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GENOSER FOR RENEWABLE ENERGY

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1. Presentation of the company:

GENOSER Structural Engineering is a civil engineering office that was established in Izmir, TÜRKİYE in 2011. We offer structural, earthquake, and geotechnical engineering solutions for all kinds of investment projects, especially in the renewable energy sector. GENOSER welcomes you with great ambition and evaluation to make you happy with its expert and dynamic team. As Genoser, we have experience in wind turbine systems, earthquake risk evaluation, structural steel projects, and solar energy installation. Combining this experience with the newest technological software and working methods, we develop the best possible solution for you in a reasonable amount of time and guarantee the highest quality and cost advantage in structural design.



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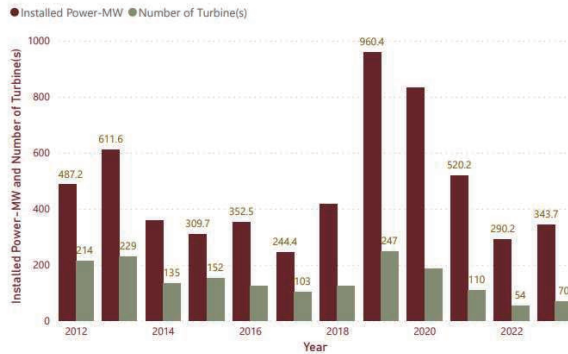
Company Specialities

- Special construction engineering for wind energy facilities.
- Special construction engineering for solar energy facilities.
- Geotechnical Engineering
Structural steel projects design.
- Special construction engineering for industrial facilities.
- Earthquake Risk Detection.
- R&D and innovation projects.

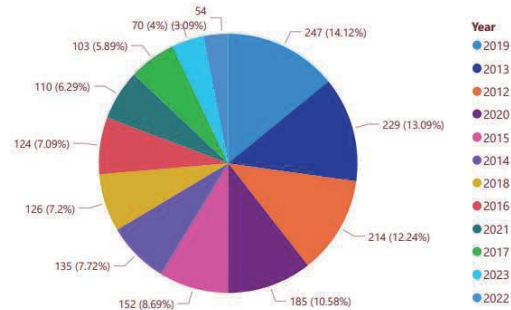
2. Special construction engineering for wind energy facilities

Genoser started its first Project in 2012. The number of installed turbines was augmenting slowly through time. By the end of 2022, the total number of the realized wind turbine Project is 1749 with 5728,1 MW Installed power.

Installed Power-MW and Number of Turbine(s) by Year



Number of Turbine(s) by Year





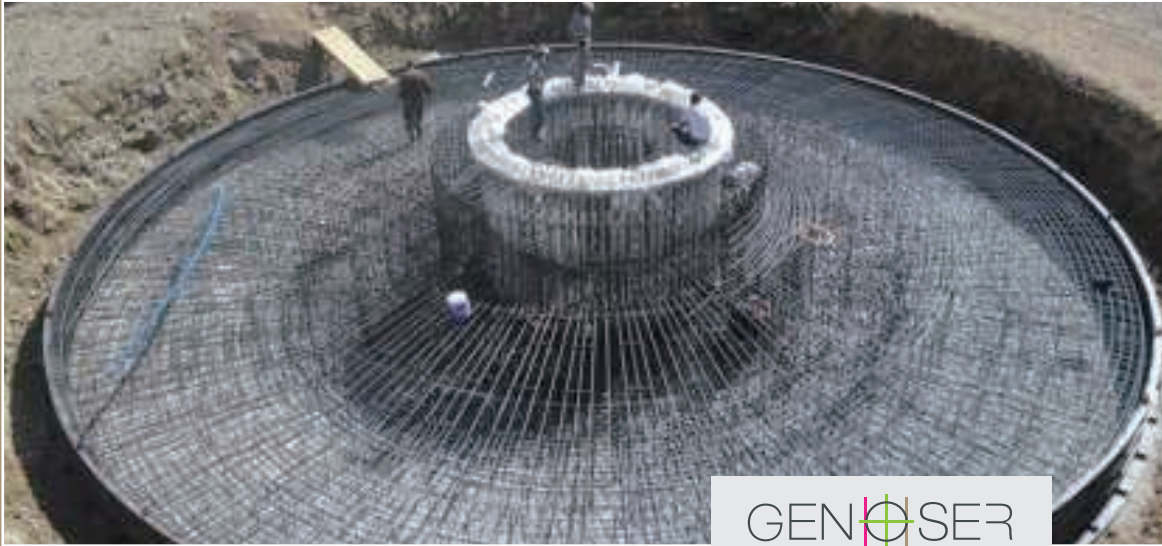
Our Special Activities for Wind Power Plants:

- The static design of wind turbine foundation.
- Wind turbine foundation soil investigation and geotechnical consultancy.
- Wind turbine foundation project consultancy and control services.
- Monitoring the structural integrity of the existing wind turbine towers.

