UHPC无缝耐磨地坪产品手册

UHPC Seamless Wear-Resistant Floor Product Manual

宁波博阳城市运营管理服务有限公司

Ningbo Boyang Urban Operation Management Service Co., Ltd.

Product Overview

Ultra-High Performance Concrete (UHPC) has emerged as one of the most groundbreaking cement-based engineering materials over the past three decades, achieving remarkable breakthroughs in material performance. UHPC is a cement-based composite material characterized by exceptional strength, high toughness, and low porosity. Its core formulation principle involves enhancing component fineness and reactivity while eliminating coarse aggregates, thereby minimizing internal defects (porosity and micro-cracks) to attain superior strength and durability. Leveraging these material properties, "Zhuliyuan" has developed a comprehensive in-situ casting technology for UHPC, capable of handling up to 5,000 ㎡ daily construction area, significantly reducing project timelines and boosting efficiency. The company's proprietary ultra-high-performance inorganic marble flooring, renowned for its unique performance advantages, has gained widespread adoption among architectural design institutes and clients, with products extensively applied in both indoor and outdoor flooring applications.

Performance parameter

chemical composition	Cement-based, inorganic mineral powder
Appearance color	Powder form/ white,/gray
guarantee period	Within 3 months from the production date
mobility	Initial mobility: approximately 210-230 mm
	10-minute mobility:>190 mm
compression strength	3 days later ≥30 MPa
	28 days later ≥80 MPa

rupture strength	3 days later ⩾7MPa
	28 days later⩾12MPa
cohesional strength	⩾3MPa
Dimensional shrinkage rate	Typical values⩽0.01%
abrasion performance	<200mm^3
resistance to impact	No cracking or detachment from the underlying layer

Product superiority

1.Extra–large dimensions:

Utilizing UHPC material cast–in–place technology, it enables massive casting with exceptional resistance to cracking and hollow drumming.

2. Superior performance:

flexural strength of 12–15 MPa, compressive strength of 80–100 MPa, scratch–free under vehicle traffic, and resistance to fracture. Additionally, it exhibits excellent adhesion to the substrate, prevents loosening, and demonstrates superior durability.

3. Short construction period:

UHPC materials exhibit excellent fluidity, enabling pumpable application with rapid construction and curing rates. The maximum daily construction area can reach 5000 m^2, significantly reducing time and labor requirements.

4. Easy to clean:

UHPC materials are inherently highly dense. With appropriate surface treatment, they exhibit water resistance and oil stain resistance. Simple cleaning can restore their surface to a pristine condition.

5. Green and Low–Carbon:

Some components use recycled aggregates to reduce resource consumption. The use of cement, a high–carbon–emitting material, is reduced by 2/3, resulting in a 60% reduction in overall carbon emissions per square meter. This makes the product more environmentally friendly and sustainable.

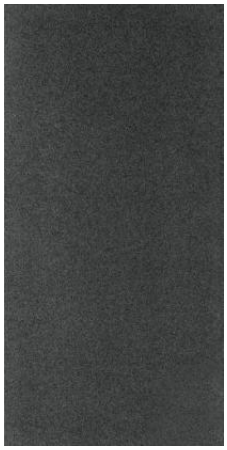
Application Scope

1. Outdoor ground surfaces: municipal pedestrian pavements, outdoor commercial plazas, park landscapes, etc.

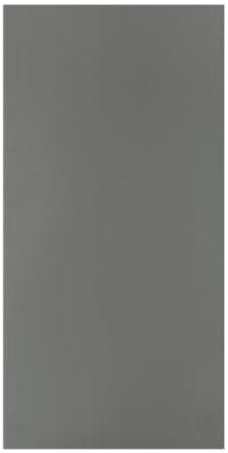
2. Indoor flooring: high-end commercial centers, hotels/banquet halls, office buildings, convention centers, airports/high-speed rail stations, schools, etc.

