MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
DNIPRO UNIVERSITY OF TECHNOLOGY

BACHELOR QUALIFICATION THESIS METHODICAL RECOMMENDATIONS

of Bachelors in specialty 192 Construction and Civil Engineering

Dnipro
Dnipro University of Technology
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FACULTY OF CONSTRUCTION
Department of Construction, Geotechnics and Geomechanics

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It is given general methodological recommendations for the implementation of qualification thesis for candidates of the first level of higher education for the specialty 192 – "Building and Civil Engineering", who graduate from the Department of Construction, Geotechnics and Geomechanics of the Dnipro University of Technology.

Responsible for the issue: Head of the Department of Construction, Geotechnics and Geomechanics, Dr. Tech. Sciences, Prof. S.M. Hapieiev.

CONTENT

INTRODUCTION

According to the "Regulation on educational and methodological support of the educational process..." attestation of applicants is carried out by the examination commission in accordance with the requirements of the standard of higher education and the educational program fulfills the curriculum.

The procedure of attestation of bachelors is carried out in accordance with the "Regulations on the organization of attestation of applicants of higher education...".

According to the Regulation the diploma project is a qualification work, the content of which is devoted to the implementation of certain special (professional) competences related to the implementation of design and design tasks and includes a set of technical documentation, which includes drawings and explanatory note.

The composition of the demonstration material (drawings) of qualification work is regulated by the requirements of the current standards and agrees with the head of qualification work.

As an exception, the qualification work can be complex (cathedral, intercafedral, inter-university) and performed by several students.

For bachelor attestation content is focused on diagnostics of the level of theoretical knowledge and practical skills sufficient for the successful performance of professional duties in the specialty.

The main purpose of the qualification work is to demonstrate compliance with the competence**Ошибка! Источник ссылки не найден.** solve engineering problems and further development in professional and social aspects.

In general, taking into account the educational nature of the qualification work and the limited time of its implementation (regulated by the schedule of the educational process), the student on some examples should show knowledge and skills regarding a particular construction object, namely: to read and develop architectural and construction drawings; count and construct elements of bearing structures of buildings, structures or technological equipment; to develop organizational and technological documentation for the implementation of certain types of work and for the construction of the facility as a whole; performing economic calculations; to substantiate measures of labor protection during the implementation of construction and installation works.

A diploma project (qualification work) can be real or educational. Diploma project is considered real in particular for the fulfillment of one of the following conditions:

- results of project developments published or accepted for publication;
- project, carried out at the request of institutions, enterprises, organizations;
- the problem solved in the project can be either a general diploma project or a detailed development of a special issue from certain sections of the project;

- project, which is a share of a comprehensive project, should contain a solution of the actual problem;
- documents confirming its practical use at enterprises, institutions, organizations are added to the project;
- together with the project there are samples of products, materials, layouts, etc., made during the graduation period according to the calculations made in the diploma project.

1. SELECTION AND APPROVAL OF THE TOPIC OF QUALIFICATION WORK. RECOMMENDATIONS FOR COLLECTING SOURCE DATA

The theme of qualification work can be the construction of housing, civil, industrial or agricultural purposes that is designed, being built or already built. In addition to the objects of new construction for development in the diploma project, there can be taken buildings or structures that are being reconstructed or overhauled.

The following list of objects is offered:

a) residential buildings: cottages, low-rise or multi-storey buildings;

b) industrial buildings: single-storey and multi-storey;

c) public buildings;

d) artificial engineering structures: tanks, overpasses, transport galleries, towers, etc.;

When selecting and approving the topic of qualification work, applicants can offer their topic with the appropriate justification for its feasibility. At the same time, the selected topics should be relevant and meet the modern requirements of design and construction practice.

The choice (appointment) of the head of the qualification work, coordination of the topic and the beginning of the qualification work by the student must take place before the production and pre-diploma practice. At this time, a significant part of the work related to clarification and adjustment of the initial data, collection of the necessary material, determination of the volume and labor capacity of work, development of a calendar plan and a construction plan for the construction of the facility, etc. should be carried out.

Initial data in the development of qualification work can serve as:

- tasks for the design of organizations and enterprises in favor of which the diploma project is carried out;
- project of production of works on the construction of the facility;
- sketch project or pre-design work;
- analog projects, if there is no project documentation for the object being developed in the diploma project;
- materials of research and development of specialists in architectural and construction, as well as in organizational and technological fields of construction production, including heads of diplomas.

