

# Application of Multimode Teaching Method in Water Supply and Drainage Course Teaching Against the Background of “New Engineering Course”

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**Abstract.** New requirements, under the background of new engineering, are put forward for talents training mode and course teaching reform, and the teaching reform on specialized courses is an important link for talents training. The paper, combining with teaching management practice, analyzed and discussed the application of multimode teaching method in water supply and drainage major course teaching.

**Keywords:** Multimode teaching method; Engineering specifications; Extracurricular teaching.

## 1. Introduction

On February 18, 2017, the Ministry of Education held a higher engineering education development strategy seminar in Fudan University. The attending colleges and universities launched a heated discussion on the cultivation of engineering talents in the new era, and jointly discussed the connotation and characteristics of new engineering course and the path selection on new engineering construction and development [1]. In the mid-term, research and practice should be implemented centering on a series of contents including the new concept of engineering education, the new structure of discipline and specialty, the new mode of talent cultivation, the new quality of education teaching and the new system of classified development. It indicated the direction for teaching reform of engineering majors. The major orientation of water supply and drainage science and engineering is generally divided into water supply engineering, drainage engineering, and building water supply and sewerage. Of which the main purpose is to train students' professional abilities and basic scientific research ability in water supply and drainage engineering design, management, and operation and maintenance. Under the background of new engineering course construction, the writer believes that the reform on specialty course teaching should be strengthened from the following aspects.

## 2. Application of Multimode Teaching Method

### 2.1 Closely Connection Among Theoretic Teaching, Engineering Specifications and Engineering Practice

The ultimate purpose of engineering major training is to solve practical engineering problems with technically feasible and economically reasonable methods. Taking building water supply and sewerage as an example, the course is an important major orientation for water supply and drainage, mainly including the contents of building water supply, water draining, hot water, fire control, rainwater, special waterscape, etc. Regarding practical design, there are many national regulations involved, and the assessment content score of such course accounts for 40% in the examination of national registered equipment public engineers. In the process of theoretic teaching, the main teaching contents of the course cover Code for Design of Building Water Supply and Drainage. However, it is difficult to fully present the design content of water supply and drainage of high-rise buildings in the form of PPT + blackboard writing. Taking the wet automatic fire-extinguishing sprinkler system as an example, students have less contact with the fire linkage control, as a result, makes it's hard for them to understand. Only relying on the explanation of textbook, the effects are not so obvious. As shown in Figure 1, it is the schematic diagram of wet automatic fire-extinguishing sprinkler system. During the course teaching, students have difficulties in understanding the principle of fire linkage

control of various components, such as fire pump, water flow indicator, wet alarm valve group, and sprinkle-nozzle. The introduction of this part in the textbook is just partial content extracted from the specifications. In order to better teach the content of this part, it is suggested that, taking the actual engineering project as the object, to carry out the explanation based on specifications, allowing the students to clearly understand that what is the whole design process and how to use the specifications, to lay the foundation for the later course design and graduation project.

## 2.2 Integration of New Professional Software into the Classroom.

With the constant development of computer technology, the functionality of professional software is becoming more and more abundant. In view of the hot topics on current design, relevant software including the popular BIM and Sponge City emerge at the right moment. Let's take Revit-MEP, the mainstream BIM software in the market, as an example to teach how to integrate professional software into the course. In the teaching process of building water supply and drainage courses, traditional CAD drawings can only teach the layout of pipelines from the plan and system drawing.