Product Series Colors

1. Solid Color Series



mountain ash

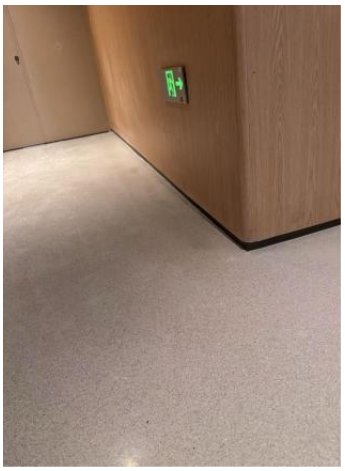


Clear water

amber

Frost-white

Product Application Effect


Floor powder application steps

I. Construction Preparation

1.1 Material Preparation

Before construction, it is necessary to prepare all the required materials, including:

1.1.1 Primer/Adhesive: The adhesive is typically composed of polymer emulsions such as acrylic, styrene–acrylic, or styrene–butadiene emulsions, epoxy resin, modified amine curing agents, silane coupling agents, and nano-sized silica sand. The epoxy resin content must be at least 35%. The ratio of curing agent to resin is 1:4. The amount of coupling agent added is 2—3% of the total mass, ensuring that the bonding strength between the base layer and the surface layer is ⩾3MPa.

1.1.2 UHPC Powder

1.1.3 The UHPC powder must meet the corresponding specifications and performance requirements established by the company.

1.1.4 Before UHPC powder is used on-site, its key properties such as strength, setting time, and color must be tested and rechecked in batches.

1.2 Grassroots Preparation

For uneven substrates with water accumulation, pre-treatment must be carried out following these steps:

1.2.1 Water Drainage and Drying: Use pumps to forcibly remove surface water. In low-lying areas, temporary drainage ditches should be constructed with a width of 100—150 mm and a slope of ≥2%. Industrial dehumidifiers should be used to continuously dry the surface, ensuring that the moisture content remains ≤6% (measured using a concrete moisture meter).

1.2.2 Repair of surface defects: Use a laser level to measure the surface flatness. For areas with height differences exceeding 5 mm, use non-shrinking repair mortar (with compressive strength ≥ 40 MPa) to level the surface. Any locally loose or sanding areas must be completely removed (with a depth of ≥ 10 mm). After cleaning, apply an interface agent and fill the area with repair mortar to the desired elevation.

1.2.3 Surface Enhancement: The surface of the dried and qualified base layer must be sandblasted or mechanically polished until its roughness reaches SP3 level. After removing any loose dust, the surface should be rinsed with a high-pressure water gun. Once the surface is dry, apply styrene-acrylic emulsion or styrene-butadiene emulsion evenly using a roller. The application process must be completed within 2 hours.

1.2.4 Drainage slope verification: Use a 2-meter straightedge along with a feeler gauge to check the flatness of the leveling layer (allowable deviation ≤3mm/2m). Additionally, use a slope gauge to verify that the drainage slope meets the design requirement of

0.5%–1%. Acceptance can only be granted after ensuring there are no areas where water can accumulate.

1.3 Construction Equipment

1.3.1 Main equipment for self-leveling construction: self-leveling pavers, mortar mixers, defoaming rollers, toothed scrapers, levels, laser levelers, trowels, wheelbarrows, scales, and vertical transportation equipment.

1.3.2 Main tools for leveling layer: mortar mixer, wheelbarrow, shovel, trowel, level gauge, and spirit level.

1.4 Working Conditions

1.4.1 Plastering of ceilings and walls has been completed. All pipelines have been installed, and floor drains have been set in place.

1.4.2 The base concrete has been poured. The thickness of the bottom coat and surface layer has been reserved according to the specified elevation, and the concrete has been cured to meet the design requirements.

1.4.3 Ensure the wall surface is level, with a horizontal control line marked 50 cm above the base level.

1.4.4 All construction materials have been prepared and delivered to the site. Upon inspection, their quality meets the required standards. The quantities available are sufficient to support continuous construction operations.

1.4.5 The underlying surface has been approved as satisfactory for use, with no signs of hollowing, cracks, or sanding. The bonding strength between the surface and the underlying layer is greater than 0.5 MPa.

II. Operating Procedures

2.1 Process Flow

Substrate preparation → Application of substrate primer → Mixing of ultra–high–performance self–leveling mixture → In–place pouring → Defoaming and rolling → Laser leveling → Finishing and smoothing → Curing

2.1.1 Leveling Layer:

Substrate preparation → Marking elevation and drawing lines → Wetting the surface with water → Applying plaster marks and guide ribs → Mixing mortar → Applying cement slurry as a bonding layer → Laying the cement mortar surface layer → Smoothing with a wooden trowel → First pass of iron trowel smoothing → Second pass for final polishing → Curing. The allowable deviation in surface flatness is 3 mm.

