

Interdisciplinary Diploma - Project in “Civil Engineering”

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Recommendations, defining the scope of graduate qualification papers on organizational-engineering issues within the framework of interdisciplinary diploma-project “Civil Engineering,” were designed on the basis of diploma-project assessment of Specialists and Bachelor students in “Civil Engineering.” Specifications of time scheduling and their reference data have been determined.

Key words: building, organizational-technological documentation, calendar planning, diploma projecting, interdisciplinary project.

The existing education standards [1, 2] specify high competent requirements for the qualification level of engineers (specialists) and Bachelors in “Civil Engineering.” The first level of the 2-tier higher professional education system involves the Bachelor qualification in accordance to the Standards [2], identifying (in comparison with engineer qualification) the reduction of:

- total study time;
- in-class learning hours to total discipline hours, including core professional course hours. In this case, the SSD (self-study development) hours are increased including the performance of tests, calculation in graphics, term papers, term projects and final qualification project (FQP).

Based on experience synthesis and analysis of leading civil engineering institutes (Moscow State University Civil Engineering- MSUCE, St. Petersburg State University of Architecture & Civil Engineering- SPSUACE) and other institutes and departments (including Northern (Arctic) Federal University) the problem - to improve the graduate qualification level- was designated. This furthers the possible performance of self-development assignments on a tight schedule at previously required SSD hours.

This is currently important in implementing final qualification projects (FQP) (diploma-projects) where the performance period for specialists is 16 weeks, while for Bachelors-10 weeks. However, the FQP content is insignificantly reduced as the project itself insignificantly such specific coherently integrated sections as architecture, engineering and organizational-technological elements, as well as other types of project development. The problem solution could be not the FQP content reduction itself, but designing guidelines and reference data which would decrease the effort intensity in performing the FQP by means of consolidated indices. Such indices could be relevant R&D projects of administering departments in collaboration with leading regional project (design) and construction organizations.

There are five administering departments in the Architecture and Civil Engineering Institute of Northern (Arctic) Federal University n.a. M.V. Lomonosov: Engineering Geology, Bases and Foundations (EGB&F), Engineering Constructions and Architecture (EC&A), Construction Operations (Technology) (CO), Highway Department (HD), Chemistry and Ecology in Construction



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(C&EC). Highly-qualified specialists and Bachelors of different professional domains and profiles in Civil Engineering have graduated from this Institute.

Traditionally, FQP is considered to be an interdisciplinary diploma-project within the framework of three basically interrelated departments (EG B&F, EC&A and CO). Final qualification projects in Highway Department and C&EC significantly differ from those in other departments, thus, these departments were not included (Table 1).

Three major sections (architecture, engineering and organizational-technological) are included in the interdisciplinary diploma-project [3, 4]),i.e. relevant to the administering departments. The content scope of each section directly depends on:

- selected department where this or that FQP will be executed;

- speciality (professional domain) or profile;
- approved final qualification project topic;
- project development task;
- reference data for specific tasks.

There are three major sections in the interdisciplinary diploma-project where the most difficult one is considered to be the organizational-technological, especially the calendar planning (CP) which is executed within the framework of Construction Operation (Technology) Department.

Organizational process design (OPD) within the interdisciplinary diploma-project is rather time-consuming due to the fact of calculating the overall quantity of work, as well as determining the labour requirements of working and computer time

Table. 1. Basic FQP Content Characteristic Features in Organizing Constructuion Operations (technology).

