

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

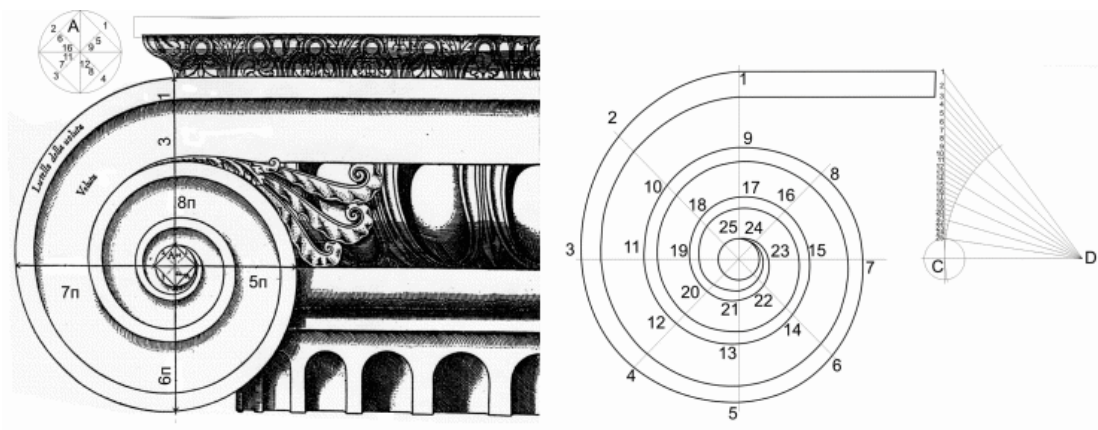
O. M. BEKETOV NATIONAL UNIVERSITY
of URBAN ECONOMY in KHARKIV

METHODOLOGICAL GUIDELINES

for practical and independent work
on the discipline

“ARCHITECTURAL DESIGN”

*(for first-year full-time foreigner students
first (bachelor's) level of higher education
specialty 191 – Architecture and town planning)*



Kharkiv
O. M. Beketov NUUE
2021

Methodological guidelines for practical and independent work on the discipline “Architectural design” (for first-year full-time foreigner students first (bachelor’s) level of higher education specialty 191 – Architecture and town planning) / O. M. Beketov National University of Urban Economy in Kharkiv; com. : M. Liubchenko, A. Radchenko. – Kharkiv : O. M. Beketov NUUE, 2021. – 60 p.

Compilers: M. Liubchenko,
A. Radchenko

Reviewer PhD in Architecture M. Votinov

*Recommended by the department of fundamentals of architectural design,
minutes № 5 on 17.11.2020.*

CONTENTS

Introduction.....	4
1 General recommendations	5
1.1 Drawing instruments	5
1.2 Drawing materials and devices	7
1.3 General guidelines.....	8
2 Basic rules for drawing	9
2.1 Format, frame, title block. Placing images on a drawing	9
2.2 Drawing lines	11
2.3 Scale application in the drawings	12
2.4 Fonts	13
3 Techniques of making and design of architectural drawings.....	21
3.1 Geometric lines on drawings	21
3.2 Font drawings.....	23
3.3 Tangent arcs	25
3.4 Architectural profiles.....	26
4 Order modular system	28
4.1 Roman orders	28
4.2 Components of the order system in detail.....	33
5 Designing small architectural forms	39
6 Individual assignment “Drawings of plan, elevation and section of building”	41
6.1 Drawings of the building plan	41
6.2 Section drawings	42
6.3 Elevation drawings.....	44
Appendix	50
References.....	59

INTRODUCTION

The presented methodical guidelines are developed for first-year full-time foreigner students first (bachelor's) level of higher education specialty 191 – Architecture and town planning. Contain recommendations and examples of completing the tasks of the first content module. Optional tasks, requirements to the work are formulated, explanations to implementation of drawings are given and the list of references which should be used when performing provided assignments.

The professional work of a contemporary architect is multifaceted and includes all stages of design, from the development of a creative idea to its implementation. The creative process of design is requires technical training, spatial representation, skills and ability to perform complex graphic building.

The purpose of this development is to acquaint students of architectural specialties with the basic requirements that are presented to the drawing, to teach how to perform and read architectural drawings, and also to perform the necessary geometric constructions in the drawings.

All tasks of this substantial module are carried out in pencil using drawing tools and accessories. This contributes to the development of spatial thinking among students, confidence and “hardness” of the hand. They gain skills in drawing tools, learn the accuracy and precision of drawings, learn to make sketches.

1 GENERAL RECOMMENDATIONS

1.1 Drawing instruments

Special tools are required to make any images or drawings on paper. The list of tools and materials for the work are given below.

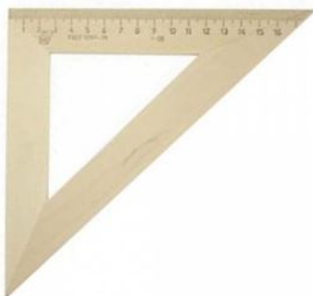
TOOLS: ruler, triangles, reyshina, drawing compass, measuring compass, protractor, curves.

Ruler. Measure distances and draws straight lines along it. The length of the ruler should be from 30 cm (Fig. 1.1).



Figure 1.1 Rulers

Triangles are of two types: with angles 90° , 45° , 45° (Fig. 1.2, a) and 90° , 60° , 30° (Fig. 1.2, b).



a



b

Figure 1.2 – Triangles

Triangles are used to draw vertical and sloping lines, as well as to construct some angles. Using two triangles or a ruler and a triangle draw parallel lines in different directions. Either side of triangle is placed on the line. Under the second side, put a ruler or second triangle and hold it motionless. The first triangle is moved in the direction of the arrow (Fig. 1.3).

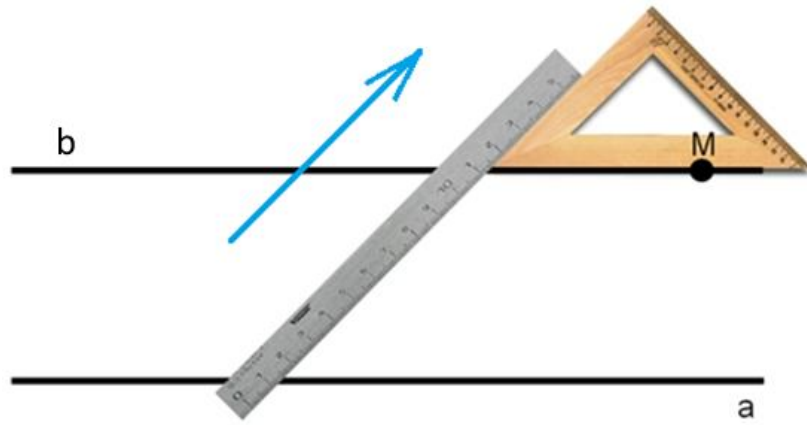


Figure 1.3 – Drawing parallel lines

T-square is used to draw parallel lines. T-squares are of different kinds, such as shown in Figure 1.4.



Figure 1.4 – Types of T-squares

Compass is using for drawing circles (Fig. 1.5, a) and measuring distances between points (Fig. 1.5, b).



a



b

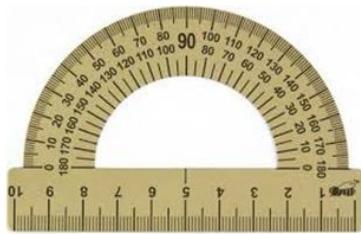


c

Figure 1.5 – Compass

When drawing circles the leg of the compass is placed in the center and rotated behind the head to the clockwise direction, tilting slightly in the direction of motion (Fig. 1.5, c). The short leg and the needle should be parallel.

The **protractor** is used for measuring and constructing different angles (Fig. 1.6, a). The **pattern** is used to draw curved lines that cannot be constructed with a compass (Fig. 1.6, b).



a



b

Figure 1.6 – Protractor and pattern

1.2 Drawing materials and devices

MATERIALS: paper, pencils, eraser, buttons, scraper, model knife, etc. (Fig. 1.7).



Figure 1.7 – Materials for drawing

Paper. Drawing paper must be durable and able to withstand multiple lines drawing and erasing. Optimum density of paper for drawing is 200 g/m^2 .

Pencils. Simple and mechanical pencils are used for drawing. Graphite rods have different softness or hardness. Usually for drawing are used hard pencils marking 2H, H; soft marking B or 2B and medium marking F, HB. A good pencil should draw a black, clear line. Thin lines are drawn with hard pencils; soft pencils are used for aiming the drawing. The hardness of the graphite core for the compass

should be one number less than the hardness of the pencil for the outline of the drawing.

The pencil is necessary to sharpen to the correct cone about 3 cm in length from the end, free from the factory mark and marking the hardness.

When drawing a line the pencil must be slightly deviated from the vertical in the direction of movement. Finishing of the drawing begins with circles and rounds, and then stroke horizontal, vertical and sloping lines. Lastly draw thin lines of hatching.

1.3 General guidelines

You should have quality drawing tools, a set of pencils, paper and erasers. Properly store tools and materials. Periodically clean the tools. Plastic rulers, triangles wash with water with detergents. Wipe wooden tools with a damp cloth or eraser. Keep paper in places that are protected from moisture and light.

When drawing you need to place a piece of paper or tracing paper under your hand. Recommended the graphite dust or eraser remnants to sweep away from paper with a special soft brush. An example of the organization of the workplace is shown in the Figure 1.8.



Figure 1.8 – The workplace for drawing

Organize a work area for drawing. Desk, which is freely located drawing board with a variable angle of inclination. There should be space on the table for the layout of the drawing tools and materials. The work chair must provide the optimum height of the seat surface. The workplace should have daytime or artificial lighting (left front).

2 BASIC RULES FOR DRAWING

2.1 Format, frame, title block. Placing images on a drawing

Depending on the size of the object, it is placed on standard drawing sheets. The International Standards Organization (ISO) system of paper sizes applies to all grades of paper and paper board and consists of five series of sizes: A, RA, SR, B, and C (Table 2.1).

Table 2.1 – Name, width and height of ISO A, B and C paper formats

Type A		Type B		Type C	
Name	Sizes (mm)	Name	Sizes (mm)	Name	Sizes (mm)
4A0	1682 × 2378	-	-	-	-
2A0	1189 × 1682	-	-	-	-
A0	841 × 1189	B0	1000 × 1414	C0	917 × 1297
A1	594 × 841	B1	707 × 1000	C1	648 × 917
A2	420 × 594	B2	500 × 707	C2	458 × 648
A3	297 × 420	B3	353 × 500	C3	324 × 458
A4	210 × 297	B4	250 × 353	C4	229 × 324
A5	148 × 210	B5	176 × 250	C5	162 × 229
A6	105 × 148	B6	125 × 176	C6	114 × 162
A7	74 × 105	B7	88 × 125	C7	81 × 114
A8	52 × 74	B8	62 × 88	C8	57 × 81
A9	37 × 52	B9	44 × 62	C9	40 × 57
A10	26 × 37	B10	31 × 44	C10	28 × 40

By placing two sheets of A series paper next to each other, or by cutting one in half parallel to its shorter side, the resulting sheet will again have the same width to height ratio (Fig. 2.1).

There are two types of sheet schema location: horizontal (type X) and frontal (type Y) orientations (Fig. 2.2).

The title block is placed in bottom right corner of the drawing sheet (Fig. 2.2). After drawing the frame and the title block there remains within the format an area constituting the working field of the drawing or drawing space.

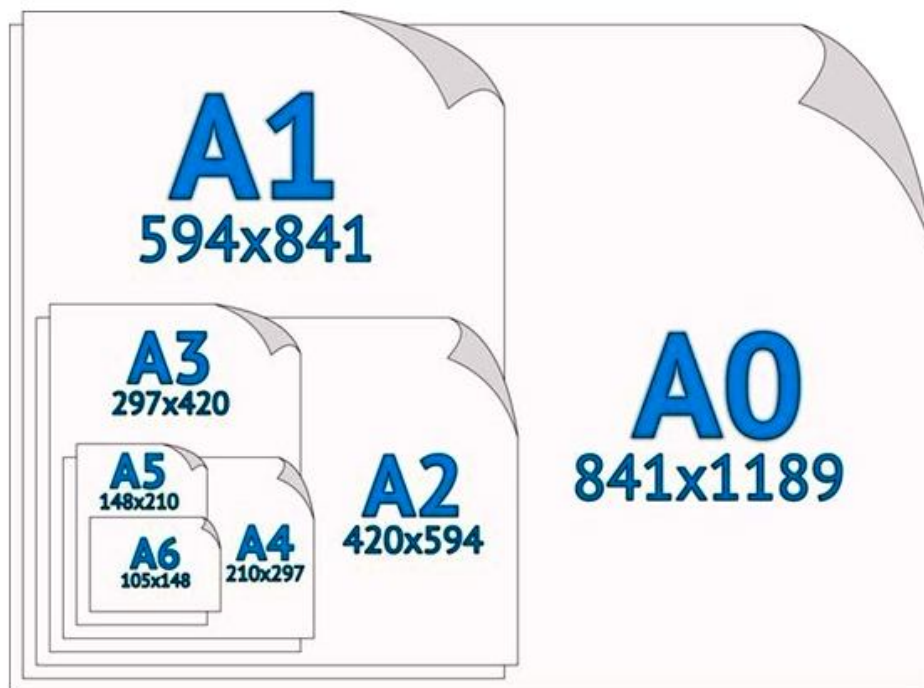


Figure 2.1 – Sheet size

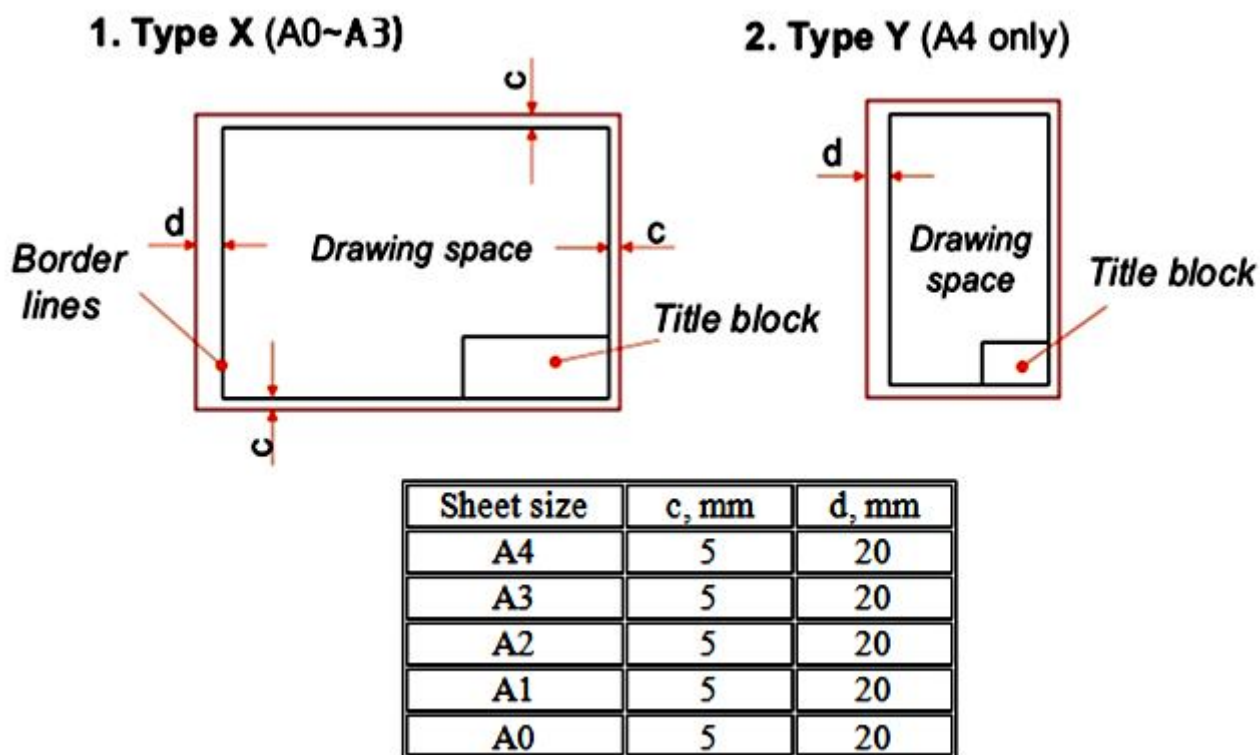


Figure 2.2 – Types of sheets location

Graphic material is placed in the middle of the drawing working field. Before work determine the dimensions of the images and in the form of rectangles outline them in the drawing (Fig. 2.3, a, b).

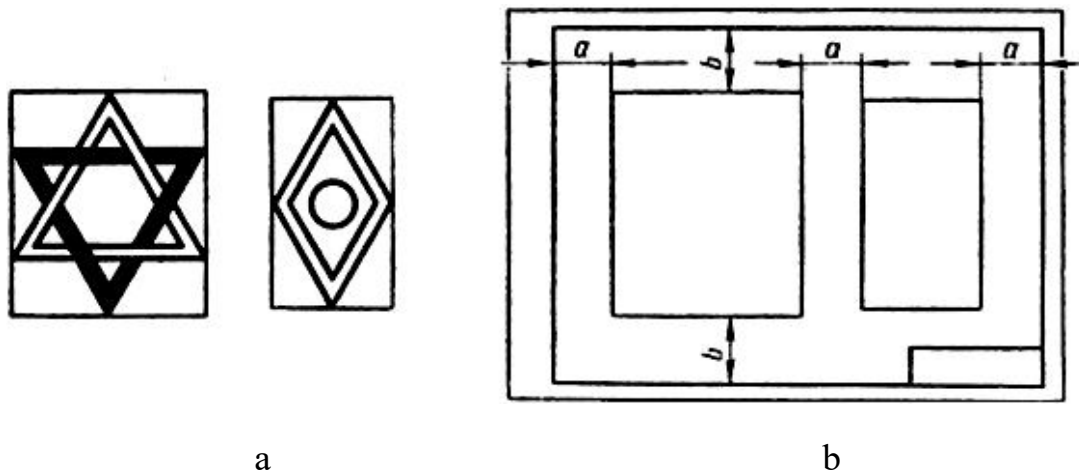


Figure 2.3 – Placing images on a drawing

The rectangles are placed that the distances from the frame to them and between them are approximately equal in all directions (Fig. 2.3, b).

2.2 Drawing lines

To understand the drawing, the standard establishes the types of lines that are used for drawings (Table 2.2).

Table 2.2 – The lines types

Line	Illustration	Thickness	Application
Continuous thick (object)		$S = 0,5 - 1,4$ mm Thick	Outlines, visible edges, surface boundaries of objects
Continuous thin		$S/3 - S/2$ Thin	Dimensions, leader, extensional
Shot break (Continuous thin free hand)		$S/3 - S/2$ Thin	Limits of partial views or sections when the line is not an axis, interrupted views and sections
Dashed		$S/3 - S/2$ Thin	Hidden outlines and edges
Dot-dash		$S/3 - S/2$ Thin	Centerlines, lines of symmetry
Chain		$S - 1,5 S$ Extra thick	Cutting planes
Long break with zig-zag		$S/3 - S/2$ Thin	Indicate of long break

The person who will read drawings have to learn what they mean. Line types are also a language type to communicate between technical people.

The thickness of the lines depends on their purpose. The outline of the depicted object is the main one in the drawing, so the lines of the visible contour are considered to be the main ones. The thickness of the base line is denoted by the letter s and taken depending on the size of the drawing and its saturation.

The main line is also used for the line of frame and the graphs of the title block.

Within one format, the selected line thickness of the same type should be the same.

It is important to know that the dashed lines in their intersection with other lines and between themselves should not have breaks.

When drawing center lines, in all cases the center of the circle is determined by the intersection of the dashes. The centerlines should extend beyond the contour lines by 3–5 mm.

The application of the drawing lines is shown in Figure 2.4.

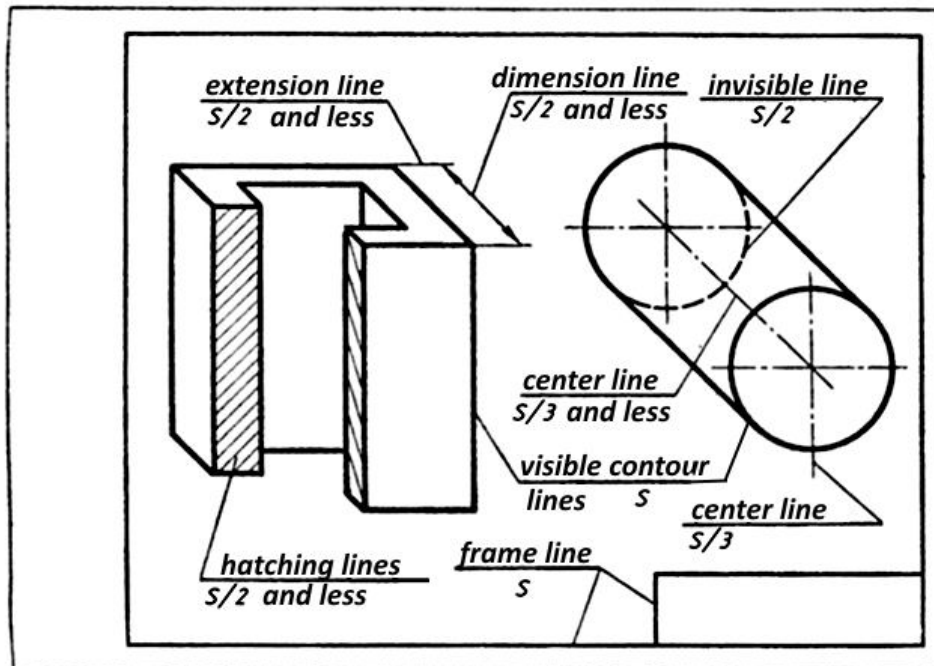


Figure 2.4 – Application of the drawing lines

2.3 Scale application in the drawings

The object in the drawing is desirable to represent a full size. However, large objects have to be reduced and small ones to be enlarged. To do this, use the scale of the drawing.

The scale is the ratio of the linear dimensions of the image the object to its true size. The scale is indicated by the ratio of two numbers, for example (2:1). Scales are selected from the range provided for in the standard and given in Table 2.3.

Regardless of scale, true dimensions are always indicated on the drawing.

Table 2.3 – Standard scales

Name	Value
Scale of reduction	1:2; 1:2.5; 1:4; 1:5; 1:10; 1:15; 1:20; 1:25; 1:40; 1:50; 1:75; 1:100; 1:200; 1:400; 1:500; 1:800; 1:1 000; 1:2 000; 1:5 000; 1:10 000; 1:20 000; 1:25 000; 1:50 000
True size	1:1
Scale of increase	2:1; 2,5:1; 4:1; 5:1; 10:1; 20:1; 40:1; 50:1; 100:1

2.4 Fonts

Standard fonts are used to make inscriptions and digital signs in drawings. Architectural drawings use an architectural font, all parameters of which are multiple of its height.

Architectural narrow vertical font consists only of capital letters and numbers. The ratio of the height h and other sizes are recommended as follows: width letters and numbers g , except for the broad letters W, M, is equal to $1/5h$. For broad letters, the width g_1 is $3/10h$. The width g_2 of digit 1 is $2/3g$. The thickness d lines of letters and numbers take from $1/5$ to $1/7g$. The distance between letters recommended taking 3–4 times of the width of letters. The distance between words 8–10 times the width of the width of letters.

An image of the architectural font and its proportions is shown in Figure 2.5.

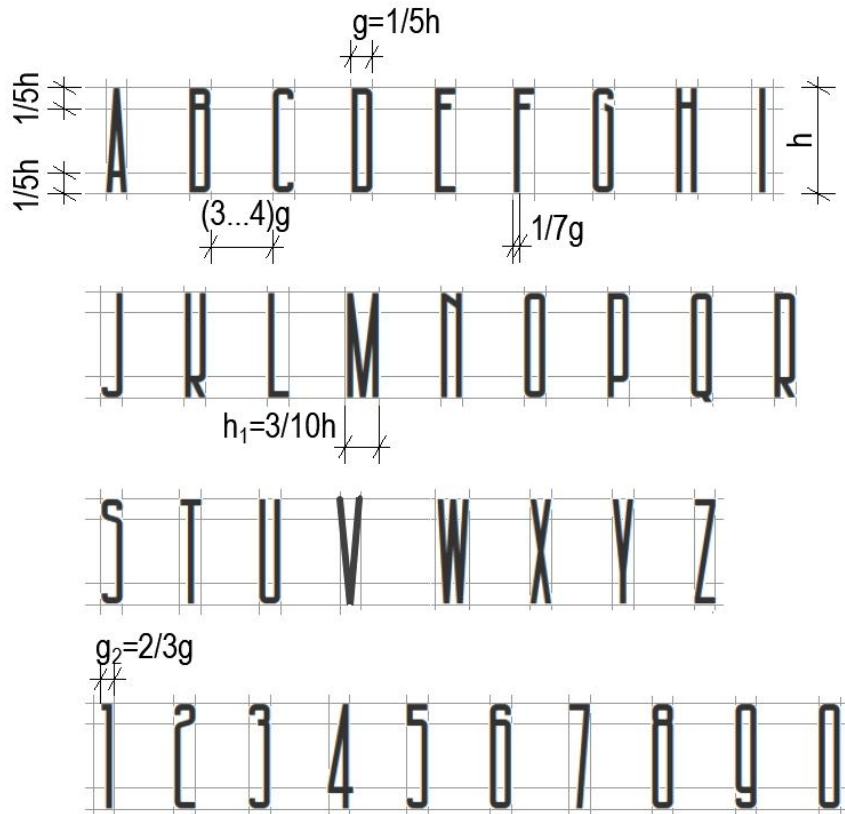


Figure 2.5 – Architectural font

Drawing font is used for writing inscriptions and drawing dimensional numbers on engineering and other drawings. The drawing font is as simple as possible in image, has a great clarity of forms and very convenient for handwriting.