Substrate Preparati：

(1). When cracks exist in the base layer, mechanical cutting should be used first to create V–shaped grooves that are 20 mm deep and 20 mm wide. Then, solvent–free epoxy resin or solvent–free polyurethane material should be used to reinforce the area, fill it in, level it, and seal it.

(2). If the compressive strength of the concrete base layer is less than 20 MPa, or if the compressive strength of the cement mortar base layer is less than 15 MPa, reinforcement measures must be taken or the surface must be reconstructed.

(3). If the area affected by hollowing is 1 square meter or less, grouting can be used for repair. If the affected area is larger than 1 square meter, the damaged portion must be removed and the surface rebuilt.

****Substrate Requirements:****

(1). Before the construction of ultra–high–performance, seamless, wear–resistant flooring (self–leveling type), a substrate inspection must be conducted in accordance with national standards. Construction can only proceed after the inspection confirms that the substrate meets the requirements.

(2). The substrate surface must be free from defects such as sanding, hollowing, peeling, looseness, pitting, grease, dust, or cracks. The bonding strength should be 0.5 MPa or higher when tested.

(3). The flatness of the substrate should be checked using a 2–meter straightedge. The maximum unevenness over every 2 meters should not exceed 3 mm.

(4). The substrate must be made of concrete or cement mortar, and it must be firm and dense. If the substrate is cement mortar, its compressive strength should be at least 15 MPa.

(5). The moisture content of the substrate should not exceed 8%.

(6). Areas where the floor meets walls, as well as areas with pipes passing through the floor, require special protective treatment before construction can begin.

(7). Application of the substrate primer:

First, apply the primer evenly onto the substrate using styrene–acrylic or styrene–butadiene emulsion. Wait until the surface is slightly dry before applying a second coat.

After application, the surface should be cured in an environment with a temperature of 20—25° C. The surface will be ready for use after about 1—2 hours of drying time.

Full curing takes at least 6 hours. Only after the primer has fully cured can the self–leveling mixture be poured onto the surface.

2.1.3 Cast–in–Situ Pouring Technique:

2.1.3.1 The proportion of ultra–high–performance self–leveling mix shall strictly comply with the product specifications, maintaining a powder–to–water ratio of 1:0.1—0.12. Mixing should be performed using a forced–action mixer to achieve a self–leveling fluid slurry, ensuring uniformity and absence of clumping. Pigments or aggregates may be added as per design requirements or client specifications to achieve desired color and texture.

The incorporation of small amounts of emulsifiers or defoamers can

further enhance product performance.

2.1.3.2 On-site pouring requirements:

(1). Inspect the mixing equipment for cleanliness and absence of impurities, adjust it to normal operating conditions, and position it in a location convenient for construction.

(2). Mixing water shall be clean tap water with temperature controlled between 5–35°C. The use of water containing oil contamination or impurities is strictly prohibited.

(3) . The flowability of the mixed material must be tested immediately after it leaves the mixer. The initial flowability should be ⩾210 mm, and the flowability loss within 30 minutes should not exceed 30 mm. Only after meeting these requirements can the material be poured.

(4) . During the pouring process, an anti-foaming roller should be used to perform crisscross rolling on the freshly poured area, with no fewer than 3 rolling cycles per square meter to ensure complete elimination of air bubbles.

(5) . The same construction area shall use UHPC powder from the same batch. Before using materials from different batches, their color and performance consistency must be tested.

2.1.3.3 For cast-in-place self-leveling concrete mixtures,

the ultra-high-performance self-leveling floor surface layer should have a thickness of 10–15mm. The uniformly mixed material should be continuously laid using a paver or toothed scraper, with material distribution progressing from one side of the construction area to the other to ensure even distribution. Real-time surface flatness

monitoring using a laser leveling instrument is required, with deviations controlled within 3mm/2m. Edge and corner areas should be leveled using trowels as auxiliary tools.

2.1.3.4 Defoaming and Surface Finishing Immediately after pouring, apply defoaming rollers in a crisscross pattern for 2–3 passes to expel air bubbles and achieve surface smoothness. Before the initial setting of the mixture (approximately 1–2 hours), use a smoothing machine for mechanical surface finishing to ensure a dense and glossy finish.

