



## Advanced Engineering Days

aed.mersin.edu.tr



### Investigation of stone deterioration in Gaziantep Kumandan Fountain

İlhami Ay <sup>\*1</sup>, Murat Dal <sup>2</sup>, Şefika Ergin <sup>3</sup>

<sup>1</sup>Hakkari University, Çölemerik Vocational School, Hakkari, Türkiye, [ilhamiay@hakkari.edu.tr](mailto:ilhamiay@hakkari.edu.tr)

<sup>2</sup>Munzur University, Faculty of Fine Arts, Design and Architecture, Tunceli, Türkiye, [muratdal1122@gmail.com](mailto:muratdal1122@gmail.com)

<sup>3</sup>Dicle University, Institute of Science and Technology, Diyarbakır, Türkiye, [sefika@dicle.edu.tr](mailto:sefika@dicle.edu.tr)

Cite this study: Ay, İ., Dal, M. & Ergin, Ş. (2023). Investigation of stone deterioration in Gaziantep Kumandan Fountain. *Advanced Engineering Days*, 8, 56-59

#### Keywords

Stone Deterioration  
Gaziantep  
Commander Fountain  
Type of Deterioration

#### Abstract

In traditional stone structures, the strength value and durability of the stone are important in terms of transferring the structure to future generations. It is important for the structures to determine the deterioration and causes of the deterioration on the surface of the stone as a result of climatic and external factors and to offer solutions. In this study, the deterioration of the Commander Fountain in Gaziantep is discussed. In this context, the deterioration was visually examined, classified and analyzed as physical, chemical, biological and anthropogenic. It is aimed that the data obtained from the study will be the basis for the conservation projects to be carried out in the coming years.

#### Introduction

Throughout human life, stone material has been used in different areas of people's lives. The high durability and strength of the stone material is important in terms of the permanence of the structures made of stone and their transfer to future generations. People have used stone material in different areas in traditional buildings. The main ones are; bearing walls, columns, flooring and facade elements. Apart from these, it is also used in construction, coating, sculpture, tombstone making, gravel, porcelain and glass industry, optical industry and ornaments [1, 2].

Stone material has been preferred more than other construction materials. The fact that stone material can be processed such as machining, drilling, chiseling is effective in this. In addition, the lower cost of stone material has made it the main construction material of many buildings [3].

Natural stones deteriorate on stone surfaces due to internal and external factors such as adverse climatic conditions, traffic density and user errors [4-6]. In order to prevent deterioration in buildings, it is important to investigate and identify the causes and to transfer them to future years [7, 8]. It is aimed that this study will form the basis for the studies in the following years and lead the repair projects in terms of addressing the existing problems.

#### Material and Method

In this study, the stone deterioration of the Commander Fountain adjacent to the northern façade of Gaziantep Historic Kır Kahvesi was visually analyzed. The deterioration was photographed and recorded. The Commander Fountain was built with black and white cut stones and does not have any ornamentation other than these stones. The fountain has a hexagonal form. The upper part of the fountain has twelve sides and is covered with a bulbous dome and there is a baba at the end. In addition, no water flows from the fountain today. The deterioration on the walls of the Commander's Façade structure was analyzed, identified and classified [9].

According to the classification, deterioration was analyzed in four groups: physical, chemical, biological and anthropogenic [10].

## Results

When natural stones are exposed to external factors such as climatic factors, natural factors or human effects, deterioration occurs on the stone surface. These deteriorations reduce the strength of the stone. In some cases, deteriorations prepare the ground for the formation of other deteriorations or accelerate the process [11, 12]. It is necessary to identify the deterioration of the stone and take measures to transfer it to future generations [13], [14]. In this context, the deterioration of the structure was analyzed as physical, chemical, biological and anthropogenic deterioration.

Surface losses on stone surfaces as a result of internal and external factors are called physical deterioration. Capillary cracks, fragment breaks, surface abrasions, cuts and joint losses are examples of physical deterioration [15]. The physical deterioration observed in the structure of the Kumandan Fountain is shown in Figure 1.



**Figure 1.** Physical deteriorations in Kumandan Fountain

The deterioration that occurs on the stone surface as a result of atmospheric events and climatic factors is called chemical deterioration. Color change, crystallization, salinization, crusting and foliation are the types of chemical deterioration [16]. Chemical deterioration occurring in the structure is shown in Figure 2.



**Figure 2.** Chemical deteriorations in Kumandan Fountain

The deterioration of organic substances on the stone surface is called biological deterioration. Algae growth, plant growth, bioaccumulation are the types of biological deterioration [17, 18]. Biological deterioration in the structure is shown in Figure 3.

Anthropogenic deterioration is the deterioration of traditional historic stone buildings caused by the conscious or unconscious damage caused by humans [19]. Destructions such as misapplication, misuse and periodic wear and tear are types of anthropogenic deterioration. Anthropogenic deteriorations in the structure are given in Figure 4.



**Figure 3.** Biological deteriorations in Kumandan Fountain



**Figure 4.** Anthropogenic deteriorations in Kumandan Fountain

## Conclusion

This study focuses on the deterioration observed at the Gaziantep Commander Fountain. The deterioration was determined by visual analysis and categorized and analyzed. Physical, chemical, biological and anthropogenic deterioration were observed.