After choosing and agreeing with the heads of diploma projects (qualification works) the topics are approved by the head of the graduating department / at the meeting of the department with further registration (fixation) by the relevant order on the faculty / university. Changing the topics of diploma projects in the process of diploma (performing qualification work) is prohibited.

The task for the qualification work is drawn up by the head in the established form, signed by the head and student and approved by the head of the department. The task contains basic source data and a calendar schedule for both qualifying work in general and individual sections.

2. COMPOSITION, MAIN SECTIONS AND VOLUME OF QUALIFICATION WORK

Bachelor's degree project (qualification work, thesis) of the specialty 192 Building and civil engineering should consist of an explanatory note of 40-60 pages of A4 format and a graphical part on at least 4 sheets of A1 format – one for each main section. The total number of sheets of the graphical part can be increased when agreed with the supervisor.

The main sections of qualification work include architectural and construction, calculation and design, organizational and technological, and equipment and economic parts.

Issues of life safety and occupational safety, prevention of emergencies, environmental protection, etc. should be reflected in the organizational and technological part, and their volume and degree of disclosure is determined by the supervisor and agrees with the relevant consultant (section supervisor) if available.

Text of the qualification work should be divided into the introductory part, the main part and annexes.

In general, the introductory part should contain the following structural elements: title sheet, tasks for the qualification work (issued by the supervisor), abstract, table of contents, abbreviations and conditional marks (if any).

The main part contains structural elements: introduction, content part, conclusions, list of reference sources, which are drawn up in accordance with the current standards.

The recommended composition of the qualification work and distribution of material is shown in Table 2.1.

Table 2.1 – Recommended structure and composition of qualification work

№	Name of parts of qualification work	Distribution Rules	
		A1 drawing, number of sheets (not less)	Explanatory note, number of pages (not less)
1.	Cover sheet	–	–
2.	Tasks for qualification work	–	–

№	Name of parts of qualification work	Distribution Rules	
		A1 drawing, number of sheets (not less)	Explanatory note, number of pages (not less)
3.	Abstract	–	1
4.	Content	–	–
5.	Introduction	–	2
6.	Architectural and construction section with a mandatory conclusion by section	1	10
7.	Calculation and design section with a mandatory conclusion by section	1	10
8.	Organizational and technological section with a mandatory conclusion by section	1	10
9.	Equipment and economic section with a mandatory conclusion by section	1	5
10.	General conclusions	–	1
11.	List of reference sources	–	1
12.	Annexes	–	–
13.	Review	–	–
14.	Supervisor's response	–	–
	Total	4	40

Annexes contain information that complements or includes the text of qualifying work, including materials that cannot be consistently placed in the main part due to the high volume or methods of reproduction. Annexes are placed in the order of references to them in the text.

These materials must be stored together with the text of qualification work. Drawing up of materials of such qualification works is carried out exclusively according to Regulations, taking into account the possibilities of text computer editors.

3. RECOMMENDATIONS FOR THE IMPLEMENTATION OF THE MAIN SECTIONS OF QUALIFICATION WORK

3.1. Architectural and construction section

In general, (the content and degree of work is agreed with the manager) in this section on the basis of the specified schemes and initial data it is necessary to design the building in accordance with the modular coordination of sizes in construction, the

main provisions on the unification of structures, existing normative documents in construction (Annex A) with the wide use of existing typical structures, parts, modern architecture.

The calculation and explanatory note of the architectural and construction section should consist of the following subdivisions:

1. Initial data – a brief description of the specific conditions of the place of binding of the object (functional purpose of the projected building; place of construction and its characteristics; climatic construction area; the characteristics of the construction site).
2. Volumetric and planning solution of the building.
3. Architectural and constructive solution of the building.

As part of the subdivision "Volumetric and planning solution..." calculated the following engineering and economic indicators: building area, (m^2), construction volume, (m^3); total area, (m^2); residential area, (m^2) - for residential properties.

The graphical part of the architectural and construction section should consist of the following projections:

1. Plan of the building on the mark 0.000 (in one of the standard scales).

For residential buildings, a plan for a typical floor is also executed.

For public buildings – additionally one characteristic plan above the floor.

2. Cross section on the stairwell (in one of the standard scales).

3. The most characteristic facade of the building (main or side). The scale is taking depending on the scale of the building plan for the mark 0.000.

