

# The application of national technical regulations and standards of construction works in mekong delta

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## ABSTRACT

Now, the standard issue has been of concern to countries, international organizations and companies. Therefore, this issue has been mentioned in many works and research projects of different organizations and individuals. Besides, in the context of international economic integration, some countries also have researches to develop and improve their national standard system. In Vietnam, the construction industry plays a pioneering role in the cause of national construction and national development. The system of regulations and standards of the construction industry is also developing in association with the development of the industry. Currently, the system of construction regulations and standards has basically met the industry's development requirements. However, the application and compilation still have some shortcomings, in this study, the authors focus on studying some issues of the application of regulations and standards in construction and design of construction works in Mekong Delta.

**Keywords:** standards, regulations, design, construction works, construction standards, Mekong Delta.

## 1. INTRODUCTION

The system of standards and regulations is the technical corridor, playing an important role in shaping the existence and development of construction works. At the same time, they are also very important legal tools commonly used in construction activities towards green criteria, saving resources, energy, environmental protection, sustainable development, protect national security, ensure investment efficiency from planning, survey, design, construction to exploitation. The system of standards and regulations also contributes to enhancing the role of State management in construction activities, ensuring the safety and health of people, and property of the State and people. However, the application of standards and regulations in practice is still inadequate, requiring in-depth studies to solve this problem.

## 2. MATERIALS AND METHODS

The system of standards and technical regulations of Vietnam and the current construction industry comply with law 68:2006 [12], which stipulates:

Standard means a provision on technical properties and management requirements used as a standard to classify and evaluate products, services, processes, the environment and other

objects in socio-economic activities in order to improve the quality and efficiency of these subjects. Construction standards are the regulations on technical standards, economic - technical norms, the order of performing technical works, criteria, competent organizations for promulgation or accreditation, for application in construction activities. Construction standards include compulsory and encouraged standards. In Vietnam, construction standards are issued by the Ministry of Construction.

Technical regulation is a provision on the limit of technical characteristics and management requirements that products, goods, services, processes, environment and other objects in socio-economic activities must compliance to ensure safety, hygiene and human health; protect animals, plants, the environment; protection of national security and interests, consumer interests and other essential requirements. Construction regulations are compulsory regulations applied in construction activities promulgated by competent state management agencies in charge of construction. These are the minimum technical requirements that must be followed for all construction activities and the building solutions and standards used to achieve those requirements.

However, each country has different construction codes because there are different regulations for specifications for each building. When designing a construction work in any country, the designer must pay attention to the construction codes of that country in order to design the work in accordance with regulations. Besides construction codes, construction standards are also an issue that needs to be consulted in the design work. The current system of construction standards in Vietnam consists of 11 volumes with 1007 standards [Vietnamese construction standards], mainly in areas such as planning, surveying, construction surveying, design, and installation of equipment for construction works, construction materials, construction and acceptance, labor safety, etc. However, in reality, the application of standards in construction projects still has many shortcomings.

### **3. Results and discussion**

#### **3.1. Application of design standards in construction works in the Mekong Delta**

The system of standards and regulations of the construction industry in the field of design plays an important role in the development of a country. Therefore, this system of regulations and standards is very necessary to have a standard quality to avoid inconvenience when the related units check the design as well as verify the design, especially not creating loopholes, in order to eliminate negative thoughts in applying design codes and standards to create substandard works.

According to Vietnam's Construction Standards, construction works, whether high or low-rise, small or large, low to high grade, must be designed to ensure structural safety, fire safety, environment for users. In addition, based on the standards and regulations, the designers design works to meet the urban landscape architecture on the basis of conformity with the urban zoning planning, detailed planning, urban design regulations on management of urban architectural planning on: minimum area and setback space; height, density, accessibility to traffic, static traffic and regulations on fire prevention and fighting, etc. current design standards are encouraged to apply, compliance is not strictly required.

However, in Vietnam, there is rarely any manager who thinks in accordance with the standard spirit that most of them rely on to "arrest" experts. Design standards are the legal documents of the managers as well as a bridge for parties to easily reach consensus. Therefore, it is very necessary to have a system of quality, complete and accurate documents and design standards. This helps to keep parties free from conflicts. Nowadays, sometimes just because of different words and methods of application, it leads to an inaccessible work, need to explain, take a long time arguing, plus a lot of troubles. All of this is happening every day in the design consultancy and verification and appraisal of construction investment projects across the provinces in our country.

