ASSESSMENT OF STONE CONSERVATION TREATMENT PRODUCTS OF *TECNOLOGÍA NAVARRA DE NANO PRODUCTOS S.L (TECNAN).*

ASSESSMENT METHODOLOGY: According to "Criteria for working in stone materials" [1*]

1 of 2: TECNAN Consolidant

TEST CHARACTERISTICS

Composition: tetraethyl silicate base with isopropyl alcohol, as solvent.
Stone surface: Commercial *Dorada Urbión* sandstone. Test blocks were prepared with the layers of sedimentation both parallel and perpendicular to the adsorption surface.
Conditions of application: Capillary absorption during 24h. 4-week polymerization period. Temperature: 16ºC ±0, 5º; Relative humidity: 65% ±3%

EFFICACY ASSESSMENT

Assessment by means of *longitudinal ultrasonic wave velocity (Vp)* measured along the rock core. Vp values are directly proportional to dry material density and inversely proportional to porosity.
Grade of consolidation:

- An average increase of longitudinal ultrasonic wave velocity (m/s) of 21.56% was obtained in comparison to the NON-TREATED stone.
- Consolidation depths (i.e. heights reached by product) of 3.5 to 4.5 cm were measured with above-90% consolidation grades.

SUITABILITY ASSESSMENT

Water vapour permeability

- Average decrease of about 29% in comparison to the NON-TREATED stone.

Colour alteration (one month after application): Color space (C*,L*,h) [2]

- 10.2% decrease in *lightness (L*)*
- 2.6% increase in *Chroma(C*)*
- 1.35º decrease in *hue (h)*

EVALUATIVE NOTE: Obtained values are within the accepted ranges of the studied parameters for this kind of product and this rock type.

Results are not generalizable beyond the studied conditions of application and lithologies [3*]

ASSESSMENT OF STONE CONSERVATION TREATMENT PRODUCTS OF *TECNOLOGÍA NAVARRA DE NANO PRODUCTOS S.L (TECNAN).*

2 of 2: TECNAN Consolidant

REFERENCED NOTES:

(1*) Laborde A., Cirujano C., Alonso F.J., Blanco M., Fort R., Jiménez C., Herráez J. A. Escudero C., Navarro J. V., Pardo D., Escartín E., García E., Gisbert J., Yanguas N., Bouzas A., Androver I., Balyuille J.M. y Amador R. (2003). Proyecto COREMANS: Criteria for working in stone materials. Ministerio de Educación Cultura y Deporte. ISBN: 978-84-8181-562-7.

(2*): After the application of this kind of consolidant products on stone surfaces, the induced colorimetric alterations (assessed here through the *lightness (L*), chroma (C*)* & *hue (h)* parameters in *L*, C*,h color space)* tend to diminish until almost completely disappearing in a few months' time.

(3*): The evaluative notes were based on results of the here conducted experiments as well as of experiments conducted in our laboratory with other conservation products of similar characteristics and published results of scientific articles within the *stone conservation* field.

This document certifies that the described experiments and results were obtained in our laboratory under the referenced experimental and environmental conditions.

This technical report consists of two pages (including this one).

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ASSESSMENT OF STONE CONSERVATION TREATMENT PRODUCTS OF *TECNOLOGÍA NAVARRA DE NANO PRODUCTOS S.L (TECNAN).*

ASSESSMENT METHODOLOGY: According to "Criteria for working in stone materials" [1*]

1 of 2: TECNAN Consolidant

TEST CHARACTERISTICS

Composition: tetraethyl silicate base with isopropyl alcohol.
Stone surface: Commercial *Dorada Urbión* sandstone. Test blocks were prepared with the layers of sedimentation both parallel and perpendicular to the adsorption surface.
Conditions of application: Capillary absorption during 24h. 4-week polymerization period. Temperature: 16ºC ±0.5º; Relative humidity: 65% ±3%

EFFICACY ASSESSMENT

Assessment by means of longitudinal ultrasonic wave velocity *(Vp)* measured along the rock core. Vp values are directly proportional to dry material density and inversely proportional to porosity.
Grade of consolidation:

- An average increase of longitudinal ultrasonic wave velocity (m/s) of 21.56% was obtained in comparison to the NON-TREATED stone.
- Consolidation depths (i.e. heights reached by product) of 3.5 (parallel lamination) to 4.5 cm (perpendicular lamination) were measured with above 90% consolidation grades.

