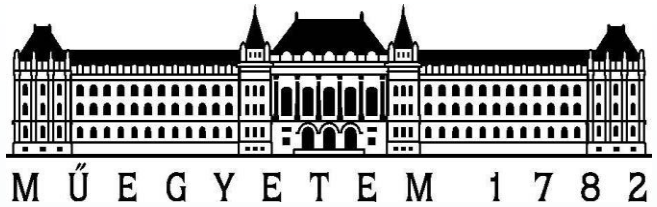


BUILDING AERODYNAMICS

# WIND TUNNEL MEASUREMENT OF TENSIONED ROOF

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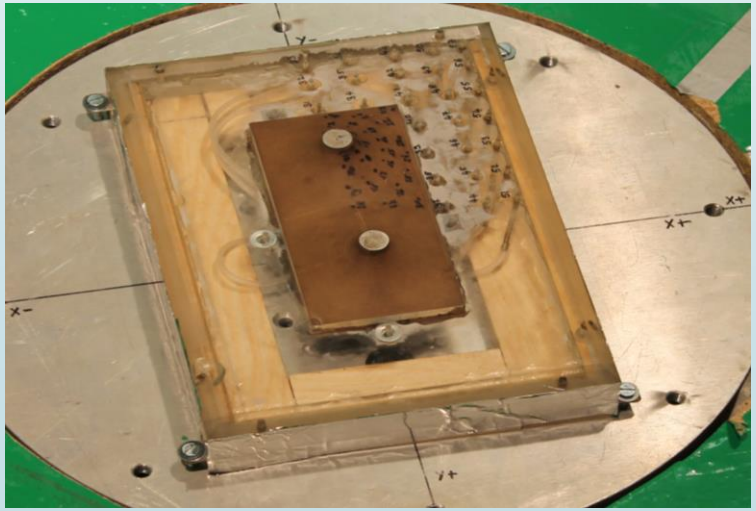
# OBJECTIVE

- Preparation of model for measurement
- Wind tunnel measurement
- To visualize the wind loading
- To make a contour plot of the mean pressure and the pressure fluctuation coefficient