Font size is determined by the height of h in capital letters and numbers and is expressed in millimeters (Fig. 2.6).

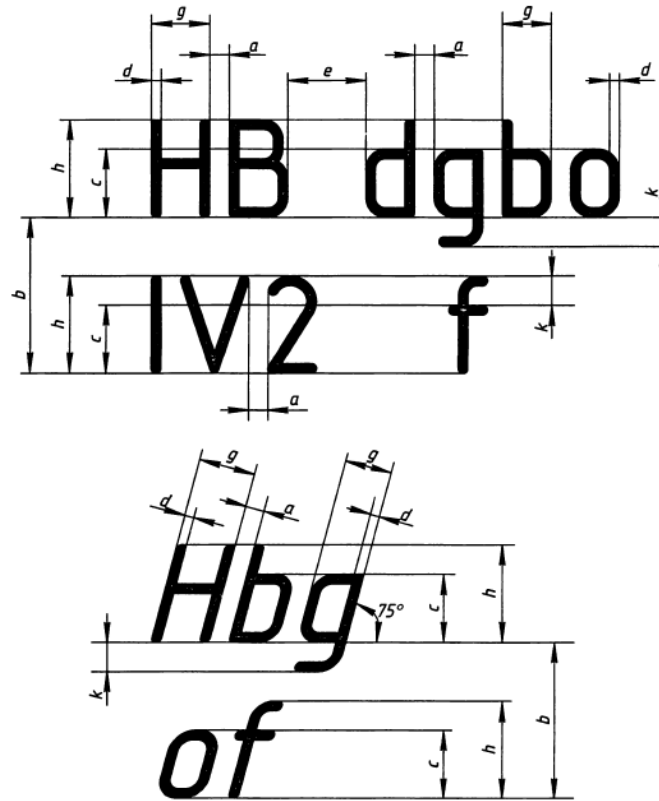


Figure 2.6 – Basic font options

The standard specifies the following font sizes: 2,5; 3,5; 5; 7; 10; 14; 20; 28; 40
In addition to capitalization, the standard defines:

- small letters – c ;
- letter width – g ;
- font line thickness (auxiliary grid step) – d ;
- distance between letters – a ;
- distance between words – e ;
- distance between line bases – b .

There are standard fonts with a slope of 75° to the horizontal line and straight without slope, with font thicknesses of 1:14 (type A) and 1:10 (type B) of font size.

The standard font is written on the grid. The grid is formed by the intersection of auxiliary lines in which the letters (Fig. 2.7).

For educational drawings use a font type B. The width of most capital letters is $6/10$ in height. The small letters height is $7/10h$, which is roughly the same as the previous font size. The width of most small letters is $5/10h$. The width of the remaining letters is calculated by the cells of the auxiliary grid.

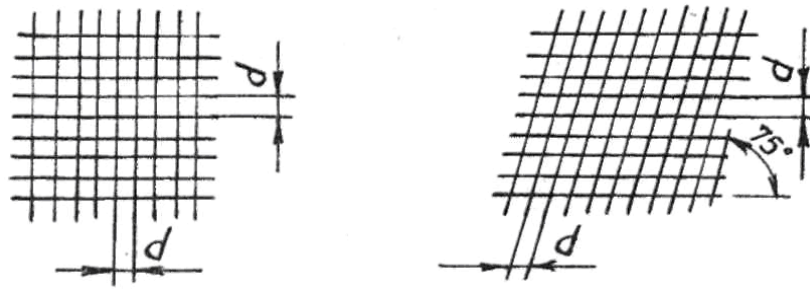


Figure 2.7 – Grid for writing letters

The standard type B font with sloping lines is shown in Figure 2.8.



Figure 2.8 – Drawing font

The width of the letters and numbers in fractions of the font size h are shown in Table 2.4. The lower and side elements of letters are included in the distance between letters and lines.

Table 2.4 Type B font options

Font options	Marking	The relative size	
The capital letters height	h	$10/10h$	$10d$
The small letters height	c	$7/10h$	$7d$
The distance between letters	a	$2/10h$	$2d$
Minimum line step (distance between line bases)	b	$17/10h$	$17d$
Minimum distance between words	e	$6/10h$	$6d$
Font line thickness (auxiliary grid step)	d	$1/10h$	d

At an apparent increase in the intervals between some capital letters (for example, the combination of AV, TA), the letters are written tightly to each other without any intervals or interval is reduced by half (Fig. 2.9).



Figure 2.9 – Distance's between letters

To develop the skills, it is recommended to mark the line, placing the letters as shown in Figure 2.10.

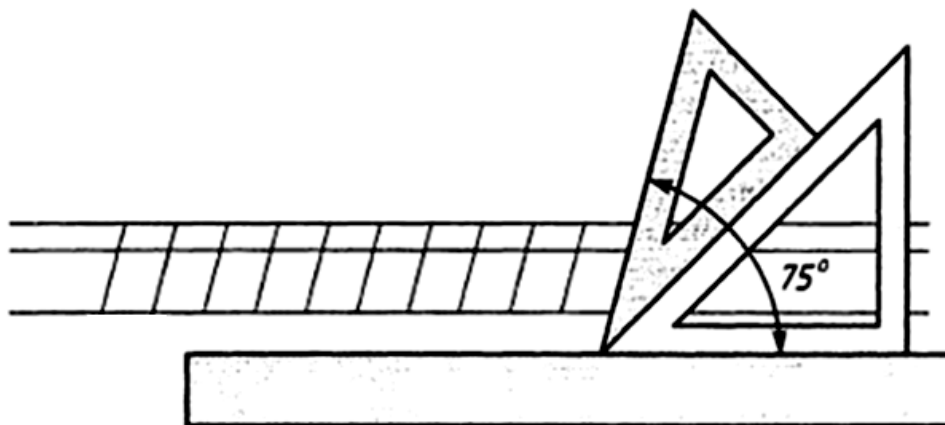


Figure 2.10 – Previous line markup

Principles of Antiqua Font Construction

During the Renaissance, much attention was paid to the art of type. In the second half of the 15th century, an active study of Roman monumental writing began.

In 1525, Albrecht Durer published his famous work – “Measurement Rules”, intended for architects, a significant part of which was devoted to the construction of fonts. Durer constructed the Latin alphabet on the basis of a square, paying great attention to the construction of ovals. The thickness of the vertical element of the "H" sign was 1:10 square, the thickness of the horizontal element was 1:3 of the vertical one. Durer was the first to give several construction options for individual characters of the alphabet.

The sequence of construction of letters in the font Antiqua Durer

Modular grid for constructing the Antique Durer is shown in Figure 2.11.

1. *Constructing straight letters.* The base is a square divided into 10 parts, $1/10$ – module (Fig. 2.12). A horizontal intersection with a radius of 1 module is constructed. The rest of the serifs are built in the same way. The second main element is built symmetrically. The connecting element passes the lower border in the center of the square and has a thickness of $1/3$ of the main module. The proportion of the constructed letter is $4/5$ – this font belongs to the group of normal fonts in width.

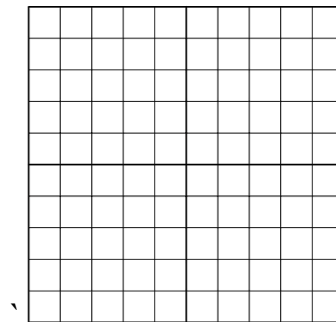


Figure 2.11 – Modular grid of Antique Durer font

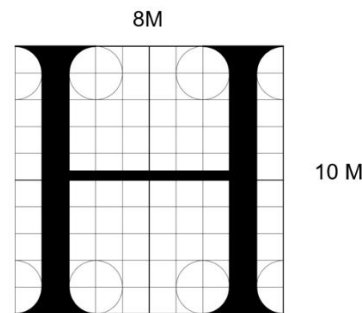


Figure 2.12 – Constructing straight letters

2. *Construction of triangular letters.* Triangular letters go beyond the border of the square (Fig. 2.13). An auxiliary parallel line $2M$ from the ramp. A perpendicular descends from it to an oblique element from a point at a height of $2M$ from the font line. Internal serif. Construction lines are drawn at a distance of $1/2 M$ from the font line and from the inner line of the sloped element.

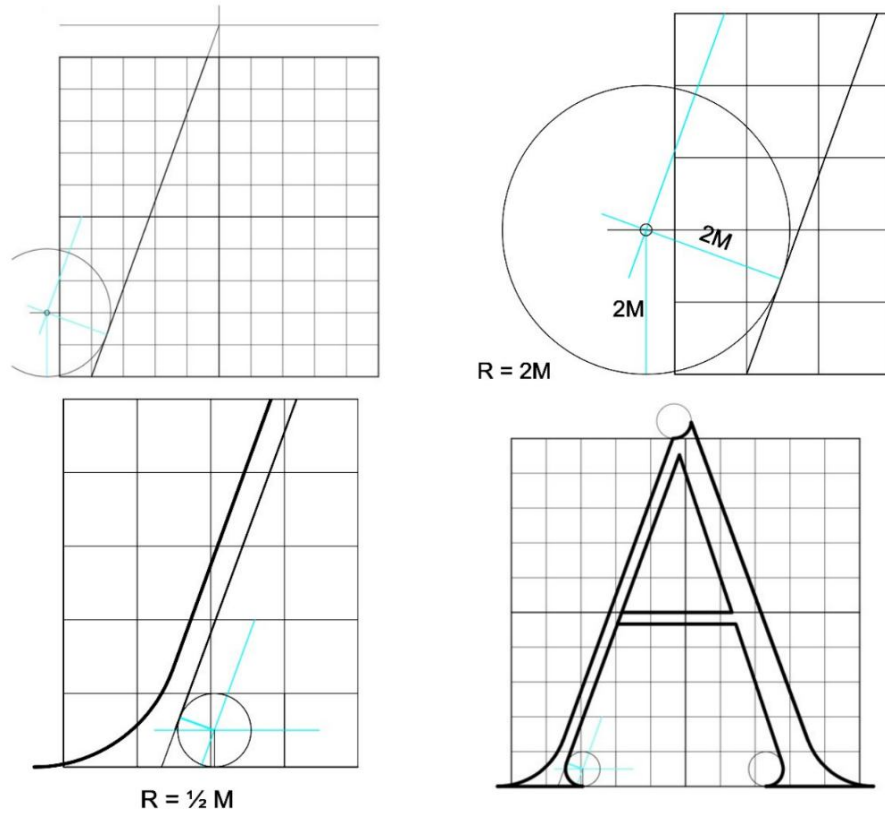


Figure 2.13 – Sequence of constructing triangular letters

3. *Construction of round letters. Method 1.* In the center of the square, draw a circle with a radius of $1/2 M$ (Fig. 2.14). The point of intersection of the circle with the upper right diagonal of the square is the center of the circle for oval of the letter O. The intersection of the circle with the lower left diagonal of the square is the center of the circle for the second oval.

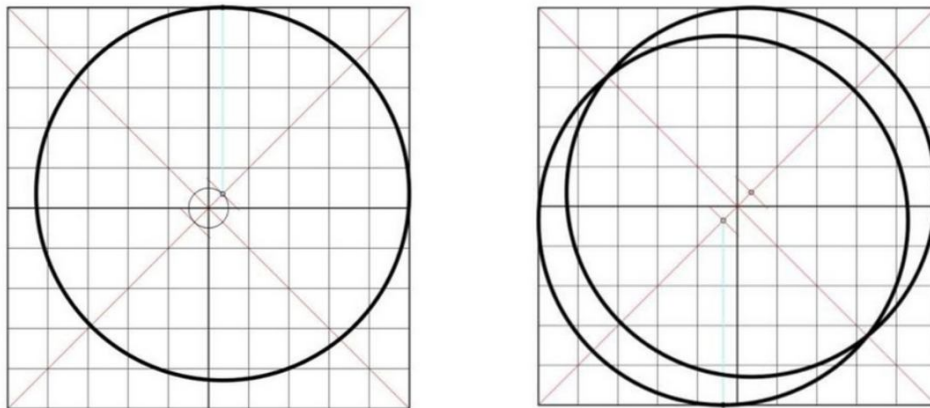


Figure 2.14 – Constructing round letters

4. *Construction of round letters. Method 2* (Fig. 2.15).

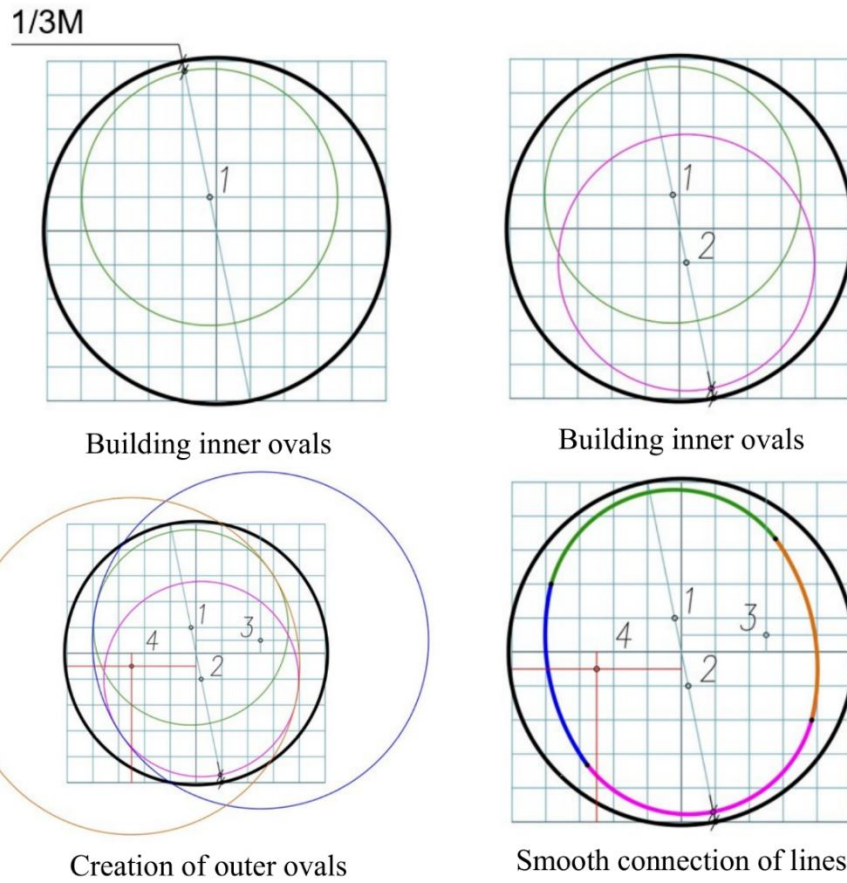


Figure 2.15 – Sequence of constructing round letters

5. *Constructing a detail.* The construction of the detail is shown in Figure 2.16. The principle of construction is clear from the figure.

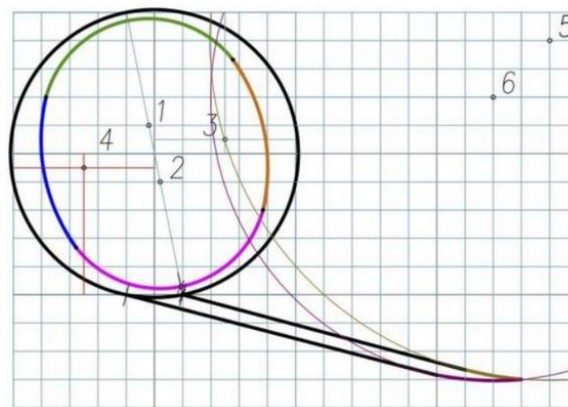


Figure 2.16 – Constructing detail

The entire font of Antiqua Durer is shown in the Figure 2.17.

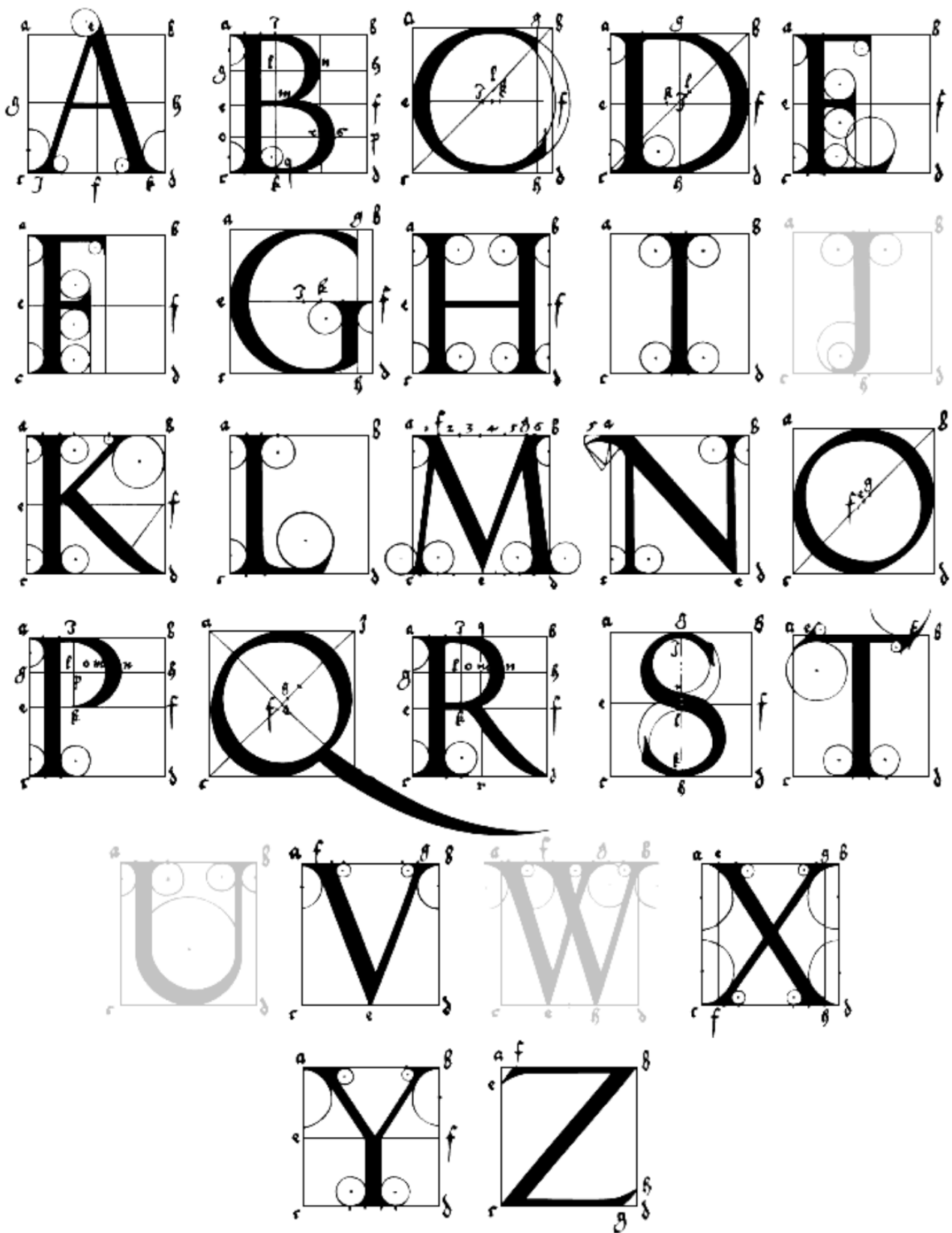


Figure 2.17 – Font of Antiqua Durer

3 TECHNIQUES OF MAKING AND DESIGN OF ARCHITECTURAL DRAWINGS

3.1 Geometric lines on drawings

Assignment “Types of lines” is performed on drawing paper A4 format of a vertical arrangement. You must purchase drawing paper with a density of 200.

To complete the task, you must have pencils hardness H or 2H and B, the triangle with angles of 45 degrees and the ruler 30 cm long.

First, you should draw a frame on the format and the title block. Then divide the drawing workspace into six squares as shown in Figure 3.1. The borders of the squares must be drawn with very thin lines with a 2H pencil (Fig. 3.1).

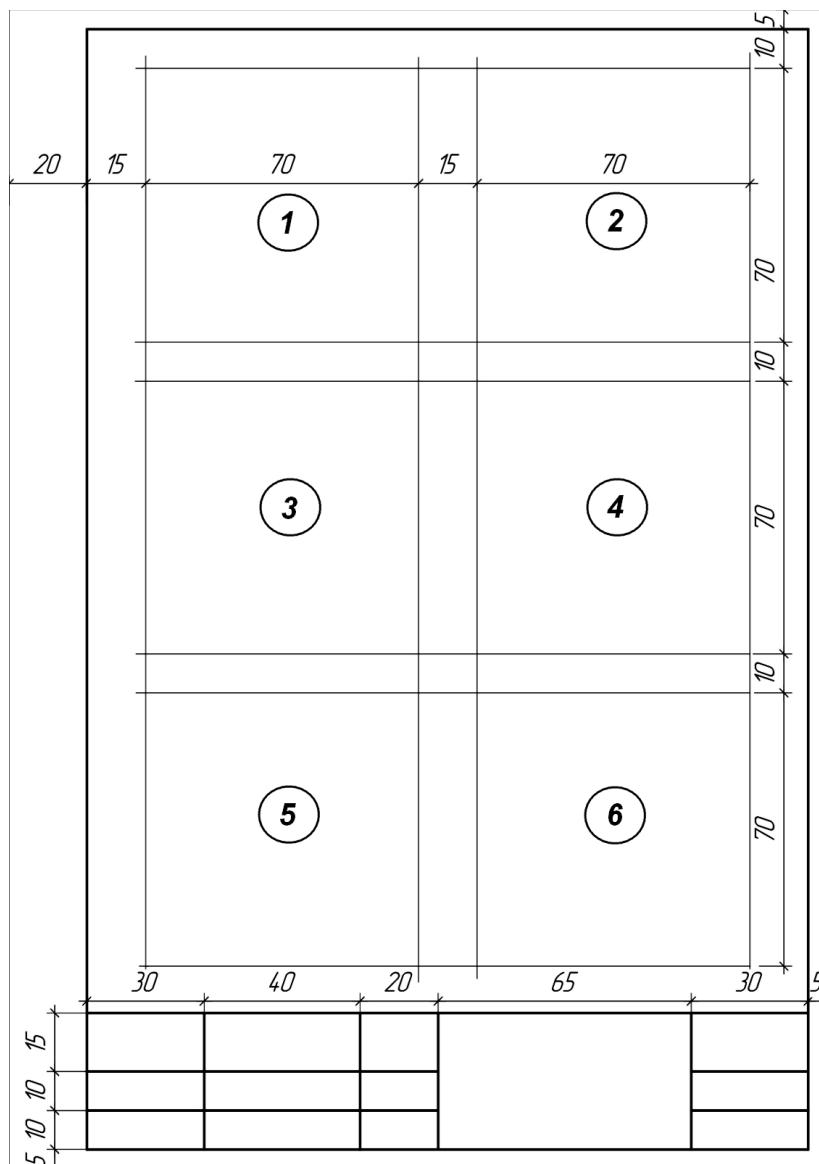


Figure 3.1 – Measurements for assignment “Types of lines”

The process of drawing lines in squares (Fig. 3.2) is follow.

1. Inclined dashed lines at an angle of 45° . Distance between lines is 5 mm.

2. Inclined continuous thick lines at an angle of 45°. Distance between lines is 5 mm.
3. Three types of horizontal lines are used in the square: 5 dot-dashed, 5 continuous thin and 5 continuous thick. Distance between lines is 5 mm.
4. U-shaped continuous thin lines. Distance between lines is 5 mm.
5. Three types of vertical lines are used in the square: 5 dot-dashed, 5 continuous thin and 5 continuous thick. Distance between lines is 5 mm.
6. Dot-dashed lines inclined at an angle of 45° that cross in the middle.