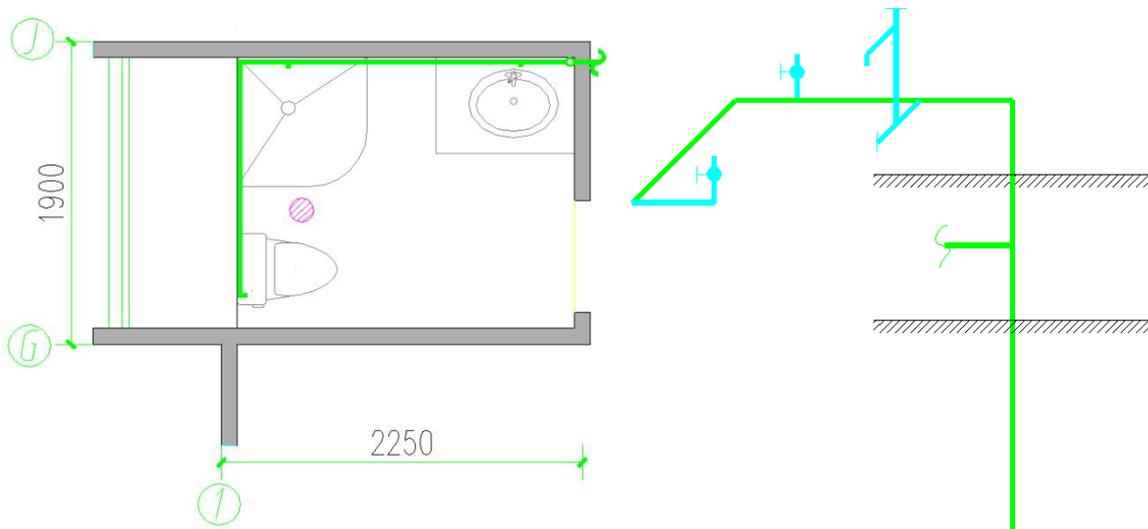


Fig. 1 The floor plan and system drawing of a certain building restroom respectively、

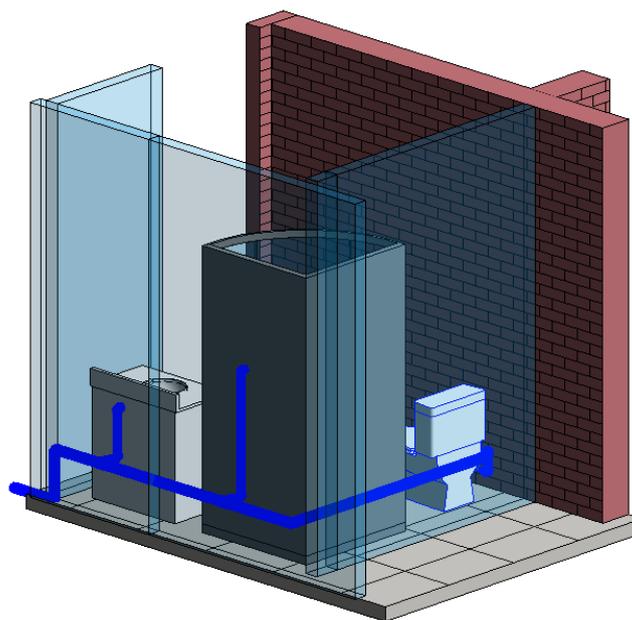


Fig. 2 MEP model of water supply pipeline

Figure 1 is the floor plan and system drawing of a certain building restroom respectively. Such kind of diagram is not intuitive, and the combination of both is needed to clearly understand the layout and direction of pipelines. In the process of course teaching, Revit-MEP is adopted to redraw the layout as Figure 2. It is available to observe the pipeline connection collision from multiple perspectives in a dynamic manner, in addition, which sets a reasonable roaming path to enter the building for observation, enabling a more efficient understanding on pipeline layout and improving the teaching efficiency.

### 2.3 Implementation of Extracurricular Teaching



Fig. 3 The site operate of V-type filter gas-water backwashing

Water supply engineering and drainage engineering are another two important major orientations of water supply and drainage major. These two directions require the design and calculation performed by the students against common water treatment structures, such as sedimentation tank, filter, biological treatment unit, etc., all of which require students to hold the deep understanding on the design and operational principle of each treatment structure. It is found that, during the course teaching, students could skillfully copy the drawings, however, if they were required to design the structures separately, their drawing presentation ability would be weakened to some extent. This is because they are not familiar with professional norms and lack of understanding on actual structures, based on which, it is difficult to connect the illustrating pictures in textbooks with the actual structures.

Taking the filter as an example, the filtration and backwashing of the filter are the key points of water supply engineering, as well as the difficulties for students to understand. It is difficult for students who have never been to the site to understand how each component work when the gas-water backwashing. Provided that, in the course of teaching, we cooperate with the laboratory small pilot simulation device to let students operate by hand, in this way, the understanding will be more vivid and profound. As shown in figure 3, it is the site operate of V-type filter gas-water backwashing. Such teaching method integrating theory with practice could not only improve students' cognition on technology, also enhance their ability to analyze and solve problems.

### 3. Summary

New requirements, under the background of new engineering, are put forward for talents training mode and course teaching reform, and the teaching reform on specialized courses is an important link for talents training. The traditional class is performed by means of multimedia teaching based on the classroom, which needs to integrate the application of new professional software and combine the

operation of laboratory small experimental unit according to the appropriate teaching contents. Furthermore, to explain the design principle of the main structures, the extracurricular teaching can be carried out directly in small-scale water treatment plant where conditions permit, or even using updated virtual reality technology to achieve the representation of engineering scenes.

## **References**

- [1]. Fudan consensus on the construction of New Engineering Course. *Research in Higher Education of Engineering*. (2017) No. 01, p. 10-11.