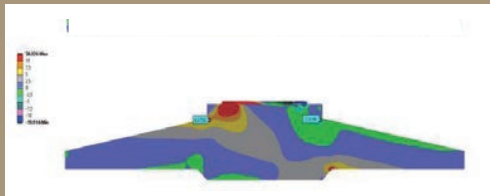
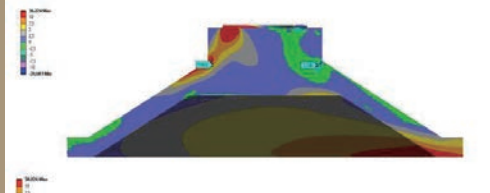
2.1. Static design of wind turbine foundation.

Wind turbine foundation design is one of the essential expertise of GENOSER. Our company works with international companies such as Nordex Energy, and Siemens Gamesa besides domestic/foreign investors. Our projects were reviewed and approved by wind turbine manufacturers' engineering departments, international independent consultancy control offices, and universities. Wind turbine foundation design.

The wind turbine foundation is the most critical transfer structure between the tower and the load-bearing layer of the soil. Since it is not a standard foundation, it is a special foundation that is exposed to external forces and fatigue affects millions of times during the service life of the tower (approximately 25 years). GENOSER generally designs wind turbine foundations in circular form and presents them to investors.



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The comprehensive analysis includes all section investigations of service and limit state, fatigue analysis for concrete and construction steel.

Since the bearing capacity of the ground is limited, a special foundation design is made for each site.

Base size change is not the only alternative for weak ground, ground improvement solutions are also offered.

The content of our wind turbine basic designs includes the following verifications as a minimum.

- Main reinforcement
- Shear reinforcement
- Anchorage reinforcement
- Punching verification
- Tensile splitting reinforcement calculation
- Crack control
- Concrete compressive stress control
- Grout compressive stress control under the base plate
- Concrete compressive stress control over anchorage plate
- Fatigue verifications
- Soil controls (rotation, shear, eccentricity, soil allowable bearing control, relative rotation, settlement, etc.)

WIND TURBINE FOUNDATION STRUCTURAL DESIGN ADVANTAGES :



This design is the most suitable geometry against the variable direction effect of the wind.

Significant savings on the required amount of the concrete and the reinforcing bars.

Required mold surfaces can be optimized and reduced.

Installation of reinforcements can be done easily in harmony with the anchor cage.

Approximately 50 inspections and controls are carried out on the basis of wind turbines.

2.2. Wind turbine foundation soil investigation and geotechnical consultancy:

The quality of the soil is an important parameter while the design of the foundation of wind turbines, The geotechnical and soil investigation report can be offered in addition to the Preparation of Site-Specific Soil Improvement Project.

Our activities :

- Preparation of Geotechnical and Soil Surveying Report
- Drilling Works
- Examination Pits
- Field Experiments
- Laboratory Experiments

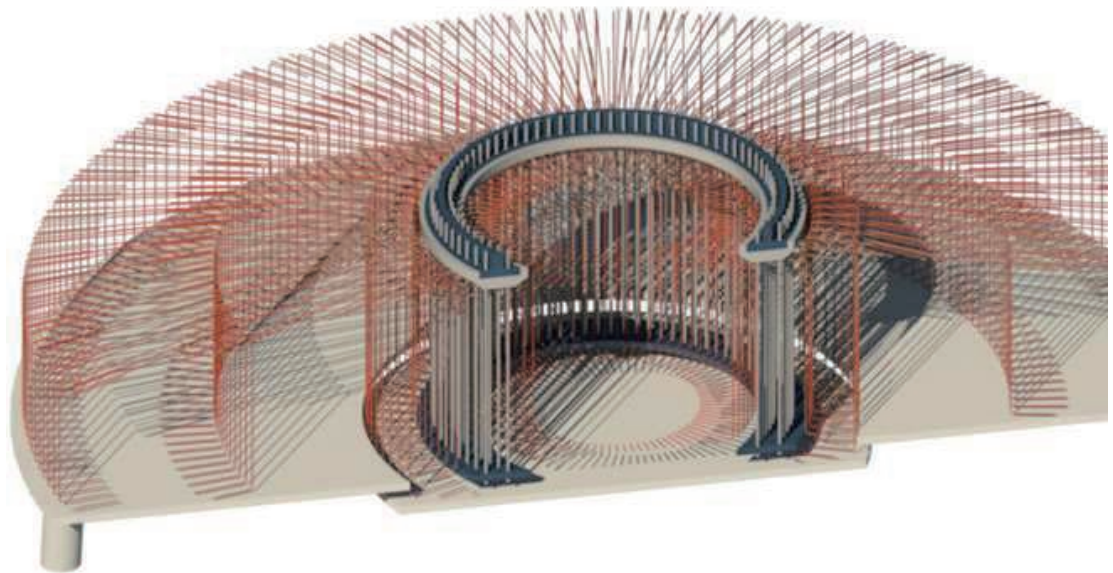


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2.3. Wind turbine foundation project consultancy and control services:

Wind turbine foundation project consultancy - control; Comprehensive inspection and compliance inspection services are provided for the projects prepared by the investors or for which they receive service, according to local ground conditions and international/local design regulations.





