

I-458 COMPARATIVE ANALYSIS OF WIND PRESSURE CHARACTERISTICS OF SOLAR PANELS MEASURED ON SITE AND IN WIND TUNNEL

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Introduction

This paper is concerned with fundamental wind load characteristics of the solar panels (Fig. 1), which had been built near the town of Saijo, Japan. In the summer of 1989, Aug. 27, when Typhoon 8917 hit the southern part of the country, series of site measurements had been carried out. Some years ago an experimental study in wind tunnel of these solar panels were also been carried out [1]. The study aims a comparison between both results, in order to guarantee a safety long term work of the supporting platforms in case of strong winds and also to propose an economical wind resistant design for the future constructions.

Measurements and Analysis

The system which was used for the measurements of the wind profile, wind velocity and direction and wind pressure is shown in Fig. 2. It was observed that the exponent of the power law for the vertical wind profile is approximately 1/3. Pressure coefficients are calculated in two different ways, directly using mean velocity component (Fig.3), and also normalizing it with the data of the wind direction measured by the ultrasonic anemometer. When the angle of the wind direction tends to be zero, results are similar to those taken in the wind

tunnel. If there is no normalization, results are close to those measured in the wind tunnel. Analysis of the data for the wind direction shows that the mean direction tends to be North, which coincides with the normal to the panel surface. Comparison between the

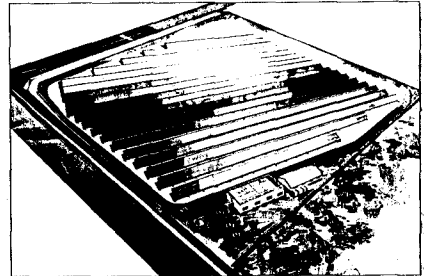


Fig. 1. Solar Panel Yard.

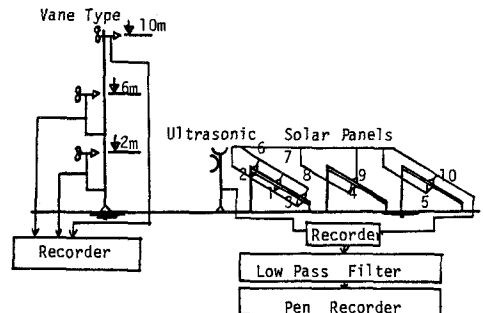


Fig. 2. Measurement Apparatus

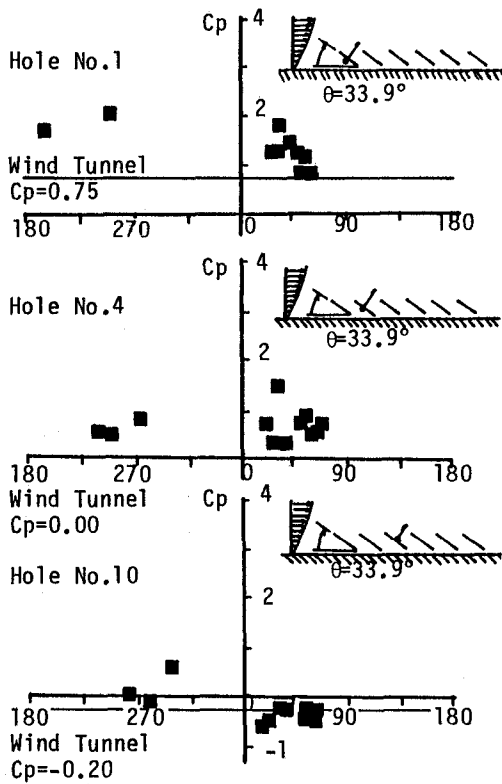


Fig. 3. Values for C_p without normalization of the velocity component.

Conclusion

Naturally observed and wind tunnel measured pressure coefficients show reasonable agreement. Based on this general conclusion, previous proposal for the reduction of the pressure coefficients across the panels is confirmed [1] (Fig 4.). Therefore it is possible to reduce the cost of the supporting platforms.

Acknowledgement

The authors would like to acknowledge Mr. S. Shigematsu and Mr. F. Sangawa (Yonden Consultants Co. Inc.) for their collaboration in the field observation.

Reference

1. Shiraishi, N., Matsumoto, M. et al, Experimental Study on Wind Loading Characteristics of Solar Panels, *Asia Pacific Symposium on Wind Engng.* Dec., 5-7, Roorkee, India, pp. 137-144, 1987

data taken by ultrasonic anemometer and Vane-type shows that for the former, wind flow is very heavily affected by the surrounding obstacles. Therefore first method of calculations, without normalization, can be assumed as a more reasonable.

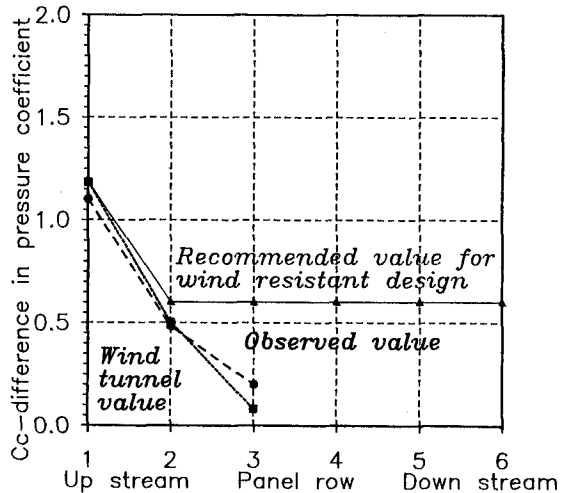


Fig. 4. Proposed reduction in the difference of pressure coefficients, $C_c = C_{p_{up}} - C_{p_{down}}$