Through investigation and evaluation from relevant topics and projects, it is possible to give some comments on the system of Vietnamese standards and regulations in the field of design as follows:

Standards and regulations have been slowly researched and reformed, so they cannot meet the requirements of the society. Most of these standards were compiled from a long time ago, with a very long shelf life (some from 1975). Only a small portion of the benchmarks are implemented on a 5-year cycle review roadmap. This is due to limited resources and changes in management decentralization, which prolongs the time to compile and publish the standard.

Content of regulations and standards is slow to be reformed, not keeping up with actual requirements; Some contents cannot be applied in the current economic and technical conditions. Content between documents still overlaps, contradicts, lacks uniformity and consistency; The consensus has not been reached among related parties. Due to mainly relying on foreign regulations and standards, many contents of regulations and standards do not take into account natural conditions (topography, geology, hydrology), socio-economic conditions among regions, consultancy and construction qualifications in Vietnam. The new regulations are only responsive and suitable for new construction investment projects. Some standardized objects such as high-rise buildings, large-space buildings, ecological works, green buildings, climate change response works and sea level rise have not been mentioned and research.

The content of the regulations and standards are sometimes general, sometimes too detailed, so it is difficult to apply. Many of the contents of regulations and standards are of administrative management, so they are not consistent with a technical document. The degree of harmony between the national standard system and that of the international standard system remains low. While Vietnam has been a member of the World Trade Organization (WTO) since 2006. This impedes competitiveness in the market economy and reduces the ability to access foreign investment projects.

Design solutions do not take into account current environmental friendly and sustainable architectural trends such as green buildings, energy efficient buildings, and climate change response works by QCVN 09:2017/BXD [1] takes effect from June 1, 2018, so these tools are being updated, supplemented and announced in the near future, although there is a manual guiding the application of QCVN 09:2017/BXD, however, because the initial investment cost is higher than conventional works, so investors have little choice. In addition, the consulting capacity in many localities is limited, do not have in-depth knowledge of energy-saving projects, on the other hand design consultancy is only the proponent of solutions, the investor is the person. decide to choose the option, so it is necessary to expand QCVN 09:2017/BXD training to investors.

TCVN 5574:2018 [10] is replaced with TCVN 5574:2012, many new points deserve attention in TCVN 5574:2018, including changing the stress model to strain model (the assumption of a flat cross-section is accepted) when calculating the cross-section of a member. This model is recommended to preferably be used to calculate the limit states (first and second) for components subjected to bending moment and axial force. For components with simple cross-section shapes (rectangular, T, I), it is still allowed to use the limited internal force method with adjustment. In addition, the changes are also related to calculation of shear, puncture, local compression, torsion, etc.

The structure in TCVN 5574:2018 is not the same as the structure TCVN 5574:2012, in the new standard, there are 3 separate parts for concrete structures, non-prestressed reinforced concrete and prestressed reinforced concrete. The set of standards is divided into 11 parts and appendices, covering the scope of application; Vietnamese-manual documents; Terms, definitions and symbols; General requirements for concrete and reinforced concrete structures; Requirements for calculation of structures of concrete and reinforced concrete; Materials for concrete and reinforced concrete structures; Concrete structure; Non-prestressed reinforced concrete structure; Prestressed reinforced

concrete structure; Structure requirements; Requirements for restoration and reinforcement of reinforced concrete structures; Calculation of fatigue reinforced concrete structures. In addition, annexes A to M discuss the relationship between compressive strength of concrete with standard compressive strength and average compressive strength respectively; Deformation charts of concrete (full deformation charts); Guidance on the application of some types of reinforcement; Detailed calculation preset; Structural system calculation; Calculate the column of annular and circular cross-section; Calculation of concrete bolts; Calculate short consol; Calculation of semi-assembled structures; Considering the reinforcement restraining the horizontal strain when calculating the components subjected to radial compression according to the nonlinear strain model; Deflection and displacement; Working mode groups of crane type crane and suspension crane.

Due to the characteristics of buildings in the Mekong Delta almost have the same common feature: constructing on soft ground, The soft soil in the Mekong Delta actually belongs to the weak clay because the clay particle content in this soft soil in most of the territory has enough clay particle content to conclude that the clay is weak. Weak clay in the Mekong Delta has a secondary mineral that accounts for a large amount, Montmorillonite ( $Al_2O_3 \cdot 4SiO_2 \cdot H_2O$ ). Montmorillonite mineral has strong activity because it has negative external charge with very large electrostatic absorption energy, hundreds of  $kN/m^2$ . In TCVN 10304:2014 [11] regulates the formulas for calculating the load capacity of the pile according to the strength criteria of the ground soil:

- For sticky soil ( $\varphi = 0$ ): bearing unit friction load between the ground and pile  $f_{i1} = \alpha \times C_{u,i}$

- For discrete land ( $C = 0$ ): bearing unit friction load between the ground and pile  $f_{i1} = k_i \times \bar{\sigma}_{v,z} \times tg\delta_i$

However, for the soils in the Mekong Delta, mainly soft soil with shear strength characteristic value ( $C, \varphi \neq 0$ ), no calculation formula is found.

When calculating the pile load capacity according to physical criteria: in table  $q_b$  (Table 2 for press piles, Table 7 for bored piles): there is no value when the cohesive soil under the pile tip has  $l_L < 0$  and  $l_L > 0.6$ . Section 7.2.2.2 requires to get SCT value of pile according to CPT. However, some projects do not have CPT data. In table  $f_i$  (table 3 for pile and bored pile): not valid when the soil around the pile has  $l_L > 1$ .

Section 4.9 in TCVN 10304:2014 stipulates that pile foundation working in saline intrusion environment should be designed according to the requirements of TCVN 5337:1991, TCVN 5338:1991 and TCVN 9346:2012 (corrosion standards). however, currently in design very little is done.

For the road and bridge construction industry, Standards 22TCN 262:2000, Design standards for motorways TCVN 4054:2005 [5], Expressway design standards TCVN 5729:2012 [6] are design processes. The regulations for the new design routes have not been mentioned or there are guidelines for the design of the roadbed for upgrading and expanding.

For the construction of irrigation works, there are still a number of old standards that have not been updated, leading to difficulties in design, construction and management. For example, the standard of hydrological calculation C6-77 has been issued for a long time, now the flow concentration coefficients, rain model coefficients, etc. are not consistent with reality (rain is now impact of climate change, there are many unusual factors that have not been taken into account, the current vegetation cover is no longer

the same as before, so the flow concentration coefficient has increased many times, etc.). Therefore, when the design unit takes a higher coefficient to suit the reality, it will increase the scale of the work, the appraisal unit will have no basis for appraisal, but on the contrary, if it does not take the increase, then will endanger the project.

Or currently, standards for waterproof drilling for earth dams are not available, but only standards for drilling waterproof treatment for dikes and standards for drilling for waterproofing for foundations under dams. This leads to difficulties in quality control when drilling the dam body. In the past 2 years, many earth dams in Vietnam have had to be drilled and constructed, especially dam repair and improvement project (WB8 project), but design, construction and management have met a lot of hard.

When making roads on the dyke surface, the current standards on the road side have many points that cannot be applied to the side of the dyke surface (such as design speed, design curvature radius, design load etc. because the existing dyke should comply with the current status).

In TCVN 8216:2018 [7] on design of earth dams still exist many issues: Definition of dam height is the part that takes into account the top of the embankment or includes the top of the breakwater, this may change the grade of the work in a number of specific projects, leading to a change in the design criteria; Or the dam height as defined in the standard is "calculated from the lowest part of the foundation pit excluding the tray feet". In some cases (such as mountainous areas), the lowest part of the foundation pit at the downstream side is 1-1.5m from the bottom of the tray foot, if calculated from this point, the height of the dam is also changed and the construction level; The required design permeability coefficient of earth dam is  $>10^{-4}$ , but based on the testing of embankment soil in the laboratory or equal to how many % of the test in the laboratory, it is not clear (in practice when designing Many projects are only equal to 80% of the laboratory permeability coefficient, but this has no basis).

TCVN 8474:2018 [8] on topographic survey of irrigation works. Shortcomings for in-field irrigation dredging and embankment dredging. The work of measuring, horizontal and vertical section on land and water. Survey costs are very high when investing in construction design survey costs are higher than construction costs. Due to high costs, a number of districts issue a resolution of the People's Council to stipulate the rate of contract at a cheaper cost. Typically, Thap Muoi district regulates 5 millions/1km of topographic survey (while the standard is more than 3 times higher than the prescribed standard about 18 millions/1km).