It is aimed that the data obtained in the study will form a basis for future conservation projects. In addition, this study is important in terms of taking the necessary measures to ensure that traditional stone buildings survive for a longer period of time.

## References

1. Hasbay, U., & Hattap, S. (2017). Doğal Taşlardaki Bozunma (Ayrışma) Türleri ve Nedenleri. *Bilim ve Gençlik Dergisi*, 5(1), 23-45.
2. Fitzner, B., & Heinrichs, K. (2001). *Damage Diagnosis on Stone Monuments – Weathering Forms, Damage Categories and Damage Indices*. 1-49.
3. Adin, H. (2007). Mardin ve Midyat'ta Kullanılan Bina Yapı Taşlarının Bazı Fiziksel Özellikleri. *Mühendis ve Makina*, 48(570), 13-17.
4. Biçen Çelik, A., Ergin, Ş., Dal, M., & Ay, İ. (2023). Analysis of Stone Deterioration on the Facades of Hatuniye Madrasah. *Journal of Architectural Sciences and Applications*, 8(1), Article 1. <https://doi.org/10.30785/mbud.1302007>
5. Dal, M., & Öcal, A. D. (2013). Investigations on Stone Weathering of Ottoman Architecture: A Kırklareli Hizirbey Kulliyeh Case Study. *Paripex- Indian Journal Of Research*, 2(13), 1-6
6. Dal, M., & Öcal, A. D. (2013). Limestone In Islamic Religious Architecture: İstanbul And Turkish Thrace. *METU Journal Of The Faculty Of Architecture*, 30(01). <https://doi.org/10.4305/METU.JFA.2013.1.2>
7. Ay, İ., Ergin, Ş., & Dal, M. (2023). Geleneksel Taş Yapılarda Meydana Gelen Taş Alterasyonları: Gaziantep Hamam Müzesi Örneği. *UMTEB - XIII International Scientific Research Congress*, 515-523.
8. Ay, İ., Ergin, Ş., & Dal, M. (2023). Geleneksel Taş Yapılarda Meydana Gelen taş Alterasyonları: Gaziantep Millet Hanı Örneği. *UMTEB - XIII International Scientific Research Congress*, 507-514.
9. Dal, M. (2021). The Deterioration Problems Observed in the Natural Building Blocks of Saint George Church in Diyarbakır Province. *Online Journal of Art and Design*, 9(1), 254-262.
10. Öcal, A. D., & Dal, M. (2012). Doğal Taşlardaki Bozunmalar (Müka Matbaası). *Mimarlık Vakfı İktisadi İşletmesi*.
11. Ergin, Ş., Gökdemir, B., Yardımlı, S., & Dal, M. (2022). Deterioration On The Stone Surfaces Of The Diyarbakır Nebi Mosque. *INTERNATIONAL REFEREED JOURNAL OF DESIGN AND ARCHITECTURE*, 0(27), 1-32. <https://doi.org/10.17365/TMD.2022.TURKEY.27.01>
12. Ergin, Ş., Dal, M., & Çelik, A. (2020). Şeyh Çabuk Camii Cephelerinde Görülen Taş Bozunma Sorunlarının İrdelenmesi ve Kimyasal Analizlerinin Karşılaştırılması. In *Mimarlık Üzerine-1* (pp. 103-124). IKSAD Yayınevi.
13. Dal, M., & Yardimli, S. (2021). Taş Duvarlarda Yüzey Bozunmaları. *Kent Akademisi*, 14(2), 428-451. <https://doi.org/10.35674/kent.922313>
14. Dal, M., Ergin, Ş., Çelik, A. B., & Ay, İ. (2023). Stone Alterations in Hatuniye Madrasah. *Advanced Engineering Days (AED)*, 7, 77-80.

15. Ay, İ., Dal, M., Ergin, Ş., & Çelik, A. B. (2023). Stone Alterations in Kasımiye Madrasah. *Advanced Engineering Days (AED)*, 7, 81–84.
16. Çelik, A. B., Ay, İ., Dal, M., & Ergin, Ş. (2023). Stone Alterations in Zinciriye Madrasah. *Advanced Engineering Days (AED)*, 7, 89–91.
17. Tokmak, M., & Dal, M. (2020). Classification of Physical, Chemical and Biological Deteriorations Observed in Ankara Stone Monuments. *International Journal of Pure and Applied Sciences*, 6(1), 8–16. <https://doi.org/10.29132/ijpas.718466>
18. Dal, M., Zülfiyar, H. C., & Dolar, A. (2020). Mimari Taş Yapılarda Görülen Biyolojik Bozunmalar. In *Geleneksel ve Çağdaş Mimari Yapılar Üzerine Akademik Çalışmalar* (pp. 29–62). İksad Yayınevi.
19. Ergin, Ş., Çelik, A. B., Ay, İ., & Dal, M. (2023). Stone Alterations in Şehidiye Madrasah. *Advanced Engineering Days (AED)*, 7, 85–88.