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

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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.

About the Company GÜNARDA

Link to the paper in DAG web

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.

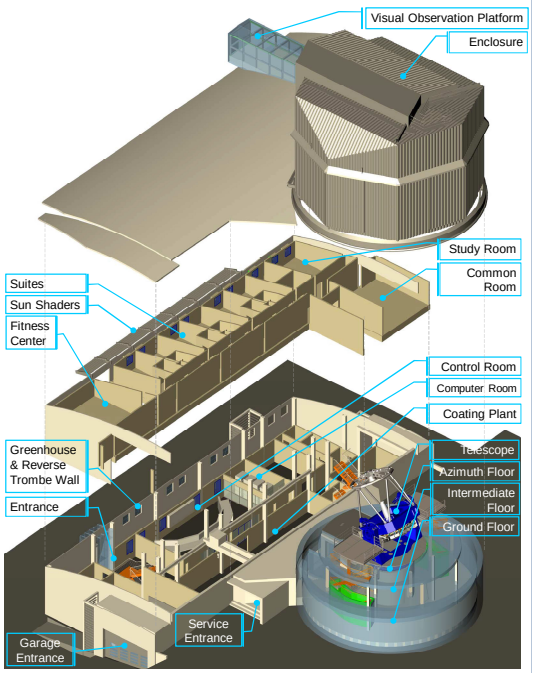

Figure: Telescope & Service Building Exploded View

RESULTS

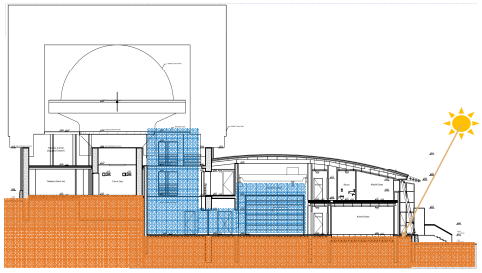

Figure: Section Through Mirror Removal Axis

Figure: Illustrations of the DAG Building

CONCLUSIONS

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.

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