4. Roof plan as needed (in one of the standard scales).

Projections are recommended to be distributed on drawing sheets as follows:

- plan of the building for the mark 0.000, the plan of a typical floor for a residential building or characteristic plan for a public building and facade;
- cross section of the building, roof plan.

If the house is symmetrical it is allowed to carry out compatible plans of the first and typical or characteristic floors.

Drawings of projections are carried out with mandatory parallel binding and approval of these projections with each other.

Depending on the nature and dimensions of designed building it is possible another distribution of the projections on the sheets with the permission of consultant on architectural and structural section of the project, namely: it is possible place all projections on one sheet A1 format with the preservation of the main projections and approved by regulatory documents of scale.

3.2. Calculation and design section

This section, in consultation with the supervisor, may include the following elements:

- reinforced concrete and stone structures;
- metal and wooden structures;
- bases and foundations;
- other constructs.

The option, volume and degree of work and disclosure of the constructive part is approved by the supervisor of the qualification work.

3.2.1. Reinforced concrete and stone structures

In the presence of the corresponding task from the head the student performs: calculation and design of reinforced concrete monolithic or prefabricated supporting element (column of the building, plate of the unceasing ceiling; staircases and platforms; multi-hollow slab; truss structures (beam, farm, etc.); coating plates; crane beams, etc.).

When performing a section, the student must:

- perform the choice of design scheme of construction;
- perform the collection of loads and distribution of them on the design scheme;
- perform a static calculation of the design (estimated effort);
- perform calculation on the first group of boundary states of structural elements (normal and inclined cross section).

The graphical part should contain:

- general design scheme (formwork drawing);
- reinforcement schemes and construction units;
- reinforcing products (main mesh, frames and laying parts);
- reinforcement specification, group specification;
- information about the details and costs of materials, necessary notes.

3.2.2. Metal and wooden structures

In the presence of the corresponding task from the head the student performs: a static calculation (a calculated scheme of construction is drawn up, load collection is performed, internal efforts are determined, a type of strained and deformed state is established); a constructive calculation (cross sections are composed, geometrical and calculated characteristics are defined, checks on the first and second boundary conditions are carried out).

For traditional objects, which are solved in the form of steel or wooden frames, it is necessary to present the installation scheme of the building, which includes schemes of connections regarding the structures of coatings and walls (columns). For structures, especially shell type, it is recommended to provide plans, cross-sections, views, etc., which will allow to imagine a constructive solution to the projected building.

For the design, which is calculated in this section, it is necessary to present working drawings.

3.2.3. Bases and foundations

If there is a corresponding task from the supervisor, the student performs:

- analysis of engineering and geological conditions of the construction site, determination of the full name of soils, determination of soils that can be used as bases, construction of engineering and geological section or column;
- based on the analysis of engineering and geological conditions, the type of foundations of the projected building is determined;
- load collection;
- calculation of the chosen type of foundation for the first and second groups of boundary states.

For shallow foundations are determined the dimensions of the base of the foundation, checking the marginal pressures, checking the strength of the underlying soil layer (if necessary), determining subsidence, calculating the foundation for pushing, determining the cross sections of the slab reinforcement and foundation column.

For pile foundations student performs determination of pile length, method of arrangement, determination of bearing capacity of piles, placement of piles in grid, checking, determination of pile foundation subsidence.

For slab foundations calculation is carried out with the help of software complexes.

The graphic part should contain: the scheme of an arrangement of the foundations; engineering geological cross-section or column; formwork drawing of the foundation structure; reinforcing products (grids, frames); specification; necessary notes.

3.3. **Organizational and technological section**

This section provides for the development of optimal options for organization or construction technology, which should provide the maximum economic effect possible

in a particular case and further development of a technological map for the adopted variant of technology and organization of a complex process.

This section should highlight the following subsections:

1. Main provisions on preparation of construction of the facility (preparatory work). In the same subdivision, an analysis of the conditions of construction should be carried out – an assessment of the climatic, hydrogeological conditions of the construction site is given; its links to external connection paths; the presence of factors influencing the limitations of the zones of action of mechanisms; sources of supply by water, energy resources and material resources; specific construction conditions, etc. (if these aspects were not reflected in the previous sections).

