GEOMETRIC MODELING APPLIED IN ENGINEERING

Todea Adela Olimpia*, Iancu Carmen*

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048, Oradea, Romania, e-mail: adela_venter@yahoo.ro; ciancu2000@yahoo.com

Abstract

In this work we will present a practical method of application modeling three-dimensional surfaces, useful for shading or protect of precipitation a useful surface. By point of view geometrically it can be modeled any surface of any geometric form, with the condition they know the characteristics of the area and the environment, the odds and positioning of of other landmarks.

Key words: modeling, geometric, pergola, sun protection

INTRODUCTION

The work refers at the shading of a surface of about 850 m^2 divided into 25 of size areas different, which becomes protected of sun and weather conditions. The goal of work is to highlight parameters review: safety, resistance, maintenance, environment, as well as the geometric method used, conclusions and observations drawn.

MATERIAL AND METHOD

Dimensions and characteristics of the area, they have been taken from the place. Useful area is urban, with the purpose must be shadowed, to resist long term to snow, ice, precipitation, weather, sun, which means about 5 years.

Having a metallic structure wich separates distributed areas, the proposed solution is pergola.With a modern design and useful, the fixing is provided so that they can do the role from the point of viewal human security. Maintining another parameter, must be accessible and easy to achieve. Visual obstruction of other adjacent areas, for example video cameras, it is important, this should be minimal.

After the on-site analysis, it was found that each area has other characteristics and each pergola must be personalized, depending on location, the useful surface, positioning, grip and shape.

. From an engineering point of view and in terms of passer safety, a fastening system was created, adapted to the shape that in general is a parallelogram, from different angles, which can withstand shearing tearing, traction, and weight due material mass, of the wind, or other factors extenals such as snow, ice, as in figure 1.

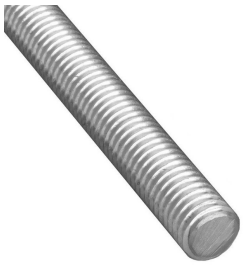

Fig. 1. Metric screw

Thus metric screw was chosen made of galvanized steel and with the larger in fill area that can withstand a breaking force, traction, shear, less than 800 N / mm2. Braces, clips were attached, stretchers, key wrenches, eyepieces, to support the whole designed structure. For stretching, metal gloves were designed and steel cables, that it's structure has greater grip resistance. All these were seen in figure 2:

Fig. 2. Metal gloves

The calculations were made according to the size for each area, of the clamping mode, the alleged mass of snow from the climatic zone temperate continental moderate, of the city of Satu Mare, which is located in the plain, and the inclination to the horizontal of the two peaks. Threading must be more permissive that is, on a larger surface because the material has a characteristic of elasticity, which must be taken into account. The characteristics of the manufacturing material are the following: elasticity is 2% the linear 5m, adheres 10 teeth / 5cm, breaking force 32/28 dan, temperature resistance -30˚C to +70˚C, tensile strength 260/250 dan, total weight 680 g/m^2.

Perforated metal gloves were created under the different angles, depending on the trigonometric calculations level difference. Certainly, these angles, have moved around 75˚, shown in figure 3:

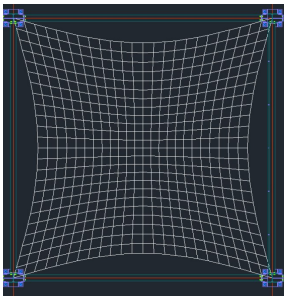

Fig. 3. Pergola

Geometric modeling refers to framing the pergola on the personalized ceilings, of different dimensions, their shape being parallelograms with two diagonal clamping tips on the metal structure established in advance and two peaks one meter down vertically.From mathematical and trigonometric calculations,the following form was established as in figure 4:

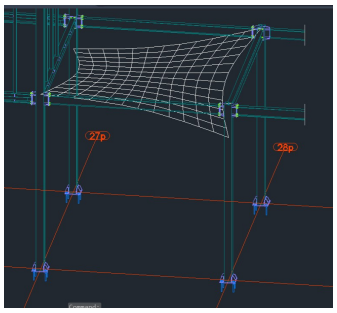

Fig. 4. Pergola 3D

Because their size is very large on average, 6m x 6m, the material, must be partitioned into glued pieces, so as to create a greater resistance by bonding. Moreover, they must be established the angles of each peak, of the parallelogram after the curve. The material was cut under a curvature of approximately 30 cm deep, to be stretched without needing help steel cables.

The bonding of the material was done with a special machine at 550˚C, with a certain speed of travel, so as to avoid burning.

The mathematical calculations have led to the framing of the well-defined geometric figure, complying with all environmental requirements. For a rigorous arrangement of pergolas on the measured surfaces, from the point of view of geometric modeling, we used Autodesk AutoCad 2020. This geometric modeling software, allowed us to calculate the exact linear quotas, of curvature and angle, as well as level differences. Thus the following final modeling was obtained as in figure 5:

Fig. 5. View of Pergola

RESULTS AND DISCUSSION

The advantage of the chosen grip is safety, the varied movement due to external factors is minimal, the resistance to any wind force induced by the environment and the distance from the mounting bracket, is as small as possible.

Advantage of the chosen material: flexible, easy to process, excellent welding, durable technology, easy to clean, durable, fine surface, stops the sun's rays.

CONCLUSIONS

The project was put into practice in 2019, corresponds as design, structure and geometric modeling of all the parameters specified during the work, with the specification as maintenance to clean the snow in winter, it is necessary and important to do, when submitting a small layer, because it may influence the entire or partial surface of the deposit, due to the elasticity and the large surfaces of the pergolas.

REFERENCES

1. Georgescu G.S., 1972, Îndrumător pentru ateliere mecanice. Ed. Tehnica Bucuresti , pp.80-738
2. Randy H. Shih, 2019, AutoCAD 2020 Tutorial First Level 2D Fundamentals, pp171-289
3. Eric Wing, 2016, Autodesk Revit 2017 for Architecture: No Experience Required, pp120-307