Wind turbine base construction technical control

In the field applications of the wind turbine foundation, checking the suitability of the reinforcement for the project, concrete-construction steel samples, etc. to the investors. technical consultancy services are provided. It is within our scope of service to organize the conformity inspection and quality control stages of existing foundations that have had problems in their application and to determine the reinforcement methods when necessary.

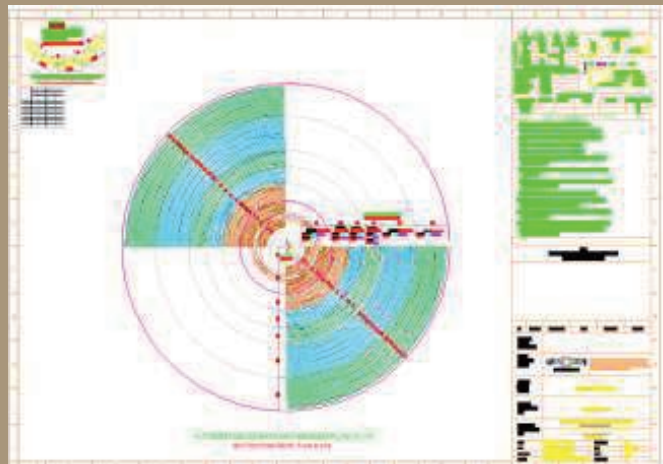
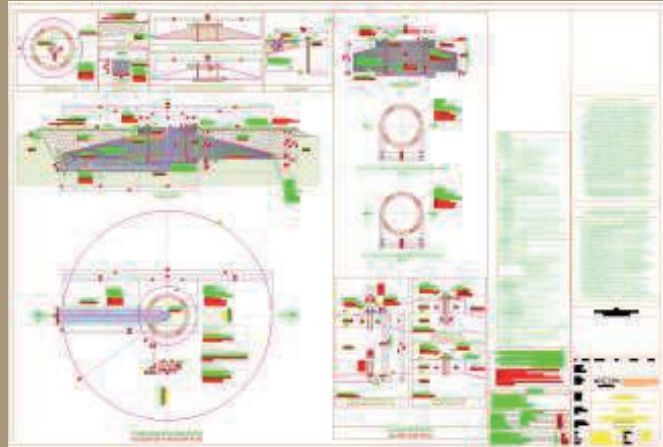
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Wind turbine foundation application projects

After the comprehensive analysis of the wind turbine foundations, site application drawings are prepared.

In the prepared application drawings, a detailed foundation formwork plan, foundation section reinforcement openings and reinforcement layout plans, and assembly tables are presented.



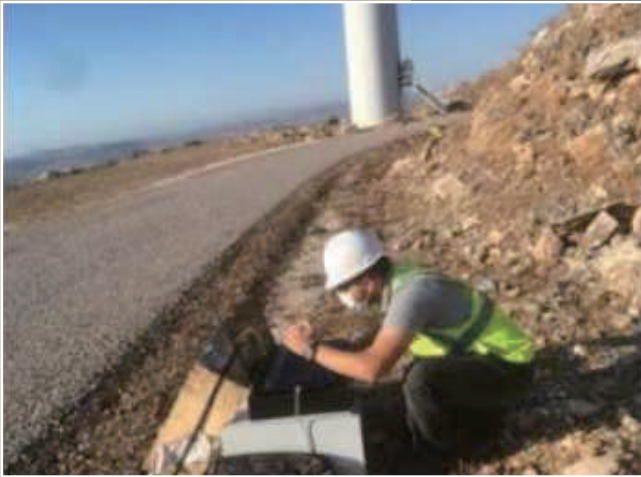
2.4. Monitoring the structural integrity of the existing wind turbine towers

Structural Health Monitoring involves observing and analyzing a system over time using periodically sampled response measurements to monitor changes in the material and geometric properties of engineering structures.

- Structural Health Monitoring of Tower Foundation
- Restoration of Tower-Foundation Connection
- Retrofitting of Tower- Foundation Connection

What are we measuring?