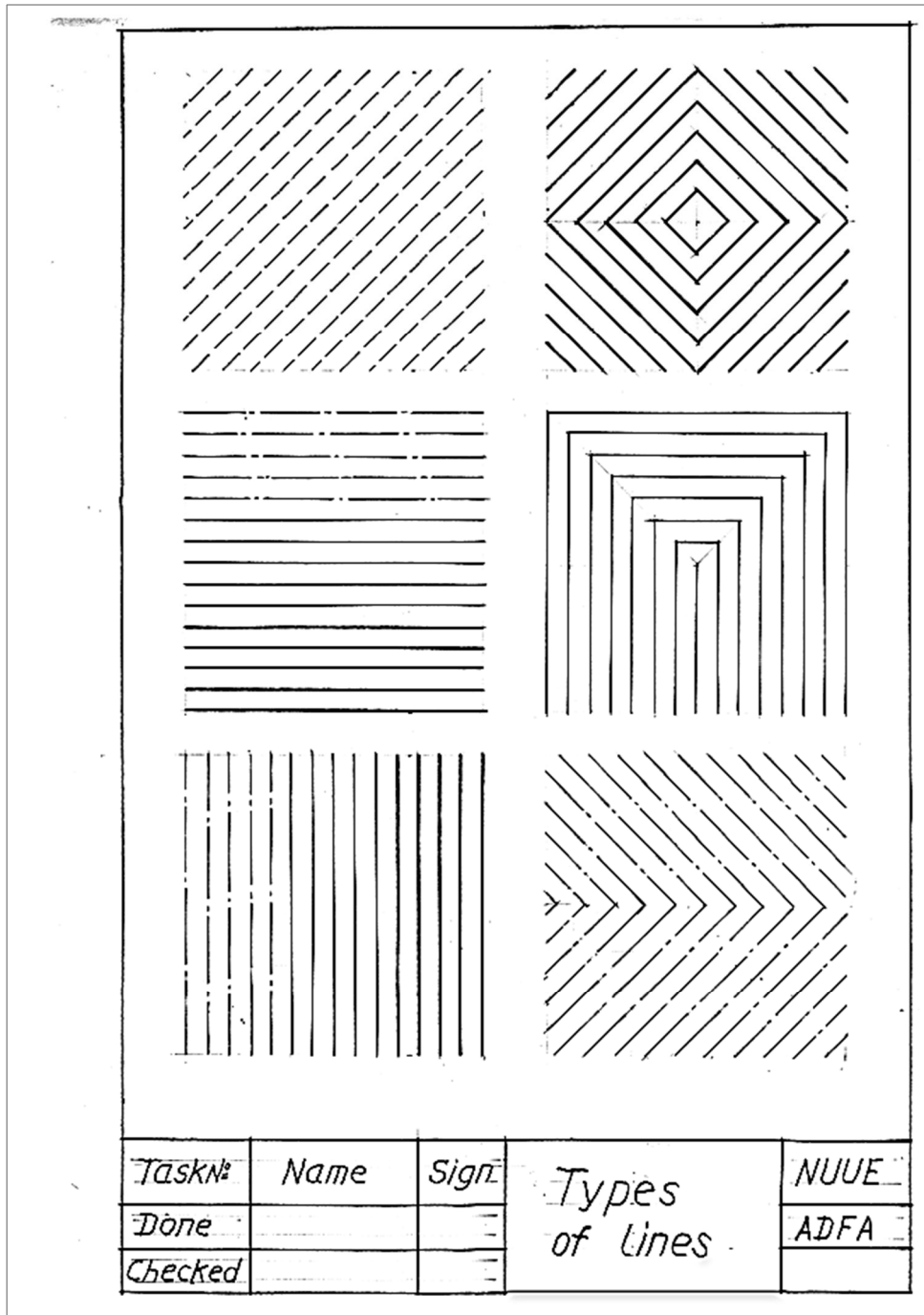


Figure 3.2 – Example of the assignment “Types of lines”

3.2 Font drawings

Font is an important component of any drawing, it helps to convey information that cannot be conveyed in other ways.

Assignment “Fonts” is performed on drawing paper A4 format of a vertical arrangement.

A grid for writing letters and numbers is marked with thin line (Fig. 3.3). There are three types of fonts: drawing, inclined drawing and architectural.

Example of assignment is shown in Figure 3.4.

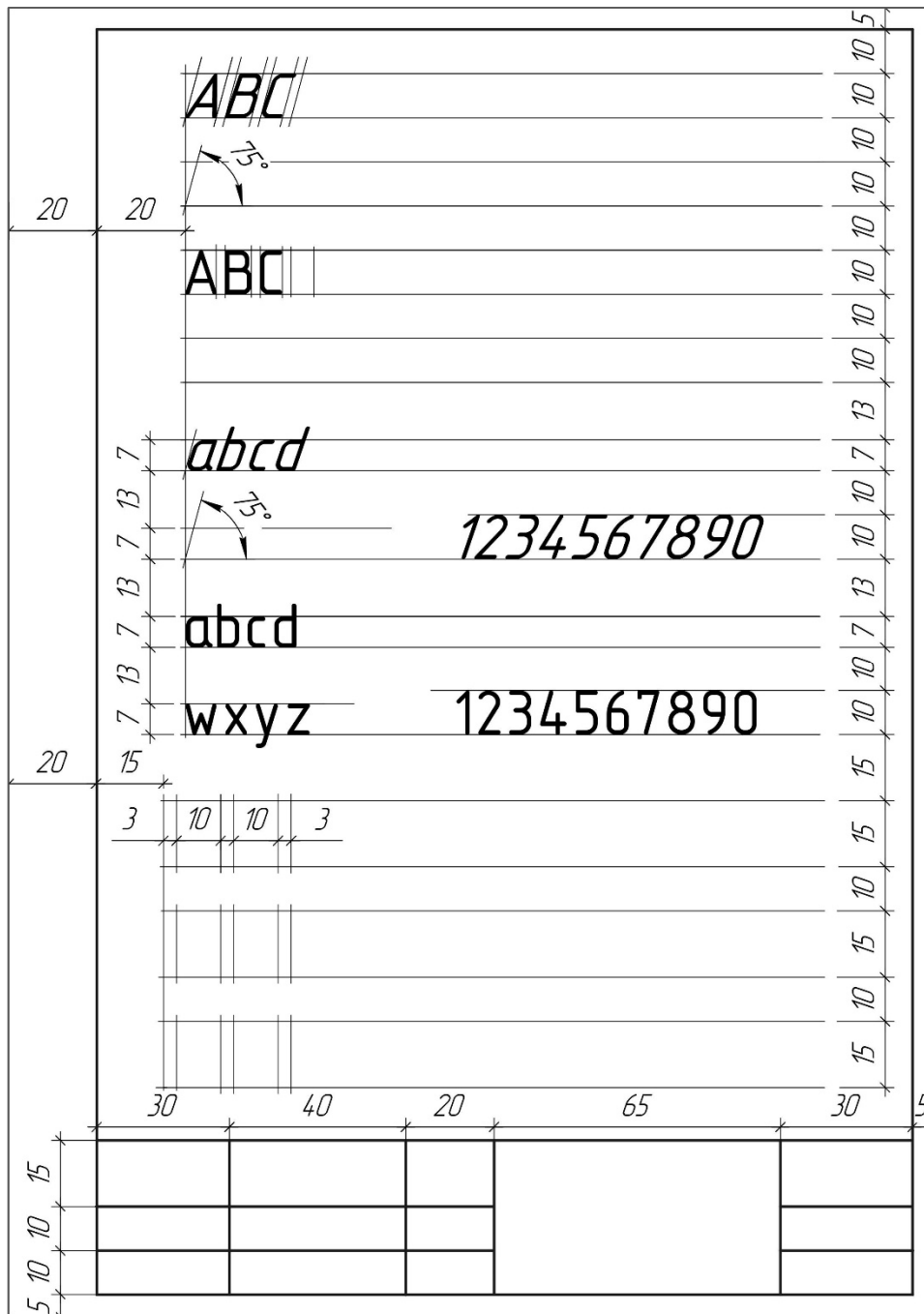


Figure 3.3 – Measurements for the assignment “Fonts”



Figure 3.4 – Example of the assignment “Fonts”

There are many types of fonts and design options for drawing works. You need understand where exactly this or that style is best applied. In architectural and construction drawing, this is especially important, because the font complements any image. A simple and discreet narrow architectural narrow font fits perfectly into any project. There is no division into uppercase and lowercase letters; in addition, the elements are not slanted. This type of font is the most basic to write, which explains its popularity. It does not have strictly established dimensions, but there are certain proportions that must be observed: the ratio of the width of letters to its height should be equal to 1/5.

In the assignment “Tangent arcs”, you should solve the eight problems of connection different lines with tangent arcs (Fig. 3.5):

- horizontal straight line with inclined straight line on the angle 45° ;
- perpendicular straight lines;
- circle and inclined straight line on the angle 60° ;
- circle and inclined straight line on the angle 30° ;
- two circles with external tangent arc;
- two circles with internal tangent arc;
- oval figure, which consist from 4 tangent arcs;
- spiral figure.

3.4 Architectural profiles

In theory and practice of architectural profile is called a drawing that depicts an architectural detail in section, the same as a profile in relation to simpler forms. The architecture profiles are drawn using a compass and a ruler. The combination of several profiles in one shape is called a complex profile. Profiles are straight and curved, direct and reverse (Fig. 3.6).



Figure 3.6 – Cornices of buildings

Assignment “Architectural profiles” is performed on drawing paper A3 format of horizontal orientation as shown in Figure 3.7.

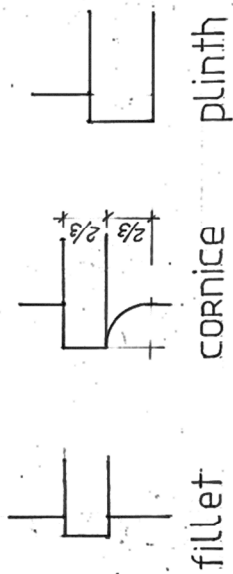
- in the assignment, draw various types of architectural profiles:
- rectilinear – fillet, cornice and plinth;
- curvilinear simple – quadrants (shaft, ordinary, reverse) and cavetto (neck ordinary, reverse);
- curvilinear complex and composite – cyma reversa, cyma recta, scotia, torus and astragal.

Architecture profiles, which are widespread in the order architecture, serve for visual enhancement, emphasizing the constructive and decorative parts of the order.

They are applied in different parts of the order: cornice, architrave, base of columns and part of pedestal of columns (see Fig. 4.2).

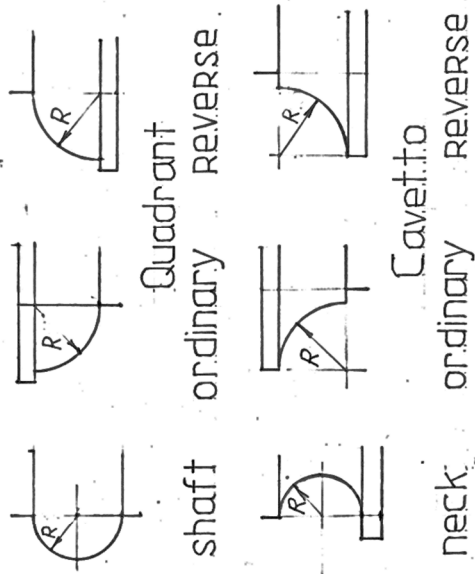
ARCHITECTURAL PROFILES

RECTILINEAR



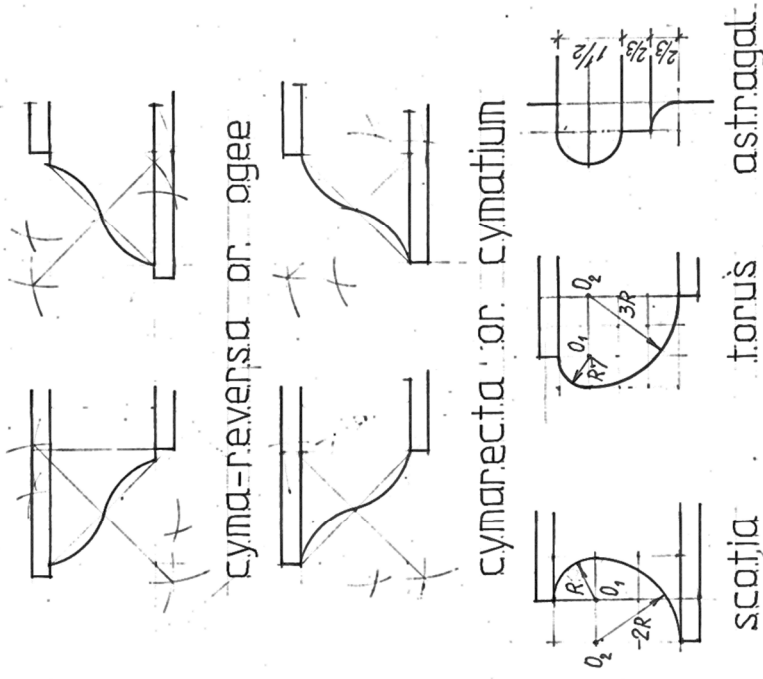
CURVILINEAR

SIMPLE



CURVILINEAR

COMPLEX AND COMPOSITE



Task N°	Name	Sign	Architectural profiles	NUUE
Done				ADFA
Checked				A2018-1a

Figure 3.7 – Example of the assignment “Architectural profile”

4 ORDER MODULAR SYSTEM

4.1 Roman orders

An order in architecture is a certain assemblage of parts subject to uniform established proportions, regulated by system. Coming down to the present from Ancient Greek and Ancient Roman civilization, the architectural orders are the styles of classical architecture, each distinguished by its proportions and characteristic profiles and details, and most readily recognizable by the type of column employed. The three orders of architecture – the Doric, Ionic, and Corinthian – originated in Greece. To these the Romans added, the Tuscan, which they made simpler than Doric, and the Composite, which was more ornamental than the Corinthian was. Certain modules establish the architectural order of a classical building (Fig. 4.1).

Each style has distinctive capitals at the top of columns and horizontal entablatures, which it supports, while the rest of the building does not in itself vary between the orders. The column shaft and base also varies with the order, and is sometimes articulated with vertical hollow grooves known as fluting. The shaft is wider at the bottom than at the top, because its ectasias, beginning a third of the way up, imperceptibly makes the column slightly more slender at the top, although some Doric columns are visibly “flared”, with straight profiles that narrow going up the shaft.

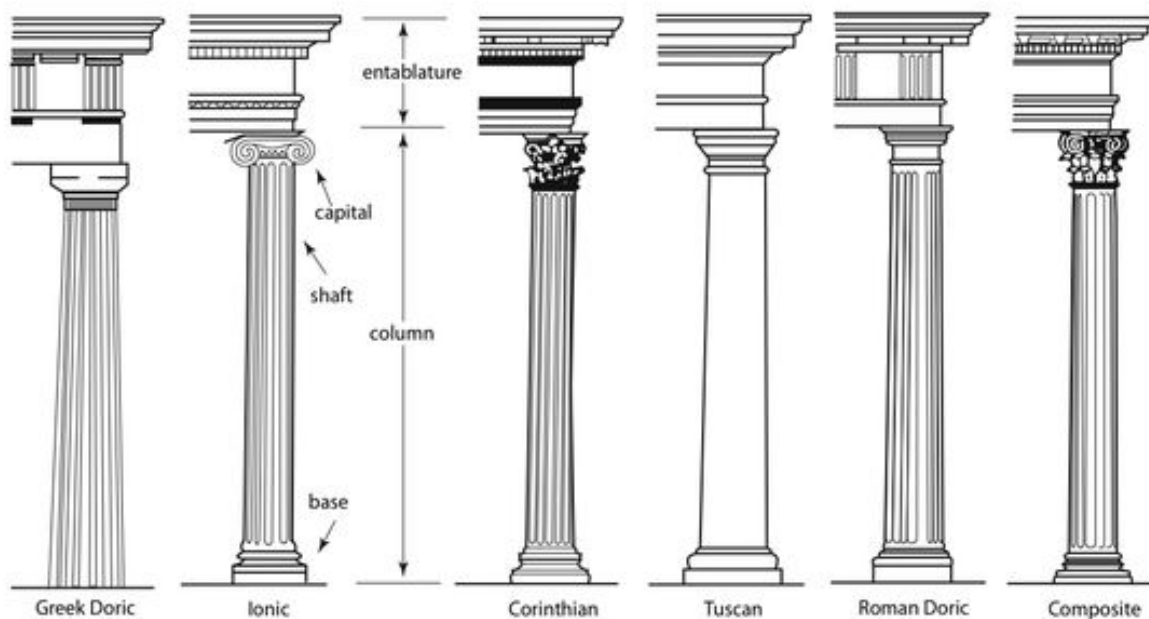


Figure 4.1 – Orders of classical architecture

The capital rests on the shaft. It has a load-bearing function, which concentrates the weight of the entablature on the supportive column, but it primarily serves an aesthetic purpose. The necking is the continuation of the shaft, but is visually separated by one or many grooves. The echinus lies atop the necking. It is a circular block that bulges outwards towards the top to support the abacus, which is a

square or shaped block that in turn supports the entablature. The entablature consists of three horizontal layers, all of which are visually separated from each other using moldings or bands. There are names for all the many parts of the orders (Fig. 4.2).

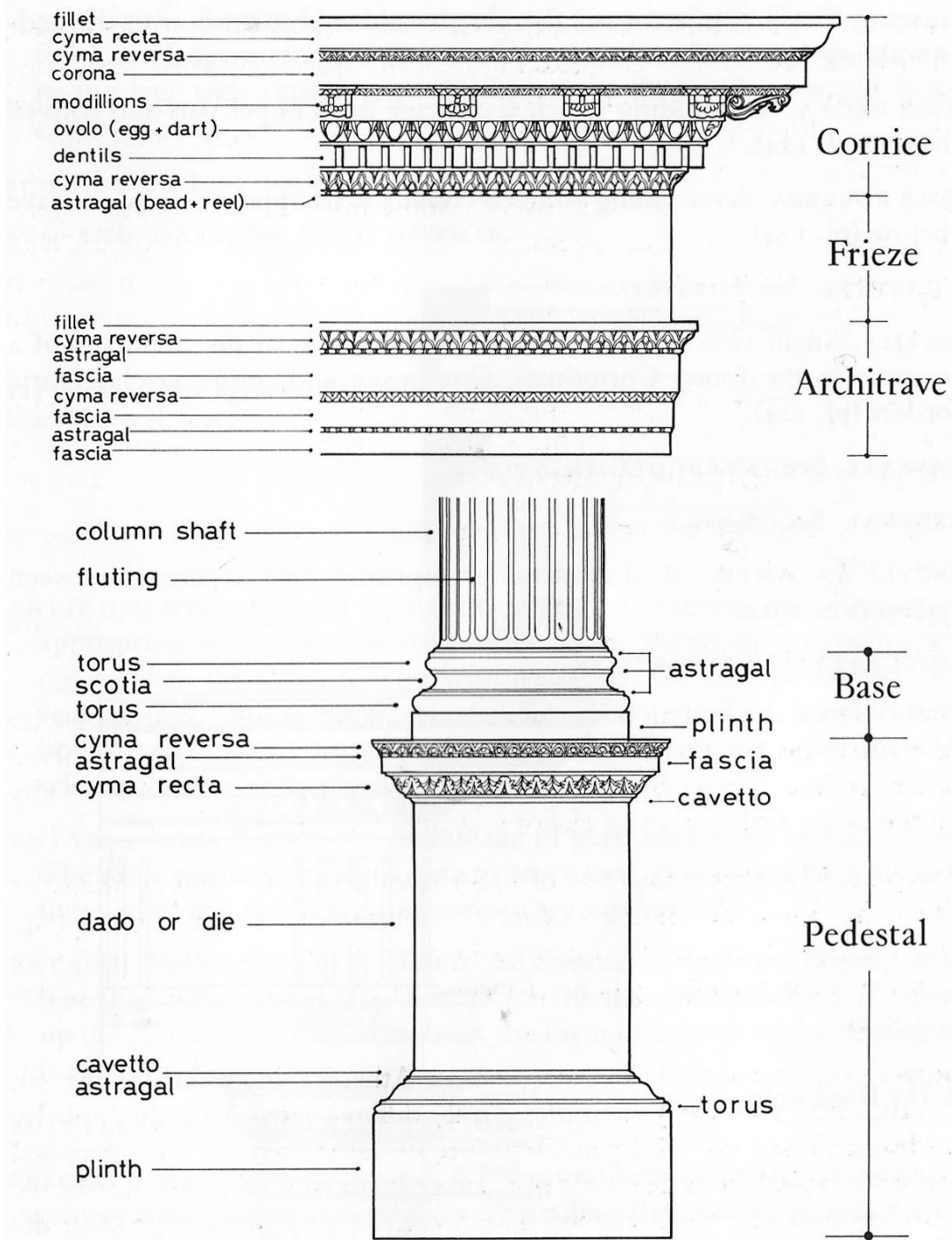


Figure 4.2 – Parts and elements of the orders

Each order responds to standard and not flexible proportions.

These ratios were theorized during the Renaissance by architects, the most influential was “Canon of the five orders of architecture” by the Italian architect Giacomo Barozzi da Vignola, to which the successive architects refer.

Follow in Table 4.1 is the proportions between the diameter of the column (considered 1 unit) and the height of the column for each order (capital and base included).

Table 4.1 – Proportions (diameter: height) of the columns by Vignola ratio

Order	Tuscan	Doric	Ionic	Corinthian	Composite
Vignola's ratio	1:7	1:8	1:9	1:10	1:10

According to Vignola the height of the Tuscan column is obtained multiplying by 7 the diameter of the column. To get the dimensions of the other parts we give the value of two moduli (singular is modulo) to the diameter, so the height of the column is 14 modulus.

Of the 14 module for the height of the column: 1 mod for the capital, 1 mod for the base, 12 mod for the shaft.

Roman architecture distinguishes five orders. The height of the Tuscan column is determined in 14 module, the Doric – 16, Ionic – 18, Corinthian and Composite – 20. For the convenience of measuring parts, the module (mod) is bits into smaller pieces called part (p). For different columns, the number of the number of parties in the module is different. For the Tuscan and Doric order, the quantity there are 12 parts in the module, for the Ionic, Corinthian and Composite – 18 (Fig. 4.3).

Scheme of 5 orders (the same module)

entablature height = $1/4 h$ of column

pedestal height = $1/3 h$ of column

module $M = d / 2$

d - diameter of column

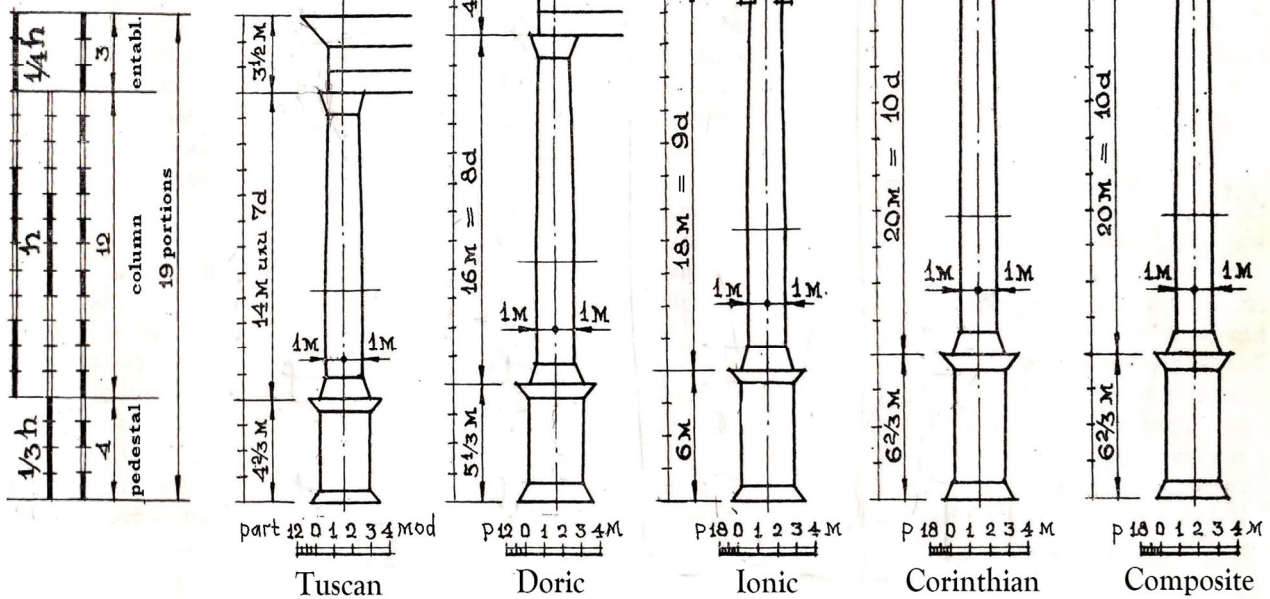


Figure 4.3 – Scheme of 5 orders

The study of orders usually begins with drawing them in masses, that is, a simplified schematic representation, when curvilinear shapes are replaced by inclined straight lines.

To determine the width of the pedestal die, it is recommended to use the rule common to all orders. The base plinth of the column forms a square in the plan, the diagonal of which is equal to 4 modules. Based on this, on the axis of the column, therefore, of the pedestal, a line is drawn at an angle of 45° and 2 modules are laid on it from the point of intersection with the axis in each direction. Through the points obtained, vertical lines are drawn, which determine the width of the base of the column, as well as the width of the pedestal die (Fig. 4.4).

