

KCS 11 30 40 : 2019

# Embankment of Lightweight Materials

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KC CODE



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 embankment of lightweight materials in existing Road Construction Standard Specifications and Harbor and Fishing Ports Construction Standard Specifications. The history of the standards are as follows:

Construction Standard	Main Content	Enacted or Revised (Year.Month)
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 Standard	Main Content	Enacted or Revised (Year.Month)
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 Standard	Main Content	Enacted or Revised (Year.Month)
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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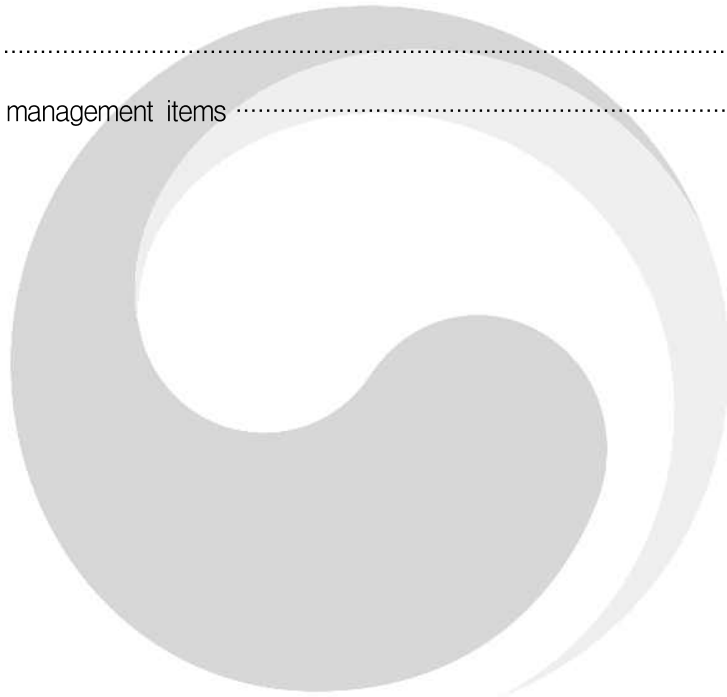
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## 1. General

### 1.1 Scope of Application

- (1) This standard is applied to construction that uses lightweight materials whose weight is lighter than high quality fill materials. The following specification is applied to a construction that lessens a load using Expanded Poly-Styrene (EPS), which is a polymer-based lightweight product, instead of using a fill material.
- (2) Since faulting of consolidation settlement occurs at the boundary between EPS blocks treated and non-treated parts and of the embankment and treated part are considerably different; gradual inclination or other countermeasures shall be taken.

### 1.2 Documents to be submitted

#### 1.2.1 Construction plan

- (1) The construction plan document is created based on the design drawings or construction specifications and is submitted to and approved by the construction supervisor prior to the start of construction.

#### 1.2.2 Items that are contained in the construction plan document

- (1) A measure to ensure trafficability for the transportation of excavation equipment, material delivery, and storage plans shall be established to carry in materials and prepare for construction.
- (2) The depth and range of EPS installation shall follow the dimensions specified in the design drawings.
- (3) The EPS block for water stoppage or drainage plans shall not be affected by the buoyancy caused by underground water or surface water. Thus, a measure for this shall be prepared.
- (4) The EPS shall be installed horizontally. In particular, a gradient from the bottom surface shall be within 1:300. A clamp is installed between EPS blocks so that all blocks are stabilized.
- (5) The EPS installation shall ensure not to exceed the allowable tolerance set by the construction specifications.
- (6) When soils are covered to protect the EPS blocks outside for covering soil work, thickness shall be more than 300 mm.

#### 1.2.3 Additional documents to be submitted

- (1) Sectional drawings for EPS block installation
- (2) Structural calculation sheet of EPS blocks

## 1.3 Reference standards

### 1.3.1 Related laws

No contents.

### 1.3.2 Related standards

- KSM 3808 EPS foam insulating materials
- KSM 3831 Compressive test methods of unplasticized foamed plastic

## 2. Material

- (1) The main materials of the EPS banking method consist of EPS blocks, which are the main body, and linking clamps that connect the EPS blocks. In the EPS block, flame retarding material shall be added in preparation for fire accidents, and these materials shall have a self-extinguishing property within 3 seconds once the fire source is removed after ignition.
- (2) The EPS materials shall follow the design drawings or construction specifications.
- (3) Damaged EPS materials shall not be used.
- (4) The EPS shall not be exposed under to sunlight for a long period of time (more than seven days). It shall be blocked from harmful substances and water, and shall not be contacted by fire.

## 3. Construction

### 3.1 Overview

- (1) Detailed measures shall be established with regard to underground water, rainfall, and inflow water during the EPS block construction.
- (2) The boundary of the EPS blocks and the cut section in the slope shall be filled with high quality materials considering the drainage of soil moisture and the infiltration of water and then sufficiently compacted. If there is a large amount of soil moisture, a sheet for drainage shall be installed in the surface of the bench cut.
- (3) In case that the EPS blocks are attached to a rock mass, ensure that no sliding shall occur between the boundary of the EPS block and the rock mass.
- (4) When the excavation surface is soft, the additional use of geotextile or geogrid is preferable. The surface soil stabilization method is also needed in very soft ground, such as landfill.
- (5) The connection section between the EPS block and the banking section shall be compacted thoroughly to prevent uneven settlement.
- (6) The EPS blocks shall be installed intercrossly and fixed with linking clamps.
- (7) In case that a protective wall is installed to protect a self-supporting surface of the EPS block, the protective wall shall be constructed to achieve the following purposes.

- ① Prevention of the discoloration of EPS blocks due to sun rays (ultraviolet rays)
  - ② Prevention of spreading fire
  - ③ Prevention of damage from impact
- (8) The slope in the EPS block needs soil covering of at least 500 mm or using materials whose permeability coefficient is small and compaction to protect the EPS block from harmful substances and nearby fire.
- (9) When a slope is formed due the installation of the EPS blocks, construction shall be done after determining possible displacement at the slope side due to the service load, such as the working load and future traffic load.

### 3.2 Construction management items

- (1) The underground water level is measured and inflow of surface water is checked.
- (2) Measurement is conducted in the middle of construction or after construction, and the allowable tolerance between EPS blocks shall be determined according to the construction purpose during EPS block installation.