2. Selection and justification of organizational and technological scheme of construction (Main works). In this subdivision, it is necessary to choose and describe ways of performing work on all stages of construction of the projected object, ranging from preparatory work (site planning) to finishing works and landscaping. Each set of works, the result of which is an intermediate finished construction product (excavated pit, pile field, foundations, building box, roof, etc.) must be worked out. For each complex it is necessary to substantiate the methods of work, select traction and auxiliary mechanisms, contractors and briefly describe the technology of work, including labor protection, environmental protection, develop measures to reduce the duration of construction. When describing the sets of works for which technological maps are developed, give a link to the relevant pages of the explanatory note and the number of sheets with technological maps.

3. Statement of the scope of work.

4. Methods of work (description with possible options for one of the complex processes).

5. Technological map developed for the adopted version of the complex process in accordance with current requirements. As a rule, technological maps are developed for zero-cycle works, for the construction of a building box, ie for complex construction processes. In this case, several technological maps are developed for one construction process. For example, the work of the zero cycle is independent, but interconnected, so technological maps can be developed for the passage of the pit, the device of the pile foundation and the construction of the foundation slab. At the request of the applicant or at the request of the enterprise technological maps for the device of a roof, floors, for any kind of finishing works and so on can be developed. The composition of the technological map must meet the current requirements and contain the following sections: scope; organization and technology of works; requirements for the quality of work; the need for material and technical resources; safety and labor protection; environment protection; technical and economic indicators. Substantiation of decisions laid down in the technological map is given in the explanatory note to the

qualification work, and the technological map itself is made in the form of graphic material.

6. Calendar construction schedule.

7. Construction master plan adopted as a standard or developed by traditional methods as a general plan of the construction site in accordance with the general plan of the object.

3.4. Economic part

The economic part is performed as a section "Economics of construction". This section should contain calculations of local, object estimates and resource information to them for general construction work and determination of the consolidated estimated cost of the object.

In the economic part, the applicant should also give an economic assessment of the decisions taken in the architectural, construction, design and organizational and technological parts of the project, develop measures to reduce the duration of construction, as well as perform the calculation of the economic effect due to these measures. The resulting technology and economic indicators in the tabular form are submitted to one of the sheets of the graphical part.

4. ORGANIZATION OF WORK ON THE DIPLOMA PROJECT AND ITS PRESENTATION TO THE STATE EXAMINATION COMMISSION

Issues of general order, as well as fundamental decisions by sections of the project, the applicant agrees with his supervisor. The applicant must understand that he alone is personally responsible for the correctness, diligence and depth of processing of all parts of the qualification work.

If necessary, to provide advisory assistance in the development of individual sections (parts) of the qualification work (as an example in writing the economic part, labor protection, etc.) from graduate or related departments are allocated teachers-consultants.

When performing any calculations, the student should focus on the maximum possible use of CAD, which is available at the graduating department at the time of industrial and undergraduate practice and graduation.

The qualification work should be carried out according to the calendar schedule of work, which is in the task for the diploma project.

Within the terms established by the calendar schedule, the student is obliged to report to the supervisor of the qualification work on the degree of readiness and the volume of performance of his work or its stages (sections).

In order to control the students' writing of qualification work at the department, a systematic check of the measure of readiness of the qualification work of each student is carried out. The supervisor records the degree of readiness of work as a percentage of the total volume of the project and reports to the head of the department.

Before submitting the qualifying work for the defense, the applicant prepares a report and relevant demonstration material, which should reveal in a concise form all the main aspects of the work. The applicant is given no more than 10 minutes to report on the content of the qualification work to the members of the state examination commission.

The contents of the report and the sequence of its teaching must correspond to the technological sequence of work on the diploma project. In the same sequence, drawings that act as demonstration material should be presented during the presentation of the report.

The contents of the report and demonstration material must be agreed with the supervisor of the qualification work.

The report on the defense of the qualification work should not be limited to listing what has been done in one or another part of the project. In the report it is important: to substantiate the decisions made; to focus on the features of the designed object, the specifics of special conditions of its construction, the use of new materials, the use of advanced technologies, new methods of work and labor, as well as technical and economic indicators, to disclose the research part of the project (if available).

Admission to the defense of the qualification work approved by the head is the successful passage of plagiarism, regulatory control and review, in accordance with the “Regulations on the organization of certification of higher education” and “Regulations of NTU" DP "on the system of prevention and detection of plagiarism”.

Educational edition

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