INVESTIGATION AND CONSERVATION OF A FRAGMENT OF A ROMAN MOSAIC FLOOR

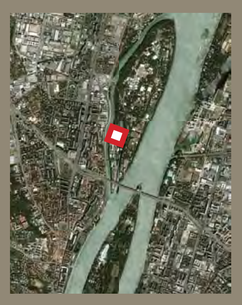
GOVERNOR'S PALACE OF AQUINCUM(PANNONIA)- Hungary - the beginning of the 3rd century AD

HUNGARIAN UNIVERSITY OF FINE ARTS - RESTORATION DEPARTMENT, **2010**

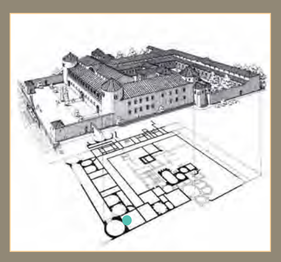
Restorer: **KÜRTÖSI Brigitta** *Supervisor:* **BÓNA István** DLA habil *Consultants:* **KRISTON László**, **BALÁZS Miklós Ernő** DLA habil

Owner: BTM Museum of Aquincum, *Excavation by* **SZILÁGYI** János, 1941

Aquincum in Pannonia



The site of the Governor's Palace of Aquincum on an island of the river Danube in the capital of Hungary



The place of the fragment in the Governor's Palace of Aquincum, chamber no. 8

Excavation photo from 1941, Óbuda, Hajógyári-sziget

The fragments with concrete support in the store of the museum

The removal of the concrete support

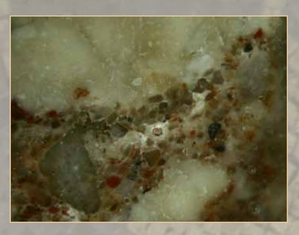
The original mortar layers of the fragment

The back of the original tesserae with traces of the white bedding mortar (*below*) and the later supplement in cement (*above*)

The condition of the mosaic before restoration in 2008

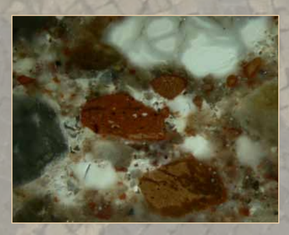
- tesserae
- supranucleus
- nucleus (1)
- nucleus (2)
- rudus

The stratification of the fragment



The border of the *supranucleus* and *nucleus* on microscopic cross-section photo

The remainders undissolved in acid of a sample from the first *nucleus* layer



Detail of the cross-section of the first *nucleus* layer

The bedding mortar, *supranucleus*

"Kalkspatzen" - detail of the first layer of the *nucleus*

"Kalkspatzen" - detail of the second layer of the *nucleus*

The remained original mortar layers under the *opus tesselatum*

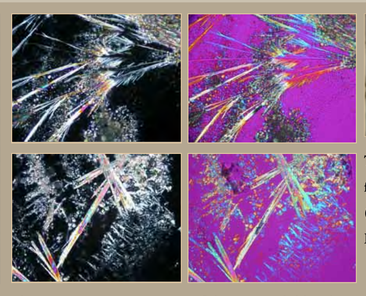
The study of the materials and the structure of this Roman mosaic aims to gain thorough information about the technique. The conservation of this fragment made possible the microscopic, chemical and X-ray diffraction examinations, which gave us exact results about the structure and the speciality of the preparation of the mosaic. The classical dry lime slaking was employed for the basic mortars. In this case the dry raw materials are spread and water is poured on them. The slaking of the quicklime happens on the premises. The average porosity value of the samples taken from the *nucleus* of the mosaic in question is approximately 30%, its density is about 1.5 g/cm^3.

The presence of chalklike kernels in the lime, called 'Kalkspatzen' in German, is quite widespread. These kernels are reserves and the moisture can activate them. A binder obtained from them migrates and it is able to bind the micro-cracks all-over the system. As an artificial pozzolanic additive, the brick flour is present in the *nucleus*, but missing in the bedding mortar. As a hydraulic component it increases the solidity of the mortar.

During the conservation work we had to save the original preparatory mortar, so we had a quite heavy object. It was necessary to work out a lightweight and easily removable support, instead of the previous concrete one, and a lightweight lime-based mortar to fill in the losses. Instead of the quartz sand and gravel fraction, a mixture of ground glass foam and glass foam-beads were used as a filler. The diverse grain-size dispersion ensures a properly stable mortar. The mortar supplement has to be easily removable; it has to be compatible with the original materials considering their physical properties. At the same time it is not supposed to be stronger than the ancient mortar. The effective porosity of the two touching layers is desirable to be similar. In this case, the measured values are about 30 %. The difference is between the density values; the used fillers halved the density of the new mortar. In this case the filling mortar mainly has a supporting role; thus it must be lightweight and stable. The new support is a composite plate made of foam glass board covered with 3P SP2 resin and woven carbon fibre on both sides. These materials were developed for industrial use. That is why it was necessary to understand their physical properties before introducing them into conservation. The artwork was fastened on the foam glass board with acetate-free silicone rubber. As a bedding mortar a Czech grouting mortar was used (VAPO inject 01), because its composition and properties resemble the original. The mixture consists of white, hydraulic and volumetrically stable lime-hydrate, mixed with latently working hydraulic fired clay – alumo-silicate component.

The fragment represents a complex, repeating geometric pattern; Solomon's knot quadruple in the middle of a four-pelta swirl. The supplement was made of tesserae from geologically similar massive limestone. The original and the completed parts show mild difference in their hue. The extent of the completion does not exceed the provably existed state of the mosaic.

The new lime-based mortar with lightweight aggregates (Glass-foam products)



The microscopic appearance of the water soluble salts extracted from the glass foam-beads, *crossed polarized light*

The German glass foam product (Poraver by Dennert)

Mortar samples	Effective porosity (%)	Density (g/cm3)
The mortar (from nucleus) of the examined Roman mosaic of Aquincum	30,33	1,48
The new mortar with glass foam fillers	30,00	0,69

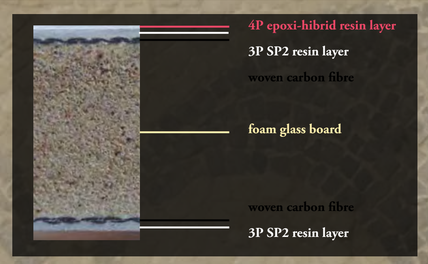
The measured values of the mortar samples

The back of the fragment with the original and the new mortar

The pH value of these Poraver products is about 9-12. The cause of this high value is the prescence of a water soluble salt called Trona ($Na_3H(CO_3)_2 . 2H_2O$). measured by XRD. It was necessary to remove the salts before use these glass foam-beads as filler in the new mortar.

The state of the threshold mosaic after restoration, 2010

The preparation of the new support with wowen carbon fibre and 3PSP2 resin



The cross-section of the new composite plate

The level differences of the remained mortar layers were 6-10 cm

Levelling of the backside of the mosaic was made by the lightweight lime-based mortar (*above*)

Acetate-free silicone was used to fix the artwork on the new support

The mosaic fragment after the fastening on the new support

The place of the entirely missing parts was formed by 6 cm thick glass foam panels, glass net and a thin layer of lightweight lime-based mortar

The third fragmentary motif before supplement

The material of the new tesserae supplements was geologically similar massive limestone. The lime-based VAPO inject 01 was used as bedding mortar

Samples of the original tesserae.

Phases of the supplement