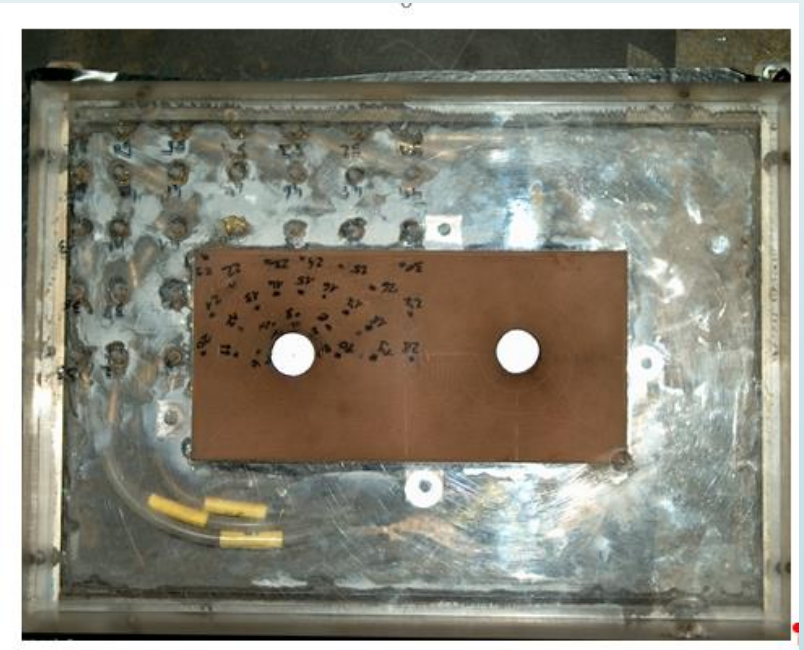
# TENSIONED ROOF MODEL

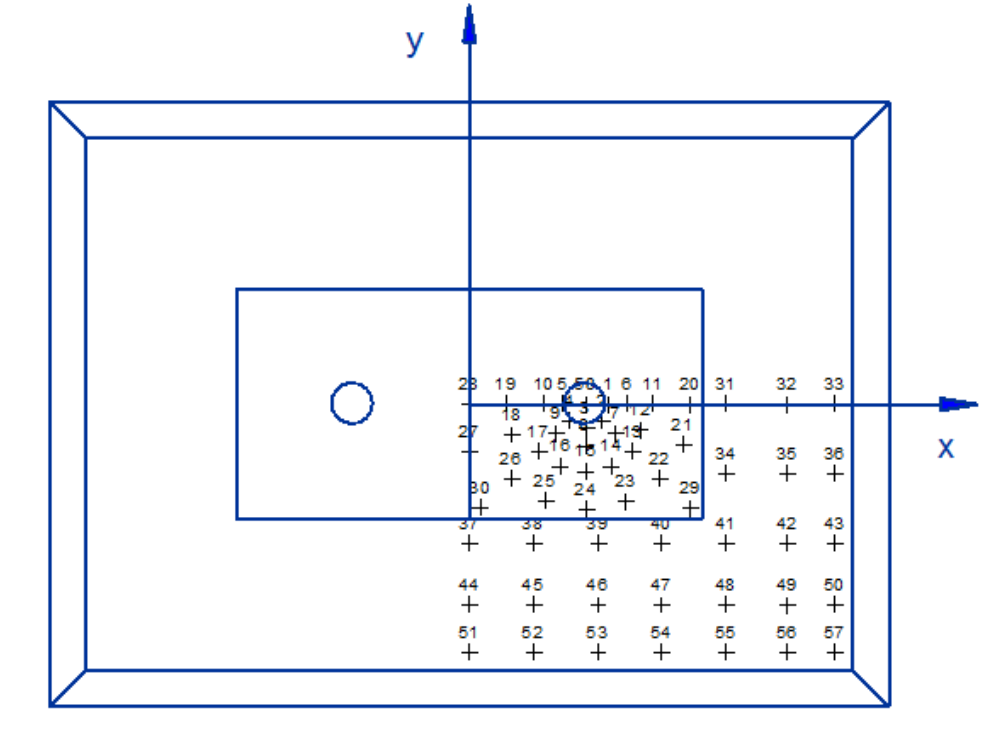
- The model scale is in 1:300 ratio
- The building model consist of two parts: the lower part of the building model is a block with horizontal flat roof surrounded by inclined roof (Plexiglass)
- The model of tent roof was manufactured of lumber



# TENSIONED ROOF MODEL

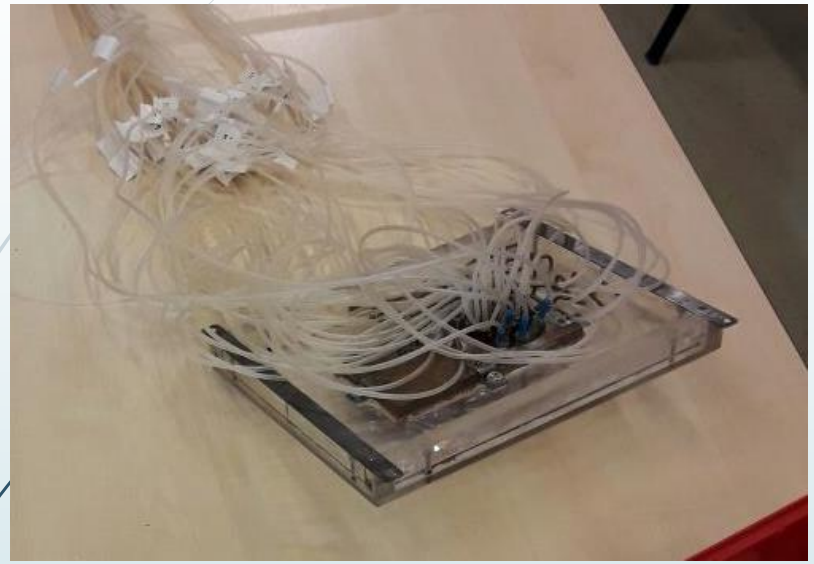
As the model is symmetrical along both axes there are pressure taps in one quarter of the model

