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Case story

Striking the perfect specification balance for Aquarabia

- one of the world's largest desert water parks

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A water theme park **in the desert**

Emerging from the desert just outside Riyadh, Aquarabia is set to become one of the world's largest water theme parks and a centrepiece of Saudi Arabia's entertainment and tourism strategy.

Designed by Dewan Architects and inspired by Arabian landscape and culture, Aquarabia stretches across more than 250,000 m^2 and brings together 22 rides, record-breaking water attractions — including the world's tallest water coaster — and fully immersive themed environments.

In 2022, the lead design consultants were tasked not only with conceptualising this iconic destination, but also with supervising its complex construction — a scope that demanded advanced expertise in corrosion protection and passive fire protection. That is where Hempel was brought in as a specialist partner.

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The Challenge

Ensuring steel protection across diverse exposure conditions

The climatic conditions of Aquarabia presented a unique challenge. The park's exterior steel structures are exposed to Saudi Arabia's harsh desert climate — extreme heat, UV radiation and airborne sand. Meanwhile, the interior steel is subjected to a humid microclimate created by water attractions, splash zones and enclosed ride areas.

This combination of dry desert environment and high-humidity pockets required carefully tailored coating systems to ensure long-term durability and structural integrity.

At the same time, the project's scale demanded rigorous cost discipline in specification decisions. While over-specification is frequently used to mitigate safety and performance uncertainty in large developments, here it would have resulted in significant cost escalation without measurable benefits — a major concern for a project valued at approximately $750 million.

Recognising the need for precision and balance, the engineering team turned to Hempel for guidance in developing clear, project-specific coating specifications.

Assessing the exposure conditions **for custom specifications**

Hempel began by analysing the park's diverse exposure zones, ranging from directly exposed external steel to concealed structural elements within themed environments, utility areas and indoor attractions. Each area required a corrosion protection system aligned with its specific exposure category, generally falling within the C4 corrosivity range.

For external structures — such as ride towers, elevated platforms and support frames integrated into architectural rockwork — the coatings system needed to withstand intense sunlight, temperature variations and humidity created by water activities. These elements also required passive fire protection due to their role in public attractions.

For instance, for external elements directly exposed to the environment and requiring intumescent fireproofing, Hempel specified a three-layer system:

- **An activated zinc epoxy primer for galvanic corrosion protection**
- **A solvent-based acrylic intumescent coating to deliver up to 120 minutes of fire resistance**
- **A high-solids acrylic polyurethane topcoat for long-term colour and gloss retention under extreme UV exposure**

This approach ensured that both aesthetic and safety requirements were fulfilled across Aquarabia's extensive themed areas.

Hempel's detailed specifications were subsequently incorporated directly into the consultant's project documentation.

Key takeaways

The learnings from the water park project should inspire future projects to prioritise detailed, environment-specific planning and innovation within their specifications.

1 **Accurate corrosivity classification is essential**

Recognising the correct corrosivity category is crucial for developing durable coating systems that withstand environmental challenges without over-specification. This ensures that solutions are not only compliant but also perfectly tailored to the project's needs.

2 **Customisation is key**

The project emphasised the importance of custom solutions, particularly in coating specifications. Engineers and specifiers are encouraged to seek solutions tailored to the unique conditions of their projects to avoid under- or over-specification.

3 **Collaboration drives successful outcomes**

Close coordination between Hempel's advisors, structural engineers, ride manufacturers and Dewan's design team ensured that coating specifications evolved seamlessly alongside architectural and structural changes. This project underscores the importance of early technical engagement and customised specifications for large-scale, complex developments.

The coating system

To meet Aquarabia's demanding technical requirements, the following coating solutions were selected:

Hempadur Avantguard® 550

An activated zinc epoxy primer offering galvanic corrosion protection, fast drying and excellent mechanical strength — ideal for steelwork exposed to fluctuating humidity.

Hempafire Pro 400 & Hempafire Optima 500

Intumescent coatings providing passive fire protection for structural steel. Hempafire Pro 400 offers high fire resistance for exterior steel, while Hempafire Optima 500 delivers low-VOC performance for selected indoor applications.

Hempathane HS 55610

A high-solids acrylic polyurethane topcoat offering exceptional gloss and colour retention, crucial for maintaining appearance in the intense desert sun and ensuring the longevity of visible architectural features.

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Together, these coatings formed a robust, durable system designed specifically for Aquarabia's environmental and safety demands.

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Seeking guidance **on specifications?**

Connect with us for complimentary advice and insights on protective coating specifications. Expect a response within 48 hours.

Explore our webpage as well, your go-to resource for all the support you need to choose the best protection for your structural steel projects:

www.hempel.com/specify-your-project

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