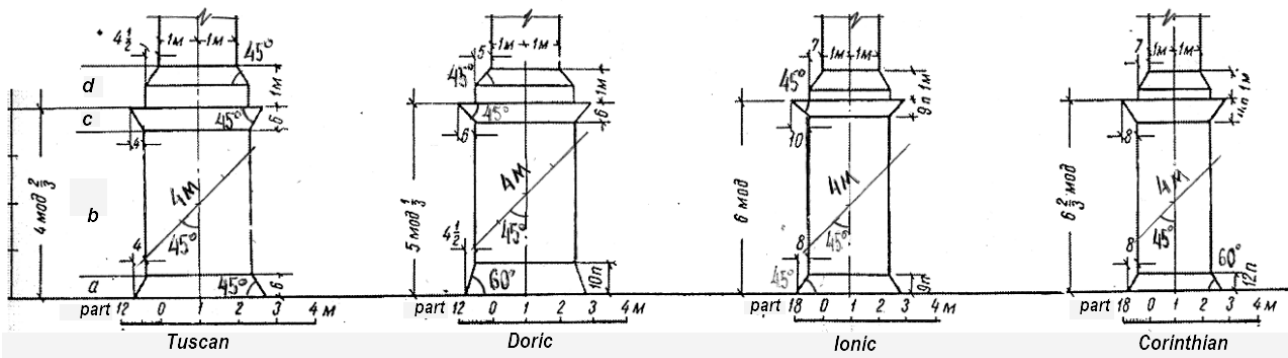


Figure 4.4 – Widths of the pedestal of the architectural order in masses:
a – pedestal base, b – die, c – pedestal cornice, d – column base

Column trunk at the bottom by $1/3$ of the height is built like a cylinder. The upper part, $2/3$ of the height, gradually becomes thinner. In the Tuscan order – by $1/5$ of the radius of the column base on each side, for other orders – by $1/6$ of the radius.

The construction of the cornice (Fig. 4.5) and the base of the pedestal, as well as the base of the column, is clear from the Figure 4.4. The height of the column base for all orders is equal to 1 module.

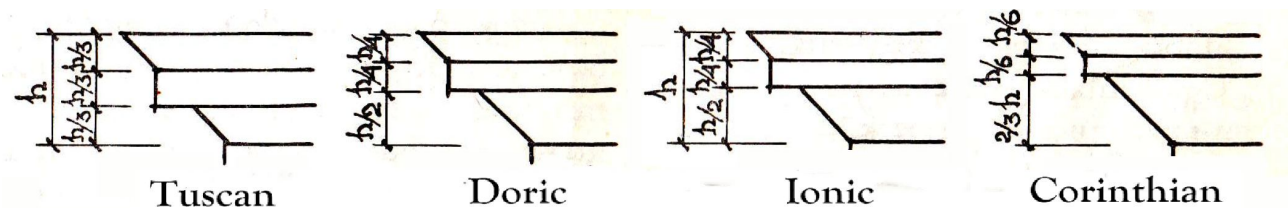


Figure 4.5 – Proportions of the cornices

Four orders in masses with dimensions of individual parts in modules are shown in Figure 4.6.

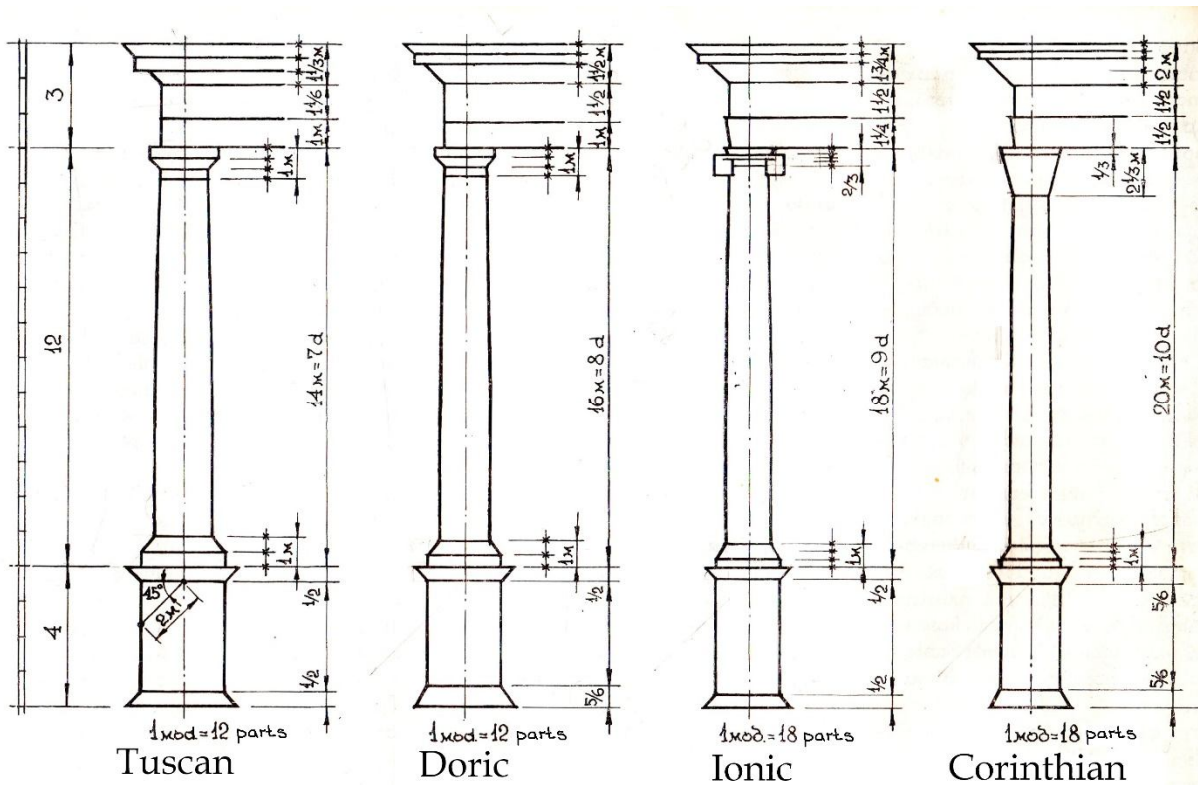


Figure 4.6 – Orders proportions according to module

Assignment “Orders in masses” is performed on drawing paper A3 format horizontal orientation (Fig. 4.7).

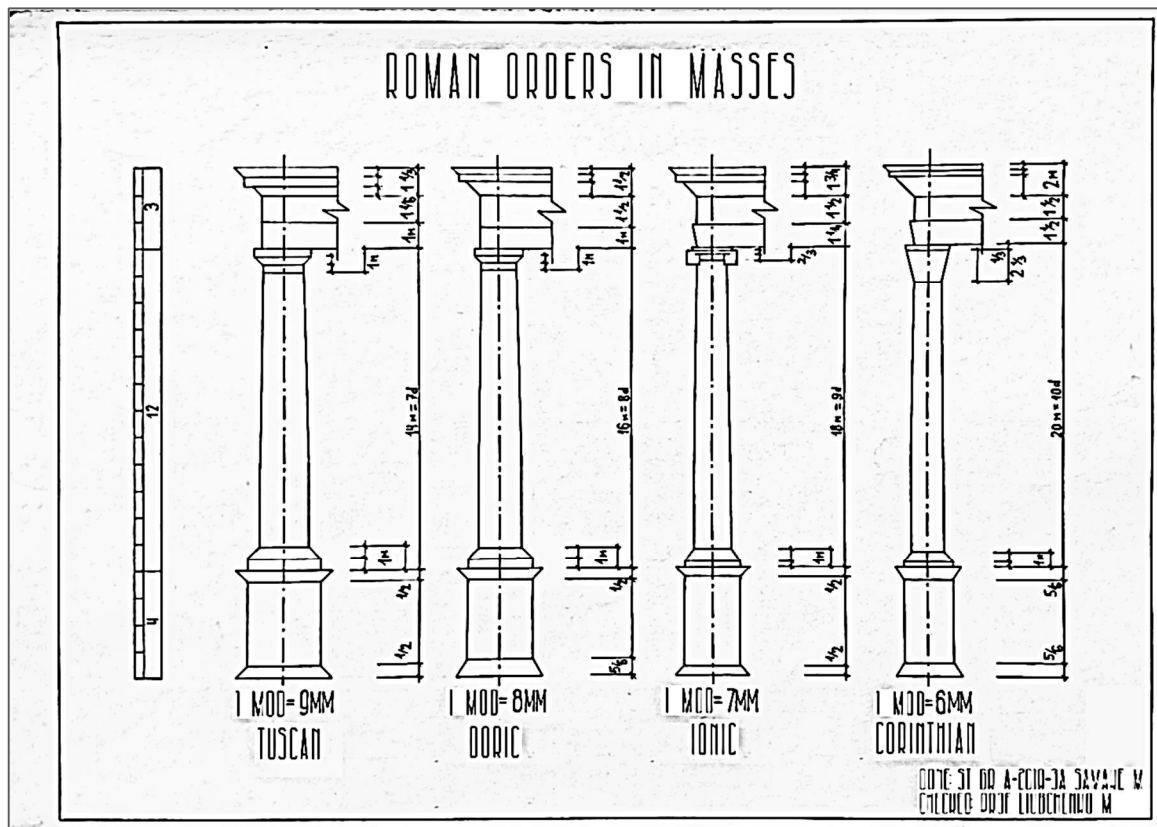


Figure 4.7 – Example of the assignment “Orders in masses”

4.2 Components of the order system in detail

Doric order. It is the simplest of the orders, characterized by short, organized, heavy columns with plain, round capitals (tops) and no base. With a height that is only four to eight times its diameter, the columns are the most squat of all orders. The shaft of the Doric order is channeled with 20 flutes. The capital consists of a necking or annulet, which is a simple ring. The echinus is convex, or circular cushion like stone, and the abacus is square slab of stone.

Above the capital is a square abacus connecting the capital to the entablature. The entablature is divided into three horizontal registers, the lower part of which is either smooth or divided by horizontal lines. The upper half is distinctive for the Doric order. The frieze of the Doric entablature is divided into triglyphs and metopes. A triglyph is a unit consisting of three vertical bands which are separated by grooves. Metopes are the plain or carved reliefs between two triglyphs (Fig. 4.8).

The Greek forms of the Doric order come without an individual base. They instead are placed directly on the stylobate. Later forms, however, came with the conventional base consisting of a plinth and a torus. The Roman versions of the Doric order have smaller proportions. As a result, they appear lighter than the Greek orders.

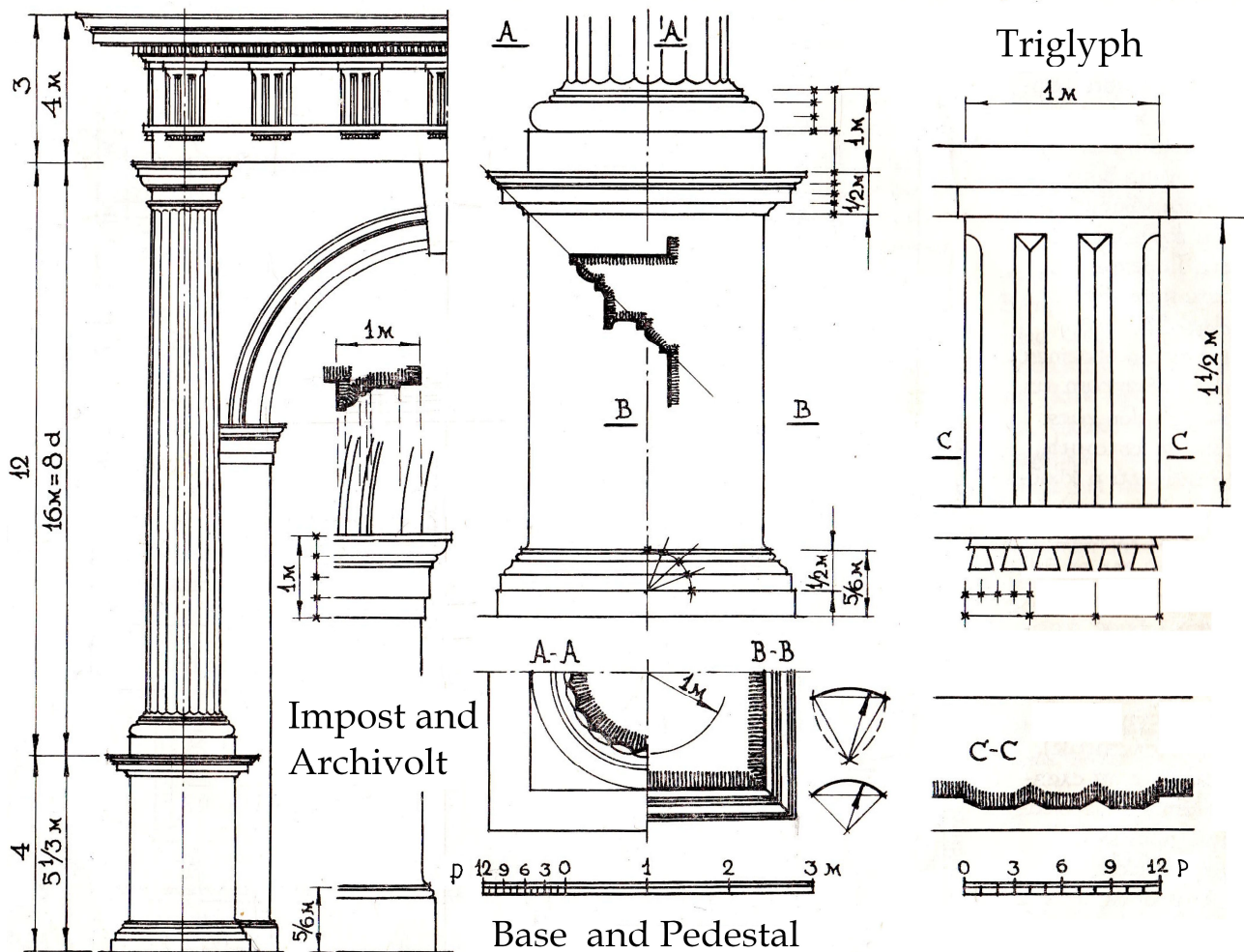


Figure 4.8 – Doric order

Ionic order came from eastern Greece, where its origins are entwined with the similar but little known Aeolic order. It is distinguished by slender, fluted pillars with a large base and two opposed volutes (also called “scrolls”) in the echinus of the capital. The echinus itself is decorated with an egg-and-dart motif. The Ionic shaft comes with four more flutes than the Doric counterpart, totaling 24 (Fig. 4.9, 4.10).

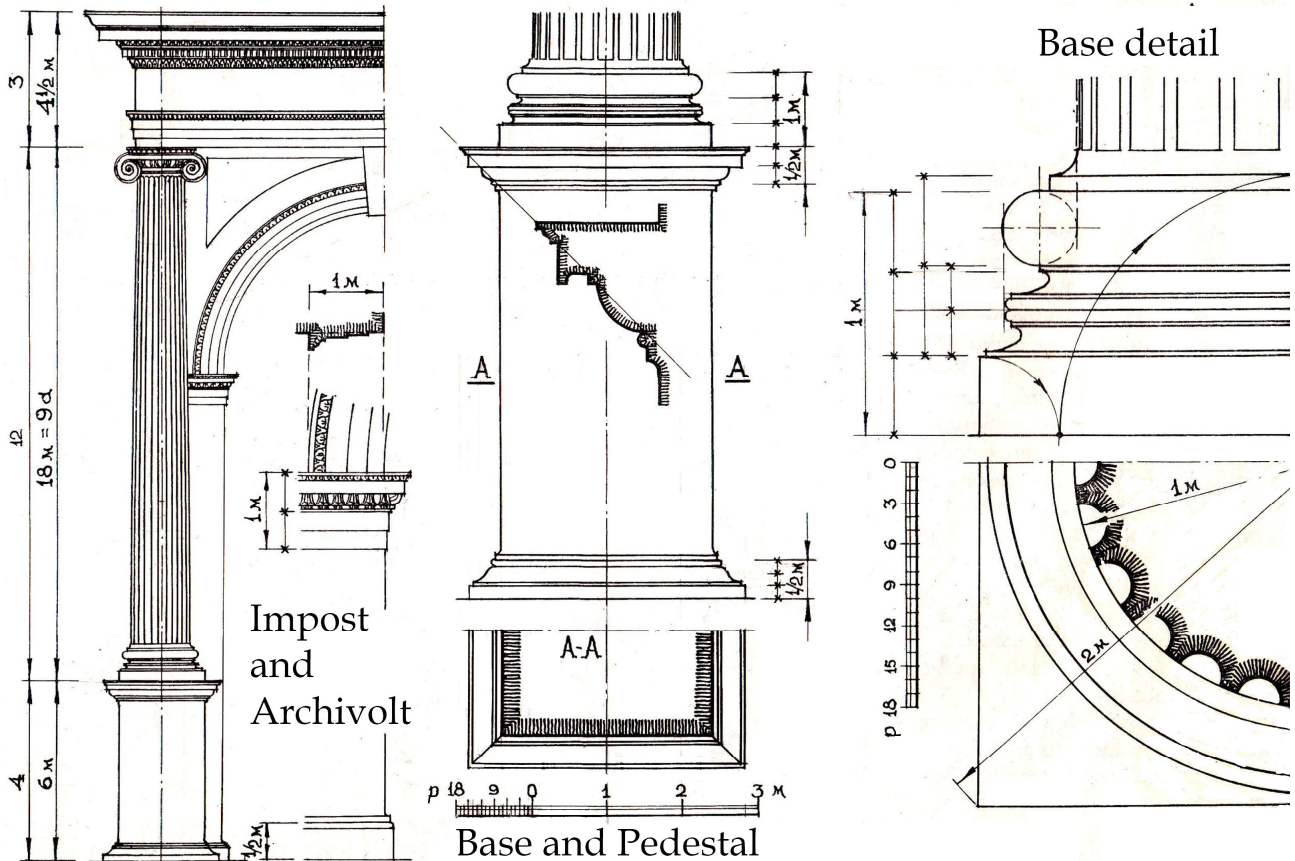


Figure 4.9 – Ionic order

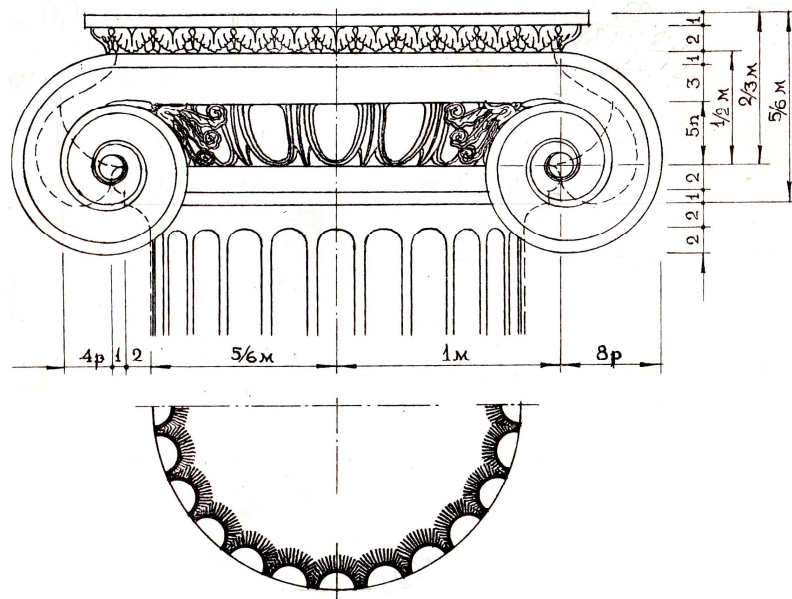


Figure 4.10 – Capital of Ionic order

The Ionic base has two convex moldings called tori, which are separated by a scotia. The Ionic order is also marked by an entasis, a curved tapering in the column shaft. A column of the Ionic order is nine times its lower diameter. The shaft itself is eight diameters high. The architrave of the entablature commonly consists of three stepped bands (fasciae). The frieze comes without the Doric triglyph and metope. The frieze sometimes comes with a continuous ornament such as carved figures instead.

Corinthian order. The Corinthian order is the most ornate of the Greek orders, characterized by a slender fluted column having an ornate capital decorated with two rows of acanthus leaves and four scrolls. It is commonly regarded as the most elegant of the three orders. The shaft of the Corinthian order has 24 flutes. The column is commonly ten diameters high (Fig. 4.11).

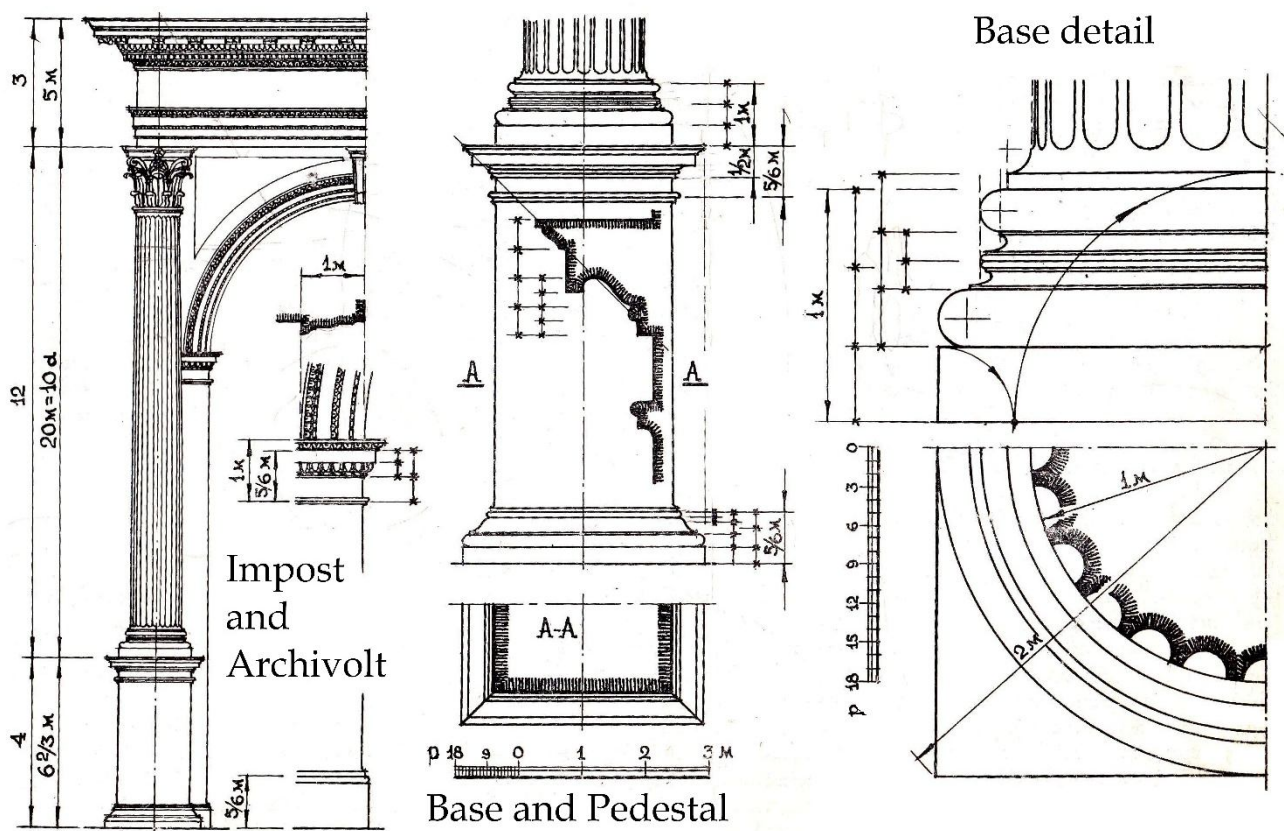


Figure 4.11 – Corinthian order

Tuscan order. The Tuscan order is a Roman adaptation of the Doric. The Tuscan has an unfluted shaft and a simple echinus-abacus capital. It is similar in proportion and profile to the Roman Doric but is much plainer. The column is seven diameters high. This order is the most solid in appearance of all the orders.

The Tuscan order has a very plain design, with a plain shaft, and a simple capital, base, and frieze. It is a simplified adaptation of the Doric order by the Greeks. The Tuscan order is characterized by an unfluted shaft and a capital that only consists of an echinus and an abacus. In proportions it is similar to the Doric order, but overall it is significantly plainer. The column is normally seven diameters high. Compared to the other orders, the Tuscan order looks the most solid.

Composite order. The Composite order is a mixed order, combining the volutes of the Ionic with the leaves of the Corinthian order. Until the Renaissance it was not ranked as a separate order. Instead, it was considered as a late Roman form of the Corinthian order. The column of the Composite order is typically ten diameters high (Fig. 4.12).

