Observatory building design: a case study of DAG with infrastructure and facilities

A. Erkan Sahmalı, Günarda Inc. (Turkey); Cahit Yesilyaprak, Atatürk University, (Turkey);
Sinan K. Yerli, Middle East Technical University, (Turkey); Onur Keskin, Isik University, (Turkey)

INTRODUCTION

Eastern Anatolian Observatory (DAG), will be built in one of the well-known mountain ridges of Erzurum, Turkey, at an altitude of 3,151 metres. As well as erecting the largest telescope of Turkey, the DAG project aims to establish an observatory complex both small in size and functional enough to give service to all astronomy community. The challenge in the project is finding a solution in geological and geographical limitations, environmental and meteorological constraints, engineering and structural considerations, energy efficiency and sustainability.

Site selection criteria include the following:

• The location should be accessible and its geographic and climatic conditions should be conducive to human habitation,
• Annual clear skies percentage should be high,
• The humidity levels should be low,
• Average wind speed should be low,
• Atmospheric pollution and ambient light should be minimal,
• There should not be any heat or light source in the immediate environment.

Structural Criteria include the following:

• The telescope pillar should not have any physical contact with any other structure.
• The telescope pillar should satisfy the stiffness level,
• Rotating Enclosure Pillar should have the necessary stiffness and strength.
• The enclosure building should carry the rotating enclosure with a mass of approximately 220 tons and resist the maximum 200 km/hr horizontal wind speed.

SPECIFICATIONS

TELESCOPE BUILDING
1. Interconnection between Telescope building and ‘Cleaning and Coating Plant’,
2. Fully isolated structural system for vibration control,
3. Well insulated enclosure building with continuous cooling system,
4. Disabled access,
5. Safety and access control,

SERVICE BUILDING
1. Control room for several telescopes,
2. Passive Solar Heating,
3. High level thermal control, energy efficient & multi comfort building,
4. Waste water treatment & recycling,
5. Aerodynamic design,
6. Safety and access control,
7. Long life cycle material usage with less operational cost.

RESULTS

An observatory is technically an engineering structure. However the seamless integration of an architectural and engineering approach to create a building that satisfies the intricate requirements of creating a sustainable structure that can survive in such adverse conditions is exemplary for a project of this size in Turkey.

The project satisfactorily meets all the expectations and has been approved for construction. Upon the completion of the project, all necessary testing will be completed and compared against the predictions of the design. This will provide valuable insight to the process of designing and building a sustainable building of this size and will provide an example for similar future projects.

REFERENCES

Acknowledgement: Authors would like to thank Atatürk University, Erzurum/Turkey, Astrophysical Research and Application Center (ATASAM), Erzurum/Turkey, Promer Con.Eng.Ltd.Co. Antalya/Turkey, Republic of Turkey, Ministry of Development, ORTA Düğü Teknik Üniversitesi, Ankara/Turkey, İşık University, İstanbul/Turkey, for their support throughout the project.

© Günarda Project Management, Research and Consulting Co. Inc. Copying, sharing, re-release, re-copying the material in this poster, without prior written consent of Günarda, is strictly prohibited.