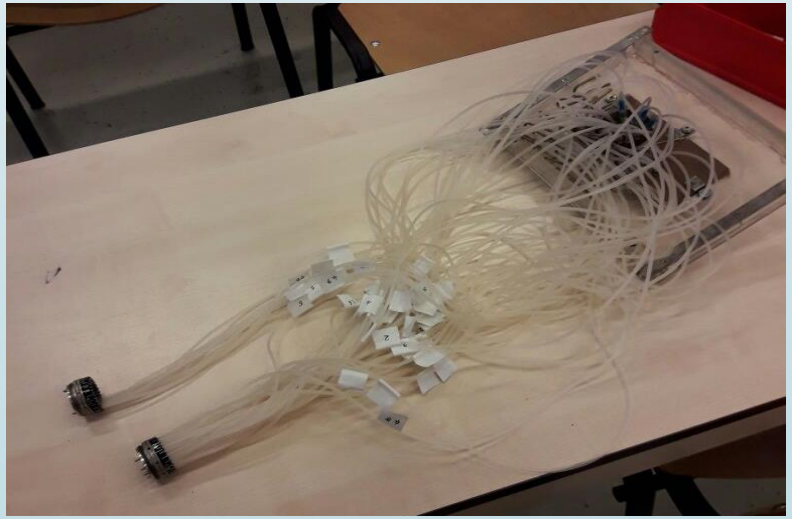





Number of taps -57

# CONNECTIONS

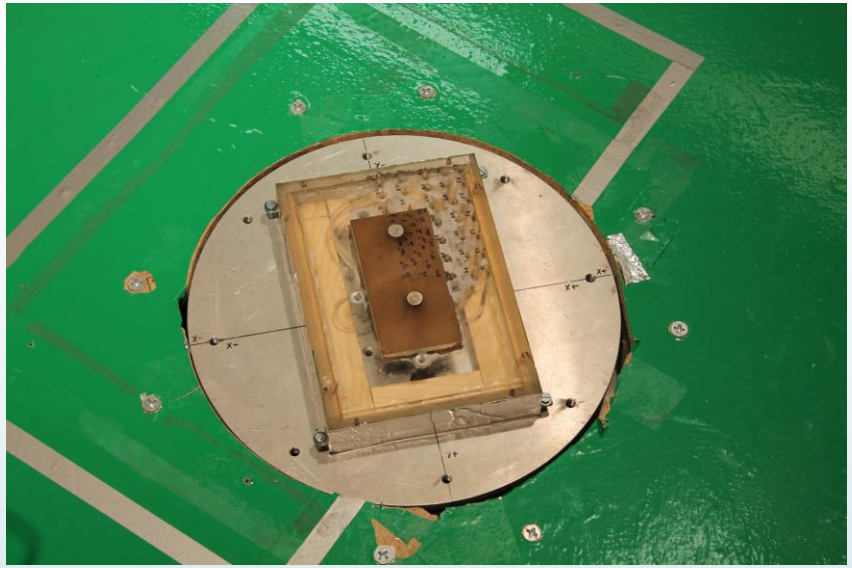




The pressure taps in the model were connected with the tubes and then to the Scanivalve