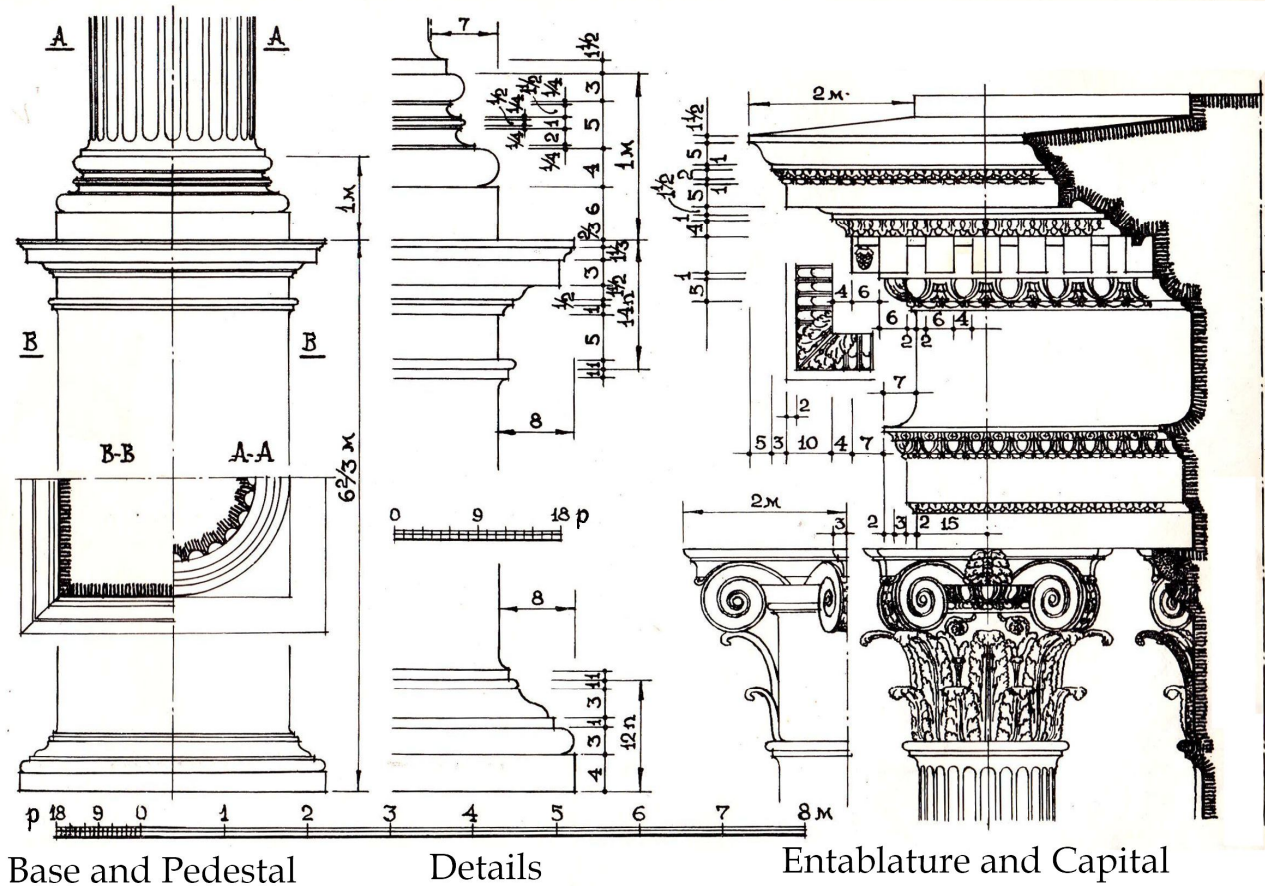


Figure 4.12 – Composite order

In order details, various profiles have their own functions – supporting, separating, and finagling. For example, the bottom of the column has a listel (chimbia), i.e. quadrant ordinary with a plinth, and on top – astragalus, i.e. shaft quadrant. The cyma reversa, the quarter shaft are usually supporting shapes, and the cyma recta and fillet are the final ones. For each profile, its own characteristic ornaments have been developed, repeating the shape of the profile (Fig. 4.13). For example, Ionic is decorate a quarter shaft, beads an ordinary quadrant, leaves is a cyma recta, meanders in a frieze.

Acanthus a plant found on the shores of the Mediterranean and particularly admired by the Greeks and Romans for the elegance of its leaves. Found on many classical designs such as the Corinthian and Composite columns.

Antefix ornamental blocks on the edge of a roof to conceal the ends of the tiles.

Bead and reel a decoration of alternating, sometimes grouped, circular and oval beads generally small in scale and used to enrich the astragal. Also referred to as “bead and barrel”, etc.

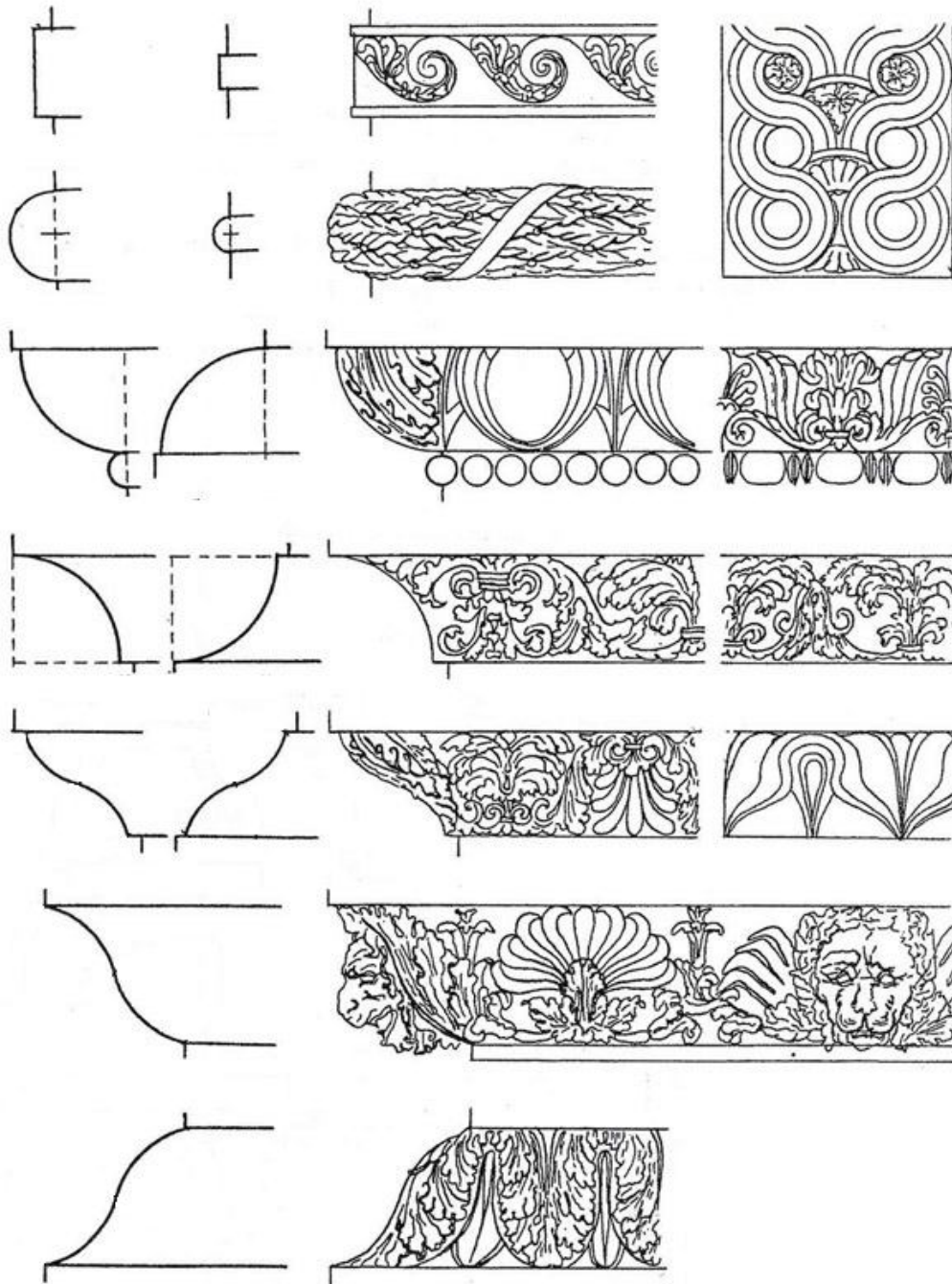


Figure 4.13 – Feature of order decoration

Egg and dart a typical feature of decoration on cornices. This style showcases egg-like motifs with arrow-like elements, alternating in between each egg shape. Egg and tongue, egg and anchor are commonly used terms.

Palmette. A stylized palm leaf shape used as a decorative element in classical art and architecture.

Assignment “Construction of the order arch fragment and its component parts” is performed on drawing paper A3 format vertical orientation (Fig. 4.14).

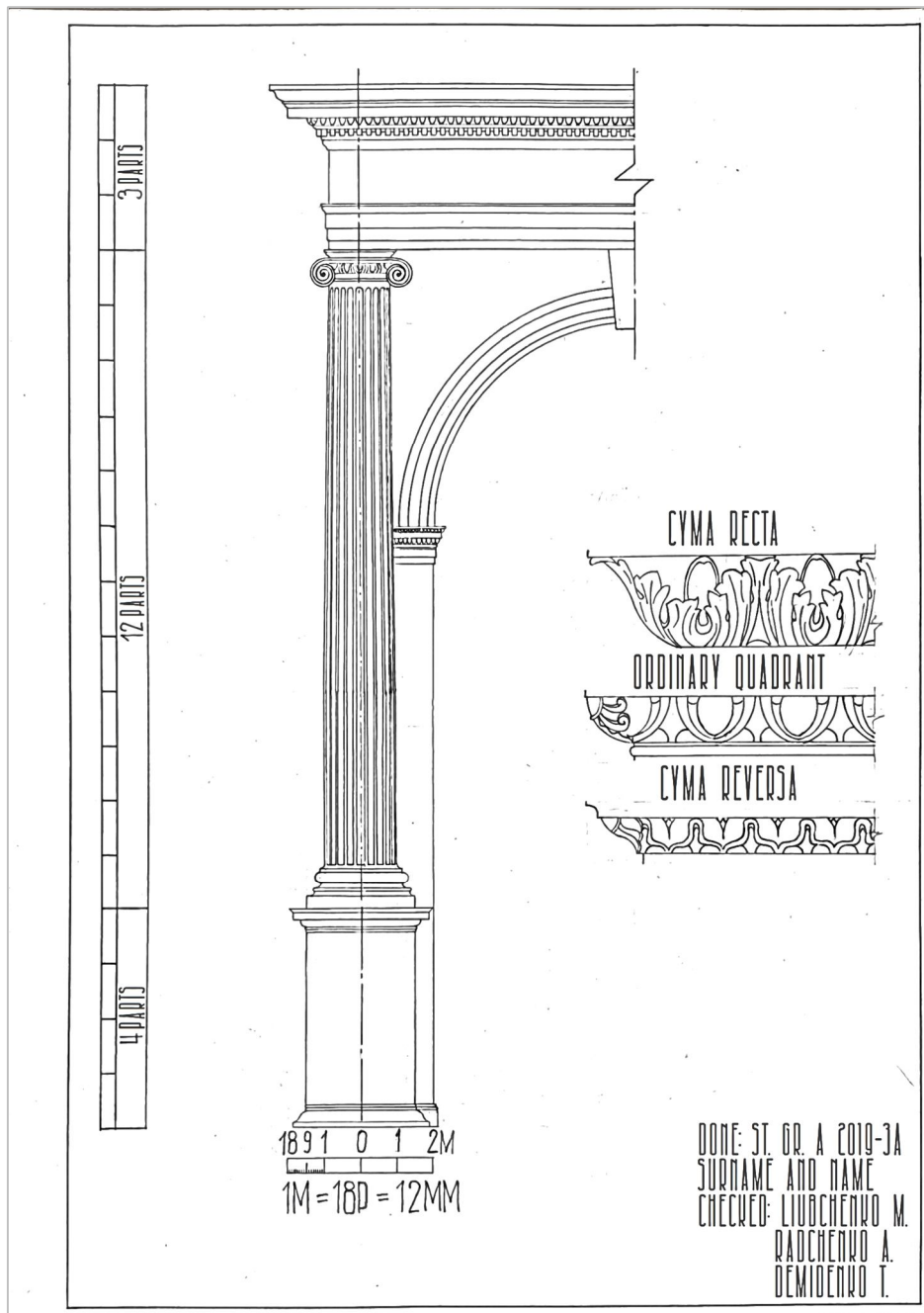


Figure 4.14 – Example of assignment “Construction of the order arch fragment and its component parts”

The drawing should place one of the Roman orders in detail (entablature, column, pedestal) with a fragment of the arch. The order is built using the module, as well as in the drawing of orders in the masses. This assignment depicts almost all profiles and large ornaments. You also need to place three different profiles with an ornament on a larger scale near the order. Their increase must be performed using the grid method. The initial image is divided into a number of equal parts by vertical and horizontal lines, thus forming a grid. The number and size of cells can be different, the more small details in the sketch, the smaller the size of the cells should be. Once the grid is marked on the thumbnail, it must be transferred to a large format along with the image.

5 DESIGNING SMALL ARCHITECTURAL FORMS

Small architectural forms – auxiliary architectural structures, equipment and artistic and decorative elements that have their own simple functions and complement the overall composition of the architectural ensemble of buildings. In landscape design, they are one of the main elements of garden decoration. These include stairs, fences, sculptures, fountains, garden and park structures (gazebos, rotundas, pergolas, garden sculptures, flowerpots, park benches and other garden furniture).

Examples of objects of small landscape architecture are shown in Figure 5.1.



Figure 5.1 – Examples of objects of small architecture

Assignment “Designing small architectural forms”. In the assignment, you need to come up with an object of a small architectural structure, for example, a rotunda. The task is carried out on one sheet of A3 format vertically located. Drawing drawn up in accordance with the rules for the design of architectural drawings.

A frame and title block are drawn on the format. Inside the working area of the drawing, images of their object are built: plan, front view. The images must have a projection connection to each other.

The plan shows a horizontal section of the rotunda at a height of about 1 meter. Dashed lines can be represent taller features such as a roof. The linear dimensions of the rotunda in mm are shown on the plan.

The facade is the main image of an object, giving the best possible idea of it. The facade should display all the elements of your design, your individual solution. The thick baseline shows the ground level. It is necessary to show the dimensions of the main elements in height.

An example of a drawing of a rotunda is shown in Figure 5.2.

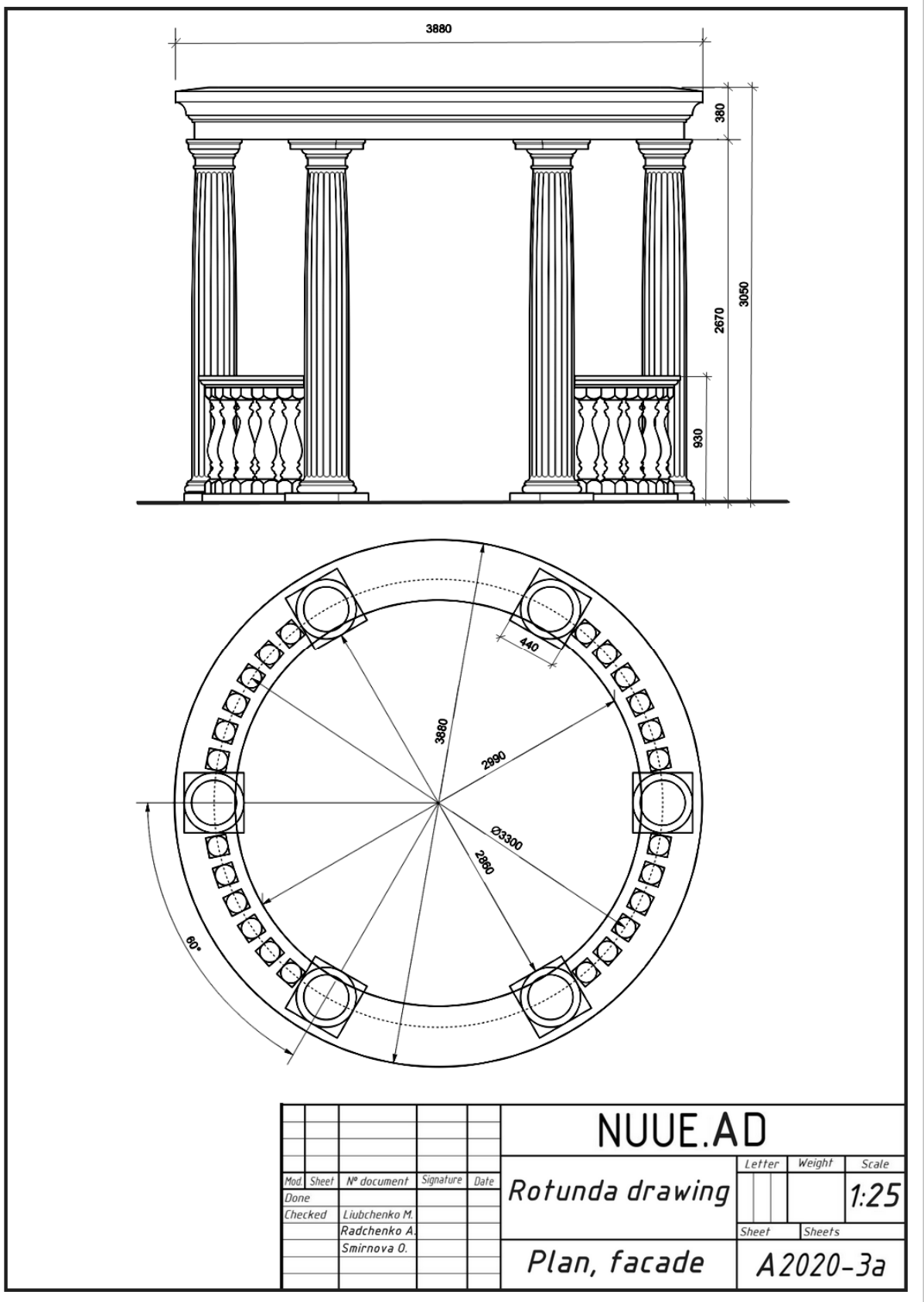


Figure 5.1 – Example drawing of the rotunda

6 INDIVIDUAL ASSIGNMENT “DRAWINGS OF PLAN, ELEVATION AND SECTION OF BUILDING”

6.1 Drawings of the building plan

The plan of the building is called the image of the building, mentally dissected by a horizontal plane at the level of window and door openings (about 1 m) and projected onto the horizontal plane of projection. The plan shows what is in the cutting plane and what is underneath it.

On the plan of the building show window and door openings, the location of the stairs, partitions and capital walls, built-in cabinets, sanitary-technical equipment and other. The plan placed under the elevation in the flat connection with it.

The position of all structural elements is determined by reference to the coordination axes.

Outside the building contour is wrote the size of window and door openings “in the light” and spaces between them (the first dimensional chain), coordination between axles (second dimensional chain) and the axis (the third dimensional chain).

Internal dimensions of areas, thickness of walls and partitions should be put on internal dimensional chains. They spend at least 8...10 mm from a wall or partition. Also bind all the outline main walls to the axes.

Floor space is put down in the lower right corner of the plan of the premises in square meters without designation of units with two decimal places and a bar beneath.

The plans show what direction the door opens. Exterior doors from the street to the house should open outwards, and the door from the stairs to the apartment is inside the apartment. Opening the other doors is depended on the convenience of planning and operation.

Sign of windows and external doors should be put on the outer side of the wall. On the open plan line shows the clipping plane for the corresponding section (Fig. 6.1).

A building plan is drawn in the following order:

- conduct longitudinal and transversal coordination axis;
- draw all external and internal walls, partitions and columns;
- produce a breakdown of window and door openings in the external and internal walls and partitions, conditionally show opening doors;
- draw stairs, sanitary appliances, built-in wardrobes, mezzanine, balcony fences and other elements;
- do the necessary external and dimension lines show the cutting line;
- write down all sizes, make appropriate titles, check the drawing;
- make a final outline.

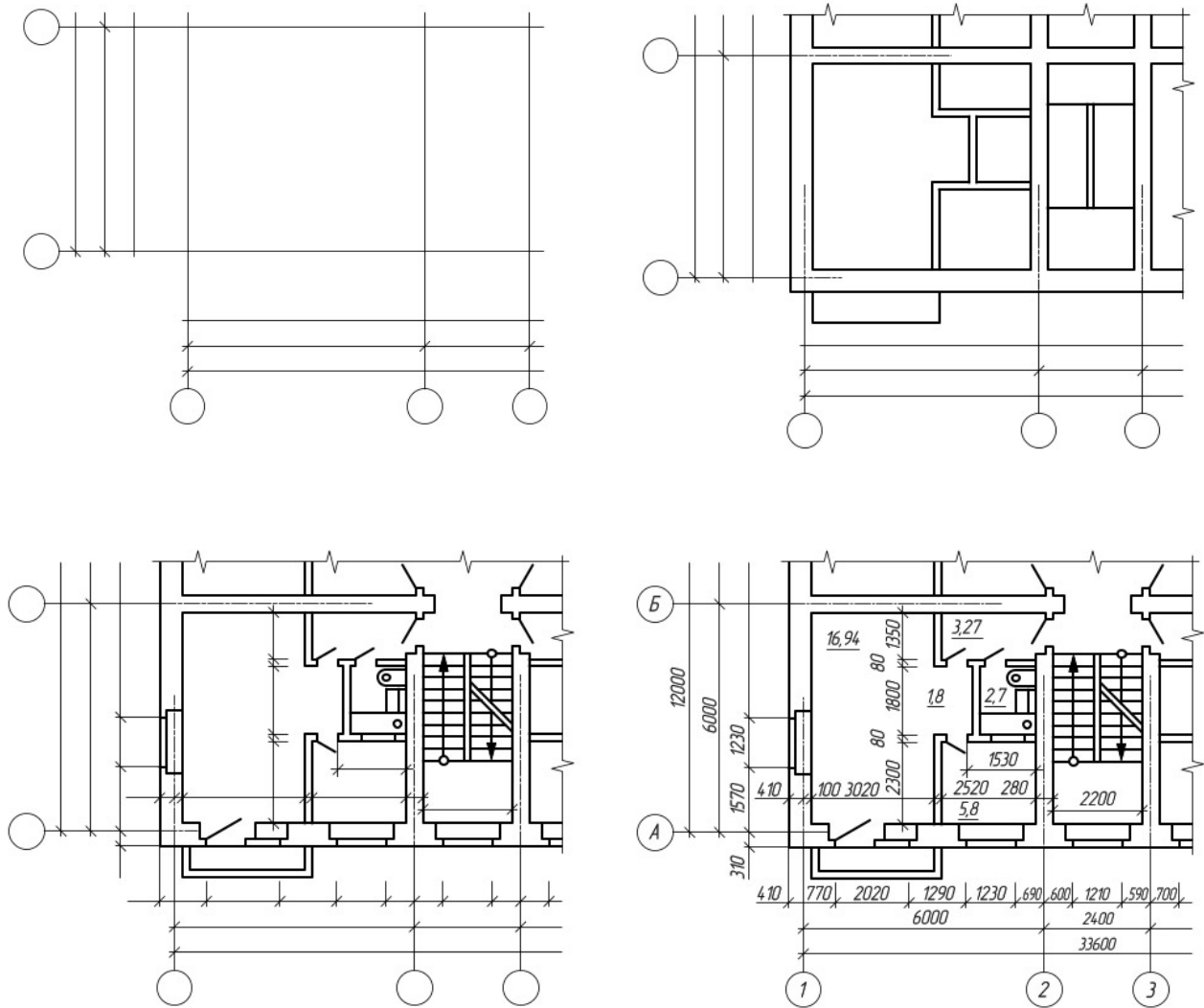


Figure 6.1 – Stages of building plan drawing

Contours of cuts and sections operate continuous main line. Elements that do not fit in the plane of section are performed by a thin line.

6.2 Section drawings

A sectional image of the building is called section. It is view mentally dissected vertical plane and projected onto the horizontal projection plane. Direction of the cutting plane is marked on the floor plan as line with arrows at the ends, showing the gaze direction. This view is signed as Section 1–1.

On the cuts visible contour lines is performed a continuous thin line. On sections coordination axes endure down and affix label sizes between adjacent axes. Position of structural elements height is determined by the elevations and dimensions, which appears on the remote lines levels of the corresponded elements. Inside the cut are marked height floors, doors and windows, as well as elevations and floor levels stairwells.

On the exterior side of the cut at a distance of 12–15 mm make a dimensional line, show the size of the window and door openings. Level sizes are drawn at a

– produce the final outline, dimensions and elevations make explanatory inscriptions and indicate the name of the section.

6.3 Elevation drawings

Types of building views in the front, rear, right and left are called elevations. Elevations give an idea of the image of the building, its overall shape, size, number of floors, the presence of balconies and loggias. View of the building from the street called the main elevation.

In the elevation drawings are drawn the location of windows, doors, balconies, door trims, etc. Dimensions are not applied on elevations but only the extreme axes are shown on it. The right or left a ground line, the top and bottom openings, eaves, top roof are represented on this drawing.

Elevations are usually performed in scale 1:100, 1:200 (civil buildings) and 1:200, 1:500 (industrial buildings). Complex view elevations are in the fragments in scale 1:10, 1:20. The elevation drawings are shown in Figure 6.3.