Tower Vibration (Period/ Frequency)
Tower Slope
Tower Vertical Movement



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3. Selected projects from among several hundred successful projects wind energy facilities :

ATARES 1 AND 2 EXTENSION



Location : Bursa, Türkiye.
Year : 2023
Power : 170 Mw
Number of Turbines : 39
Type of Turbine : N149/4800 TS125m

GÜLPINAR RES



Location : Çanakkale, Türkiye.
Year : 2023
Power : 160 Mw
Number of Turbines : 29
Type of Turbines : E115/ EP3-E3-ST-92/ FB/C/01
E160/ EP5-E3-ST-99/ FB/C/01 - E160/ EP5-E3-HST-120/ FB/C/01

UŞAK RES



Location : Uşak, Türkiye.
Year : 2022
Power : 102 Mw
Number of Turbines : 17
Type of Turbine : Gw165-6.0-100mhh-iec5

ÜÇPINAR RES



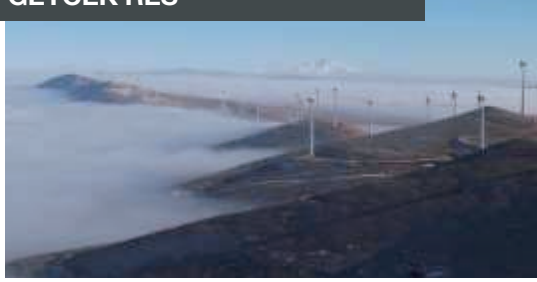
Location : Kayseri , Türkiye.
Year : 2021
Power : 68.4 Mw
Number of Turbines : 12
Type of Turbines : N163/5700 TS118m

İSTANBUL RES



Location : İstanbul, Türkiye.
Year : 2021
Power : 211,2 Mw
Number of Turbines : 44
Type of Turbine : N133/4800 TS125m

GEYCEK RES



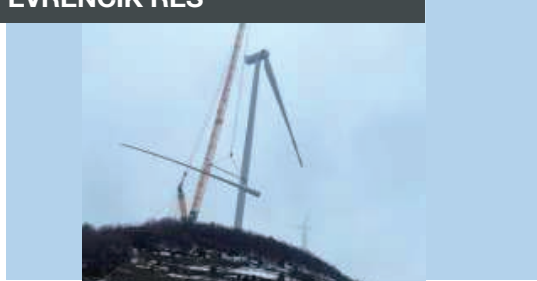
Location : Kırşehir, Türkiye.
Year : 2013
Power : 150 Mw
Number of Turbines : 30
Type of Turbines : N133/4800 TS125m

ZONGULDAK RES



Location : Zonguldak, Türkiye.
Year : 2020
Power : 121,9 Mw
Number of Turbines : 23
Type of Turbine : GE 5.3-158-121mHH

EVRENCİK RES



Location : Kırklareli, Vize, Türkiye.
Year : 2019
Power : 129,60 Mwe
Number of Turbines : 27
Type of Turbines : N149/4500 TS125m

Selected projects from among several hundred successful projects wind energy facilities :

LODOS RES



Location : İzmir, Türkiye.
Year : 2013
Power : 120 Mw
Number of Turbines : 50
Type of Turbine : E-82

SÖKE RES



Location : Aydın, Türkiye.
Year : 2019
Power : 103 Mw
Number of Turbines : 23
Type of Turbines : N149/4500 TS105

ÜÇPINAR RES



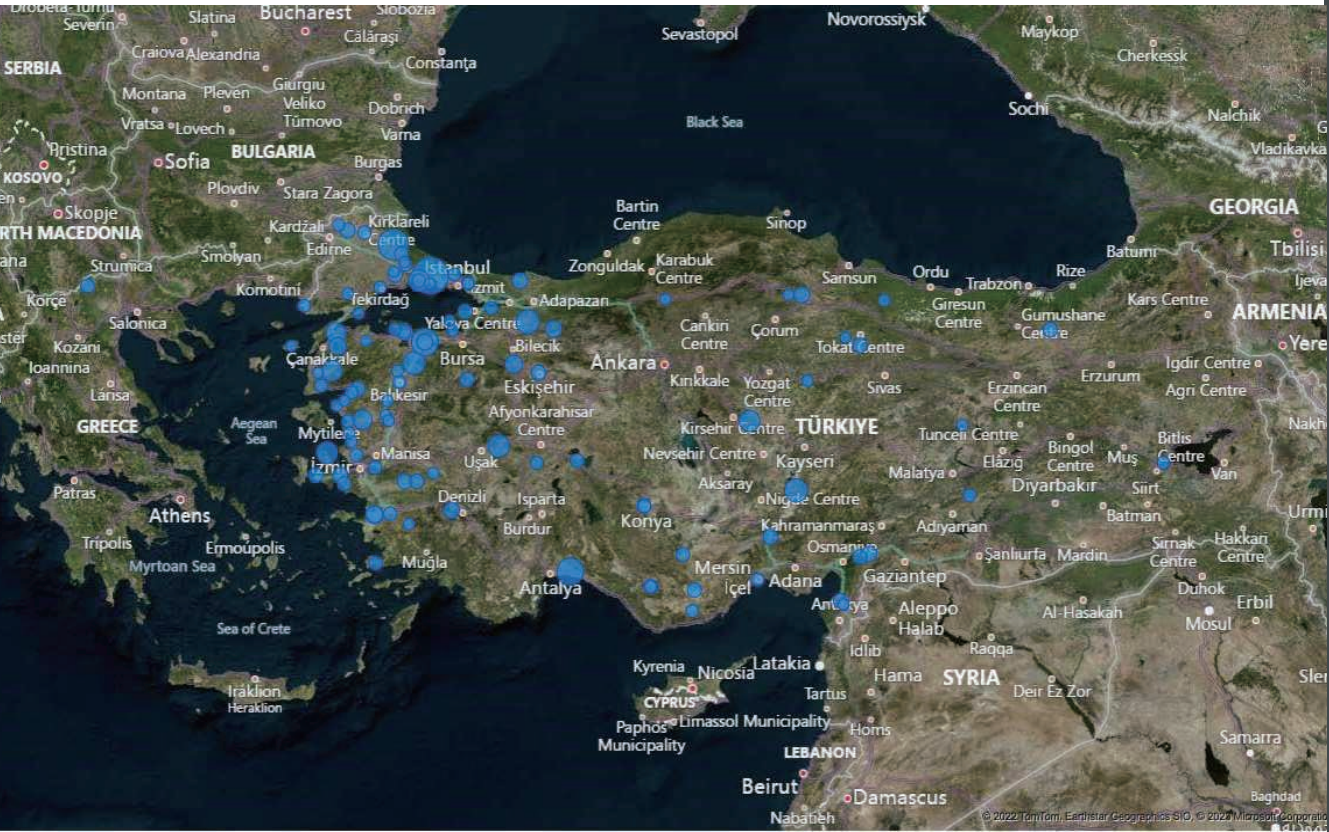
Location : Çanakkale, Türkiye.
Year : 2018
Power : 100 Mw
Number of Turbines : 33
Type of Turbine : SWT-3.4-108-D3-3.4-108-S-T79.5-583