SUITABILITY ASSESSMENT

Water vapour permeability

- Average decrease of about 29% in comparison to the NON-TREATED stone.

Colour alteration (one month after application) [2]

- 10.22% decrease in *lightness (L*)*
- 2.86% increase in *chroma (C*)*
- 1,35º decrease in *hue (h)*

EVALUATIVE NOTE: Obtained values are within the accepted ranges of the studied parameters for this kind of product and this rock type.

Results are not generalizable beyond the studied conditions of application and lithologies [3*]

2 of 2: Aquashield Ultimate nanotechnology hydrophobic product applied over TECNAN Consolidant

Aquashield composition: nanoparticle base with isopropyl alcohol, as solvent.
Stone surface: Commercial *Dorada Urbión* sandstone treated with TECNAN Consolidant (after a 4-week polymerization period).
Conditions of application: Two successive layers of product sprayed from a distance of 20-30 cm off the stone surface.
Temperature: 16ºC ±0.5º; Relative humidity: 65% ±3%

EFFICACY

Water repellence grade:

- An average contact angle (º) of 142.17º was obtained with very low deviation (2.3º).

SUITABILITY

Water vapour permeability

- 12% average decrease in comparison to the consolidated stone
- 41% average decrease in comparison to the surrounding non-treated stone

Colour alteration (one month after application) (2)

- 0.37% decrease in *lightness (L*)* in comparison to the value of the consolidant; 10.55% decrease in *lightness (L*)* in comparison to the non-treated stone.
- 2.7% increase in *chroma (C*)* in comparison to the value of the consolidant; 5.66% increase in saturation *chroma (C*)* in comparison to the non-treated stone.
- 0.5º increase in *hue (h)* in comparison to the value of the consolidant; 0.96º decrease in *hue (h)* in comparison to the non-treated stone.

EVALUATIVE NOTES:

- ***Efficacy*** values of the hydrophobic product of the consolidant + water repellent system were found to be systematically slightly higher than those obtained for siloxane- or polysiloxane-based hydrophobic products.
- Obtained ***suitability*** values are within the accepted range for this kind of product and this rock type. Similar results can be expected for hydrophobic products with similar nanoparticle components.
- In conclusion, the compatibility between the TECNAN consolidant and the TECNAN Aquashield hydrophobic product was found to be good.
  The Aquashield hydrophobic treatment was also tested with other commercial consolidants with similar chemical composition (i.e. ethyl silicate base), and the obtained efficacy and suitability values were within the acceptable ranges for this kind of conservation treatments.

Results are not generalizable beyond the studied conditions of application and lithologies (3*)

ASSESSMENT OF STONE CONSERVATION TREATMENT PRODUCTS OF *TECNOLOGÍA NAVARRA DE NANO PRODUCTOS S.L (TECNAN).*

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1) TECNAN Consolidant; 2) Aquashield Ultimate hydrophobic product applied over TECNAN Consolidant

REFERENCED NOTES:

(1*) Laborde A., Cirujano C., Alonso F.J., Blanco M., Fort R., Jiménez C., Herráez J. A. Escudero C., Navarro J. V., Pardo D., Escartín E., García E., Gisbert J., Yanguas N., Bouzas A., Androver I., Balyuille J.M. y Amador R. (2003). Proyecto COREMANS: Criteria for working in stone materials. Ministerio de Educación Cultura y Deporte. ISBN: 978-84-8181-562-7.

(2*): After the application of this kind of consolidant products on stone surfaces, the induced colorimetric alterations (assessed here through the *lightness (L*), chroma (C*)* & *hue (h)* parameters taken within *L*, C*,h color space* tend to diminish until almost completely disappearing in a few months' time.

(3*): The evaluative notes were based on results of the here conducted experiments as well as of experiments conducted in our laboratory with other conservation products of similar characteristics and published results of scientific articles within the *stone conservation* field.

This document certifies that the described experiments and results were obtained in our laboratory under the referenced experimental and environmental conditions.

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