2.2 Construction Areas

2.2.1 Ultra–high–performance seamless wear–resistant flooring (self–leveling) construction areas are specified in the design drawings.

三、quality standards

3.1 Project Assurance

3.1.1 The selected materials, types, strength (mix ratio), and colors shall comply with design requirements and construction specifications.

3.1.2 The bonding between the surface layer and the base layer must be secure, free from defects such as hollow drums or cracks.

3.2 Core Specifications

3.2.1 Surface Finish: The surface must be smooth and crack–free, free from sand holes, with uniform color consistency and no noticeable color variations. The flatness deviation shall not exceed 3mm/2m, ensuring seamless integrity.

3.2.2 Sloped surfaces for floor drains and liquid storage containers must comply with design specifications, featuring no overflow, leakage, or water accumulation. The junctions with floor drains (pipelines) shall be tightly sealed and smoothly integrated.

3.2.3 The height of the kickboard should be consistent, with uniform wall penetration thickness and secure bonding to the wall surface. Local areas with hollow drumming shall not exceed 200mm in length and shall be limited to no more than 2 occurrences within a single inspection range.

3.2.4 The width and height difference between adjacent steps of stairs and steps shall not exceed 10mm. Corners shall be straightened, and anti-slip strips shall be kept straight.

3.2.5 The materials and visual appearance of floor trim shall comply with design and construction specifications, featuring neat and smooth edges with no color mixing at adjacent areas of different surface layers.

4 . Finished Product Protection

4.1 During the application of primer and surface plastering, electrical and water pipelines, various equipment, and embedded components must remain undamaged.

4.2 During material transportation, protect doors, entryways, railings, etc., and avoid damage.

4.3 Moisture-retaining effect of thin film: Prevents rapid evaporation of surface moisture in self-leveling coatings, which may lead to plastic cracking or reduced strength.

Once the self-leveling slurry has initially hardened (approximately 2–3 hours post-construction, when footprints are no longer visible on the walkway), immediately cover the surface completely with plastic film (e.g., polyethylene film). Ensure tight coverage and secure the edges with heavy objects. Maintenance period: Keep the film in place for at least 2–3 days. Avoid stepping on or performing any other operations during this time.

4.4 Application of sealant (topcoat): Purpose: After curing, apply a specialized sealant to enhance the floor's wear resistance, stain resistance, glossiness, and achieve complete sealing of surface micropores.

After film curing, ensure the floor surface is completely dry and clean. Select a water-based or solvent-based epoxy/polyurethane sealant compatible with the self-leveling system. Apply 1–2 coats uniformly using a roller. Maintain good ventilation during construction.

V. Quality Issues to Be Noted

5.1 Hollow Drumming: Primarily caused by floating dust or oil stains on the substrate surface, uneven application of interface agent, or delayed curing. During construction, ensure thorough substrate cleaning, uniform and complete application of interface agent, and prompt curing after pouring.

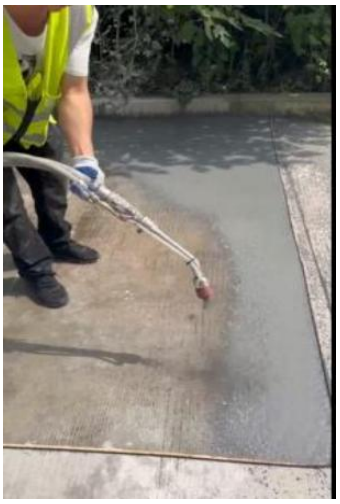
5.2 Water leakage prevention: Before pouring, use a laser leveling instrument to establish slope control lines to ensure drainage gradients comply with design specifications (typically 0.5%–1%). Monitor surface slope continuously during pouring to prevent water accumulation.

5.3 Low strength control: Strictly maintain powder–to–water ratio at 1:0.1—0.12 to ensure uniform mixture mixing (stirring duration ⩾3 minutes). Apply curing film within 24 hours post–pouring, maintain curing temperature at 5–35° C, and ensure curing duration of at least 7 days.

Construction procedure diagram: Base layer surface cleaning → Surface interface agent application:

Ground surface cleaning–Application of interface agent on ground surface

Ground coating procedure: Mixing–Spraying–Application of defoaming roller



The smoothing machine performs mechanical surface finishing with polishing.

Flooring

DesignExamples: