Korean Construction Specification

KCS 11 30 10 : 2019

Replacement Works

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국토교통부

Foreword

· This standard was organized and integrated as the code by comparing and reviewing duplicate or contradictory content within the existing construction standards (design standards, standard specifications) due to the transition of the construction standards code system.

· This standard is established by integrating and organizing the parts that are related to replacement works in existing Road Construction Standard Specifications and Harbor and Fishing Ports Construction Standard Specifications. The history of the standards are as follows:

Construction standards	Main contents	Establishment or revision (Month Year)
Road Construction Standard Specification	· Established by the Korean Society of Civil Engineers commissioned by the Ministry of Construction	Establishment (Dec. 1967)
Road Construction Standard Specifications	· The specifications were improved and revised to become general specifications of overall road work by reviewing the related existing specifications and guidelines that were used and being developed.	Revision (Dec. 1985)
Road Construction Standard Specifications	· The specifications were improved and revised to be better specifications by advancing and complying with the currently used specifications and guidelines, along with the introduction of new theories.	Revision (May 1990)
Road Construction Standard Specifications	· The specifications were revised to enhance the international competitiveness and to promote quality improvements of road works by reorganizing the system to cope with the openness of the construction market as a result of the launch of the World Trade Organization (WTO).	Revision (July 1996)
Road Construction Standard Specifications	· The specifications were re-organized to establish a system of national standards and to reflect the revision of contents and other standards, such as the Korean Industrial Standard (KS) and the Standard Specification of Concrete according to the Construction Standard Organization Guideline, and to improved and revise standards to address the problems.	Revision (Nov. 2003)

Construction standards	Main contents	Establishment or revision (Month Year)
Road Construction Standard Specifications	· The specifications were revised to improve the problems produced during the road construction and to induce reliable constructions through consistency with other standards such as the KS, Standard Specification of Concretes , and Standard Specifications of Tunnels, ensuring the prevention of shoddy and faulty construction thorough quality control.	Revision (Mar. 2009)
Road Construction Standard Specifications	· The specifications were revised to reflect the recommendations from the Central Construction Technology Deliberation Committee and changed the standard specifications, specialized specifications, and design drawings.	Revision (Sep. 2015)
Road Construction Standard Specifications	· Partial revision, including overview, forest and tree protection materials, and general construction works.	Revision (May 2016)
Standards Specifications of Harbor Construction	· Establishment of the Standards Specifications for Harbor Construction	Establishment (Dec. 1976)
Standards Specifications of Harbor Construction	· Revision of the Standards Specifications for Harbor Construction	Revision (Dec. 1977)
Standards Specifications of Harbor Construction	· The specifications added various design conditions for harbor construction, and included general policies and standards of designs in relation to harbor facilities, counter facilities, and other facilities for harbor construction.	Revision (Dec. 1986)
Standards Specifications of Harbor Construction	· The standards were significantly revised to provide a basis to apply the re-estimation of deep-sea waves, the estimation of wind speeds, and load coefficient to improve the safety of harbor facility and equipment, including coastal maintenance facilities.	Revision (Dec. 1996)
Standard Specifications of Harbor and Fishing Port Construction	· The standards were completely revised to include preemptive countermeasure against climate changes and to reflect the changing port construction conditions.	Revision (Nov. 2005)
Standard Specifications of Harbor and Fishing Port Construction	· The specifications were significantly revised to reflect the modified contents in the upper technical standards and other fields standards, improving related specifications, such as mass concrete and cap concrete and other related specifications such as filter mats, ships, quay walls, and other attached facilities, and added specifications concerning marina facilities.	Revision (Dec. 2012)

Construction standards	Main contents	Establishment or revision (Month Year)
KCS 11 30 05 : 2016	· Integrated and organized the code system due to the transition to the code system of construction standards.	Establishment (Jun. 2016)
KCS 11 30 05 : 2016	· Modified to satisfy the Korean Industrial Standards and Construction Standards.	Modification (Jul. 2018)

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1. General

1.1 Scope of application

(1) This standard is applied to construction methods that improve grounds by removing partial or entirely soft ground and replacing it with high quality soil.