HAMZABEYLİ RES



Location : Edirne, Türkiye.
Year : 2017
Power : 25,12 Mw
Number of Turbines : 2
Type of Turbines :

Installed Power-MW by Location



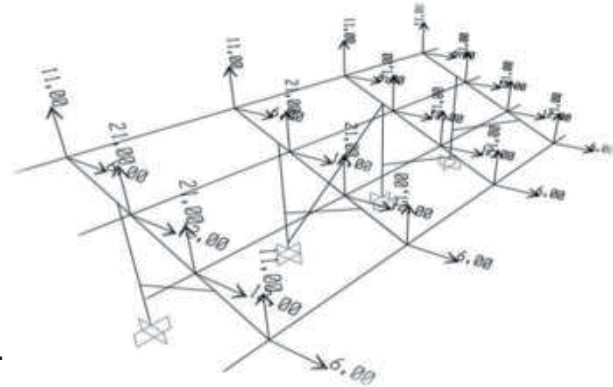
4. Special construction engineering for solar energy facilities

Our company prepares static projects in accordance with TEDAŞ technical specifications for solar power plants to be installed both on the fields and on the roofs within the scope of licensed and unlicensed electricity generation.

Our project experience in renewable power plant construction projects exceeding 3000 mw comes to a nationwide market share of approximately 25%.

4.1. Our Activities on Roofs :

- Pre-Analyzing of Project: Assessment of technical compliance and special consulting.
- Determination of the static suitability of the existing building roof system and Roof Strengthening Project.
- Determination of the static suitability of the solar panel mounting structural members.
- Roof static compliance studies and static reports for different types of buildings.
- Roof cover IN-SITU test.
Solar Panel Construction Design Control.
- Innovative Assembly Construction Design.