Regulations on construction permits are specified in the construction law 2014 [13], however, for riverside and coastal constructions, there is no specific regulation that each province People's Committee will have specific rules. Example: According to Article 2 of Decision 47/2015/QĐ-UBND promulgating the regulation on the protection scope of irrigation works and dykes in Soc Trang province, there are regulations on the protection scope of irrigation works, such as submerged canals, rivers, ditches (collectively referred to as canals), the protection scope of works is calculated from the edge of the canal to each side, specifically as follows:

- Channel 1 level or channel with channel surface width, ( $B \geq 25m$ ), the minimum protection range of channel is 20 meters.

- Channel 2 level or channel with channel surface width ( $B \geq 15m$  to  $< 25m$ ), minimum channel protection scope is 15 meters.

- Channel 3 level or channel with channel surface width ( $B \geq 8m$  to  $< 15m$ ), minimum channel protection scope is 10 meters.

- In-field channel or channel has channel surface width ( $B < 8m$ ), minimum channel protection range is 5 meters.

Although each province has regulations on a coastal protection corridor, however, in fact, people in the Mekong Delta often encroach on the coastal protection corridor, leading to many landslides, causing a lot of loss of property and people.

The Construction Law also stipulates that the construction of works is to have a construction permit, but many projects when starting construction without the construction permit of the competent state agency. Or construction illegally (wrongly) is when the construction is not in accordance with the construction permit issued by the People's Committee of the district or province.

### **3.2. Application of construction standards in construction works in the Mekong Delta**

Construction the works: is the construction and installation of equipment for new construction works, repair, renovation, relocation, remodel; construction demolition; warranty and maintenance works. After completing the steps of architectural design, structural design and interior design and related procedures, the selection of a reasonable construction contractor is the top concern for the investor. Most investors choose the construction units through the introduction of friends, relatives, acquaintances without paying attention to certain criteria. So how can we choose a construction contractor wisely and intelligently so that the end products are quality works.

The activities of standardization in the construction of works recently have really become an effective tool to help managers have a basis for technical management, work quality, construction progress construction costs as well as safety in construction.

Due to the geological characteristics of the Mekong Delta and the large land area, most of the construction works are mostly low-rise, construction units often use TCVN: 4453:1995 [4], however, at present, this standard has some inappropriate content such as: TCVN 4453:1995, Section 6.1.1 stipulates, for grade 100 concrete (durability level 10MPa), a ready-made spreadsheet in annex C may be used in the standard; For concrete grade 150 (15Mpa) or more, the material composition in concrete must be designed through a laboratory (calculating and casting test samples) to check, this work must be done at centers and laboratories have LAS-XD. The 28-day compressive strength of the standard, graded laboratory sample must be at least 10% greater than the specified design strength of the concrete. However, due to the characteristics of the Mekong Delta region, the skills of the workers are mostly not through formal training, but mainly experience and the quality of current input materials has decreased. actual construction is not small (may be more than 10%). While in developed countries it is specified that the results of the laboratory sample compression must be at least 20% higher than the specified design strength level.

Clause b, Article 6.1.2 specifies the slump or hardness of concrete mixture determined depending on the properties of the building, the content of the reinforcement, the transport method, the weather conditions. When choosing the slump of the concrete mixture to design, it is necessary to calculate the slump loss during storage and transport. The slump of the concrete mixture at the pouring position can be referenced in Table 11. Article 6.1.3. Calibration of concrete components at site. The adjustment of concrete components at the site is carried out in accordance with

the principle of not changing the water/cement ratio of the designed concrete component. When the aggregate is wet, reduce the amount of mixing water, keeping the required slump. When it is necessary to increase the slump of the concrete mixture to suit the construction conditions, it is possible to add water and cement at the same time to keep the water/cement ratio.

However, in the actual construction, the construction unit to achieve the specified slump usually only adds water, leading to the concrete mixture with slump, but the discrete concrete mixture, the cement water will flow through the coffa slot. when the hardened concrete structure is pitted. Constructing progress TCVN 4055:2012 has regulated that all construction works before starting construction and installation must have design of construction organization and design of construction methods for construction and installation. Some professional contractors will provide the investor with a clear construction plan full of contents: construction methods, construction time to complete and and handing over works, specifying how much delay is maximum. This can be considered as one of the most prominent criteria for evaluating the contractor's unit quality. However, at present, many contractors rely on the relationship to get the work, so there is no design of construction organization or the determination of the construction time in the contract, leading to the construction time exceeding contract.

