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Material deteriorations occurring on the facades of the Mor Sergios Bakhos Church

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Abstract

Mor Sergios Bakhos Church is an important monument having significant tangible and intangible cultural heritage value regarding the geographical context, where it is located. However, various material problems have occurred on the stone structure as a result of various conditions today and the structure encountered the risk of being destroyed. Within this context, the aim of the study is to determine and document the material deteriorations of Mor Sergios Bakhos Church, which is one of the symbolic values for the city of Mardin. Ground laser scanning technique was used in order to achieve this purpose and orthophotographs were obtained from the point cloud data via the various programmes. Facade drawings of the building were achieved with the help of the scaled orthophotographs obtained. In the final stage, material deterioration schedules were processed on the facade drawings obtained and the damage maps of the building were obtained. Most frequent material deterioration seen on the facades of the building is the use of cement and paint arising from the faulty repairs, according to the findings. Within this context, it was concluded that preventing the human-originated faulty repairs, which was the greatest problem seen on the building, is important within the context of ensuring sustainability.

Introduction

Conservation concept is a complex process containing decisions regarding how the cultural heritage is interpreted and preserved [1]. Stone structures are the works of art occupy a great space in the world in the field of cultural heritage. However, they expose to material deteriorations in time and encounter with the risk of extinction. Material deteriorations occurring on the stone structures constitute a serious risk regarding to lose the architectural elements and details that characterize the building customs and skills for centuries [2-3]. An integrated approach intended for conservation not only requires the instant treatment of the physical, chemical and biological deterioration problems, but also requires the periodic documentation and monitoring of the material problems seen on the stone, in order to understand the causes of the problems seen in anywhere completely. Various conservation interventions to be carried out on the stone structure must be carried out considering the phases exposed by the stone [4-6]. Because the stone material reacts against the current environmental conditions in various forms depending on the deteriorations and repairs it has undergone, which is called "memory effect". With this point of view, in literature it is emphasized that the periodic determination and documentation of the stone materials is important [7-8]. Within this context, the aim of the study is to determine and document the material deteriorations of Mor Sergios Bakhos Church, which is one of the symbolic values for the city of Mardin.

Location and History of the Building

Mor Sergios Bakhos Church is located in Mardin Province, Midyat County, Anıtlı (Hah) Neighbourhood, on Block Nr. 104 and Plot Nr. 57. The immovable, which has the characteristic of monumental architecture, was determined

as "1st Group Building". The church of the monastery is dated to the 7th century. The entrance to the courtyard of the monastery is provided by a door, which is placed on the southwest corner and built in a relatively small size. Church section of the monastery is located on the northeast of the courtyard and the courtyard is surrounded by additional venues on the east, west and north directions. Although the most of the additional venues located on the west side have been destroyed today, the venues located on the north and east of the courtyard have survived with various repairs [9].

Material and Method

Initially, the structure was investigated on-site, and stone material deteriorations were mapped on the schedule prepared. Determination schedule is presented in "Table 1".

Table 1. Problems encountered on construction elements made of masonry material in Mardin / Mor Sergios Bakhos Church

Problems Encountered on Construction Elements Made Of Masonry Material In Mardin / Mor Sergios Bakhos Church																												
																									Faulty Repairs		
NATURAL STONE CONSTRUCTION ELEMENTS				Loss of surface	Fragmentation	Formation of gap/ hole	Pitting	Cracks	Spalling	Foliation	Discharge of jointing	Surface contamination	Shell formation	Efflorescence	Crystallization	Formation of plant	Formation of moss	Corrosion (Rust stain)	Tear	Loss of form	Colour change	Use of cement	Fall of plaster	Other
VERTICALBEARINGS	**SINGLE BEARINGS**	Leg																						
		Column																						
	CONTINUOUS BEARINGS	Wall		-	X	-	-	X	-	-	X	-	-	-	-	X	-	-	-	-	-	X	X	-
HORIZONTAL BEARINGS	**FLOORINGS**	Flat		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Curvilinear	Vault	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Dome																					
WALL OPENINGS	Window	Lintel/jamb		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Sill		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Door	Lintel/jamb		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Sill		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Arch			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUXILIARY ELEMENTS	Network																							
	Moulding			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gargoyle			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chimney																							
	Element for passage to the cover																							