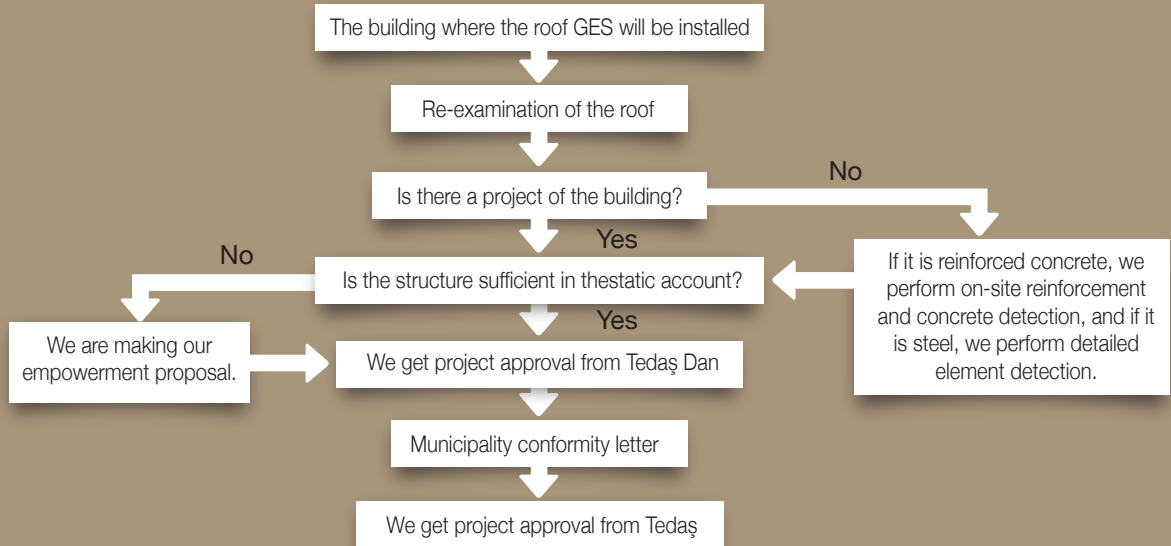




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GES Roof Installations Internal Statistics Project



Existing Roof Bearing Capacity Analysis and Roof Reinforcement Project:

There are **two** different scope of work

1

**ROOF VISUAL
EXPLORATION**

Speedy

2

**ROOF STATIC
CONTROL**

Wide



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1. Roof visual exploration

WHICH EXAMINATION SHOULD BE DONE?

1. I would like our roof to be visually inspected by an onsite expert.
2. We would like to get preliminary information about our roof carrier system.
3. We do not need a static account-based review at this time.
4. We request information on the suitability of the roof covering.
5. We want to know approximately how much installed power we can make by determining the suitable areas of our roof in general.
6. We are an EPC company that will bid on the employer. We want to do a low-budget information study.

Our service according to your demands above is roof visual exploration.

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SCOPE OF ROOF VISUAL RECONNAISSANCE:

1. Observational studies to provide general information to the employer.
2. It is done by the expert technical team.
3. The general geometry of the building and the carrier system is visually examined.
4. Static calculation and loading simulations are not performed.
5. Upon request, the survey drawing that will be the basis for the panel layout can be delivered
6. A general roadmap of what needs to be done is reported.
7. The solar mounting construction to be used is defined.
8. A summary discovery report is given.

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2. Roof static control :

WHICH EXAMINATION SHOULD I DO?

1. We want to know if our roof can carry additional loads from solar panels.
2. We would like to have a check based on static calculation by an authorized engineering office.
3. Instead of visual interpretations about the roof, we want to proceed with numerical results.
4. I would like to examine the current projects and the application in place.
5. We will receive a GES Conformity Letter from the relevant civil administration based on its report.
6. We think that our roof is insufficient, we want to see reinforcement alternatives and their approximate costs.



Our service according to your demands above is ROOF STATIC CONTROL.

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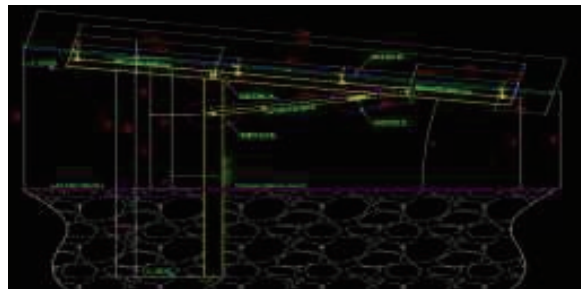
SCOPE OF ROOF STATIC CONTROL :

1. The building is examined on site, and the existing static projects, if any, are obtained from the Workplace.
2. A model of the building is created in the computer environment, and loading simulations are made.
3. In addition to loads such as coating, snow, wind, solar panel loads are affected.
4. According to the structure type, earthquake lateral translations, which are determinative in earthquake damage, are made.
5. The work done can be used in GES official permit processes.
6. The study is focused on the roof carrier system, its scope can be expanded according to the special request of the employer.
7. In case of possible inadequacies, retrofit alternatives are reported and approximate quantities are given.