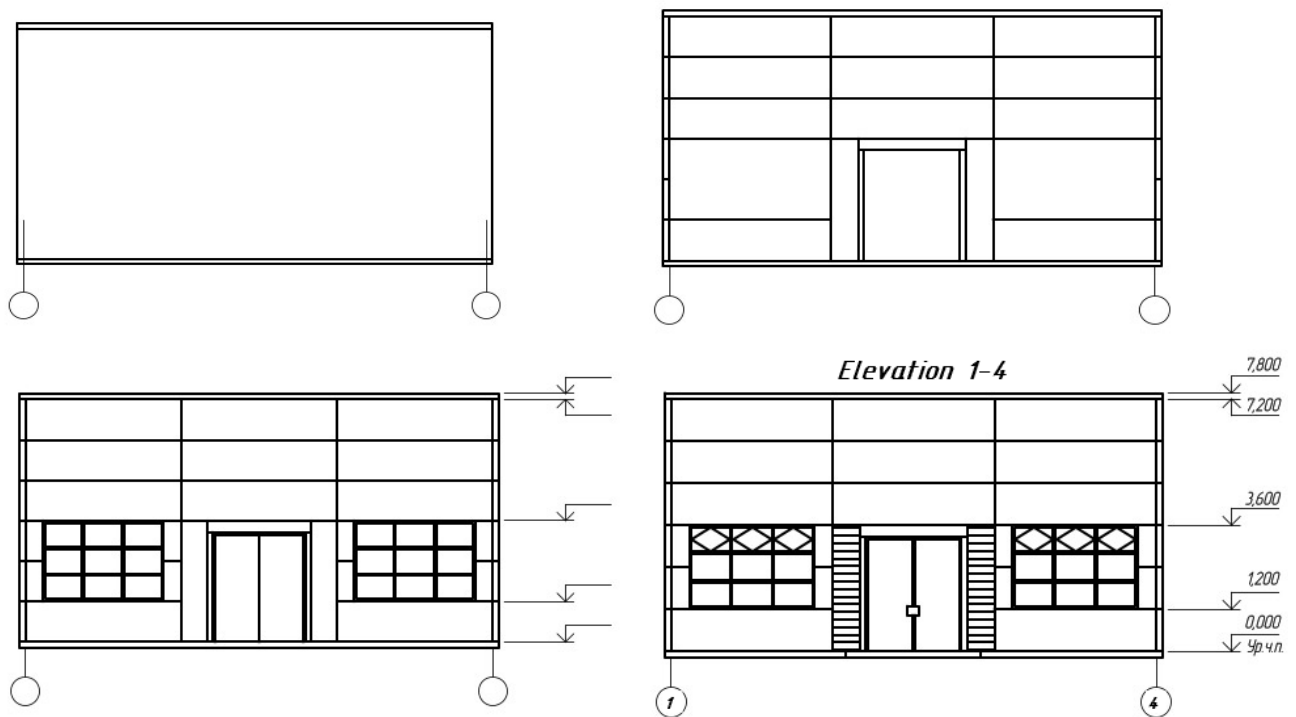


Figure 6.3 – Stages of building elevation drawing

A building elevation is drawn in the following order:

- draw the axis and the outline of the building;
- draw the windows and doorways, balconies, canopies plates, cornice and others architectural elements;
- draw the window frames, doors, fences balconies, vents and chimneys on the roof, write down marker icons;
- applied levels of the appropriate heights, marked focal axis;
- after verification of compliance with the plan and make the final circuit.

Draw the main line of the ground. Land line make thickened line that goes beyond the elevation view. On the architectural drawings on walls sometimes show shadows and elements entourage.

Sometimes necessary information can be conveyed without showing the interior construction. A large scale may be all that is needed to show the necessary details. Many details are best shown by combining elevations and sections drawings.

Assignment “**Drawings of plan, elevation and section of the building**” should be performed on the A2 format sheets in scale 1: 100. To perform of drawing it is necessary to do:

- draw coordination axes and bearing walls with reference to the coordination axes, partitions;
- show windows and doors with opening;
- draw a stairs (if the building has several floors);
- write the required dimensions in mm;
- show the arrangement of furniture in the premises;
- show plumbing equipment;
- write the premises numbers;
- in the free space of the drawing write: explication of the premises (list the numbered premises) and explication of kitchen equipment.

Above the plan write the title, drawing scale, title block (Fig. 6.4–6.8).

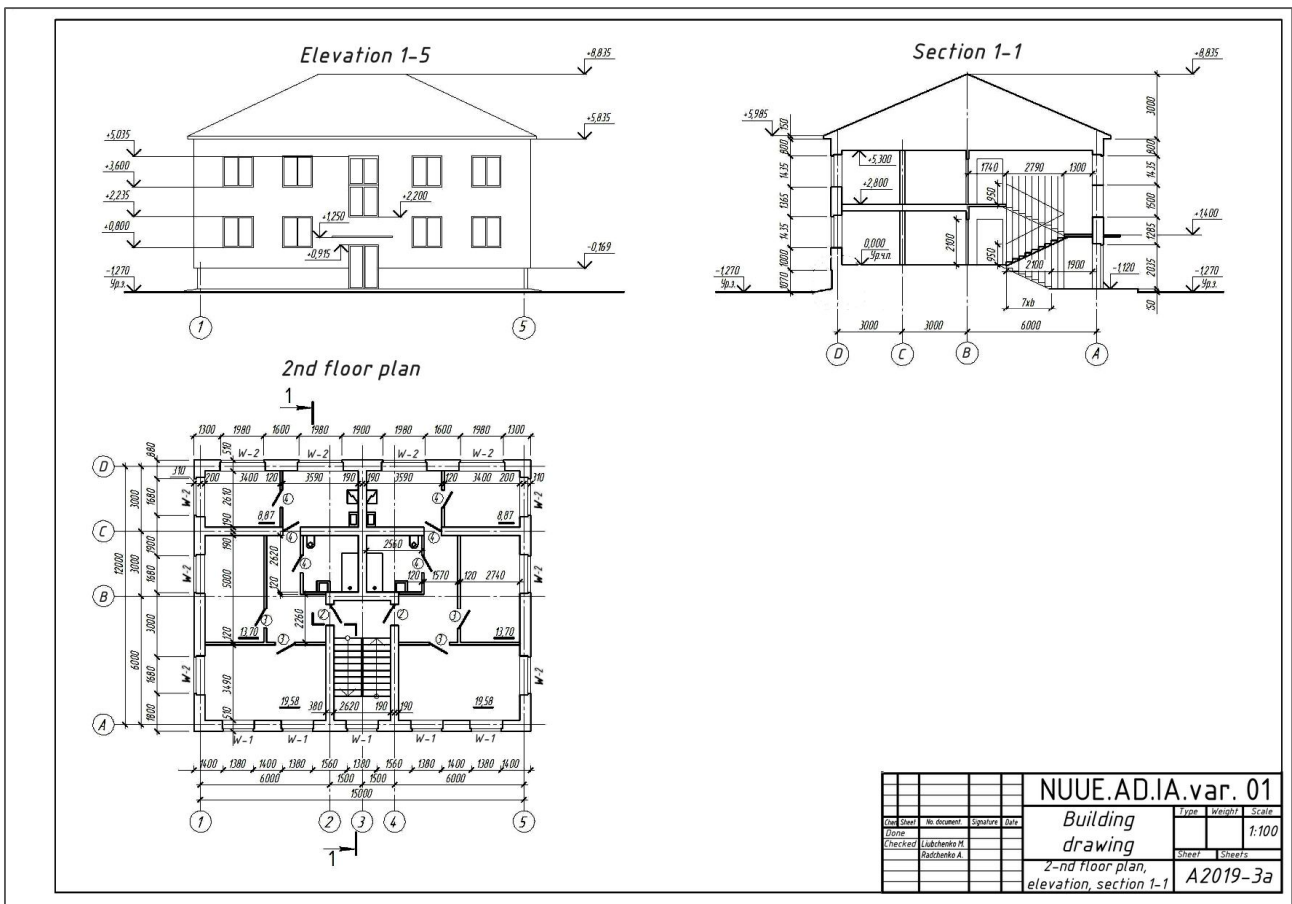


Figure 6.4 – Assignment “Drawings of plan, elevation and section of the building”

1-st floor plan S 1:100

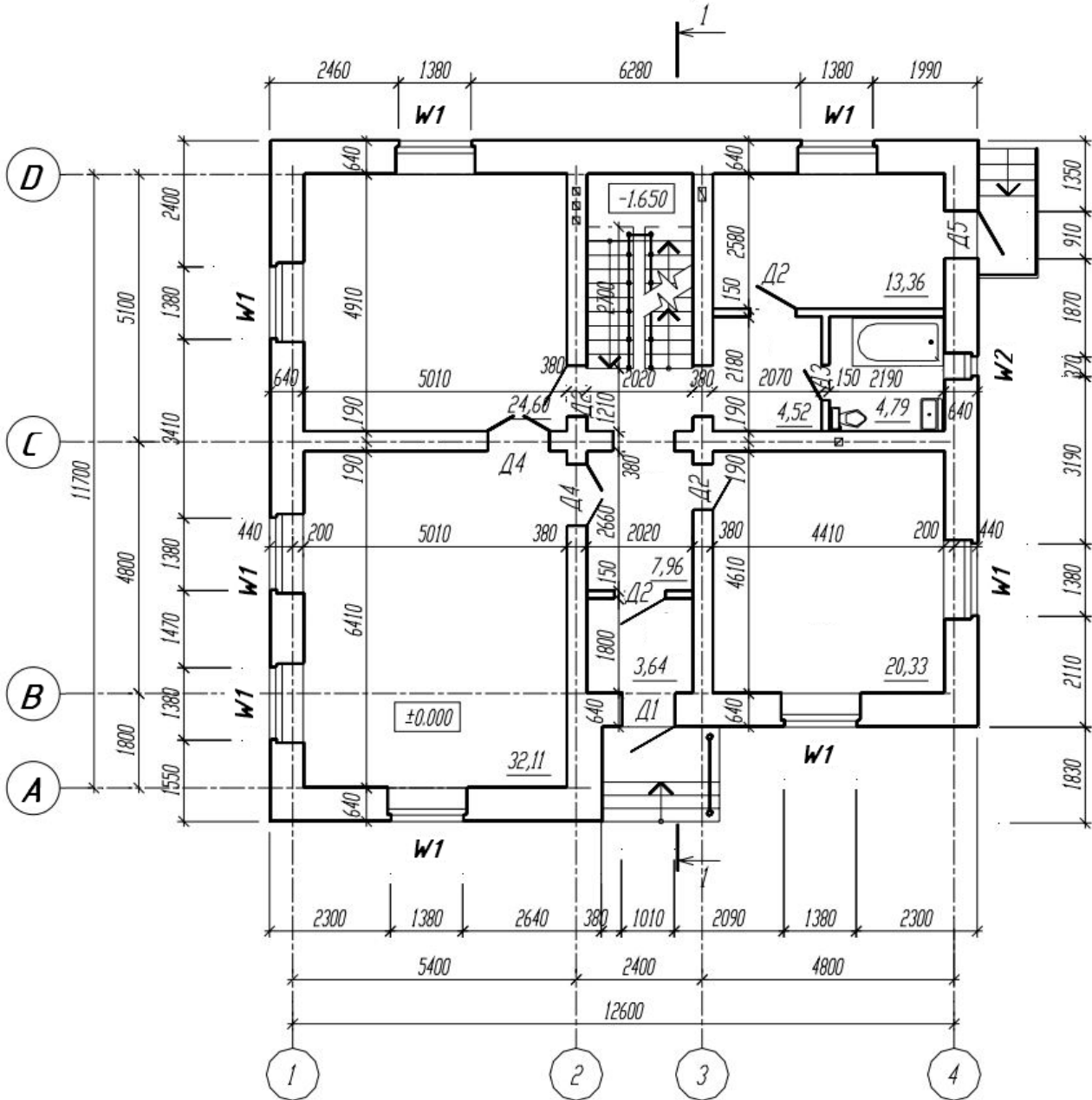


Figure 6.5 – Examlle of 1st floor plan (scale 1:100)

2-nd floor plan S 1:100

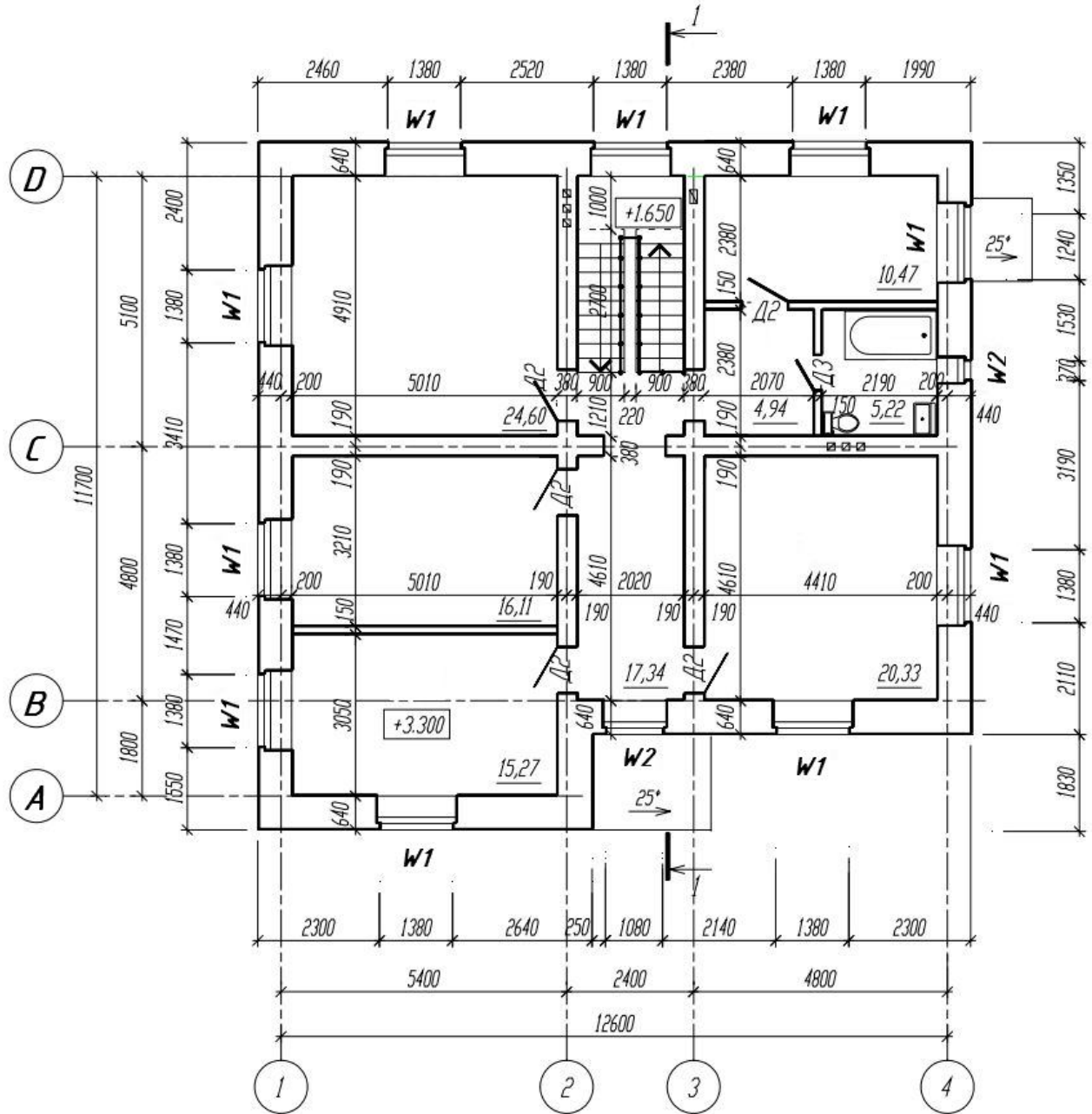


Figure 6.6 – Example of 2nd floor plan (scale 1:100)

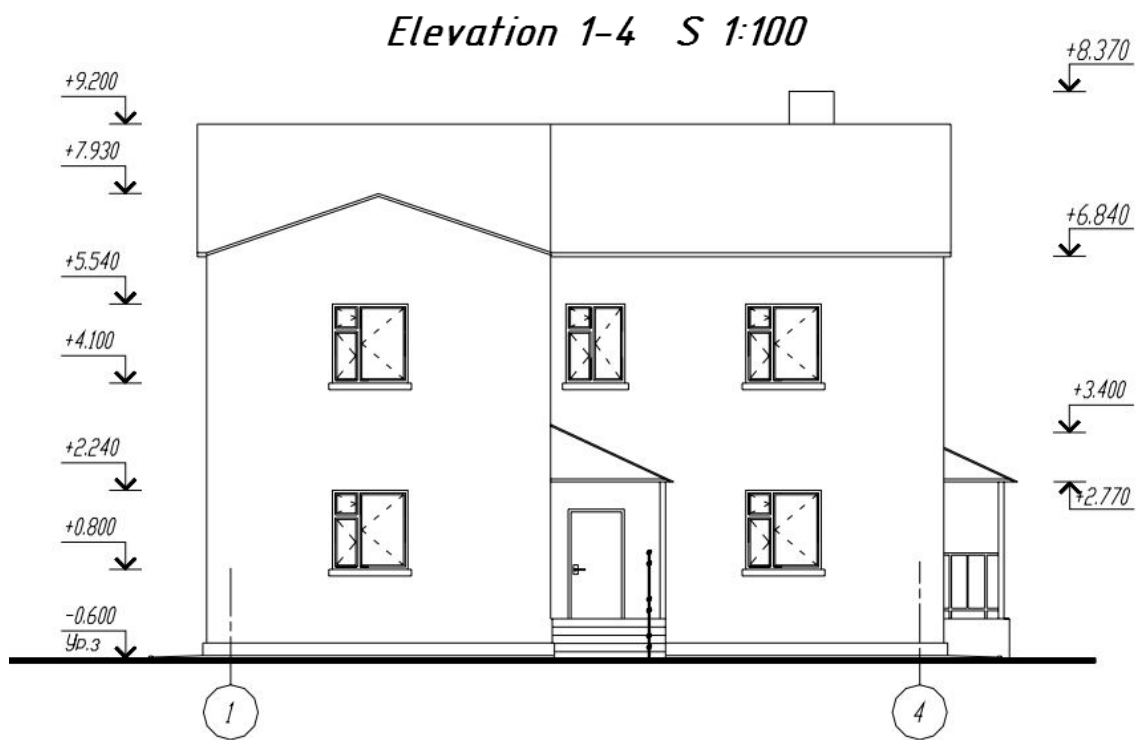


Figure 6.7 – Example of elevation 1-4 (scale 1:100)

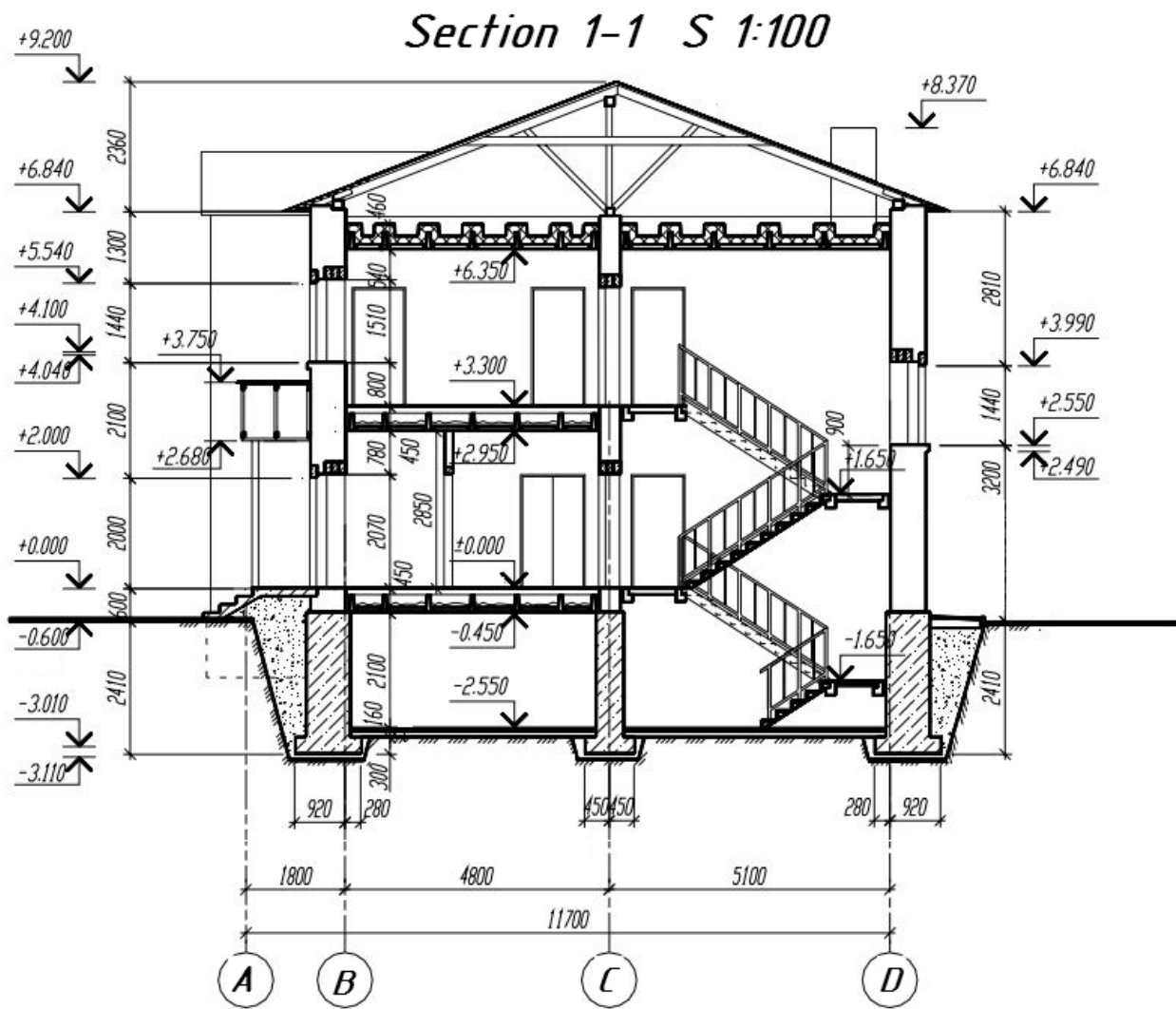
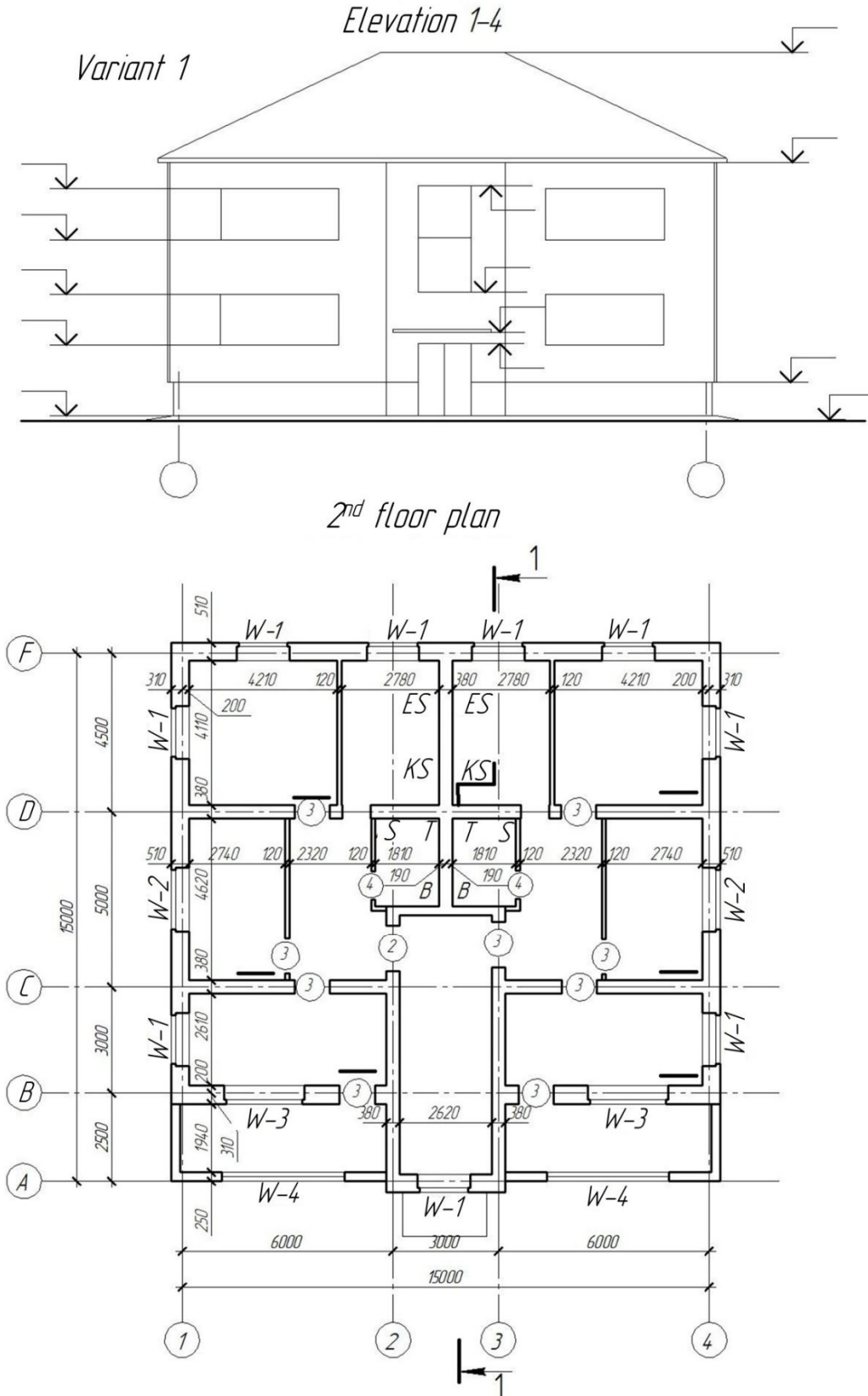


