THE HISTORY OF ROMAN CEMENT AND ITS USE IN CONSERVATION OF ARCHITECTURAL MONUMENTS

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Only ten years ago the idea of Roman cement was actually not existing in literature concerning history and conservation of historical architecture. This once extremely popular material was used mainly in 19th and in the beginning of 20th century to form building’s elevations with cornices, friezes, rustication, portals and other architectural elements as well as different sculptures and reliefs like busts, medallions, cartouches, mascarons and floral decorations. After the First World War it was almost completely forgotten, supplanted by Portland cement and by new styles, using the other type of aesthetics. Roman cement’s due place in the history of architecture started to be restored by international research project ROCEM – Roman CEMENT to restore built heritage effectively, executed in years 2003-2006. Institute of Ceramics and Building Materials, Division of Glass and Building Materials in Krakow, basing on the results gained from the project, in years 2006-2008 worked out the technology of Roman cement production in rotatory kiln. Received material turned out to be fully compatible with original cement. This way a modern equivalent of historical cement was introduced to the market, what gave an opportunity to preserve and sometimes even to save from total destruction original plasters, architectonical details and decorations. Since that time several architectural monuments have been restored.

Keywords: Roman cement, Mortars, Cast elements, Architectonical decorations, Architecture at the turn of 19th and 20th century

1. INTRODUCTION

Roman cement is a natural, highly hydraulic binder, produced by firing lumps of marlstones – limestones containing clay, formerly in shaft kilns, today also in rotatory kilns, in the temperature of 800-1200°C (under the temperature of vitrification). High resistance to weather conditions, ability to harden under water, fast setting time (even around 7 minutes!) and surface without air bladders are the characteristic features of that material. They turned out to be extremely significant at creating architectonical decorations – cast elements or run mouldings and together with nice, sandy colour resembling stone (but much cheaper than it) they contributed to huge popularity of this cement.

2. HISTORY OF ROMAN CEMENT

The beginnings of Roman cement should be searched in the middle of 18th century, when John Smeaton, in England regarded as a father of civil engineering, was wrestling with the problem of constructing the Eddystone Lighthouse on Cornwall coast [1]. Searching for durable, resistant to weather conditions material, he was experimenting with different types of mortar. The effect of these experiments was an essential discovery – a binder with the best hydraulic properties is received from soft limestones containing some amount of argillaceous additions - not from hard, pure limestones as it was primarily presumed. Smeaton’s invention was used exactly 40 years later by James Parker, curate from Northfleet in Kent, who made experiments with stones from the coast of Isle of Sheppey. In 1796 he patented a method of receiving cement by using a marl-limestone, describing his invention in specification: The

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principle and nature of the said Invention consists in reducing to powder certain stones or argillaceous productions, called nodules of clay, and using that powder with water, so as to form a mortar or cement stronger and harder than any mortar or cement now prepared by artificial means [2]. That cement, at first called Parker’s cement, was then named in various ways – Sheppey cement, aquatic cement and most popular – Roman cement, probably because of the same high hydraulicity (although it has to be remembered that ancient Roman cement and Parker’s cement are two different materials!). Parker finally sold his patent to Samuel Wyatt, famous architect and engineer and the cement manufacturing continues under the name “Parker Wyatt” (patent was used by Samuel’s cousin, Charles) [3]. In 1810 the patent ran out what gave a possibility to make the material more popular.

Fig. 1 Architectonical decorations restored with Roman cement, tenement house, Cracow (by A. Skorek)

Fig. 2 Architectonical decoration restored with Roman cement, tenement house, Cracow (by A. Skorek)
At the beginning Roman cement was mainly used in engineering structures. As a very durable material it was applied by Mark Isambard Brunel during the building of Thames Tunnel and also by Robert Stephenson when erecting foundations of Britannia Bridge [4]. Roman cement’s popularity finished in British Isles in the sixties of 19th century, when its production was slowly expiring. But in the meantime it started to be appreciated in other countries, in middle-eastern Europe and USA (called there a “Rosendale cement”). Quickly Roman cement became the material “without any borders”, truly continental one (its factories were working from Sweden to Italy, from France to Russia) [5]. The beginnings of Roman cement production in Polish lands go back to the middle of 19th century, when in 1853 Jan Ciechanowski, the State Counsellor and director of Inconstant Income Department in Polish Kingdom Comission of Income and Treasury built and initiated a factory of that cement in village Kozioł near Ołkusz [6]. One of the first buildings, where Roman cement mortars were used was the building of Credit-Land Society in Warsaw (1856-1858), designed by Henryk Marconi [7]. Destroyed during the Second World War, today it has only several arches with original cement preserved.