| Speciality / profile | Administering department | Content scope % | Designed Common Technical Document (CTD) | | |
|--|--------------------------|-----------------|--|--|--------------------------------------|
| | | | Type | Detail level of calendar plan | Reference data |
| Specialist Degree | | | | | |
| Industrial and Civil Engineering (ICE) | EGB&F | 10...12 | PEP | Activity summary | Consolidated indices / or comparable |
| | EC&A | | | Work activities | |
| Expertise and Property Management (EPM) | CO (T) | 20...25 | CMP (construction management plan) | Construction stages (activity summary) | Project design |
| Building Design (BD) | EC&A | 17...20 | | Consolidated indices / or comparable | |
| Bachelor degree | | | | | |
| Industrial and Civil Engineering (ICE) | EC&A | 10...12 | PEP | Activity summary | Consolidated indices / or comparable |
| | CO (T) | 20...25 | | Work activities | |
| Expertise and Property Management (EPM) | CO (T) | 17...20 | CMP | Construction stages (activity summary) | Project design |
| Structural Engineering (SE) | EC&A | 10...12 | | | Consolidated indices / or comparable |
| Construction in North Climatic Conditions (CNCC) | EGB&F | 10...12 | PEP | Activity summary | Consolidated indices / or comparable |
| Underground Constructions, Bases and Foundations(UCBF) | | | | | |

to develop database sources for designing the calendar plan itself. Different organizational – technological (design) documentation (OTD) of calendar plans [5- p. 41] have various detail levels which depend on the following:

- site improvements (construction engineering);
- hierarchy level where the OPD type is considered;
- stated objectives and targets of OPD;
- specialization (profile) of construction and assembly organization (CAO);
- designers' and users' competence in documentation development.

Earlier, to develop construction management plans (CMP) consolidated requirement norms of different resources (for example, 1 million rub. estimated cost of construction-assembly operations) existed and were widely used in different sectors. Today, as such a system has not been updated its application is becoming more and more complicated. As a result, students experience distinct difficulty in performing self-development assignments and / or final qualification projects as they do not have the possibility to look through the overall engineering design package. In this case, developing skills in calculating the overall quantity of work is important for different disciplines (construction technology and others; organization, management and planning, etc.).

This could be an advantage, however, providing that within interdisciplinary self-development activities once obtained results in one discipline become the reference data for another discipline, and then alternatively it involves the following:

1) performance of self-development activities is deferred due to the compulsory repetitive calculations, as each discipline itself includes its individually specific construction sites and their elements, and these calculations could be identical;

2) new knowledge acquisition is

retarded as this knowledge becomes "invisible" in the enormous "run-over" of time-consuming calculations.

The above-mentioned issues are currently very important in performing interdisciplinary diploma-projects. As the diversity of OTD is significant and the detail level of the project is different within each specific stage of civil engineering [5, p. 41], then the following aspects should be formulated:

- content scope of relevant final qualification project section;
- type of designed OTD;
- detail level of specific documents;
- possible application of consolidated comparable indices determined within the framework of R&D projects executed in the Department of Construction Operations (Technology) and other similar leading university departments.

On the basis of all the above-stated and review of existing long-term experience in progress of tutorial of diploma-projects, the organizational framework of the FQP, including different specialities and profiles, as well as those being executed in various administering departments, was systematized (Table 1).