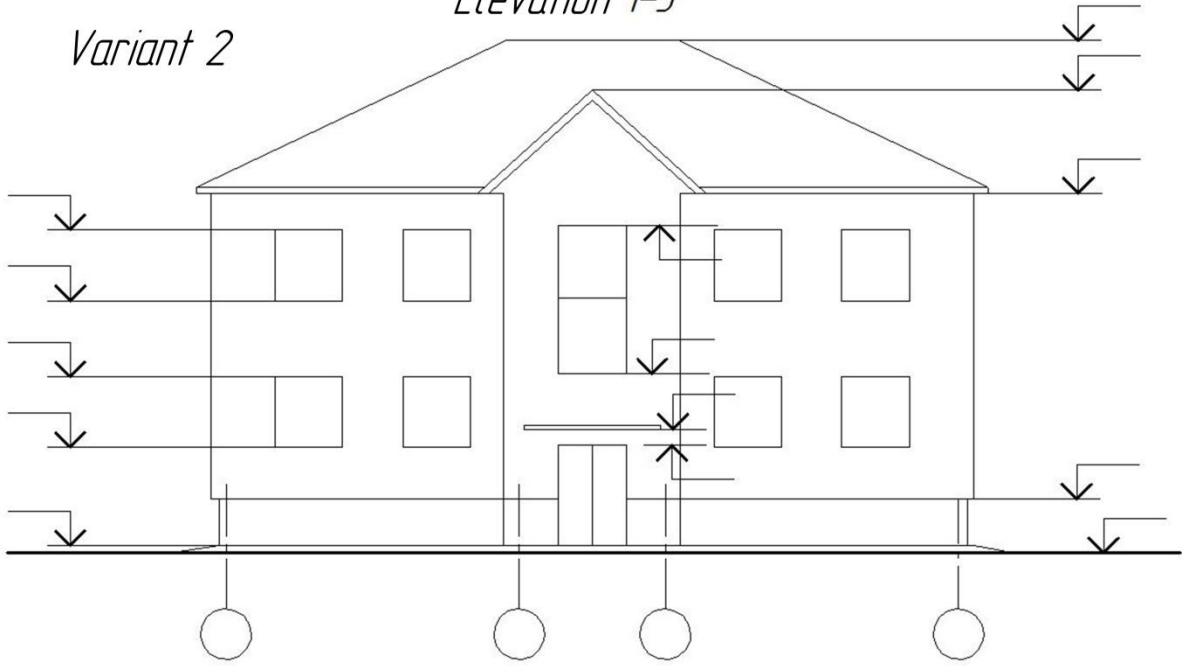
Figure 6.8 – Example of section 1-1 (scale 1:100)

APPENDIX

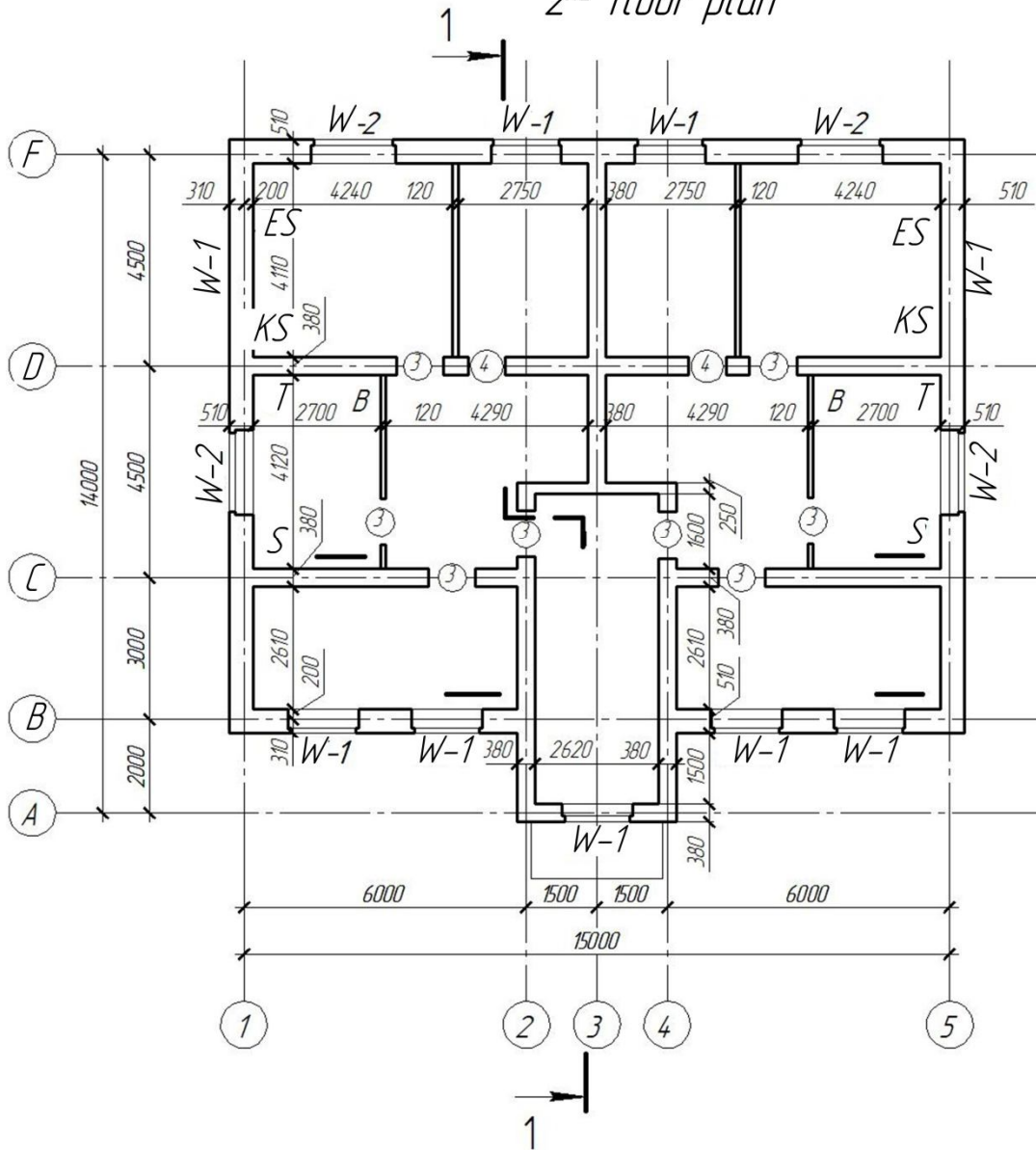
Variants for assignment “Drawings of plan, elevation and section of the building”

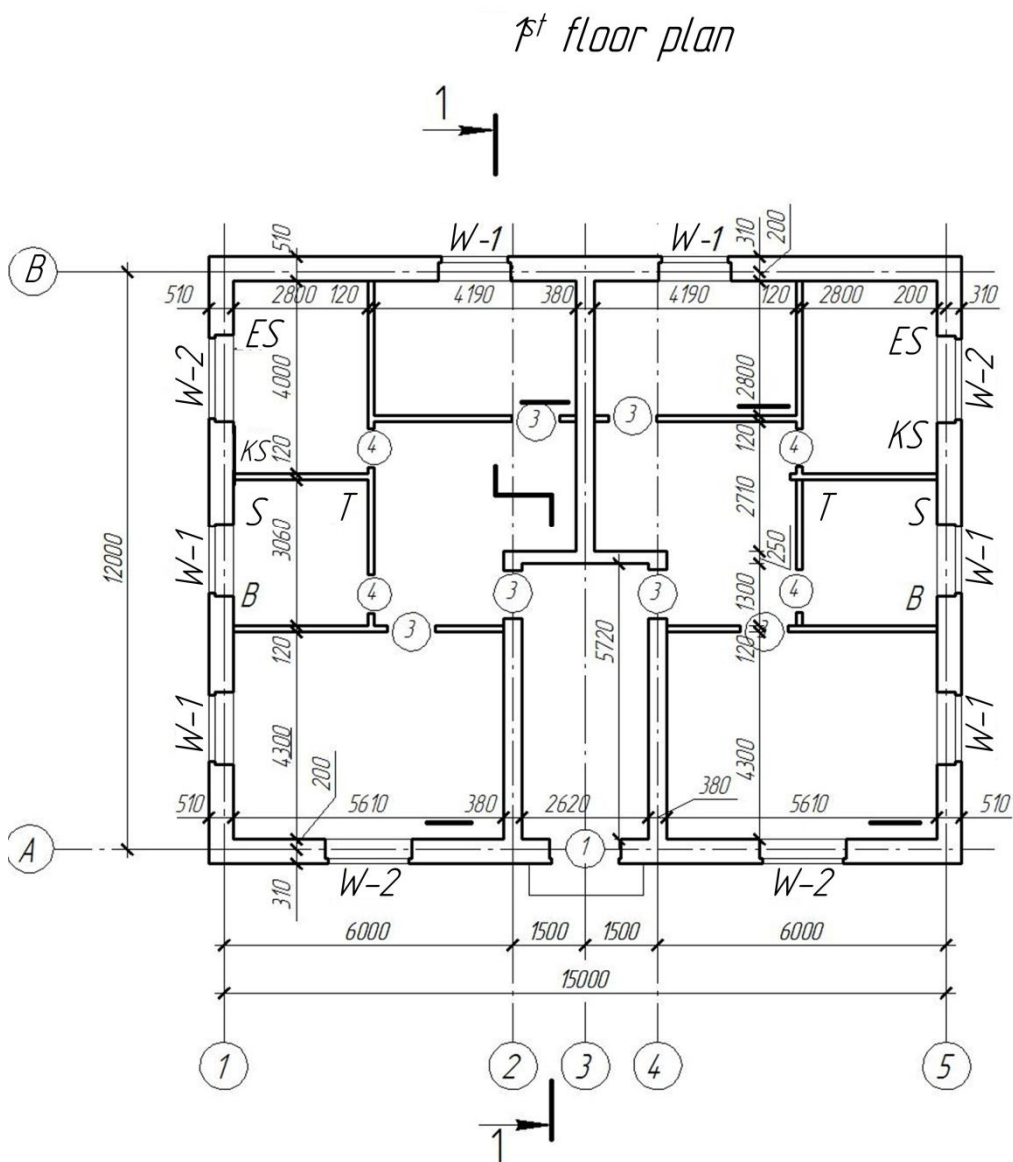
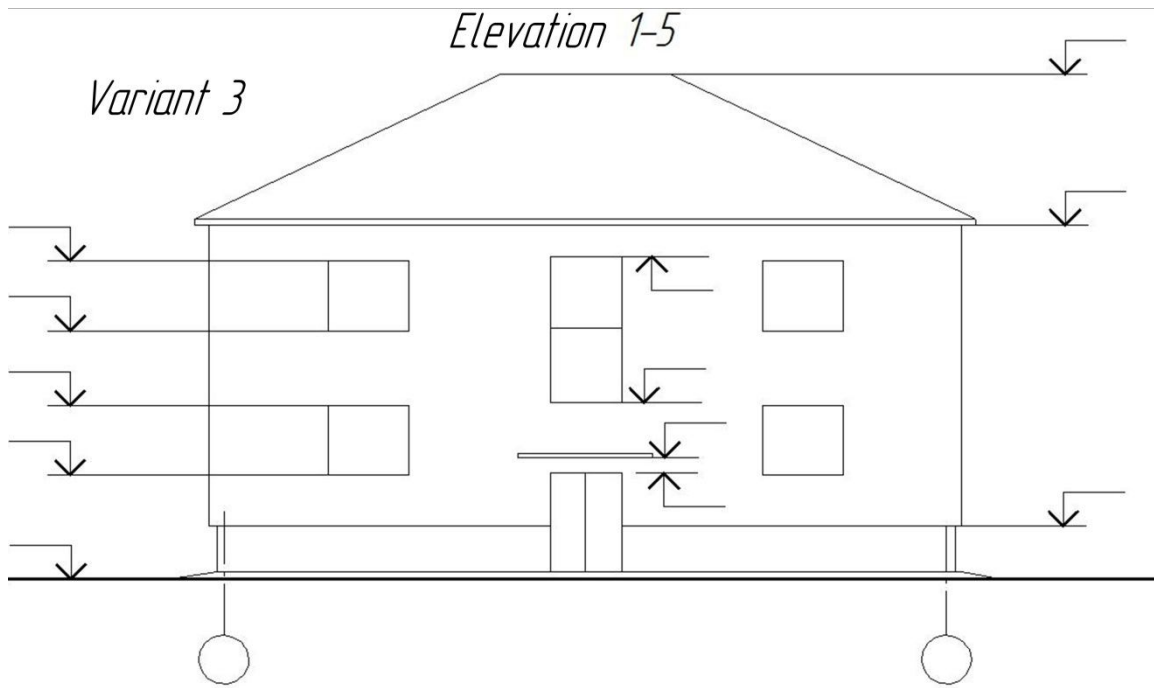