Fig. 3 Antoni Suski house in Grodzka Street in Cracow, restored with use of Roman cement paints and mortars, by A. Skorek

The appearence of Portland cement and new architectonical styles representing the other type of aesthetics (modernism!) led to diminution of Roman cement’s role in architecture. Extremely popular in second half of 19th and in the beginning of 20th century, in interwar period it was used rather rarely (an example can be a house from 1925, restored in 2010 on Serkowski Square in Cracow). After the Second World War knowledge of its production and its applying techniques was forgotten.

3. CONSERVATION OF BUILDING MONUMENTS WITH ROMAN CEMENT’S USE

Walking around European cities like Cracow, Prague or Vienna gives an opportunity to see how big effort was made in 19th century to form, from in many cases still mediaeval cities, truly modern urban organisms, adapted to the requirements of the era. A huge number of tenement houses and public buildings like banks, theatres, opera houses and railway stations were than erected, creating unique character of the cities. Most of them, dressed in historical costumes, were full of architectonical decorations like busts, medallions, cartouches, mascarons and floral ornaments. In many cases these decorations were made from Roman cement – durable, fast-setting material, on the other hand plastic, ideal for casting and plastering.
This walk can also show, that a lot of buildings where Roman cement was used, didn’t get a proper conservation. It often results in degradation of Roman cement plasters and stucco-works. Restoration methods included various types of towellings and Portland cement coats as well as covering elevations with successive layers of paint. Both made impossible proper co-operation with the original Roman cement. As the time went by crackings and flaking of new layers from an old basis took place, as a result of different technical properties of the materials. The substantial defect of using non-compatible “fillings” was also appearance of colour differentiations, what negatively influenced aesthetics of the restorated buildings. It has to be stressed, that because of the Roman cement durability, many of these buildings had only small losses and dirt caused by air pollution, so with the proper material they were very easy to renovate in a simple and above all effective way.

Thanks to the invention of scientists from Cracow Division of the Institute of Ceramics and Building Materials now there is a possibility to restore in a proper way buildings, where Roman cement was applied. It is fully compatible with historical substance and because of that it causes no additional dangers for renovated facades. Yet it is necessary to stress, that using Roman cement mortars and paints require to follow the technological rules strictly. Essential preparations have to be done, because the success of conservation depends mainly on condition of the basis. Before starting the work elevation has to be cleaned of dust, pollutions and old layers of paints and mortars of different type (from example Portland cement mortars). Another important thing is a proper drying of the elevation’s surface if any dampness occurs. It also has to be remembered, that plastering can be done only in moderate temperatures, between 5 and 25°C.

In consequence these rules create a necessity of taking more efforts by executors than usually. In times of frantic competition to get more and more orders, when most important is a fast completion of works, spending time on proper application of the material becomes unprofitable. That’s why still only few conservators and constructors decide to apply mortars and paints based on Roman cement.
There is also another reason – aesthetics of restored elevation. It must be emphasized that using Roman cement will never mean excellently smooth and perfectly colour-united surface like it is when using resinous-mineral paints. The appearance of so called cloudiness is a characteristic feature of the material and it is something absolutely natural during its application. Fortunately more and more opinions are expressed that perfectly painted elevations diminish charm of old buildings and consequently do not preserve the spirit of the original. What results from natural properties of the material, what visualises its characteristic features seems to be more and more appreciated.

4. CONCLUSIONS

To this day several monuments erected with the use of Roman cement mortars, paints and casts were restored with today-produced material. Majority of these buildings is situated in Cracow, which is the most “opened” city as far as Roman cement’s application is concerned. Among them there is the elevation of Wielopolscy Palace (the seat of Cracow Municipality) from the side of Poselska Street,
Antoni Suski house in Grodzka Street, built in 1906-1909 according to Władysław Ekielski’s project [8] (Fig. 3), other tenement houses and buildings of monasteries (f.e. Piarists monastery). Moreover the application of Polish Roman cement was tested in Great Britain, Switzerland (in the city of Sion) Austria, Germany and others.

Dedicating more time to application of Roman cement as well as intellectual and physical efforts, give noticeable results when the work is done. There is a hope, what already restored buildings show, that with a combination of proper material and skills of an executor, monuments from 19th and the beginning of 20th century can return to the days of their splendour.

REFERENCES