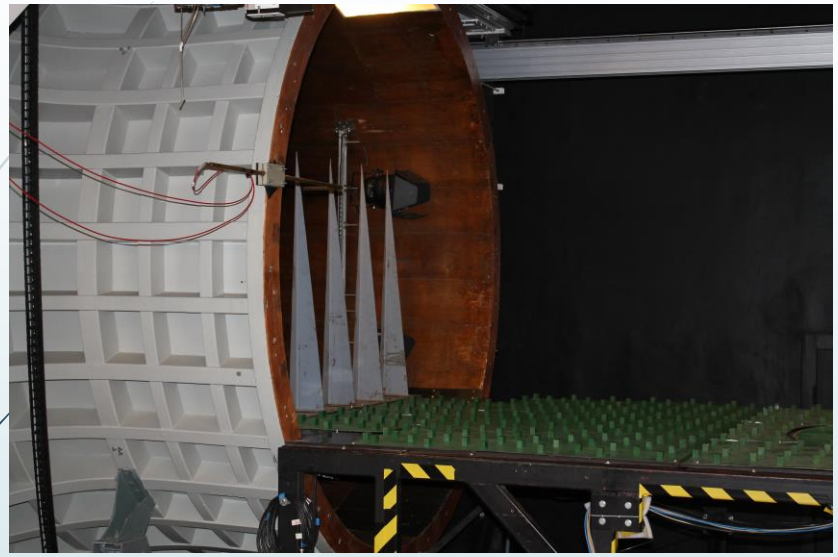
# MEASURING SETUP

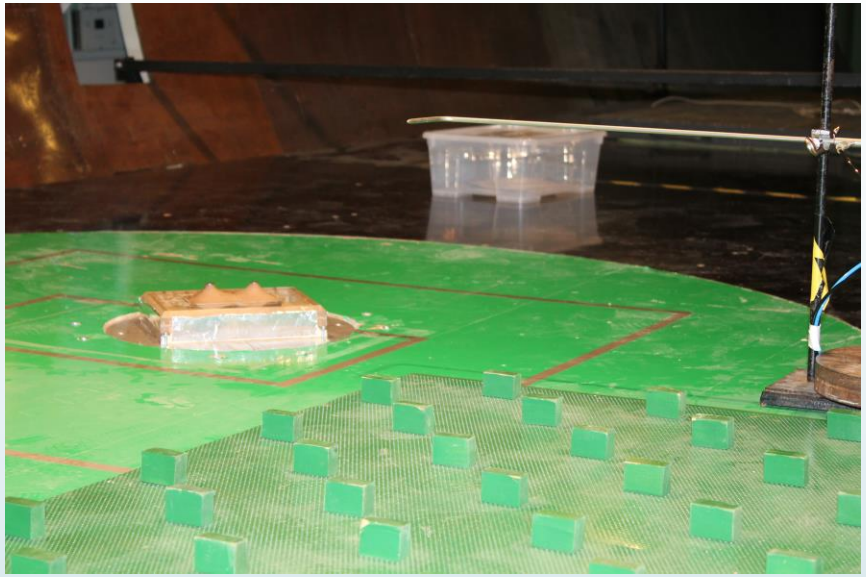
- The model has been fixed to the turntable integrated in the fixed plate representing the ground
- By rotating the turntable, the wind direction (angle of attack) can be changed

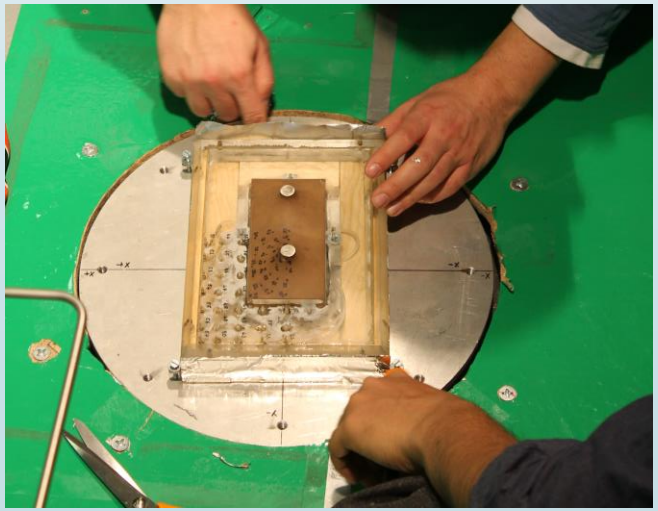


- The bottom surface of the setup is covered to avoid the disturbance due to the wind force
- The turntable attached to the stepper motor can rotate the model 360° so that different angles can be measured according to the requirement

