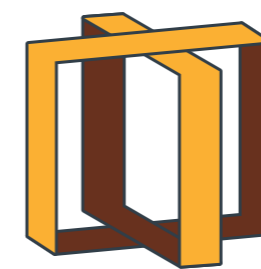
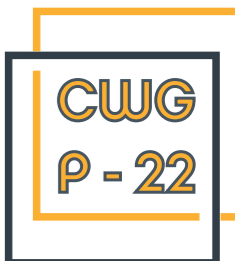


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NEW



ARMOX



REVOLUTIONARY SEISMIC RESISTANT TECHNOLOGY
FOR MASONRY CAVITY WALLS



TECNOLOGIA
E RICERCA ITALIANA
SRL

Via Malta 12/O
25124 Brescia
Phone +39 030 2942138
Fax +39 030 6182529
Mail: info@trimaterials.com



2018

What it is



UNIVERSITÀ
DEGLI STUDI
DI BRESCIA

ARMOX CWG P-22 is the first nano-composite fibre reinforced material of the world which, thanks to 3 years of experimental research, provides increased out-of-plane behaviour of unreinforced masonry (URM) cavity walls in seismic regions

ARMOX CWG P-22 is recommended both for increasing strength of existing buildings during earthquake and it increases the thermal insulation of the houses originally built with empty cavity

It has been experimentally demonstrated, referring to more than 300 Standard and Experimental tests performed by University of Brescia, that just casting **ARMOX CWG P-22** in the cavities from the outside of the houses (without disturbing residents) it's possible to both strengthen and insulate them in a couple of days.

Test results of mechanical and physical properties have been reviewed by Delft University of Technology, the Netherlands. Besides Studio Calvi has confirmed by engineering studies that the out-of-plane behaviour of URM cavity walls will considerably be increased when applying **ARMOX CWG P-22** due to the good bondage with the walls

ARMOX CWG P-22 application is safe and easy: it's only necessary to remove few bricks from the outer leaf of the cavity wall and cast or pump the material inside the cavity. Once the application is completed, bricks previously removed can be easily replaced, in order to keep the architecture of the building unchanged

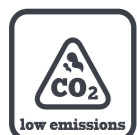
ARMOX CWG P-22 is an environmental-friendly material, and it's ideal for Cultural Heritage buildings, as it is not visible from the outside.

The **ARMOX CWG P-22** nano-binder is totally organic-free and it permits, thanks to its incredible high specific surface, top level composite material mechanical and chemical behaviour.

Benefits



ECO FRIENDLY



- **ARMOX CWG P-22** is developed to improve the out-of-plane behaviour and increases the flexural strength of single walls. This technology also reduces the energy consumption more than 30% (*)
- **ARMOX CWG P-22** increases the thermal insulation of the empty cavity walls up to the 30%, reducing the energy consumption of the house.
- **ARMOX CWG P-22** is composed by non-conventional hydraulic binder and recycled cellular glass.
- The extraordinary bonding properties both on Calcium Silicate and Clay bricks create a solid monolithic wall instead of two thin leaves of cavity walls.
- Application of **ARMOX CWG P-22** is easy and fast: the retrofitting of houses take place only from the outside of the building in a couple of days, without disturbance to residents. They can continue to use their homes during the progress of the works.
- **ARMOX CWG P-22** is safe and eco-friendly: no hazardous raw materials are used and it is composed by recycled and low-CO2-emission elements.

Basic and behaviour

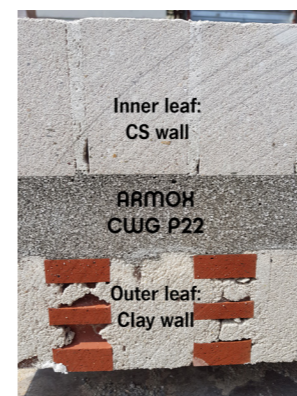
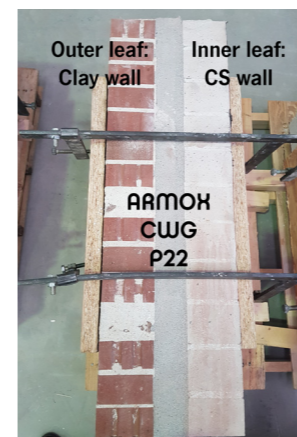


Fig.1-2: section of cavity wall samples used for flexural test strengthened with **ARMOX CWG P-22**

ARMOX CWG P-22 basic is to create a thick monolithic solid wall instead of the two thin leaves (one usually constructed with Calcium Silicate bricks and the other with Clay bricks) to increase mainly the out-of-plane behaviour during earthquakes. At the same time, thanks to the high performances low-density mix design ($\approx 1000 \text{ kg/m}^3$), it increases the thermal insulation of the walls (*).

ARMOX CWG P-22 is a Fibre Reinforced Concrete-like material (FRC): it uses synthetic fibres inside the mix design to increase the energy absorption of the earthquakes also during high deformations of the building, due to severe earthquakes. Its mode of operation is based on FRC (Fibre Reinforced Concrete) strengthening technologies on a low density-high performance material.

ARMOX CWG P-22 is tested to resist to the most severe environmental parameters: -20 °C +20°C thermal shock under soluble salts attack (UNI CEN/TS 12390-9); 25 litres per minute rain for 72 hours (full-scale experimental test performed at Brescia University, Civil Department); neither interstitial nor surface condensation with the following parameters: -10°C and 85% of relative humidity (RH) outside and +20°C and 65% of RH inside the building.

ARMOX CWG P-22 nano-composite technology takes advantage, for the first time in the market, of highest mechanical behaviour acicular raw materials which can transfer shear and flexural stresses to a new level. The smallest dimensions of the binder, furthermore, allow to penetrate inside the wall in a scattered and capillary way, increasing binding without using any other chemical and/or organic binder.

(*) data compared to uninsulated cavity walls of 60 mm thicknesses

Research and certifications

UNI-EN 1015-11: 2016

Test methods for building mortars – PART 11: determination of flexural and compressive strength of hardened mortar.

UNI-EN 12664: 2002

Determination of thermal strength by using the hot griddle method with a guard ring and the thermofluximeter method.

UNI-EN 14651: 2007

Test method for metallic fibre concrete - Measuring the flexural tensile strength (limit of proportionality (LOP), residual)

UNI-EN 12390-13: 2013

Test on hardened concrete – PART 13: determination of compressive secant elastic modulus.

UNI-EN 12390-9: 2017

Testing hardened concrete - Part 9: Freeze-thaw resistance with de-icing salts - Scaling

UNI-EN 16322: 2013

Conservation Of Cultural Heritage - Test Methods - Determination Of Drying Properties

UNI-EN 1015-12: 2016

Methods of test for mortar for masonry - Part 12: Determination of adhesive strength of hardened rendering and plastering mortars on substrates

The list above represents only a small part of Standard and Experimental tests performed on **ARMOX CWG P-22** technology. All tests have been performed and verified by the University of Brescia, Mechanical and Civil Department (Italy)