In this stage, external wall scanning was conducted using laser scanning device (Faro Focus Laser Scanner) and point clouds were obtained in the scanning procedure. In recent years, photogrammetry and point cloud technology has been used in cultural heritage studies [10-21]. The point clouds that were obtained in laser scanning procedure were transformed into the 3-dimensional images of the building using the software named PointCab Origins 4.0. Orthophotographs (vertical photos) were produced regarding the building by taking sections from the desired points on the 3-dimensional images using the software named PointCab Origins 4.0. AutoCAD software was used in creating the drawings of the facades ("Fig. 1").

Figure 1. Obtaining the scaled orthophotographs of the building in the programme named PointCab Origins 4

Results

Facade drawings of the building were achieved with the help of the scaled orthophotographs obtained from the point cloud. Material deteriorations were processed on the facade drawings obtained and the damage maps of the building were obtained. According to these maps, the problems of fragmentation, discharge of jointing, cracks, use of cement, formation of plants, plaster deterioration are seen on the **south facade**. Problems of discharge of jointing, cracks, use of cement, formation of plants, and plaster deterioration are seen on the **north facade**. Problems of fragmentation, discharge of jointing, cracks, use of cement, formation of plants, use of paints, and plaster deterioration are seen on the **east facade**. Problems of fragmentation, discharge of jointing, cracks, use of cement, formation of plants, and plaster deterioration are seen on the **west facade** (''Fig. 2'').

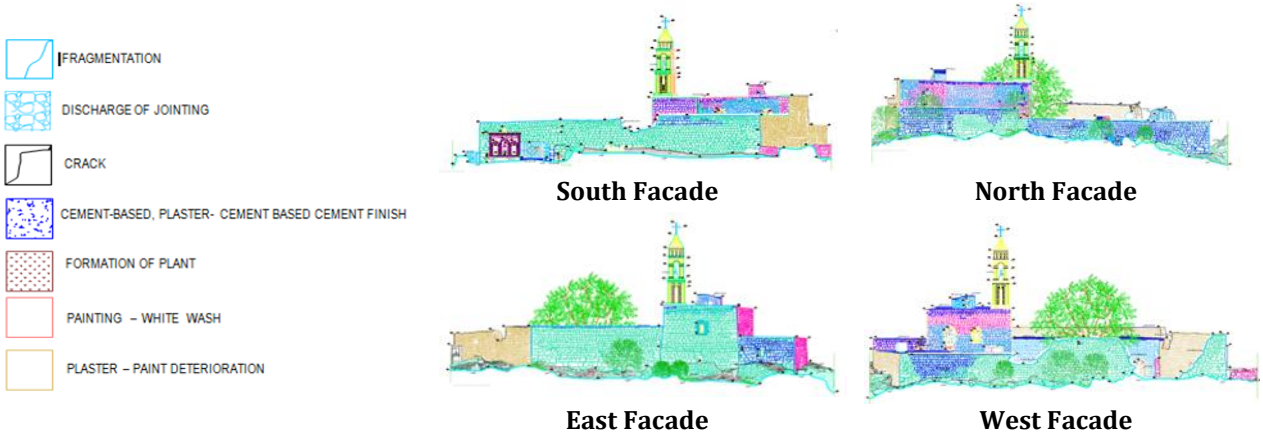

Figure 2. Mapping of material deteriorations on the facades

Conclusion

In the study, material deteriorations of Mor Sergios Bakhos Church, which is one of the symbolic values for the city due to reflecting the tangible and intangible cultural heritage of Mardin city, were documented using the drawings obtained by transforming the data obtained from the ground laser scanning into orthophotographs. According to the findings, most frequent material deterioration seen on the facades of the building is the use of cement and paint arising from the faulty repairs. These deteriorations are followed by fragmentation, discharge of jointing, cracks, formation of plant, and plaster deterioration respectively. Within this context, it was concluded that preventing the human-originated faulty repairs, which was the greatest problem seen on the building, is important within the context of ensuring sustainability.

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