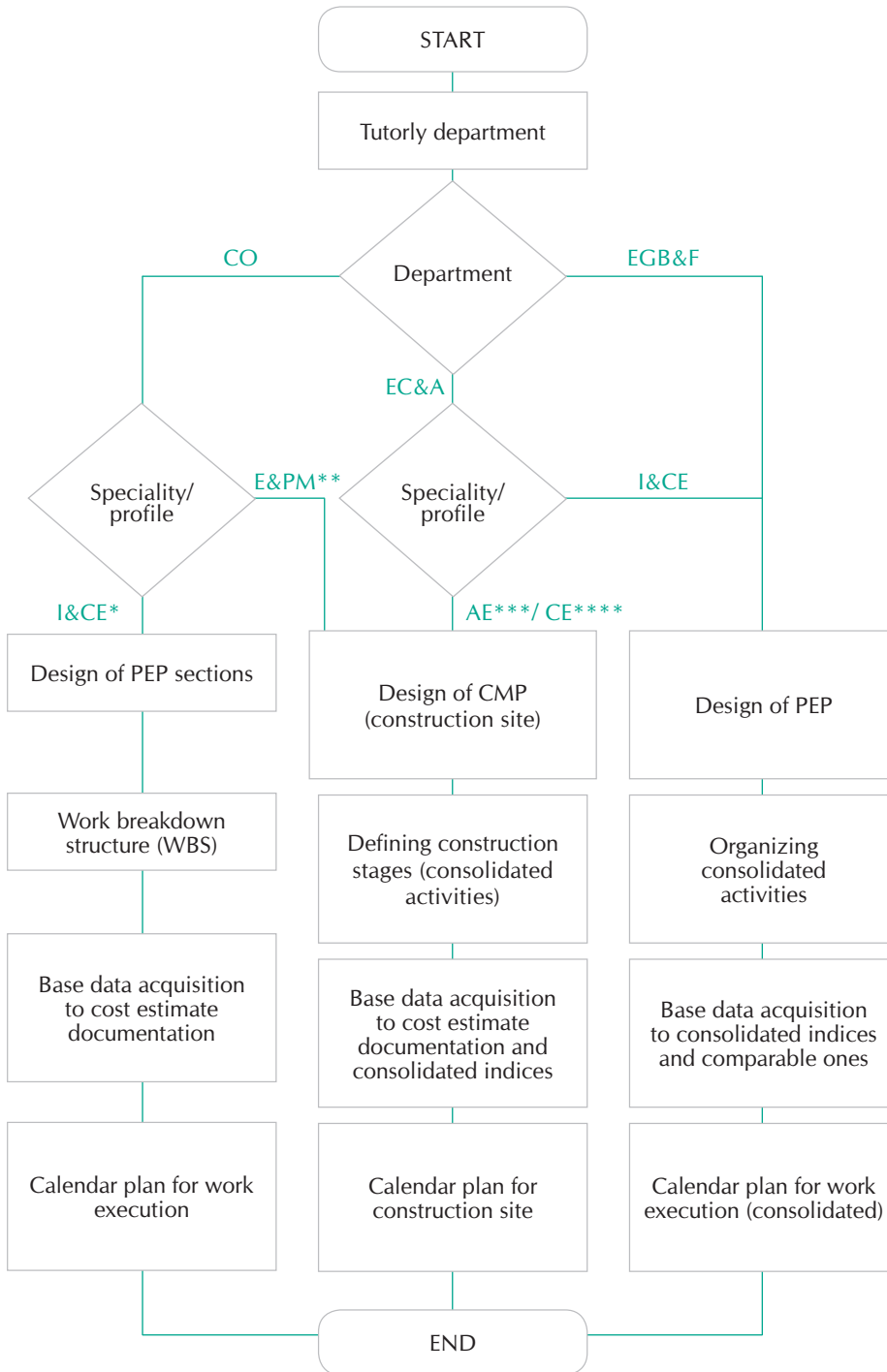
The calendar plan can be considered as the fundamental document, as it is included in the OTD designed at different stages of OPD:

- construction site calendar plan [6, p. 16] within the construction management plan (CMP);
- consolidated calendar plan within activity management plan (AMP) and/or detailed project execution plan (PEP) plus specified activity summary;
- calendar plan of construction project [7, p. 9] included in PEP.

The following flow diagram of OTD type selection and its specification clearly illustrate the calendar plan classification (Fig. 1).

These methodological approaches are only suggestive and can vary in the

Fig. 1. Flow Diagram of OTD type Selection and its Specification.



* I&CE- Industrial and Civil Engineering
 ** E*PM-Expertise and Property Management
 *** AE- Architectural Engineering
 ****CE- Civil Engineering

context of relevant substantiation and this, in its turn, depends on such factors as project targets, availability of base data, specification and standards and other necessary information. Customer demands in this or that project can also be taken into account which would be executed within the framework of R&D activities of relevant department.

The application of suggested recommendations could improve the quality of final qualification projects due to the decreased time-consuming data base search for the organizational framework of the interdisciplinary diploma-project, and, as a result, released time could be used for a more detailed study of the

profile section included in the FQP.

The above-mentioned facts are of significant importance in enhancing engineering education, improving its quality level and solving those current questions arising during the execution of interdisciplinary diploma-projects in construction institutions (institutes and departments). Suggested recommendations could be instructive for students and FQP tutors of different specialities and profiles and could be included in advanced training and continuing education courses.

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