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创造特种建材的无限可能
UNLIMITED POSSIBILITIES FOR CREATING SPECIAL BUILDING MATERIALS

UHPC
超高性能混凝土

Ultra-high performance concrete

钢桥面铺装 / 桥梁加固 / 桥面拓宽
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Steel bridge deck paving/bridge reinforcement/bridge widening airport runway repair/water dam repair and reinforcement

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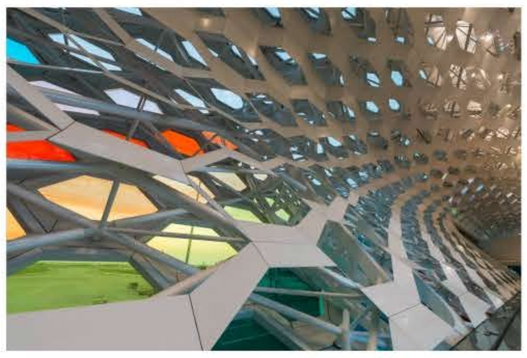
UHPC is a kind of special engineering material with high strength, high toughness and high durability, which has good application prospects in the fields of national defense engineering, marine engineering, nuclear industry, special security and protection engineering, and municipal engineering. Tests have proved that its flexural strength is three times that of ordinary C50 concrete, shrinkage is reduced by 50%, and it remains intact after 700 freeze-thaw cycles, which is known as the concrete that **"never cracks"**.

一 Product characteristics

- 1. UHPC is now used as the outer protective layer of steel structures of offshore oil platforms, which can greatly improve the service life of pillars in the water level change area.
- 2. UHPC's early strength development is fast, late strength is very high, used for reinforcement and repair works can replace steel and expensive organic polymers, can maintain the integrity of the concrete system, but also reduce costs.
- 3.UHPC has high strength and good impact resistance, it can be used in the protective structure of national defense project, and also can be used in the special structure which needs high load bearing capacity.
- 4. UHPC's high compactness and good working performance, so that the surface in contact with the template has a high degree of finish, the outside world is difficult to invade the harmful media to the UHPC, and UHPC in the coloring agent and other components are not easy to precipitate outward, the use of this feature can be used as a decorative material for the outside of the building UHPC.



二 Performance "Technical Requirements for Ultra High Performance Concrete (UHPC) T/CECS 10107-2020"

Extension Classification of Ultra High Performance Concrete

Level	UF1	UF2	UF3
extensibility	S<650	650≤S<750	S≥750

Ultra High Performance Concrete Durability Requirements

Items	Structural	Non-structural
Chloride diffusion coefficient/(x10^{12} m^2/ s)	≤0.40	≤0.60

Classification of compressive properties of ultra-high performance concrete

Level	UC1	UC2	UC3	UC4
Compressive Strengths	$100 \le f_{cu} < 120$	$120 \le f_{cu} < 150$	$150 \le f_{cu} < 180$	$f_{cu} \ge 180$

Classification of tensile properties of ultra-high performance concrete

Level	UT1	UT2	UT3	UT4
Tensile strength/MPa	≥5	≥5	≥7	≥10
Residual Tensile Strength/Elastic Ultimate Tensile Strength	≥0.7	/	/	/
Tensile strength/elastic ultimate tensile strength	≥1.00	> 1.00	≥1.10	≥1.20
Tensile strain/x10^{-6}	< 1000	≥1000	≥1500	≥2000

Note 1: UT1 level represents that UHPC shows no significant strain hardening phenomenon or only strain softening phenomenon during uniaxial tensile test, UT2, UT3 and UT4 levels represent that UHPC shows different degree of tensile strain hardening phenomenon during uniaxial tensile test.
Note 2: The residual tensile strength is taken as the tensile stress corresponding to the ultra-high performance concrete when stretched to a tensile strain of 1500x10^{-6}.
Note 3: The indexes listed in the same grade should be satisfied at the same time, otherwise the grade should be downgraded.

Performance requirements for ultra-high performance concrete mixes

Items	Extension	Expansion degree longitude loss	Extension time
request	≥650mm	≤100mm	3~10s

Requirements for Mechanical Properties of Ultra High Performance Concrete

Categorisation	Items			
	Compressive strength(MPa)	Tensile Properties	Modulus of elasticity(GPa)	Flexural strength(MPa)
Structural	≥120	Not less than UT2 grade	≥40	≥14
Unstructured	≥100	Not less than UT1 grade	≥40	≥10

Shrinkage requirements for ultra-high performance concrete

Items	Nature Conservation	Thermal conservation
Drying contraction/x10^{-6}	≤300	≤100
Early age self-contraction/x10^{-6}	≤1000	/

Scope of application

1. Using the high strength nature of UHPC, you can reduce the size of the structural components and get more space. The use of UHPC can build longer spans, greater headroom of the bridge; can reduce the size of the bottom column section in high-rise buildings, get more use of the area.
2. The use of UHPC high tensile strength, corrosion-resistant nature of the production of oil and gas pipelines to replace the high cost of large diameter thick-walled steel pipe, significantly improve the durability of the pipeline, reducing costs
3. Using UHPC's high permeability, manufacture of low and medium radioactive nuclear waste storage containers.
4. Used in military and security fields to manufacture anti-explosion and anti-impact devices.
5. On-site repair and structural reinforcement.

Application of UHPC in bridge paving

Application of UHPC in anchor zone concrete of cable-stayed bridges

Application of UHPC on urban transport construction projects

Application of UHPC in precast girder box

Application of UHPC in underground decorative panels

Application of UHPC in exterior wall decoration

UHPC in lightweight staircases

Application of UHPC in underground pipe corridors

UHPC in architectural sun shading panels

UHPC in polished concrete

UHPC in architectural flooring

UHPC in sewage pipes

Application of UHPC in translucent concrete

Application of UHPC in precast concrete components

UHPC in Seismic Columns for Building Foyers

UHPC in urban/home applications

UHPC in the application of anti-explosive engineering

UHPC in Craft Products

UHPC in thin-walled cover beams

UHPC in cover plates

四 Construction process

1.Mixing

① Put the premix into the mixer and mix it dry for 60s.

②Add water and additives, and continue mixing for 8~10min until it is homogeneous.

Note: The quantity of each mixing should be 1/2~2/3 of the capacity of the mixer; according to the power of the mixer and the speed of the mixer, the mixing time can be increased or decreased appropriately.

2. Maintenance

Basic principles of good curing: Loss of moisture from UPC should be avoided as much as possible during and after 7d of the construction of moulded specimens, precast production elements and in-situ casting. Immediately after finishing, the exposed surface of UHP concrete should be covered with plastic film or curing agent to prevent loss of water by evaporation. For large areas, especially when exposed to wind and sun, immediately begin curing a section of the finished surface to avoid prolonged exposure of the surface after plastering.

五 Packaging and storage

Packed in composite bag, net weight 25kg/bag, shelf life 3 months; must be stored in dry and ventilated room, the bag is sealed, pay attention to moisture-proof, anti-freezing.