(2) The application scope of the replacement works is suitable for all earth and sand ground and the depth to be improved is generally shallow. Although there are many construction methods, they can be categorized into two methods, according to the replacement method as described in Section 1.2.

1.2 Type of replacement work

(1) The replacement method by excavation refers to a method that removes a soft ground layer closely located to the surface by excavation and refills the removed layer with higher quality earth and sand. This method is suitable for small scale improvements to construction sites.

(2) The forced replacement method refers to a method that pushes out a layer of soft ground layer by the weight of fill materials or by blasting and replaces the vacated layer with higher quality materials.

2. Material

(1) The materials for replacement shall be tested with a soil quality investigation to verify whether the design requirements are satisfied.

(2) A type and frequency of the soil investigation test follows the rules in the construction specification. The investigation test results shall be submitted to the construction supervisor prior to start of construction t and approved by the construction supervisor.

3. Planning and management

3.1 Replacement method by excavation

(1) The scope and depth of the excavation and replacement shall follow the design drawings.

(2) The construction plan documents shall be submitted to the construction supervisor prior to the start of construction. The following items shall be included in the construction plan documents.

① Excavation plan

A. Excavation equipment is selected, and excavation phases are planned.

② Replacement plan

A. The replacement is planned by phase, according to the plane level and depth.

③ Transportation plan of excavation and replacement soils

A. In this plan, the transportation equipment, a processing place, and borrow pit of soil are selected, and the storage yard is planned.

④ Compaction plan

A. Compaction equipment, compaction orders, and the number of compactions are planned.

⑤ Environmental contamination

A. The damage due to contamination shall be investigated in the case of underwater constructions, and countermeasures shall be provided.

(3) The construction management items are as follows:

① Excavation soil amount

② Replacement soil amount

③ Verification of compaction effects by phase

④ Other instructions from the construction supervisor

3.2 Forced replacement method

(1) The construction plan document is created prior to the start of construction, and submitted and approved by the construction supervisor. The following items shall be contained in the construction plan document.

① Preparations for construction

A. Removal of obstacles on the surface or underground and arrangements on the ground surface.

② Filling plan

A. The delivery plan of fill material to the site and the overall fill scope are determined by planning a fill scope by phase. Much care should be taken not to have excessive plastic in the ground during filling.

③ Action plan for soils that are driven by shear failure in the soft ground

(2) The following items shall be measured not only during filling, but also after the filling and reported to the construction supervisor for the construction management.

① Fill material amount

② Measurement of elevation of the ground surface

③ Replacement material amount

④ Other instructions from the construction supervisor: A frequency of the measurements shall follow what the construction supervisor instructs.

4. Construction

4.1 Replacement method by excavation

(1) Part or the entirety of the soft ground layer is excavated and removed, and then replaced with higher quality soil.

(2) If inflow water is drained during the excavation of soft ground, where underground water level is high, the excavation slope will be vulnerable to collapse, which will be followed by additional excavation due to the installation of drainage. Thus, drainage shall not be done if high quality replacement material that does not need compaction is used.

(3) To prevent the collapse of the excavation slope, the replacement materials shall be delivered as soon as possible as the excavation progresses.

(4) The replacement thickness shall be determined according to the capability and constructability of the construction equipment. If only a part of the upper layer that is convenient for construction is removed, the stability of the composite ground shall be ensured.

4.2 Forced replacement method

(1) The forced replacement method pushes out a soft ground layer by using the weight caused by an embankment or by blasting and replaces the layer with higher quality materials.

(2) Soft ground that is uplifted shall be quickly removed so that soft soils uplifted during the forced replacement in the next phase shall not act as a passive resistance force.

(3) The self-weight replacement method pushes out the soft soils to the side by the filling materials that replace the soft soils. The embankment starts from the road center and progresses into the edge of the road surface.

(4) The blast replacement method pushes out the soft ground layer to the side by blasting and replaces the soft ground layer with higher quality soil materials. If there are surrounding structures nearby, a vibration evaluation shall be conducted through a test construction.

(5) The use and storage of required gun powder at the construction shall comply with the related regulations, and any hazards of theft shall be prevented.

(6) Safety staff shall be arranged to prevent accidents during blast, and siren and whistle shall be used to alarm the surroundings.