When constructing a project, in addition to the issue of construction quality as well as economic efficiency, the construction unit is more appreciated when it comes to occupational safety for their own workers. The construction unit has certain responsibilities for the labor safety assurance of construction workers such as: purchase accident insurance, labor protection equipment, propaganda and training to improve workers' awareness. This not only contributes to minimizing unfortunate accidents that affect the quality of construction works, but also builds up the reliability of the construction unit on the market.

The issue of occupational safety and sanitation is specified very specifically in the Labor Code, the Labor Safety Law, the Construction Law, etc. the system of technical regulations on occupational safety and health for machines, equipment and works have been issued. (Construction Law, Labor Code, National Technical Regulation on Safety in Construction QCVN 18:2014/BXD) [2], National technical regulation on occupational safety for lifting equipment: QCVN 07: 2012/BLDTBXH [3]; QCVN: 02/2011/BLDTBXH- National technical regulation on occupational safety for electric elevators; QCVN 12:2013/BLDTBXH - National technical regulation on occupational safety for suspended working floors; QCVN 13:2013/BLDTBXH- National technical regulation on occupational safety for Electric panels; QCVN 16:2013/BLDTBXH- National technical regulation on occupational safety for hoisting machines; QCVN 18:2014/BXD-National technical regulation on safety in construction of the Ministry of Construction; QCVN 29:2016/BLDTBXH-The National Technical Regulation on occupational safety for cranes of the Ministry of Labor outlines the technical, organizational and safety measures. But in fact, many occupational accidents occur due to a lack of design documents and lack of labor protection measures.

In addition, because the construction is carried out in a wide space, conditions and terrain as well as different weather, workers often work at high altitude, in contact with a variety of specialized machinery and equipment. There are many risks of occupational accidents resulting in loss of life and property. The main reason is

due to the limited capacity of the construction units, the expertise and experience have not met the requirements, or the contractor chooses inappropriate or unsatisfactory construction plans and measures compared to the actual construction conditions in terms of space and time; Subjective, failure to inspect, fail to promptly re-evaluate the safety and stability conditions of works before organizing the construction; Do not take up safety response measures in unsafe situations.

### 3.3. General assessment of the current situation of applying regulations and standards in construction and design of construction works in the Mekong Delta

#### a. Strength:

Scale and coverage of the system of regulations and standards in construction and design of our country's construction works are increasingly expanding.

The proportion of national standards that are in harmony with international standards is increasing.

The ratio of standards in construction and design of our country's construction is being reviewed on schedule.

The correct application of regulations and standards in construction and design of construction works has brought great efficiency to the construction industry in particular, for the country in general.

#### b. Weakness:

The coverage of the system of regulations and standards in construction and design of construction works has not covered all construction fields such as construction standards on soft ground, construction standards specific to the Mekong Delta, etc.

The proportion of national standards that are in harmony with international standards is increasing, but the efficiency is not high.

A number of regulations and standards in construction and design of construction works have not been properly reviewed.

There are no statistics on the correct application of regulations and standards in the construction and design of construction works, which brings economic benefits.

#### c. Opportunity:

Applying appropriate construction regulations and standards in construction and design will bring about high efficiency in the quality of the work.

The system of regulations and standards in construction and design of construction works will clearly be the basis for easy management and implementation of all levels.

#### d. Challenge:

Lack of strategy to develop a system of regulations and standards in construction and design of construction works.

The development of the system of regulations and standards in construction and design of construction works still has many shortcomings.

The financial source for building a system of regulations and standards in construction and design of construction works is inadequate and limited.

Human resources are insufficient and weak.

The mobilization and cooperation between stakeholders is still limited.

The connection between local documents and national standards is overlapping.

### 4. CONCLUSIONS

Unlike the compulsory regulations in QCVN, TCVN is a type of legal document under the law, mainly voluntarily applied but with a lot of content that is mandatory, because it cannot be detailed in in QCVN.

Therefore, the construction requires scientific, serious, coupled with both meeting the needs and practical conditions of Vietnam and absorbing the civilization of the world - To be able to become an effective tool in state management, at the same time an effective tool, accompanying engineers and subjects and individuals operating in the construction field.

On the basis of assessing the application of design and construction regulations and standards for works in the Mekong Delta (advantages and disadvantages), The authors analyze challenges and propose solutions to improve the efficiency of applying design and construction standards for Mekong Delta projects.

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