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No.445/1
Dated: 25th of March, 2009
Belgrade

EURAS TECHNOLOGY
ENGINEERING d.o.o.
PANCEVO

Subject: Testing of corrosion risk for reinforcement by applying EURAS GEL for injecting of dilatations and ruptures in reinforced concrete and unreinforced concrete.

According to your request dated 9th of February, 2009, we have done the testing of corrosion risk for reinforcement by applying EURAS GEL, of the delivered samples of EURAS GEL 10+ and EURAS GEL -20 for injecting of dilatations and ruptures in reinforced concrete and unreinforced concrete.
According to the testing done , we are issuing the results of testing and professional opinion of the named above products.

With kind regards,

Head of Testing
Dr Dusan Antonovic, Full Prof.-signed

Dean of the Faculty of Technology and Metalurgy
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RESULTS OF TESTING

of corrosion risk for reinforcements by applying gels EURAS GEL 10+ and EURAS GEL-20 for injecting of dilatations and ruptures in reinforced concrete and unreinforced concrete.

Gels, mainly having polyacrylates as the base , are successfully used for cementing of ruptures in buildings made of reinforced concrete. In European Union countries there is no obligatory procedure of testing of this kind of matter, nor the procedure of testing of possible corrosion damages on steel reinforcing which were made by their application.

Gels are multi-component systems, which polymerize by forming macromolecule compounds which have a characteristic to physically link and discharge water on the outer chains. Low viscosity is one of main reasons for their application by injecting ruptures and segregation in reinforced concrete. Reinforcement is coated by gel after injecting .

Reinforced concrete constructions contain more or less ruptures which appear because of little power of stretching of concrete. In ruptures, a part of reinforced steel becomes unprotected by concrete and because of that becomes available to corrosion means. Because of the shortage of alkali medium , firstly it comes to local depassivizing of reinforced steel and then to corrosion in the presence of corrosion means from air and water. Water collects in ruptures , steel corrodes , coloring concrete brown color, made because of dissolving of Fe , transforming it into Fe+++ form. With the passing of time, ruptures broaden more and more and reinforcement corrodes more and more.

The product EURAS GEL is building material used to fill ruptures in reinforced concrete constructions as well as for elastic and plastic cementing of dilatations and accompanying ruptures in AB constructions and is a part of Patent no. 1391566, protected at the European Patent Office in Munich. Ordering party is the author of EURAS GEL, B.Sc.(Arch.) Zoran Kostic who represents the company Euras Technology Engineering d.o.o. from Pancevo. It is produced in two variants, as EURAS GEL 10+ and EURAS GEL -20. It is built in dilatations and ruptures of concrete under high pressure(from 50 to 200 bars). By injecting, gel fills the whole space, pressing out the present liquid and remains as permanent insulation.

EURAS GEL 10+ has a high pH value (pH>10) , which brings to passivizing of steel. Firstly, it reduces, then it prevents corrosion and forming of corrosive products $Fe_2O_3 \cdot 3H_2O$.

EURAS GEL-20 is used to fill dilatations and ruptures in reinforced concrete constructions of special purposes (tunnels and so) for it has a very low temperature of freezing (the measured value is -24 degrees C) , which has not been achieved in any other matter so far.

Determining of pH values of acrylate gels

Determining of pH values of acrylate gels was done in testing bodies , in glass containers with diameter of 60mm. In the period between measurings of pH values, containers were well closed and held on the temperature of 23 degrees C.

For measuring of pH, pH electrode was used, and measurements were done the following way. Three hours later, pH value was bigger than 10 , and two days later 11, to fix on 11,3 after that. Measurements last over nine months. Stability of gel is very high. According to the results of testing it can be concluded that EURAS GEL protects the reinforced steel from corrosion with three only possible ways (structure of gel was not given as it is protected by Patent):

-it contains corrosion inhibitors which stop corrosion processes.

-gel itself is a kind of diffuse material , which transports alkali from water in the concrete pores to the surface of steel reinforcement and turns it from the state of active corrosion into the passive state by which it protects the surface of reinforced steel from corrosion.

-or gel also contains corrosion inhibitors (stable in alkaline and acid medium), and it also provides necessary pH to turn steel surface into a passive form.

Capability of shrinking and growing of gel in water solutions of ruptures

Tested gel shows little up to moderate growing, and stability of gel is even after nine months very high, organoleptic method .

Corrosion testing

Corrosion behaviour of reinforcement steel (method: potentiostatic testing with pure gel to DIN EN 480-14). Corrosion measurements show the absence of active dissolution of reinforcements in the presence of gel, which is the consequence of appropriately applied corrosion inhibitors and alkaline medium, which enables passivation of steel reinforcement.

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CERTIFIED TRANSLATION

This is to certify that the above is a true translation of the original document written in Serbian language. Translation number: 92/2009

Ljiljana Aleksic, B.A.
Sworn Permanent Court Interpreter for English Language
appointed by the Ministry of Justice in Belgrade, Serbia
Decree No: 740-06-1416/2000-04,dated 1st of November,2000.

Pancevo, Republic of Serbia
Date: 29th of March, 2009

PERMANENT COURT INTERPRETER FOR ENGLISH LANGUAGE STALNI SUDSKI TUMAČ ZA ENGLESKI JEZIK
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