

Joint Research on Precast Underground Storm-water Storage Facilities

Year of
research

2010

Implementation of
anti-inundation measures

(Purpose)

As the climate is changing due to global warming, torrential rains that exceed the projected precipitation in a short time occur very frequently. Flood control measures include construction of stormwater attenuation and/or infiltration systems as well as drastic measures like improvement of trunk lines and pump stations. A precast underground storm-water storage facilities is being employed increasingly across the country, thanks to its advantages. As most of the components are finished at factories, the system is constructed quickly. Because the system is built underground, it frees up the surface space for various uses. The system has a large space and that makes maintenance easy. Japan Institute of Wastewater Engineering Technology (JIWET) issued the technical manual for precast underground storm-water storage facilities in March 2004. In this research, we reviewed the manual, considering cost-effectiveness, construction efficiency and environmental protection. For example, we reviewed the waterproof material, increased the types of concrete used and reviewed additional past construction cases.

(Results)

(1) Examination of waterproof performance after change in the lining material

Polyurethane resin, used as a waterproof material between blocks, has improved in durability and ease of construction since the previous edition of the manual was issued. Changing the lining thickness to suit the improved quality, we examined the waterproof performance. The result shows that the lining keeps the waterproof performance if the thickness is reduced from 200 mm to 80 mm. (See Figure 1.)

With the change in the lining thickness, we have also changed the total amount of required polyurethane resin in the Estimation part.

(2) Examination of safety on additional types of concrete

We set expansive concrete as the standard material for the precast components. Expansive concrete is generally more expensive than ordinary concrete. Demand for use of ordinary concrete, just as in other sewer systems, is increasing. To meet the demand, we have examined whether ordinary concrete can be used for the areas not critical in terms of strength and leakage. The strength test result has confirmed safety.

Since use of low-grade concrete containing ash of recycled sewage sludge is increasing, we have examined safety of concrete containing sewage sludge ash (adjusted particle size) as the material of precast components. The strength test and dissolution test results have confirmed safety.

(3) Changes in grouting

The previous edition of the technical manual specifies torque connection with PC steel rod as the standard method for joining the blocks vertically. When the groundwater level is lower than the bottom of the system, grouting of the sheath holes are not required. Instead, the PC steel rods are covered with unbonded cladding. However, it is possible that the PC steel rods become subject to corrosion because of rain or humidity during construction or changes in groundwater level after construction. Although unbonded cladding has rust resistance, grouting is more reliable. We have decided to stipulate that the sheath holes must be grouted under any condition. (See figure 2.)

(4) Addition of design examples

- 1) Added design for air exhaust.
- 2) Added an example of a grit tank installed in a multipurpose facility.
- 3) Added several special cases of recent constructions to the Material part.

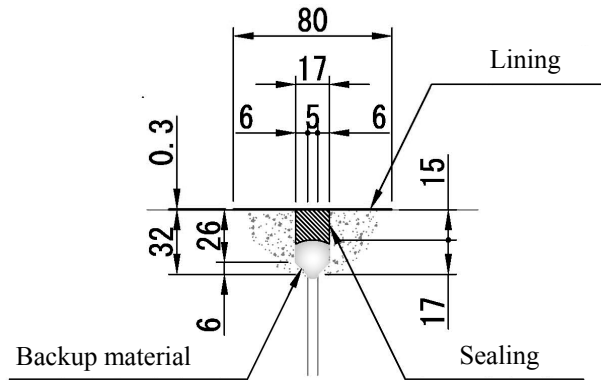


Figure 1 Dimensions of the lining

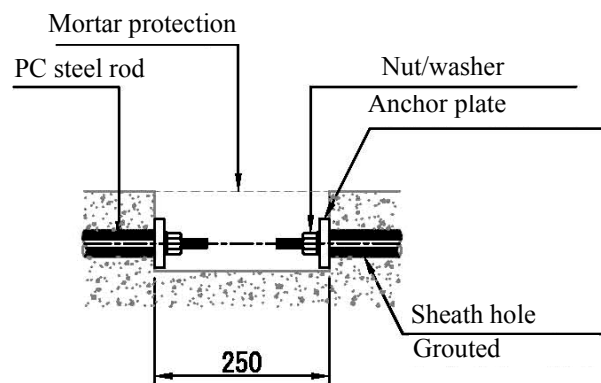


Figure 2 Grouting of sheath holes

(Product of research)

As a product of the research, we have compiled the technical manual for precast underground storm-water facilities systems (revised edition).

Collaborators: Tsurumi Concrete and Japan Institute of Wastewater Engineering Technology
 Contact: Ryohei Sakane, Shizuo Yoshikawa, Shiro Tamura

Key words

Precast, Stormwater attenuation and/or infiltration, Storm-water facilities