Theoretical-methodological challenges to the study and safeguarding of industrial tile production memories. The case of the Constância Ceramics Factory in Lisbon

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SUMMARY: This work addresses the field of memory related to the industrial production of ceramics in Portugal between the 19th and the 20th century, namely the knowledge of materials and techniques of tile production. The study of the industrial and socio-technical memory is seen a way to enrich technical and scientific knowledge and, thus, contributes to enable more conscious practices of conservation and restoration of the tile heritage, alongside to the safeguarding of this same memory. With this objective, the theoretical and methodological perspective of the research (which is under development) is performed over the case study, of the memories of the socio-technical aspects, of the Fábrica de Cerâmica Constância (Constância Ceramic Factory), in Lisbon.

KEY-WORDS: Tile factory production, Industrial memory, Technical knowledge, Tile heritage conservation

In the field of conservation, restoration and safeguarding of cultural heritage it is crucial to consider the relationship between materiality and immateriality [1]. The study of memory, having in view its recovery and safeguarding, echoes this motto by resurfacing certain social facts, objects, materials, knowledge and values, reframing and dignifying the past. It also allows the continuity of that memory into the future (and its transformations) and, as such, of the cultural heritage with which it is associated.

In the case of industrial tile production in Portugal between the 19th and 20th centuries, studies of history and respective industrial memory have been documented [2, 3, 4 and 5]. However, much remains to be researched, especially considering aspects related to the materials, procedures, and technical knowledge of the tiles production [6]. Given this situation, researchers from the National Azulejo (Tile) Museum (MNAz) and *Laboratório Nacional de Engenharia Civil* (LNEC) have, in a collaborative way and for several years now, tried to contribute to filling-up this gap in knowledge.

The *Fábrica de Cerâmica Constância* (Ceramic Factory Constância) -Figure 1, located close to the National Museum of Ancient Art, operated between 1836 and 2001. Since its foundation, this

factory has manufactured decorative and utilitarian ceramics. However, it is difficult to specify the date when the tile production began. Nevertheless, from the first years of the 20th century, this factory structure would come to stand out in the production of important references in Portuguese tiles history, as well as attracting renowned artists [7, 8, 9, 10 and 11]. In 2001 the factory activity was closed due to bankruptcy, and its assets sold a few years later. Around 2018, the factory buildings were to be demolished, leaving the equipment, documents, products and work materials found in the factory structure at risk of being lost (Figure 2). Therefore, also an imminent risk of loss of invaluable socio-technical memory.

Figure 1. Constância Ceramic factory. Left: factory logo; Middle: entrance to the factory facilities/shop before demolition; Right: after the demolition (Image by Pinto Soares)

Figure 2. Products and work materials left in the factory and found after its closure.

A team from MNAz and LNEC visited the site during the weeks before demolition to try and safeguard distinct aspects related to of the memory of the factory, a laborious and challenging activity. A PhD will be developed about this factory and its production which, hopefully, will build over the information and materials collected towards that purpose. The work will essentially focus on the study of sociotechnical memory [10 and 11]. To this aim, the following aspects will be addressed:

- the importance of studying industrial memory related to the ceramic production sector, specifically related to azulejo tiles, to understand and safeguard heritage also contributing to the implementation of more conscious tile conservation and restoration procedures;
- an overview of the history of the Constância Ceramic Factory and its role in Portuguese tile production;
- the risk of memory loss related to the Factory: bankruptcy, deactivation and destruction of the building, kiln and other assets, dispersion of former workers and their often-old age;

- the importance of collecting and analysing documental information, from image sources (photos and audio-visuals) and plans, maps and drawings related to the production process;
- the study of the productions, techniques, materials and artistic knowledge related to the tile production of this factory based on the material evidence and oral testimonies.

The points above will be documented to highlight the theoretical-methodological path that has been followed, also indicating the challenges that, from this perspective, arise for the survey, analysis and production of scientific knowledge.

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Geopolymers for glazed tiles lacunae in conservation practice

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SUMMARY: Glazed tiles are a definite mark in Portuguese architecture. Their thorough use in buildings from the 19th Century implies the actual need for conservation actions. Geopolymers are inorganic materials with a high application potential and their use was tested for filling "biscuit" lacunae. Results were promising but implied the need for further development of geopolymers suited for this specific use.

KEY-WORDS: Glazed tiles; Lacunae; Geopolymers

Glazed tiles (azulejos), are an important asset for Portugal, as they are relevant items in architectural history and a definite mark of the country's cultural past [1]. These tiles, commonly used as façade finishing elements, stand out because of their size and very particular aesthetics. Distinct production techniques used throughout their chronology [2], [3], affect how they respond to the actions of water, wear, and damage. Glazed tiles consist of a ceramic body called "biscuit" and a glazed surface [4]. The raw-materials and production techniques of the ceramic body are crucial in determining the tile's qualities. There are very relevant differences in tile properties throughout the ages is this is especially clear when comparing currently manufactured tiles and tiles used up to the beginning of the 20th Century. These differences arise from variations in the raw materials, the porous structure, and the effects of damaging factors, such as weathering, salts and exposure to chemical substances [4]. Applied tiles often display degradation patterns and need careful repair in order to maintain the overall characteristics of the façades. Lacunae are frequent and this kind of damage needs specific intervention so as to enable these tiles to be reused on the same surface.

The use of geopolymers has a long history, but their application in this context is relatively novel [5, 6].These are inorganic materials which possess a mineral origin, and their composition involves the use of a precursor, an alkaline activator and a solvent. The process of geopolymerization takes place by a chemical reaction that usually occurs in an alkaline medium, resulting in the formation of inorganic polymers with silicon and aluminum (connected by oxygen ions) as main constituents. The alkalinity of the solution is achieved through the use of activators such as sodium and potassium hydroxides and/or silicates. Geopolymers formed in this way have a varied composition and, henceforth, an array of characteristics when it comes to physical, chemical and mechanical performance [7].

It was considered relevant to test the use of geopolymeric materials as a possibility for the filling of missing tile fragments due to the fact that they harden without need for heating and also because of their inorganic matrix. The lack of heating needs enables a simple intervention for lacunae filling, whilst the inorganic matrix may be a plus in terms of durability, but especially in terms of compatibility with the ceramic tile.

The geopolymers used for this study were produced using metakaolin and different proportions of zeolite or fly ash and adding sodium hydroxide and/or calcium hydroxide as alkaline activators [8].