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RESTORING THE TRENCADÍS MOSAIC ON THE INNER FACE OF THE PARK GÜELL BENCH, BARCELONA.

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Historical Introduction

1899: Eusebi Güell buys the land that shapes Park Güell. Antoni Gaudí is then entrusted with the construction of a residential area inspired in the English models create to fight the massification of cities.

Park Güell, around 1913

1913: Plaça de la Natura's perimeter is closed with the construction of a wave-like bench that is also used as a banister. For this construction, J.M. Julol collaborates with Gaudí. The bench is 102 meters long and its design forms 23 small galleries that encourage social meeting points. It is covered with Trencadís mosaic, using ceramic and some elements of porcelain to cover its inner side and pieces of glass to cover the outer face.

1914: The project is abandoned.

1922: The local government of Barcelona buys the Park property to make it a public park.

From the maintenance to the Restoration

Ever since Park Güell has been open to the public, it has had an important flow of visitors, which has even been exagge rated during the past decade. The ceramic of the Trencadís has degraded due to the quality of its materials, its usage and the fact that it is outdoors. The most common damage is the loss of glazing parts and sometimes also the bescuit.

Deterioration state before replacement of pieces

From the beginning, the eroded pieces were substituted by others made of ceramic that could be very different in design, color, or even the form of cut of the piece, etc. It could be considered that there was the will to maintain them but not to preserve the original.

Around 1990 a very important intervention took place with the intention of restoring the whole Park, including the bench.

Restoration

Currently, an intense job to retrieve the original aspect of the bench is taking place. Since 2011 we are taking part of its conservation and restoration works. Two types of actions have been done:

First: Replacement of deteriorated or anachronistic pieces from previous interventions. They are substituted by other pieces of the period and if none are available, by copies.

Second: Restoration of original and unique pieces that have partially lost glazing elements.

Procedure:

-Cleansing of accumulated dirt, earthy deposits and calcareous crust, both from the glazing elements surface and the *bescuit* and also the cut zone.

-Removal of antique non original rejoint mortars that superimpose the glazing elements. These mortars optically generate thick junctions that hide part of the ceramic's polychromy.

-Removal of the organic remains formed during the glazing elements-bescuit interphase.

-Acrylic resin injection in the zones with blisters.

-Volumetric reintegration of the lacunae with a lime mortar. Gravels of small granulometry with similar color to that of *bescuit* and with hydraulic properties have been used.

-Chromatic reintegration. Throughout time, different types of paints have been used. We have observed that some colours were altered by the action of UV rays. The study described underneath has lead us to work with silicates.

Section 35-36, deteriorated trencadís

During the restoration

After the restauation

Section 50, detail recuperated according to original models

Section 53, tile with volume

During the restoration

After the restoration

Section 20-21, detail pictorial retouch

Section 17, before the estauration

Recuperation of volume and color

ECRA S.L. team

Section 44, separation of glazing elements

Consolidation

Final result

Works "*in situ*"

Section 58, Cleansing process of the inner moss

Biological affectation

Deep cleaning

Reintegration

Color recovery

Works "*in situ*"

Lab studies

The tests were intended to study the resistance and stability of acrylic and silicate based colours. These tests were applied for chromatic reintegration of the ceramic materials during the 2011 and 2016 interventions, during which they were exposed to the main environmental degradation factors. Induced aging conditions were applied to test tubes prepared in the lab in order to check the changes in their behavior and resistance in a determined period of time. These test tubes were separated in the following groups, which correspond to the main chromatic degradation factors: direct sunlight (1800 hours); gradual temperature changes during natural 24 hour cycles (registered by datalogger Cryopak ¡MINI); induced UV light (UVB10% UVA90% Phillips, 2x4,75w. 1200 hours); fluctuating relative humidity in a closed environment by nebulisation (Steam inhaler 30%-100%).

The specific diagnostic techniques to obtain the results were the following:

Digital microscopy for the analysis of superficial texture. Digital microscope AM413M-FVT. UV.

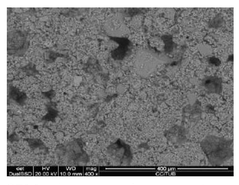
Scanning electron microscopy to obtain micro topographic images of the mortars used in the leveling of the surface (base for the applied chroming).

Chromatic study of the samples before and after inducing the aging processes. Colorimetre RN 110, Nh3 Quantotech. Colorimetric space CIELAB.

Study of the drying time and thermic variation for the testing of the vitrium changes of the varnish. Drying stove in the lab S.7000 Functiun Line Heraeus.

Results

After the application of induced aging conditions on the acrylic based colours, in general white, yellow and red colours darken, changing the ΔE* category. Parameters Δa* Δb* tend to green, while green, blue and black colours tend to get lighter, with a slight tendency to yellow. Blue and black colours lose resistance to ΔE*, substantially getting lighter. For the silicate based colours, even though some colours have varied in ΔE* without changing their category, the visual perception is minimum, since the chromatic layer of these paints is the most concentrated one in the pigment-binder relation, obtaining a more dense and matte visual appreciation of the colour.



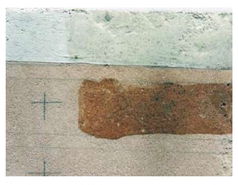
SEM microscopy base mortar

Test tubes table, acrylic colours

Microscopy. Acrylics texture

Microscopy. Silicate texture

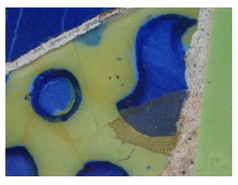
Table of silicated colours



Addition of UV varnish protection

Addition of silicates protection

Measurements colorimetre



Trapped dirt on surface

As for the varnishes, UV protection acrylic has an outdoors curing time of hours, during which it traps suspended particles that break the polymeter chain of coverage. With time, it gets yellow and dirty. Other silicate superficial protections can crystallise in the surface, creating a whitish glaze or a micro scaled effect of the paint applied.

Looking towards the future (Conclusions)

From the beginning, the bench has been subject to multiple effects that have generated degradation processes:

1. Continuous usage has worn it away, and in a more accelerated way during the past years due to touristic pressure.
2. Effects of it being outdoors have activated physical and biologic degradation processes.
3. Intentional vandalism acts.

Any intervention in the restoration will never be definite, as the alteration causes cannot be modified. We think it is convenient to periodically carry out **conservation-restoration** interventions which will avoid the appearance of new damages.