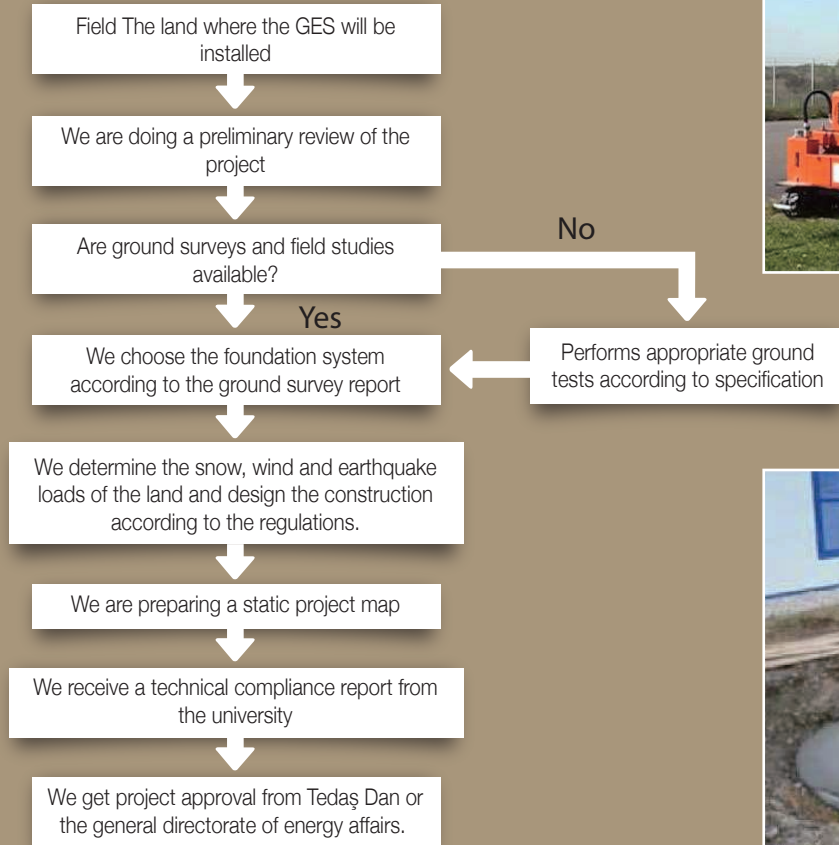
4.2. Our Activities on Field instulation:

Feasible soil exploration has importance to select the right foundation type for suitable supporting soilconstruction.

- Soil investigation and Field Research
- Present Construction selection and Project staticcontrol
- Foundation Type Selection
- Design and control of the construction static project



Ges Field Installations Internal Statistics Project



4.3. Steps of Static Projects for Solar Energy Systems

1. Pre-Analyzing of Project:

Assessment technical compliance and special consulting for investors in case of poor.



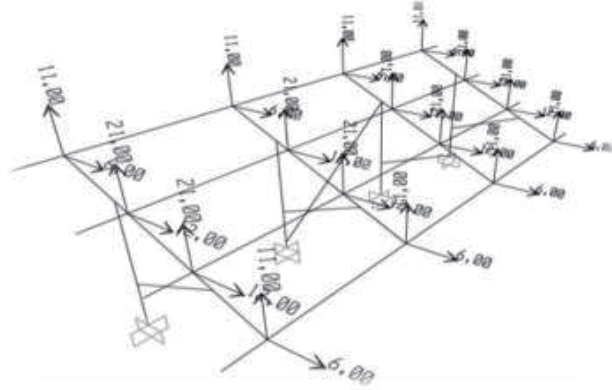
2. Soil Exploration and Field Research:

According to the soil exploration specifications; competent technic tests (boring, seismic tests, laboratory tests etc.) examines by GENSER. Feasible soil exploration have importance to select right foundation type for suitable supporting soil construction.



3. Construction Design – Static Calculation and Project Planning :

Designing the most suitable and economic construction special to the PV panels, local climate conditions (snow, wind, etc.), and earthquake risks. Designs based on TS498, TS648, DBYBHY-2007, Eurocode 3-9 instructions. Special design systems for both one construction material and mixed construction materials.



4. Foundation Type Selection:

Making special selections according to the soil investigation report between raker pile, embedded in the concrete pile, or surface concrete foundation types. Raker pile application is generally a more economic, fast, and selectable supporting type relative to the others. However, on hard rock, poor supporting resistance, or corrosive areas raker pile application is not possible. An embedded concrete pile is suitable for eliminating the disadvantages of field conditions. Surface concrete systems are preferable for poor supporting soils because of their long life and high resistance capacity.

Steps of Static Projects for Solar Energy Systems

5. Present Construction Design and Project Controlling:

According to the relevant instructions static calculations and controls special to local conditions for pre-decided constructions by investigators. Consulting for investigators on this process about more economic methods and static improvement. Genser has already controlled and improved conveyor systems which are produced or designed by a lot of foreign firms.



6. Static Projects Special To Roof Setup:

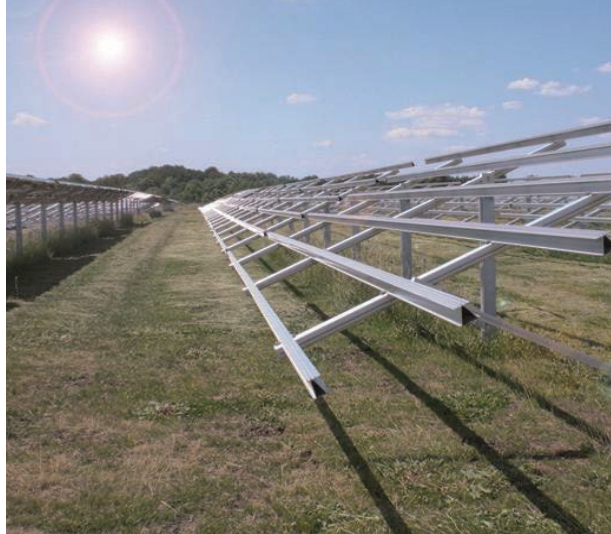
Static project planning according to the TEDAŞ technic specifications for unlicensed solar energy systems. Making roof strength performs tests within this process besides tests for bottom carcass members. Project operations, observational site analysis by our technic team, durability tests, and relievo works are our presented services for investigated structure. Legal permission issues from authorized corporations and the Head Office of TEDAŞ for prepared projects and static calculations.