Variant 2
Elevation 1-5



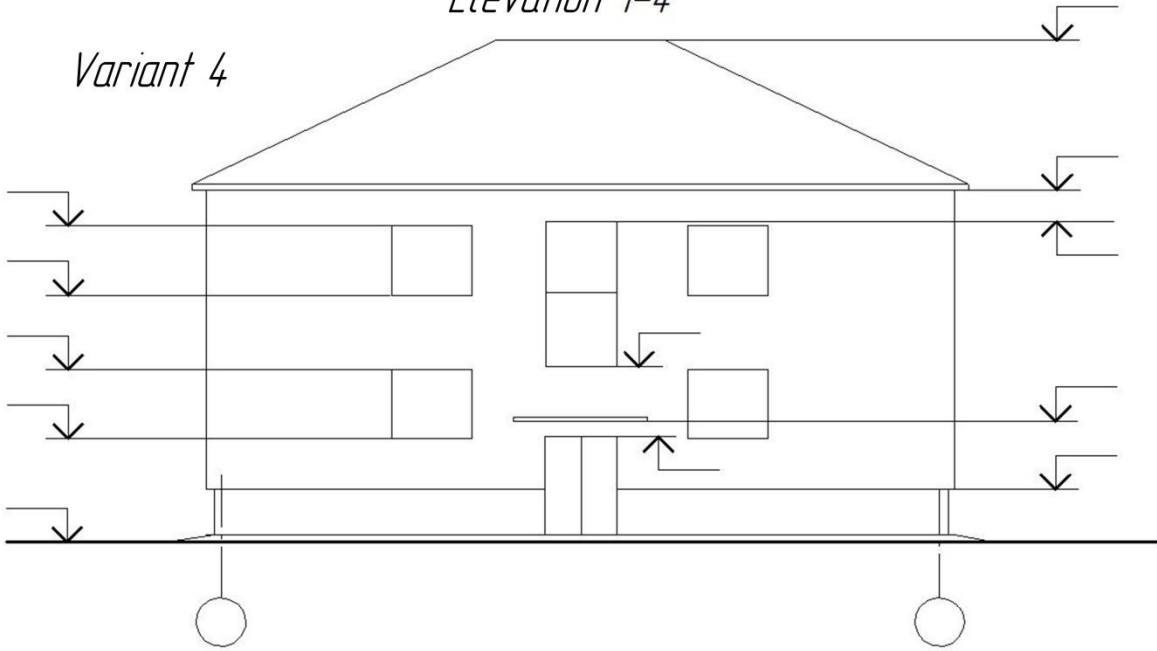
2nd floor plan



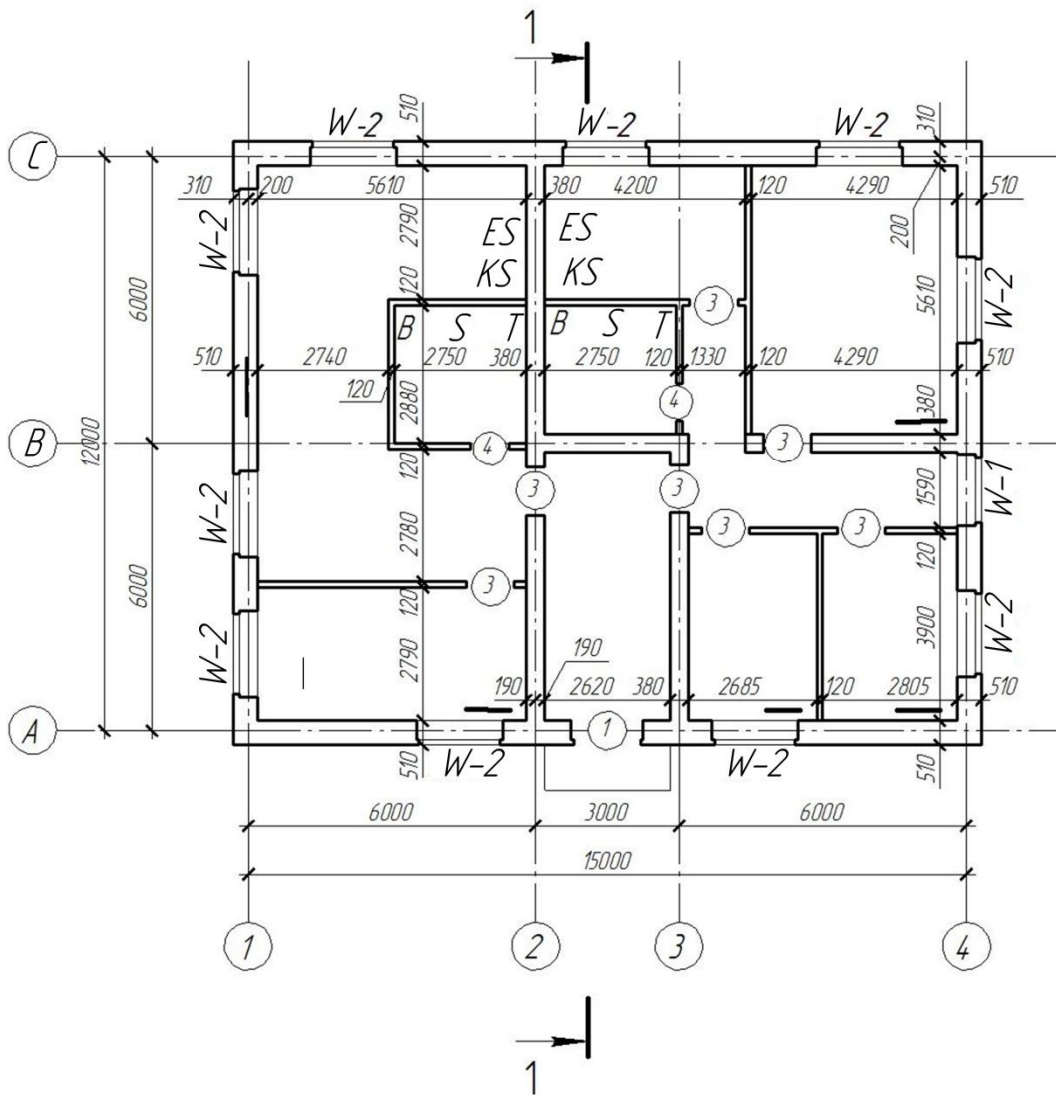


Elevation 1-4

Variant 4

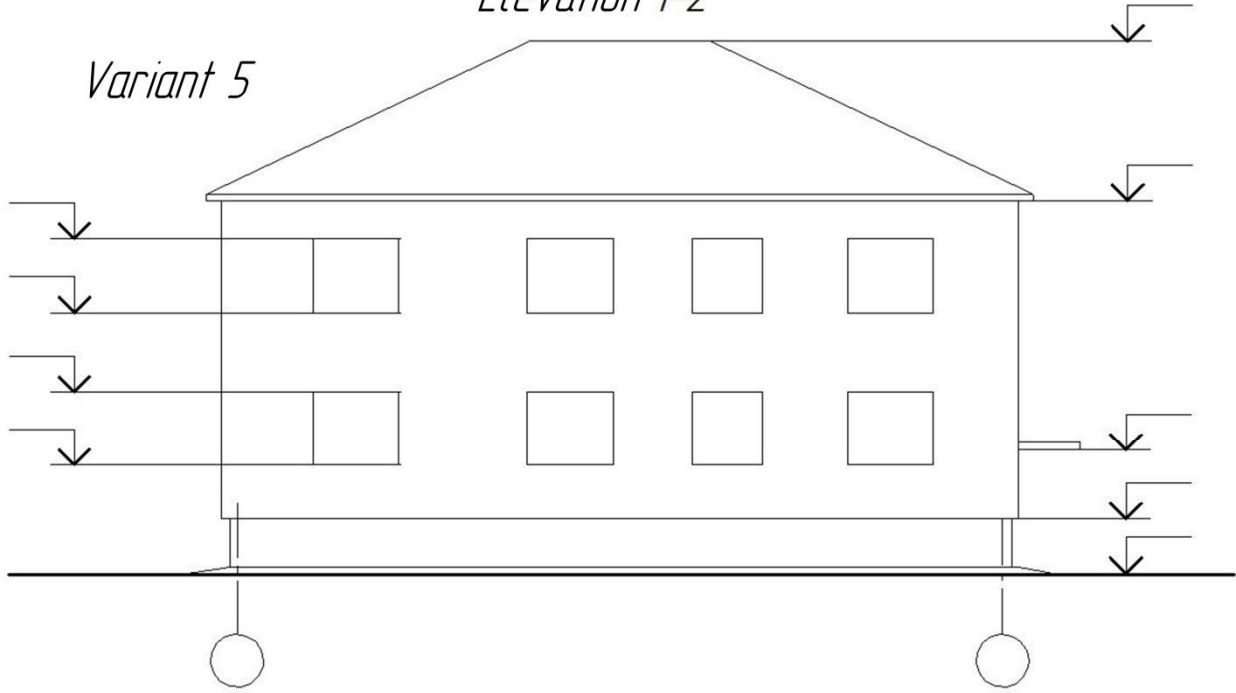


1st floor plan

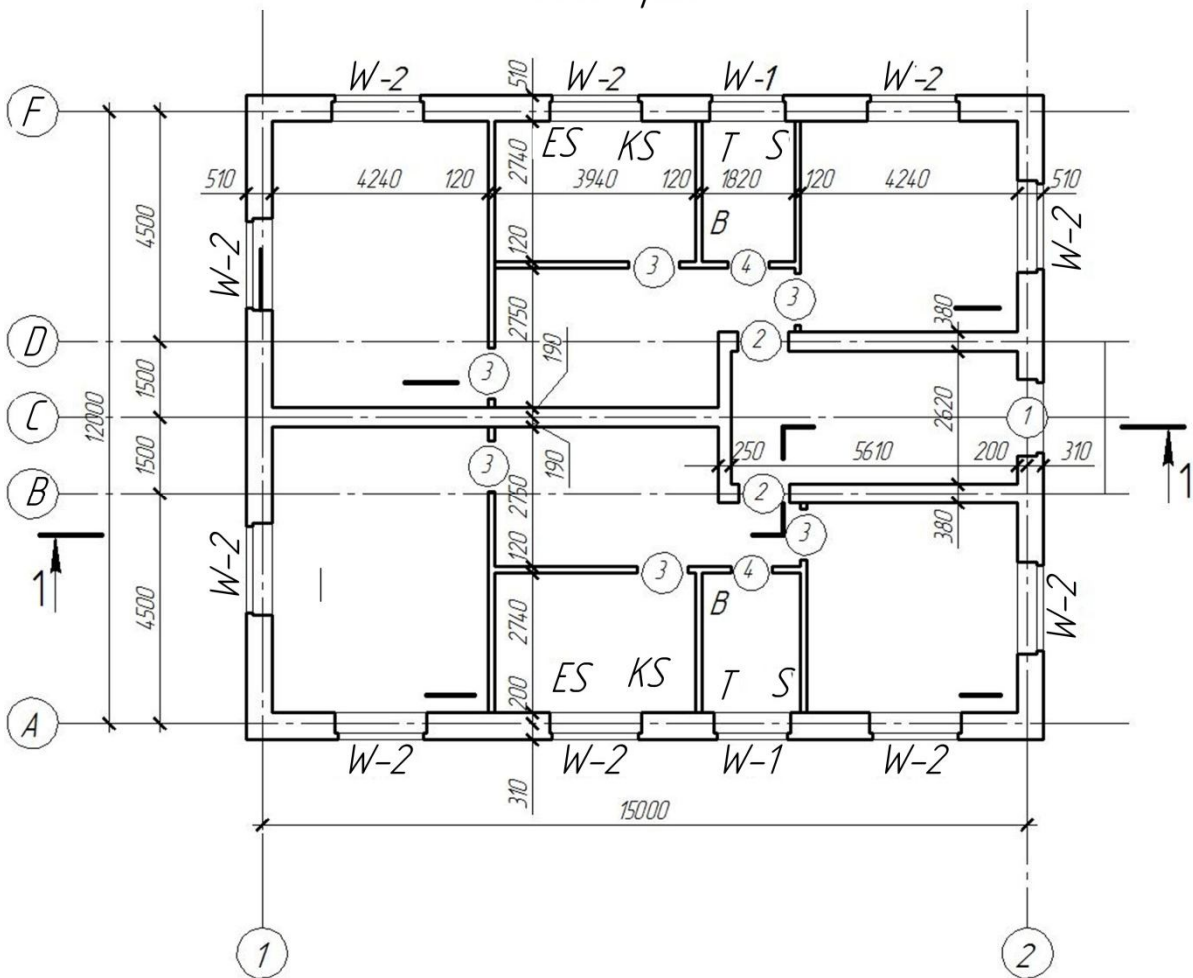


Elevation 1-2

Variant 5

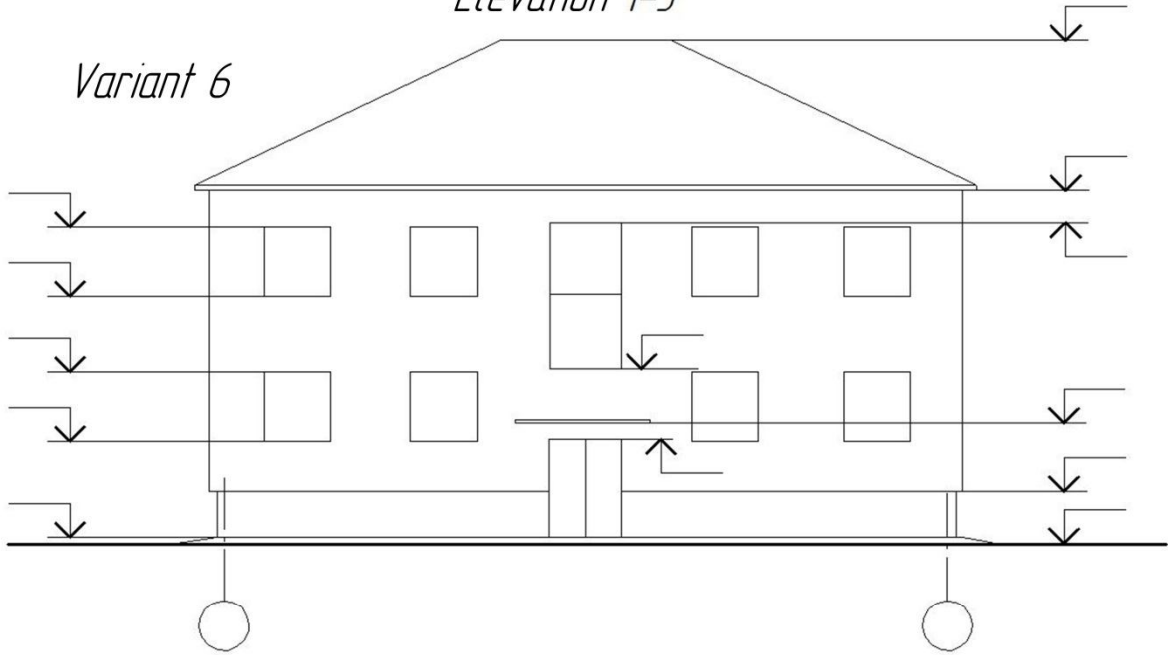


1st floor plan

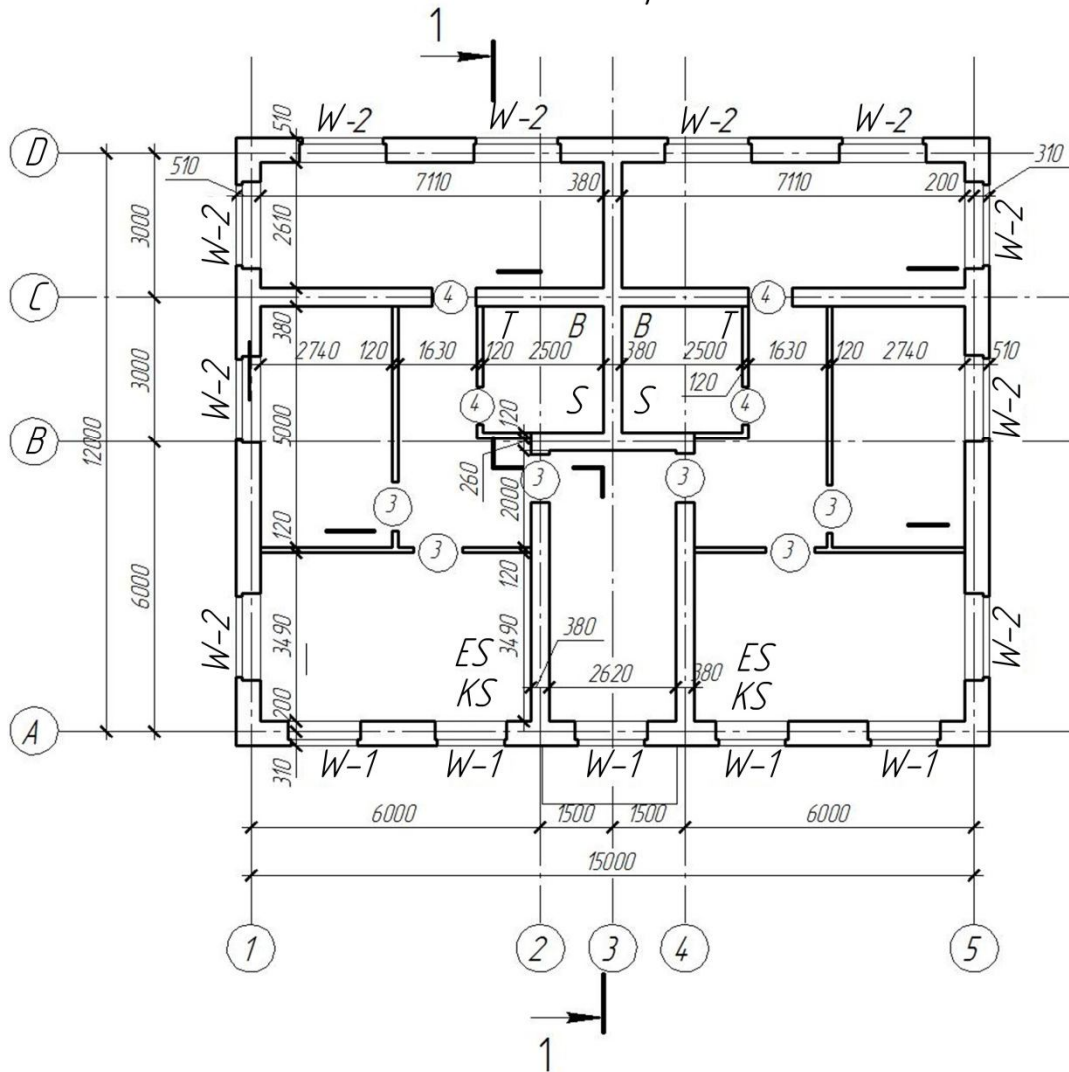


Elevation 1-5

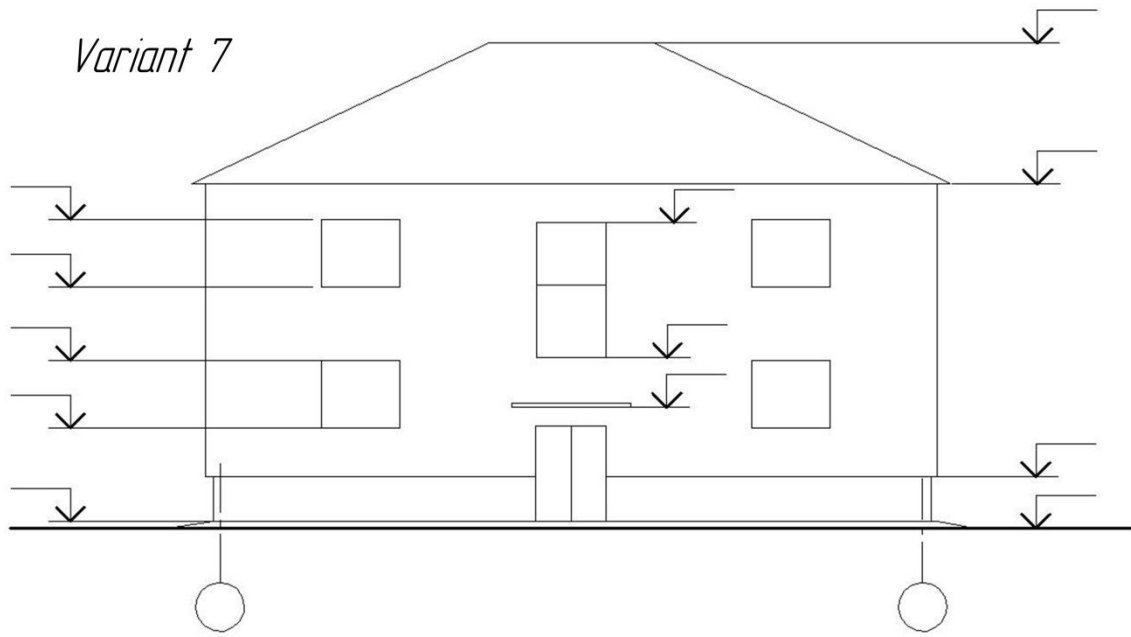
Variant 6



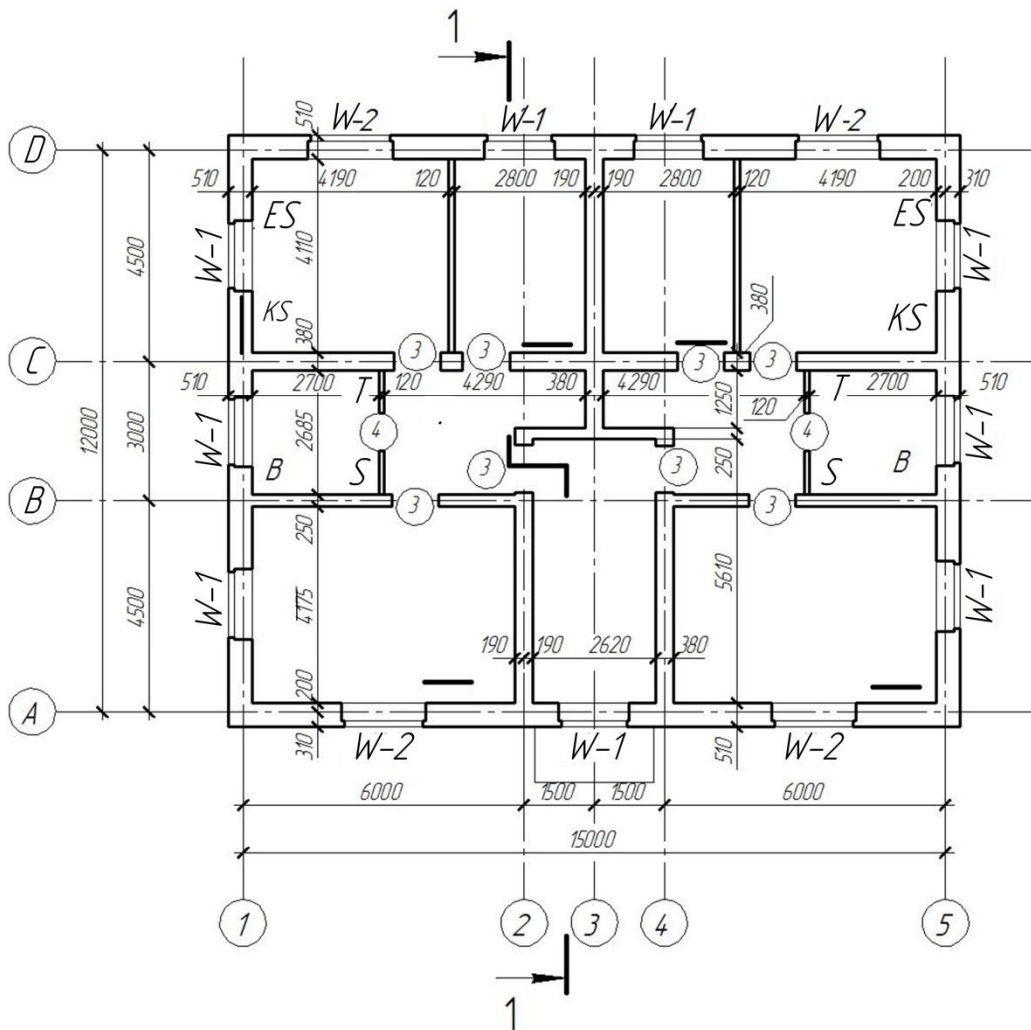
2nd floor plan



Elevation 1-5

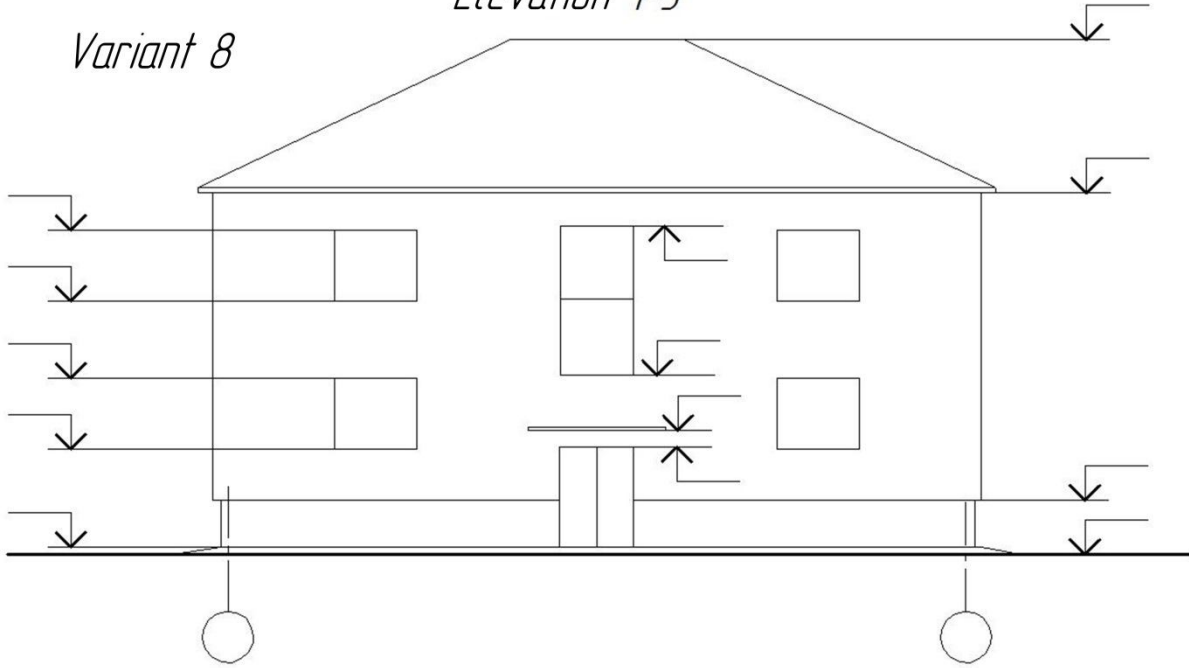


2nd floor plan

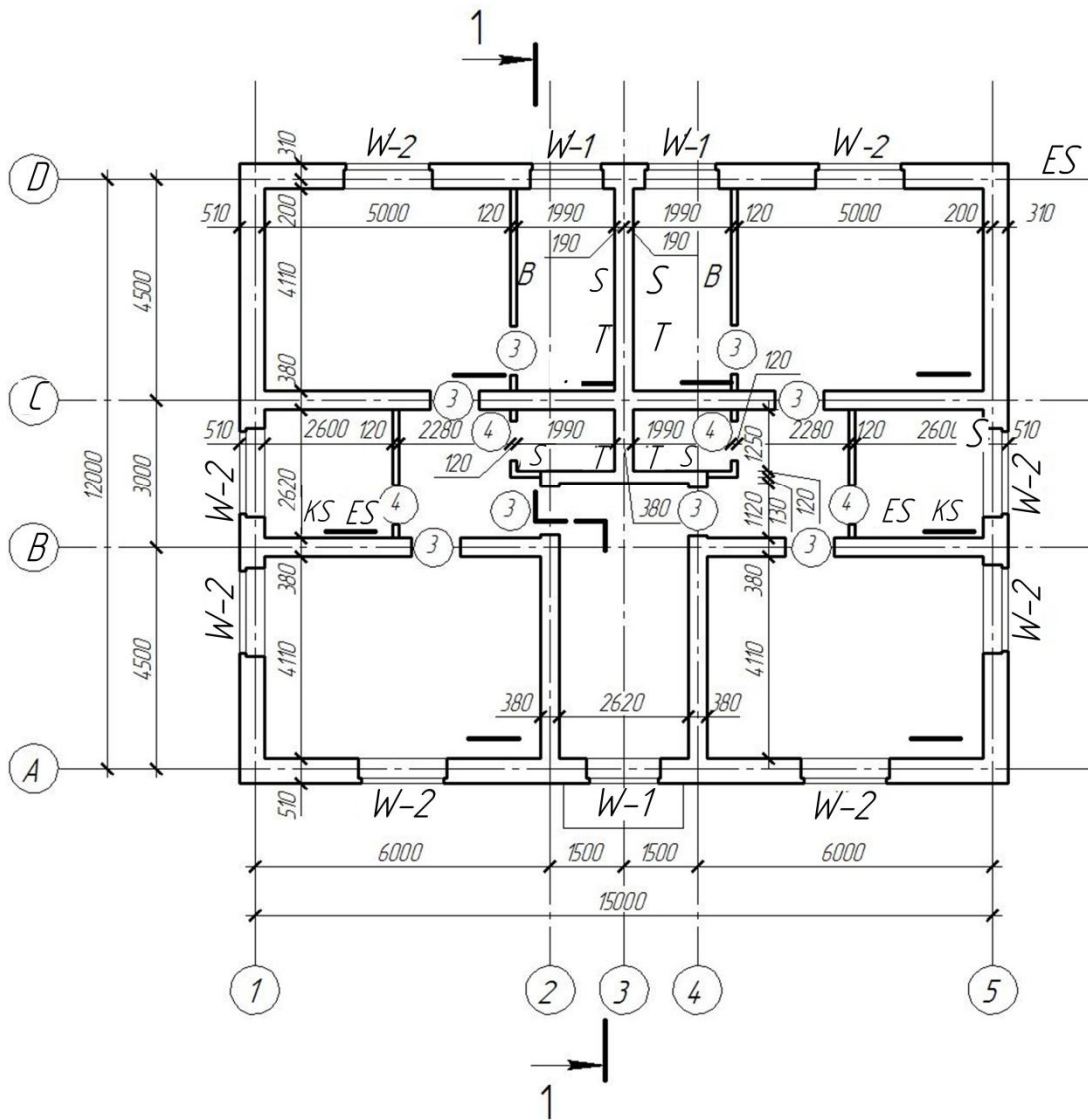


Elevation 1-5

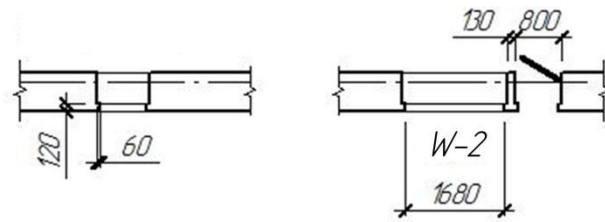
Variant 8



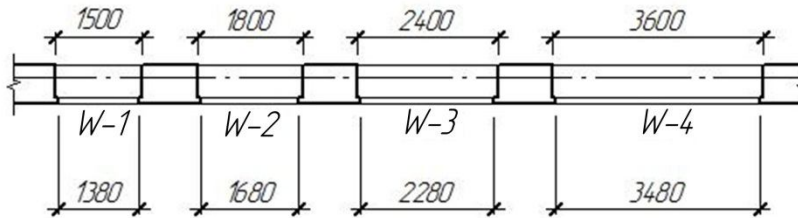
2nd floor plan



Explanation for the task



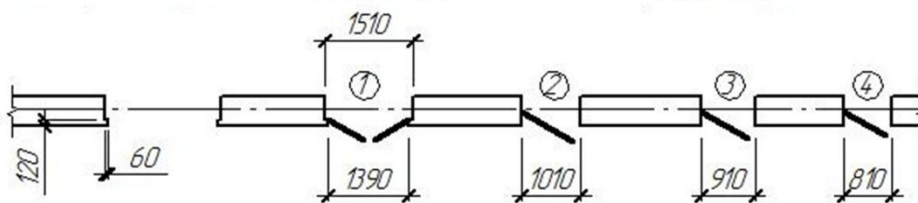
Windows



Doors

Outside door

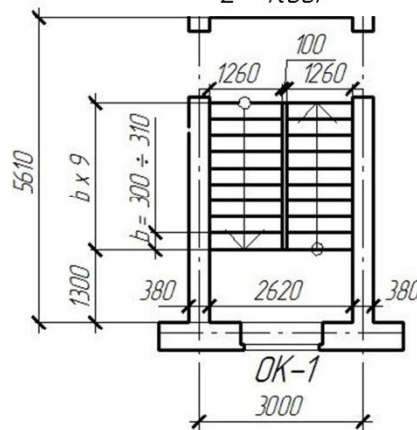
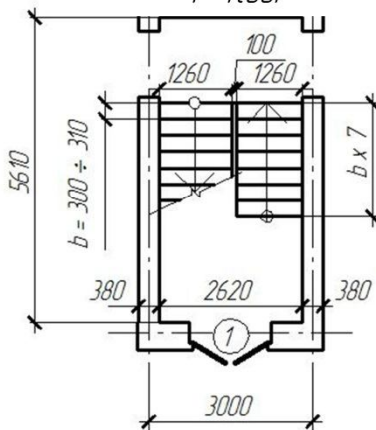
Inner door



Stairs

*Stairs on the
1st floor*

*Stairs on the
2nd floor*



Sanitary-engineering devices

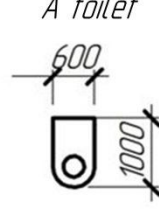
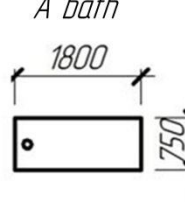
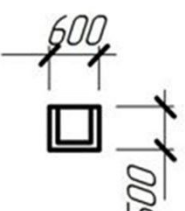
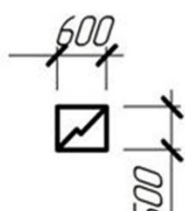
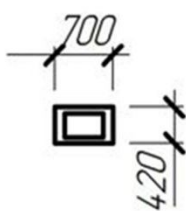
A kitchen sink

An electric stove

A sink

A bath

A toilet



REFERENCES

1. Barletta B. A. The Origins of the Greek Architectural Orders / B. A. Barletta . – Cambridge : Cambridge University Press, 2001. – 220 p.
2. Order architecture [Electronic resource]. – Electronic text data. – Regime of access: <https://www.britannica.com/technology/order-architecture>, free resource (date of the application: 10.01.2021). – Header from the screen.
3. Виньола Д. Б. Правило пяти ордеров архитектуры / Д. Б. Виньола. – М. : Архитектура-С, 2005 – 168 с.
4. Радченко А. О. Основи архітектурної графіки [Електронний ресурс] : навч. посібник / А. О. Радченко, О. Ю. Усачова ; Харків. нац. ун-т міськ. госп-ва. ім. О. М. Бекетова. – Електронні текстові дані. – Харків : ХНУМГ ім. О. М. Бекетова, 2018. – 248 с. – Режим доступу: <https://eprints.kname.edu.ua/48487/1/2017%20%D0%BF%D0%B5%D1%87.8%20%D0%9D%20pdf.pdf>, вільний (дата звернення 10.01.2021). – Назва з екрана.
5. Синебрюхов В. Н. Архитектурные ордера : учеб. пособие [Электронный ресурс] / В. Н. Синебрюхов ; Московский институт инженеров сельскохозяйственного производства имени В. П. Горячкина. – Електронні текстові дані. – М. : МИИСХ им. В. П. Горячкина, 1983. – 68 с. – Режим доступа: <http://koha.kname.edu.ua/cgi-bin/koha/opac-detail.pl?biblionumber=30490>, свободный (дата обращения 10.01.2021). – Название з екрана.
6. ДБН В.2.2-9:2018 Будинки і споруди. Громадські будинки та споруди. [Чинний від 2019-06-01]. – Київ : Міністерство регіонального розвитку, будівництва та житлово-комунального господарства України, 2019. – 43 с.

Виробничо-практичне видання

Методичні рекомендації

до практичної та самостійної роботи
з дисципліни

«АРХІТЕКТУРНЕ ПРОЄКТУВАННЯ»

*(для іноземних студентів першого курсу
денної форми навчання першого (бакалаврського) рівня вищої освіти
спеціальності 191 – Архітектура та містобудування)*

(Англ. мовою)

Укладачі: **ЛЮБЧЕНКО** Марія Анатоліївна,
РАДЧЕНКО Алла Олександрівна

Відповідальний за випуск *М. А. Вотінов*
За авторською редакцією
Комп'ютерний набір *М. А. Любченко*
Комп'ютерне верстання *М. А. Любченко*

План 2020, поз. 61 М.

Підп. до друку 03.03.2021. Формат 60 × 84/16.
Друк на ризографі. Ум. друк. арк. 3,0.
Тираж 50 пр. Зам. № .

Видавець і виготовлювач:
Харківський національний університет
міського господарства імені О. М. Бекетова,
вул. Маршала Бажанова, 17, Харків, 61002.
Електронна адреса: rectorat@kname.edu.ua
Свідоцтво суб'єкта видавничої справи:
ДК № 5328 від 11. 04. 2017.