



C.T.S. S.R.L.

Via Piave, 20/22 - 36077 Altavilla Vicentina (VI) - Italy

Tel. +39 0444 349088 - Fax +39 0444 349039

www.ctseurope.com - cts.italia@ctseurope.com

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Milano
Via A.F. Stella, 5 - 20125
Tel. +39 02 67493225
Fax +39 02 67493233
cts.milano@ctseurope.com

Firenze
Via L. Gordiniani, 54 - 50127
Tel. +39 055 3245014
Fax +39 055 3245078
cts.firenze@ctseurope.com

Roma
Via G. Fantoli, 26 - 00149
Tel. +39 06 55301779
Fax +39 06 5592891
cts.roma@ctseurope.com

Napoli
Via delle Puglie, 228 int.4 - 80143
Tel. +39 081 7592971
Fax +39 081 7593118
cts.napoli@ctseurope.com

N a n o E S T E L

CONSOLIDANT AND FIXATIVE PRODUCT FOR NATURAL STONE,
BRICK, TERRACOTTA, MORTARS AND PLASTERS

PROPERTIES

Nano ESTEL is a colloidal aqueous dispersion of nano-sized silica, around 10-20 nm. These dimensions are smaller than those of acrylic microemulsions (40-50 nm), and those of nanolime (200 nm).

It presents itself as a very fluid liquid, although it has a dry residue of 30%, and being stabilized with Sodium Hydroxide (NaOH <0.5%) it has an alkaline pH (pH = 9.8 to 10.4).

Because of the water evaporation, the particles bind among themselves forming a silica gel, similarly to what happens for ethyl silicate, and thus determining the consolidating effect.

ADVANTAGES

Compared to **ESTEL 1000** ethyl silicate, the silica dispersion can be applied in humid environments, and presents a reduced setting time (3-4 days).

Being an aqueous dispersion, **Nano ESTEL** is not flammable and has no symbols of toxicity, with a consequent reduction of the risk factors in laboratories and on site, and the reduction of transport and storage costs.

Unlike alkaline silicates it does not cause the formation of damaging secondary by-products (with sodium and potassium silicates, soda and potash are formed respectively, which carbonate in contact with air forming soluble salts).

Because of the nature of the formed silica gel, the reduction of permeability to water vapour is minimal.

The consolidating action due to the formation of silica allows the use of **Nano ESTEL** also as a binder of inert materials for the production of mortars for small fillings, or with pigments, obtaining a matt and chemically stable surface.

LIMITS

The penetration capability is reduced compared to ethyl silicate, and the level of the consolidating power is still being studied. Also the durability of the mortars thus obtained is to be evaluated.

USE

Nano ESTEL is a concentrated product, at 30% of dry residue, to be diluted with 1-2 parts of demineralized water, thus bringing the percentage of active material to 10-15%. It is recommended to perform some tests to determine the exact dilution ratio, which may be different from that indicated, depending on the support and the effect to be obtained.

The surface must be cleaned and cured of any salt efflorescence.

The atmospheric temperature and the temperature of the treated surfaces must be between 5°C and 35°C. Below 5°C, the reaction does not take place.

The product can be applied also in the presence of high values of humidity, or even on wet surfaces (even if this makes penetration difficult).



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Nano ESTEL can be applied by dipping, using a brush or by spraying with low-pressure sprayers, and finally injected via syringe into the fissures.

Its reaction is completed after about **three to four days** with ambient temperature of 20°C approx.

To speed up the setting, ethyl alcohol or Solvanol are applied before, then **Nano ESTEL** diluted in demineralized water.

Due to the heterogeneity of existing materials, it is indispensable to carry out preliminary tests on a sample of material that one wants to treat so as to be able to verify:

- the degree of the consolidating effect that you get;
- the amount of material to be used;
- the absence of colour variations on the treated stone.

WARNINGS

The gelatinization of **Nano ESTEL** can be obtained with one of the following systems:

- with water evaporation (normal method)
- changing the pH (for example mixed with lime it cements suddenly)
- mixing it with water soluble solvents (alcohol, acetone)
- adding a salt (method not recommended for the restoration field)

It is therefore necessary to evaluate the influence of these parameters before applying the product.

In case of overdose you can remove the excess, before hardening, with swabs soaked in dematerialized water.

Since the alkaline pH, the effect on certain types of painting films can be negative: please check carefully before applying.

PHYSICAL DATA

Active principles	nano-sized silicon dioxide
Active content (%)	30
Dynamic viscosity (mPas at 20 °C)	6-8
Density (g/cm ³ at 20 °C)	1.1–1.3
Vapor pressure (hPa at 25 °C)	32
Particle size (nm)	<20
Specific surface (m ² /g)	260
pH	9.5-10.4

PACKAGING

Nano ESTEL is available in 1 - 5 - 25 kg pack size.

STORAGE

12 months in its original packaging tightly closed. Store the product between 5 and 40 °C.

The information contained in this sheet is based on our knowledge and laboratory tests at the date of the last version. Users must verify the suitability of the product for the specific use by preliminary tests, and is required to comply with the laws and regulations in force concerning safety and hygiene.

C.T.S. S.r.l. guarantees the constant quality of the product but is not liable for any damage caused by improper use of the material. Product intended for **professional use** only.



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Listed in the following table are some **references** gathered on the product “**NANO ESTEL**”:

<i>Name of the monument/work of art/site</i>	<i>Town - Country</i>
Calcestruzzo dell'acquedotto romano	Sesto Fiorentino - Italy
Cimborrio della Cattedrale di Barcellona	Barcellona – Spain
Capilla de los Sastres – Cattedrale di Terragona	Terragona - Spain
Portale in arenaria Galleria Ricci Oddi	Piacenza – Italy
Ritocco pittorico sull'orologio del Campanile di Lavis	Lavis - Italy
Concotti in terracotta provenienti dal sito palafitticolo di Lucone di Polpenazze	Lucone - Italy

Scientific studies carried out by Universities

University - Pavia – Italy

Licchelli M., Weththimuni M., Zanchi C.; “Nanoparticles For the consolidation of Lecce Stone”, Atti del XXIV Congresso Nazionale della Società Chimica Italiana, Lecce, 11-16 settembre 2011.

Università degli Studi – Napoli – Italy

Angelici E., Grassini S., Fulginiti D., Parvis M., Segimiro A.; “Compatibilità and efficiency of restoration products for artefacts in neapolitan yellow tuff” Scienza e Beni Culturali XXIX, Bressanone, 2013.

Laboratório Nacional de Engenharia Civil - Lisbona – Portugal

G. Borsoi, R. Veiga, A. Santos Silva; “Effect of nanostructured lime-based and silica-based products on the consolidation of historical renders”, 3rd Historic Mortars Conference 11-14 September 2013, Glasgow, Scotland.