcher

7- Practical exercise 07 (Enlarging a given project with incomplete data):

This exercise involves two documents : a plan and a main elevation at a scale of 1/100 (Figure 3-19) (as per the attached example – each student will be given a separate project to complete the missing documents).

Students are required to :

- Read the project documents, namely the plan and the main elevation.

- Enlarge both documents to a scale of 1/50 on A2 drawing sheets.
- Complete the missing documents at a scale of 1/50 to obtain a complete set of project documents, including: Plan - Sections - Elevations - Axonometric projection - Interior and exterior perspectives - Some details (window or door at a scale of 1/20) - Massing diagram - Site plan - Model

The student must attach all required attachments, including calculations, written descriptions, and data tables.

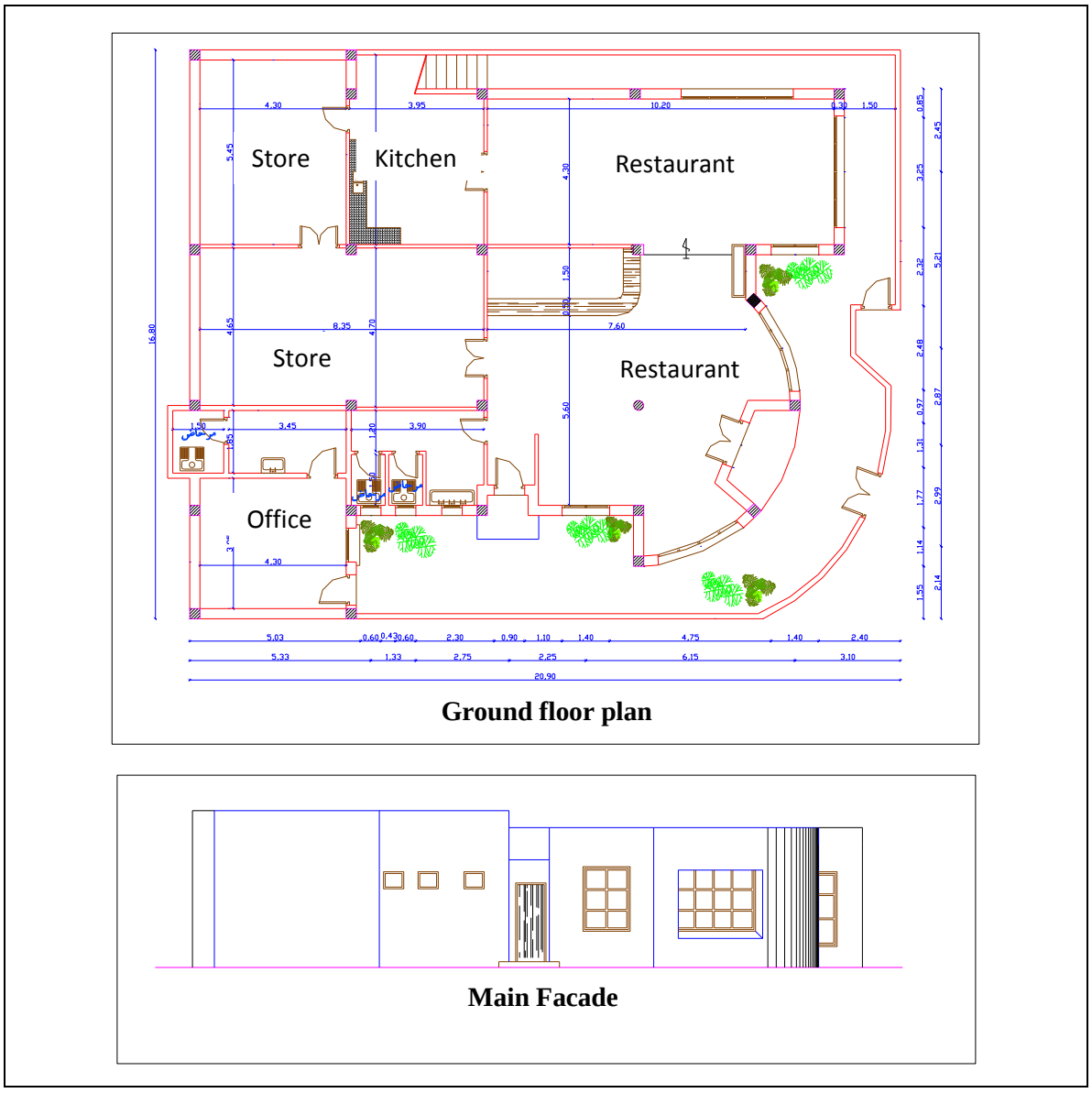


Figure 3-19: Practical exercise 07 "Extraction of various architectural documents (enlargement of the project " missing data ") – size (A2)" - Source: Researcher

Conclusion:

- Conclusion:

The handout of the material of the project workshop 1 included an architectural student-training program for first-year architecture students during the first semester.

The handout was characterized by lessons provided to students of the first year of the bachelor's degree in a simplified manner without complexity, and practical exercises were used to support and develop the process of acquiring students' skills.

The student was prepared to enter the first year of a Bachelor of Architecture through theoretical and practical lessons. Sequential applied exercises required of the student reinforced these concepts, enabling him to absorb and apply them. The publication includes a list of references for students to use.

The student developed the language of architectural expression through the architectural vocabulary provided in theoretical and other lessons. His artistic sense was also enhanced by equipping him with all the rules in force in architectural drawing, to develop the creative skills and talents of the student in drawing, and making initial ideas. Additionally, the student was trained in the skills of using various drawing tools.

In addition to developing the student's abilities to understand all geometric projection lessons, how to use drawing scales, and learning the basics of architectural drawing. The student was also practically qualified about how to prepare architectural documents for the architectural project, such as architectural plans, sections, facades, and architectural and construction details.

The content of the program of project workshop 1 for the first semester is considered a base and a basic stage of student formation, which enables him to directly enter the stage of controlling the architectural structure and realizing the field (architectural), acquiring the ability of spatial imagination within the framework of the architectural structure, and understanding the dialectical relationship between form, function and structure (the second semester).

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