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Technical Code for Waterproofing of Underground Works

地下工程防水技术规范

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Issued by **the Ministry of Housing and Urban-Rual Development of the People's Republic of China**

Contents

1 General provisions

1.0.1 This code is formulated with a view to meet the requirement of high quality, advanced technology, economy and rationality as well as safety and usability in the waterproofing design and construction of underground works.

1.0.2 This code is applicable to the waterproofing design and construction of underground works, such as underground works of industrial and civil buildings, protection projects, municipal tunnel, mountain and underwater tunnel, underground railway, highway tunnel and so on.

1.0.3 The waterproofing design and construction of underground works shall follow the principle of "Combining waterproofing, drainage and blocking together, being flexible and rigid, adjusting measures to local conditions and administering comprehensively".

1.0.4 The waterproofing design and construction of underground works shall meet the requirement of environmental protection and take corresponding measures.

1.0.5 The waterproofing of underground works shall adopt new material, technology and technique with reliable quality, which have been tested, detected, identified and verified in practice.

1.0.6 The waterproofing design and construction of underground works shall comply with not only the requirements stipulated in this code, but also those in the current relevant ones of the nation.

2 Terms

2.0.1 Binder

It is the general name for such mineral admixtures as portland cement, fly ash, fine slag and silicon powder, which are used to prepare concrete.

2.0.2 Water to binder ratio

It refers to the ratio between water consumption and total binder content in preparing concrete.

2.0.3 Operational time

The period from the opening of mono-component material in vessel or the mixing of multi-component material to the time not suitable for construction.

2.0.4 Impermeability of film coating

The ability of the cured coating membrane to resist groundwater seepage.

2.0.5 Water resistance of film coating

The ability of the cured coating membrane to maintain different kinds of performance indexes under long-term immersion in water.

2.0.6 Polymer cement water proof coating

A kind of bi-component water proof coating with polymer emulsion and cement as raw

material, which is mixed with other additives.

2.0.7 Self-adhesive waterproofing membrane with macromolecular carrier

A kind of waterproof sheet coated of macromolecular self-adhesive membrane layer sheet with synthetic macromolecular sheet as its bottom film. It used for construction by pre-applied full bonding installation.

2.0.8 Pre-applied full bonding installation

A kind of construction method to lay waterproof sheet coated of macromolecular self-adhesive membrane on the base plane and then to cast the structural concrete so as to tightly bind concrete grout and sheet self-adhesive membrane together.

2.0.9 Self-adhering polymer modified bituminous waterproof sheet

A kind of waterproof sheet with high polymer modified asphalt as the main material and with self adhesive on the whole.

2.0.10 Concealed nail washer

Installed on the surface of base layer, it is composed of material hot-welding with waterproof plastic sheet and designed to fix the washer of waterproof plastic sheet.

2.0.11 Non-nails layouts

A kind of laid method to fix waterproof plastic sheet on the concealed nail washer or hang it on the base layer through hot welding.

2.0.12 Backing material

A kind of deformable material for controlling the caulking depth of sealing material and preventing the sealing material from bonding the base joint.

2.0.13 Pre-grouting

A kind of grouting to pre-fill surrounding ground crack with grout before excavation so as to block water flow and strengthen surrounding ground.

2.0.14 Surrounding ground grouting before lining

A kind of post-excavation grouting to strengthen the surrounding ground of pore and block water flow before lining.

2.0.15 Back-fill grouting

A kind of post-lining grouting to fill the space between lining and surrounding ground.

2.0.16 Surrounding ground grouting after lining

A kind of grouting for surrounding ground when it need improve the waterproof capacity of lining after the back-fill grouting.

2.0.17 Gel time

The period from the preparation or mix of grout to its stagnation.

2.0.18 Composite segment

A kind of segment is made by compounding steel plate and concrete.

2.0.19 Gasket

A kind of sealing material for the waterproofing of segment joint. It is prefabricated by the plant and fixed inside the groove of segment gasket on site.

2.0.20 Holt pore sealing washer

A kind of sealing washer for preventing segment bolt pore from water leakage.

3 Waterproofing design of underground works

3.1 General requirement

3.1.1 In the waterproofing design of underground works, it shall ensure accurate rating, reliable scheme, easy construction, duration and usability as well as economy and rationality.

3.1.2 The waterproofing scheme of underground works shall be determined according to project planning, structure design, material selection, structural durability and construction technique.

3.1.3 The waterproofing design of underground works shall be determined according to the function of surface water, groundwater and capillary water as well as the influence of human-induced altered surrounding hydrological geologic conditions. Fully-closed or partially-closed waterproofing and drainage design should be adopted for single underground works while the height for the waterproofing design of attached underground or semi-underground works shall be 500mm above the outdoor terrace.

3.1.4 As for the upstream-face main structure of underground works, it shall adopt waterproof concrete and take other waterproof measures in accordance with the requirement of waterproof grade.

3.1.5 It shall take waterproof measures to strengthen detail structures, such as movement joint (inducing joint), construction joint, Later-cast band, wall-through pipe (box), embedded parts, reserved passage joint and pile head.

3.1.6 Anti-backflow measures shall be taken for the by wash, floor drain, passageway, window well and air shaft of underground works while anti-freezing measures shall be taken for drains in cold and severely cold region.

3.1.7 As for the waterproofing design of underground works, it shall collect the following information according to engineering characteristics and needs:

1 The elevation of the highest groundwater level, the earliest indication of it, the actual water level elevation in the last few year as well as their specific conditions with seasonal variations;

2 Groundwater type, supply source, water quality, flow rate, flow direction and pressure;

3 Engineering geological structure, including direction of strata, inclination, joint and fracture, characteristic, distribution and permeability coefficient of water-bearing strata, karst cave and depression spring as well as the conditions of filling area, collapsible soil layer and swelling soil layer;

4 Historical air temperature change conditions, precipitation amount and strata frozen depth;

5 Regional topography and landform, natural flow, reservoir, abandoned gallery and mine as well as the drainage system of surface water, flood, and feed-water;

6 Earthquake intensity, geothermal heat and gas-containing hazardous substance within the engineering scope;

7 Construction technical level and material source.

3.1.8 The waterproofing design of underground works shall include the following contents:

1 Waterproof grade and waterproofing requirements;

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