

Structural Assessment of the 13th Century Great Mosque and Hospital of Divriği: A World Heritage Listed Structure

Cem Demir^{*†}, Omer Faruk Halici[†], Ali Naki Sanver^{††}, Mustafa Comert^{††}, Fikret Kuran^{†††}, Nicola Berlucchi^{††††}, Ali Hurata^{†††} and Alper Ilki[†]

[†] Istanbul Technical University, Civil Engineering Faculty
Ayazaga Campus, 34750, Sariyer, Istanbul, Turkey

E-mail: demirce@itu.edu.tr^{*}, halici@itu.edu.tr, ailki@itu.edu.tr - Web page: <http://www.itu.edu.tr>

^{††} RISE Engineering & Consultancy
Eclipse Maslak C15, Maslak, Sariyer, Istanbul, Turkey
E-mail: alinaki@rise.ist, mustafa@rise.ist - Web page: <http://www.rise.ist>

^{†††} Directorate General of Foundations
Milli Müdafaa Caddesi, No: 20, Kızılay, Çankaya, Ankara, Turkey
E-mail: f.kuran@vgm.gov.tr, a.hurata@vgm.gov.tr - Web page: <http://www.vgm.gov.tr>

^{††††} Studio Berlucchi S.r.l
Contrada Soncin Rotto, 4, Brescia, Italy
E-Mail: nicolaberlucchi@studioberlucchi.it - Web page: <http://www.studioberlucchi.it>

ABSTRACT

The Great Mosque and Hospital of Divriği is located in the central eastern part of Turkey, in Divriği, Sivas. The historical facility, constructed on a sloped hill, consists of a monumental mosque and a two-story hospital, which are adjacent to each other. The mosque and the hospital share the southern kılba wall of the mosque. The structure dates back to 13th century Mengüjekids period and has been listed by the UNESCO as a World Heritage since 1985. Great Mosque and Hospital of Divriği is particularly notable for its monumental stone portals that are decorated with three-dimensional ornaments carved from stone. The structural system of the structure consists of multi-leaf stone masonry walls and stone piers that support the roof structure which consists of stone arches and vaults. The only exception to this use of stone masonry is the western side brick masonry vaults that are known to be damaged and rebuilt together with stone buttresses adjoining with the western façade main wall. Another surviving trace of this incident is the almost 60 cm out-of-plane top displacement of the 12 m high western façade wall and the mosque western portal. Located at about 90 km away from the North Anatolian Fault Line, that is known to have created $M_w > 7.0$ earthquakes in the past, the structure is prone to destructive seismic activities.

In this study, after a brief introduction on the structural system and current condition of the structure, the structural performance of the Great Mosque and Hospital of Divriği is investigated through site observations, historical records and structural analyses. For this purpose, a 3D finite element model of the structure is developed and examined under the effects of vertical loads and seismic actions. For realization of the linear and nonlinear structural analyses, the recommendations given in the Guidelines for Management of Seismic Risks for Historical Constructions (2017) document are followed. In the light of the analyses results, the potential reasons for existing damages and previous interventions are investigated and recommendations for potential interventions are outlined for further preservation of the structure.

REFERENCES

- [1] Guidelines for Management of Seismic Risks for Historical Constructions, Directorate General of Foundations, Ankara, Turkey (Online in Turkish: <https://www.ipkb.gov.tr/tr/yayinlar>), (2017).