7. TEDAŞ/ Ministry of Energy Permissions :

Drawings and static calculation reports prepared according to specifications and standards of TEDAŞ for unlicensed projects and Ministry of Energy and Natural Resources for licensed projects. Operating the process of technic examination of the construction file and realizing possible revisions are generally our standard services for a lot of projects.

8. Construction Technic Controller:

Servicing as a construction technic controller upon demand of investigator for under construction or in the process of TEDAŞ final acceptance systems. In this process, the differences and disconformities between the project and practice, using the right cross-sections and controls of joint members control and test by our technic team.



5. Selected projects from among several hundred successful projects Solar energy facilities :

Ali Sami Yen Sports Complex Nef Galatasaray Stadium

- Existing roof static control
- Sub-assembly construction design control



Brisa Aksaray Facility

- Existing roof static control
- Sub-assembly construction design control



Erdem Holding Izmit Facilities

- Existing roof static control
- Sub-assembly construction design control



Ma' Adra Vineyards, Balikesir

- Existing roof static control



Yildirim Holding-gemport Gemlik Bursa

- Existing roof static control



Yildirim Holding-rotaport Gulf Kocaeli

- Existing roof static control



Selected projects from among several hundred successful projects Solar energy facilities :

Friterm Thermal Gebze Facility

- Existing roof static control
- Sub-assembly construction design control



Omya Mining Karabig Facility

- Existing roof static control



Tegnatia Epc Solutions Muş Field Ges

- Sub-assembly construction design control



Maxion İnci Alüminyum Roof Ges

- Existing roof static control
- Sub-assembly construction design control



Maxion İnci Alüminyum Roof Ges

- Existing roof static control



Defne Agriculture Tire Izmir Facility

- Existing roof static control



Selected projects from among several hundred successful projects Solar energy facilities :

Kiliç Sea All Facilities

- Existing roof static control



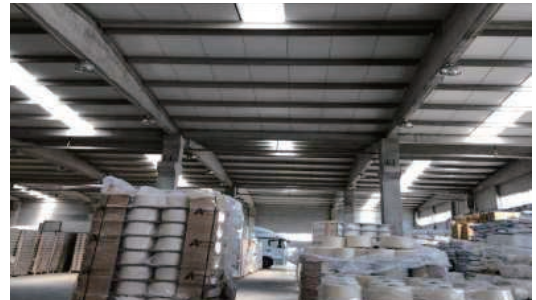
Akca Holding Köşk And Saruhanli Facilities

- Existing roof static control



Successful Denizli Warehouses

- Existing roof static control



Turkuaz Automotive Denizli

- Sub-assembly construction design control



Pepsico Kemalpaşa İzmir Facility

- Existing roof static control



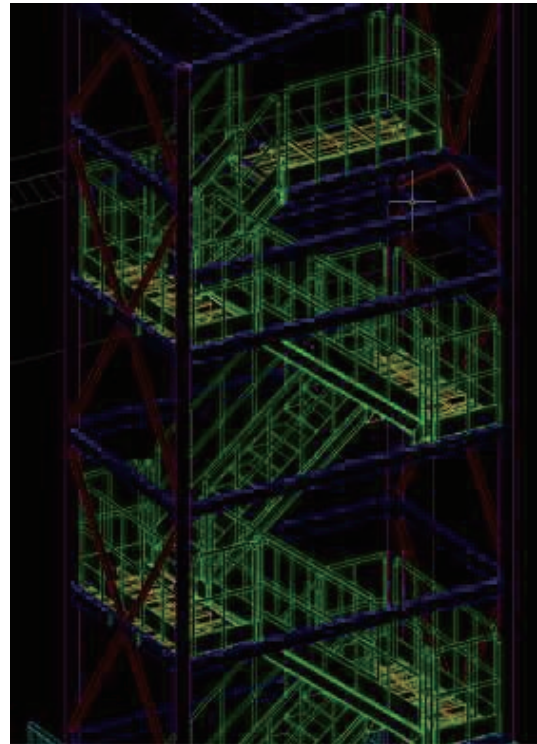
İşbir Synthetic Balıkesir

- Existing roof static control



6. Special Structural Steel Projects for Facilities

Construction design, static calculation, and projecting PV panels and local most economical under snow, wind, and earthquake loads determined according to the conditions and adequate safety construction designs are made.



REFERENCES :



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