

KCS 11 40 30 : 2019

Slope Drainage

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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 reinforced concrete culverts in each standard based on the existing Road Construction Standard Specifications. The history of the standards are as follows:

Construction Standard	Main Content	Enacted or Revised (Year.Month)
Road Construction Standard Specifications	<ul style="list-style-type: none">• Established by the Korean Society of Civil Engineers commissioned by the Ministry of Construction	Enacted (1967.12)
Road Construction Standard Specifications	<ul style="list-style-type: none">• 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.	Revised (1985.12)
Road Construction Standard Specifications	<ul style="list-style-type: none">• 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	Revised (1990.05)
Road Construction Standard Specifications	<ul style="list-style-type: none">• 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)..	Revised (1996.07)
Road Construction Standard Specifications	<ul style="list-style-type: none">• 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.	Revised (2003.11)

Construction Standard	Main Content	Enacted or Revised (Year.Month)
Road Construction Standard Specifications	<ul style="list-style-type: none"> 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. 	Revised (2009.03)
Road Construction Standard Specifications	<ul style="list-style-type: none"> 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. 	Revised (2015.09)
Road Construction Standard Specifications	<ul style="list-style-type: none"> Partial, revision including overview, forest and tree protection materials, and general construction works. 	Revised (2016.05)
KCS 11 40 30 : 2016	<ul style="list-style-type: none"> Integrated and organized to accommodate the code system due to the transition to the code system of construction standards. 	Enacted (2016.06)
KCS 11 40 30 : 2018	<ul style="list-style-type: none"> Modified to satisfy the Korean Industrial Standards and Construction Standards. 	Revised (2018.07)
KCS 11 40 30 : 2019	<ul style="list-style-type: none"> Modified to satisfy the Korean Industrial Standards and Construction Standards. 	Revised (2019.11)

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1. Generals

1.1 Scope of Application

- (1) This standard is applied to constructions of side gutters in mountain ridges, which are small concrete structures for side gutters.

1.2 Reference standards

1.2.1 Related laws

No contents.

1.2.2 Related standards

- KCS 10 10 10 Public administration requirements
- KCS 11 20 15 Excavation
- KCS 11 80 25 Stone (block) masonry retaining wall
- KCS 11 20 25 Refilling and backfill
- KCS 14 20 00 Concrete construction
- KCS 21 50 05 General items of forms and temporary shore construction
- KS F 4005 Concrete and reinforced concrete L-shape
- KS F 4010 Reinforced concrete plume and bench plume
- KS F 4016 Reinforced concrete U-shape

1.3 Submission documents

- (1) The requirements and procedure of document submission follow the corresponding requirements in KCS 10 10 10.

2. Materials

2.1 Materials

2.1.1 Concrete materials

- (1) The materials used in cast-in place concrete shall follow KCS 14 20 10.

2.1.2 Factory-produced concrete side gutter

- (1) For factory-produced concrete side gutters, products that pass the specifications of KS F 4005, KS F 4010, and KS F 4016 shall be employed.
- (2) The factory products marked in the design drawings shall be used after the approval from the construction supervisor.

3. Construction

3.1 Construction standards

(1) Excavation

- ① The excavation shall follow KCS 11 20 15.
- ② If the excavation place of the drain structure is on the road or slope, the excavation size shall be the required to be the minimum section area, so much care should be taken not to damage the already-completed part.
- ③ The excavation of the drain structure can be done by machine. The excavation shall be constructed according to the determined depth and inclination.

(2) Foundation

- ① The foundation materials instructed by the construction supervisor and design drawings shall follow KCS 11 80 25.

(3) Form

- ① The form shall follow KCS 21 50 05.

(4) Concrete placement

- ① It shall follow KCS 14 20 10. In particular, much care should be taken not to have material segregation, and structural integrity shall be ensured.
- ② The foundation of the drain facility shall have the same gradient specified in the design.
- ③ The concretes inside the form shall have no voids ensured by using a vibrator, and vibrating compaction shall not be focused at a single place for a long time to prevent material segregation or laitance occurring in the surface.
- ④ Slip prevention shall be installed at steep places, and concrete shall be placed to see the effects of the slip prevention fully.
- ⑤ If the bottom and wall are constructed separately according to the instruction of the design drawings and the construction supervisor, 16 mm diameter or larger reinforcing bars shall be installed every 300mm to play the role of a dowel in the joint area.

(5) Concretes shall be cured for 14 days or longer, and the curing period may be shortened if the required strength or higher is obtained based on the concrete strength test results.

(6) The refilling and backfilling shall follow KCS 11 20 25.

(7) Side gutter construction in mountain ridges

- ① To block the inflow of surface water from the slope, side gutters on the mountain ridge are installed at a locations, which are a distance away from the top end of the slope, and side gutters shall be installed at places needed according to the site investigation results.
- ② Surface water shall be drained through side gutters on the mountain ridge that have been installed along the slope.
- ③ When refilling is done after the side gutter completion, it shall not be lower than the upper

end of the side gutter to induce the inflow of surface water naturally. Compaction shall be done thoroughly to prevent the settlement or movement of the side gutter on the mountain ridge due to the infiltration of surface water.

(8) Longitudinal drain openings (road waterway)

① Longitudinal drain openings (road waterway) at the banking section

- A. Longitudinal drain openings (road waterway) are constructed in place casting or by precast.
- B. Longitudinal drain openings (road waterway) shall be lower than the banking of the completed slope so that rainwater shall not infiltrate the concrete walls.
- C. Compaction shall be thoroughly done after the excavation of longitudinal drain openings (road waterway).
- D. End sill rip rap pad collecting gutters or impact vertical blocks shall be installed at places where slope gradient is 32° or steeper, and flow rate is 3m/s to avoid damage to the surrounding facilities due to the torrent impact.
- E. A cover shall be installed at gradient place of 1:1 or steeper in the banking section since super-critical flow and an associated hydraulic jump may occur. In particular at the berm, and water is splashed out of the longitudinal drain openings (road waterway) thereby scouring the face of slope.

② Longitudinal drain openings (road waterway) at the cut section

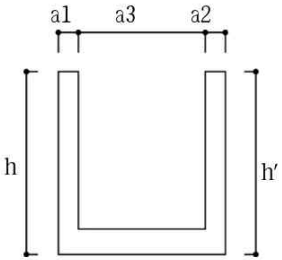
- A. The location of the longitudinal drain openings (road waterway) at the cut section is installed at a place where surface water amount in the valley is high.
- B. The height of the longitudinal drain openings (road waterway) shall be deeper than that of the slope.
- C. When rocks are excavated, rock joints shall not be generated.
- D. The berm inclination shall be directed to the inside if longitudinal drain openings (road waterway) are placed so that berm water does not flow to the slope.
- E. A cover shall be installed since a hydraulic jump may occur, in particular at the small end area, and water is splashed out of the longitudinal drain openings (road waterway) thereby scouring the face of slope.

3.2 Construction's allowable tolerance

3.2.1 Specification management of concrete side gutters

(1) The specification management of concrete side gutters shall follow Table 3.2-1.

Table 3.2-1 Standards of specification management of concrete side gutters

Item	Specification (mm)	Measurement criteria	Note
Reference level	± 30	<ul style="list-style-type: none"> · When construction length is more than 40 m : One place in every 40 m · When construction length is less than 40 m : Two places 	
Width a_3	-50		
Height h, h'	-30		
Length L	-20		