



Technical drawing of a roof structure. The drawing shows a side elevation of a roof with a pitch of $25^\circ \pm 1^\circ$. The roof is supported by two vertical columns. The total height of the structure is 2517. The total width of the structure is 3751. The roof is divided into sections with lengths 992, 992, 4104, 992, and 992. The height of the roof above the columns is 700.

Reheert hij heeluit van Durgemeester

Namens dezen,
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1. Origin

At the end of 2016, Greencells took the decision to develop his own PV-mounting structure.

For this new activity by Greencells the 2 managers by Magna Automotive for the development of the PV-mounting structure were recruited:

Eric Lauer

(Non-Automotive Department Manager)

Christophe Touchet

(Business Dev. and Engineering Manager Non-Automotive Department)

Eric and **Christophe** started by Greencells at the beginning of the year 2017.

They represent the know how of Greencells for the designing and the production of Greencells PV-mounting Structure.

2. Design activities

The drawings and the static calculation activities are **made in house**.

2.1 Standards

The design of the mounting structure is generally made according to the **EUROCODES**.

On request from our customer, the studies can be made with the consideration of other standards requirements. In this case, the support of an extern expert is required.

2.2 Ground Expertise

The ground expertise is conducted by an extern ground expert.

After his investigation on site (soil survey, pull out test, chemical analysis, ...), the ground expert calculates the minimum requirements for the foundation as for example the ramming depth, the required corrosion coating system.

2.3 Tools for the drawings activities

Drawings activities are conducted with the help of:

Autodesk - Autocad 2016

Autodesk - Civil 3D 2016

2.4 Tools for the static analysis activities

Static analysis activities are conducted with the help of:

Dlubal - RFEM (FEM Structure analysis software)

Dlubal - Shape Thin (Properties and stresses of thin walled cross sections)

Dlubal - RF STEEL EC3 (Design of Steel Members and Sets of Members accrd. to EC3)

3. Physical tests

3.1 Assembly

In case of a new concept, a first PV-mounting structure is produced, assembled and tested in order to verify the feasibility of the assembly



3.2 Corrosion

Accelerated corrosion tests (ISO 12944) are conducted by an independent laboratory (ex. DEKRA).



Sweihan - 1.17GWp - UAE

3.2 Corrosion

Coating systems:

Pile: Hot galvanization ISO 1461 or ZM430(Magnelis) for piles

Other profiles: Hot deep galvanization EN10346 : from Z600 to ZM430(Magnelis)

Fasteners: Magni 565, 1000Hrs NSS or Stainless

PV-clamps: Aluminium

Those tests **confirm** that the all coating systems are enough resistant.

3.2 Mechanical resistance

Mechanical resistance tests are conducted in order to verify the correlation with the results of the static analysis.

4. Production

4.1 Checks before production

A third party (Technical advisor, Civil Engineer Technical control office) checks the design and the static analysis (ex. Fichtner, Socotec, OST Energy, etc.).

4.2 Certification

ISO 9001; ISO TS 16949 (Automotive standard)

4.3 Steel suppliers

ArcelorMittal, ThyssenKrupp, Wuppermann, etc.



5. PV-Projects

Quoted

PV-plants: 114

Global power: 4.928 MWp

Countries: 32

Customers: EDF, NEOEN, Solaire Direct, QCells, Wirsol, European Energy, First Solar, EON,...

PV-mounting structure concepts:

- 1 Pole 2V
- 2 Pile 3V
- 2 Pile 4L to 10L

PV-mounting structure variants: 259 (Approximately 2 variants per project)

Built

PV-plants: 49

Global power: 1.755 MWp

Countries England, France, Germany, Italy, Honduras, Abu Dhabi, Northern Ireland, Poland, Denmark

Customers: QCells, EON, Pairan, Wirsol, Kaco, Sterling&Wilson,etc.

PV-mounting structure concepts:

- 1 Pole 2V
- 2 Pile 3V
- 2 Pile 4L and 6L FS4 modules
- 3 Pile 8L

PV-mounting structure variants: 86 (Approximately 2 variants per project)

Quality performance: < 500ppm

Delivery performance: 99,8% of parts delivered in time

6. References

UK

Flixborough - 5MWp, Manor Farm - 5 MWp, Axe View - 5MWp, Pick Hill - 5 MWp, Hill Farm - 5MWp

Denmark

Stubbekobin - 3.6MWp, Oster Toreby - 10 MWp, Peldysparken - 7MWp, Hundetu-devej - 10MWp

Poland

Novogard - 6.5MWp

Albania

Fier - 10MWp

UAE

Sweiha - 1.177GWp

