Uses of Building Stones in Architectural Elements of El Kantara Town, Biskra (Algeria).

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Abstract- The preservation and conservation of historical and cultural built heritage is necessary to preserve the history of cities and the identity of populations. Built heritage is a cultural asset whose preservation and protection is essential to any society. Building stones are one of the most widely used construction materials throughout history. Normally, building stones come from the vicinity of where they are used, which ensures the integration of the built heritage with its surroundings. Due to their decay, building stones need to be preserved and conserved.

El Kantara, formerly Calceus Herculis, is an oasis located 52 kilometers north of Biskra, Algeria. It is characterized by its rich history with alternation of different civilizations: Roman, Muslim and French. El Kantara is an example of vernacular architecture that uses building materials provided by the local environment. Due to the mountainous nature of El Kantara, building stones have been one of the most used materials since the Roman period.

Our research is based on Dachra Dhahraouia as a case study. It is one of three villages in El Kantara and the oldest core of the city. It was founded around the 7th century by a group of families who had arrived to this place during the Muslim conquests because of its strategic location and its position, on the heights overlooking the El Hai valley and the palm grove. When the French settled in El Kantara and created their village, the name Dachra Dhahraouia changed to Red Village because of its red earth color.

Dachra Dhahraouia is a protected area (May 6, 2013). It is considered a model of authentic Arab-Berber architecture, for its type of construction, its doors, its alleys, the organization of its houses, its traditional materials and its architectural character in harmony with nature, traditions and customs. The building stones are used in houses, in foundations of historic walls, in entrance steps in public spaces as benches and in steps of stairs. They are also used in the fence wall of the old cemetery.

The aim of this paper is to study the different existing building stones used in architectural elements of Dachra Dhahraouia. In order to achieve the purpose of this study, six samples (5 × 5 ×
5 cm) of the different stone types were tested from different houses and public spaces. Polarization optical microscopy and X-ray diffraction techniques were used for petrographic characterization. Bulk density, porosity, color and ultrasound propagation wave measurements were used for petrophysic characterization of the heritage stones.

The most-used building stone found in Dachra Dhahraouia is a limestone, used in foundations, fence walls and in steps of stairs. Quartzite valley pebbles are used just in the foundations. Dolomite is also part of the building stones used in public spaces as pavements. Also, ashlars from the Roman period are reused in entrance steps and in the foundations of some houses.

**Index Terms**- building stones. architectural elements. El Kantara. Heritage.