# MEASURING SETUP

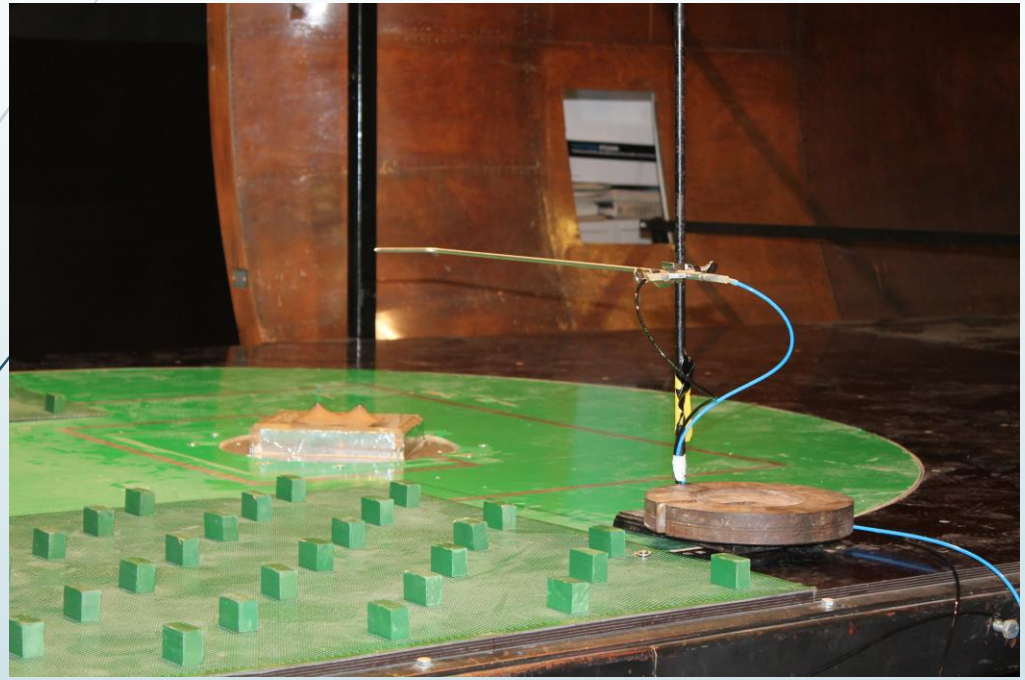






To create boundary layer roughness elements were place in the test section as turbulent generators

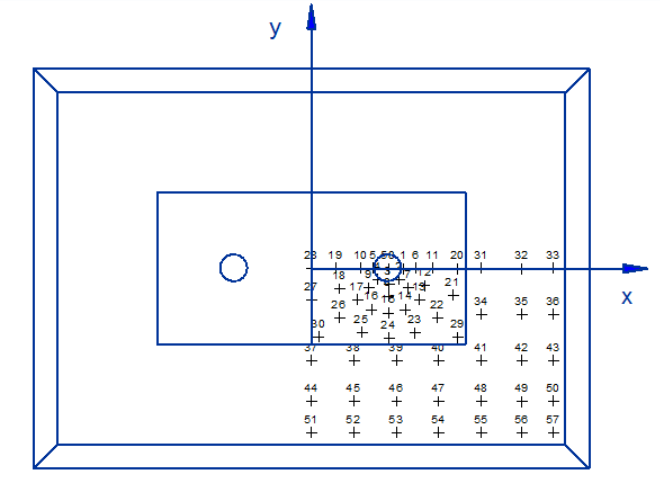
# MEASURING SETUP

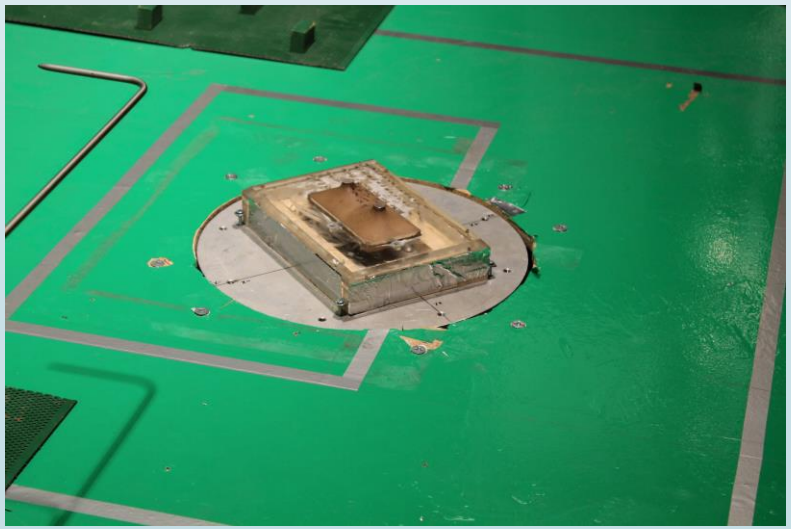


Pitot static probe is kept at a distance of 309 mm as reference

From the boundary layer data based on the model height of about 70mm respective u/uref is determined which is 0.645641741

# MEASUREMENT



The turntable is rotated initially $45^0$ to get the wind loading distribution for flow from that angle

To get the flow all around the building 3 more measurements are taken at angles $135^0$, $225^0$, $315^0$

# CALCULATION

The measurement data include the

- Mean pressure(P_mean)
- Pressure fluctuation(P_RMS)
- Reference pressure(P_ref)

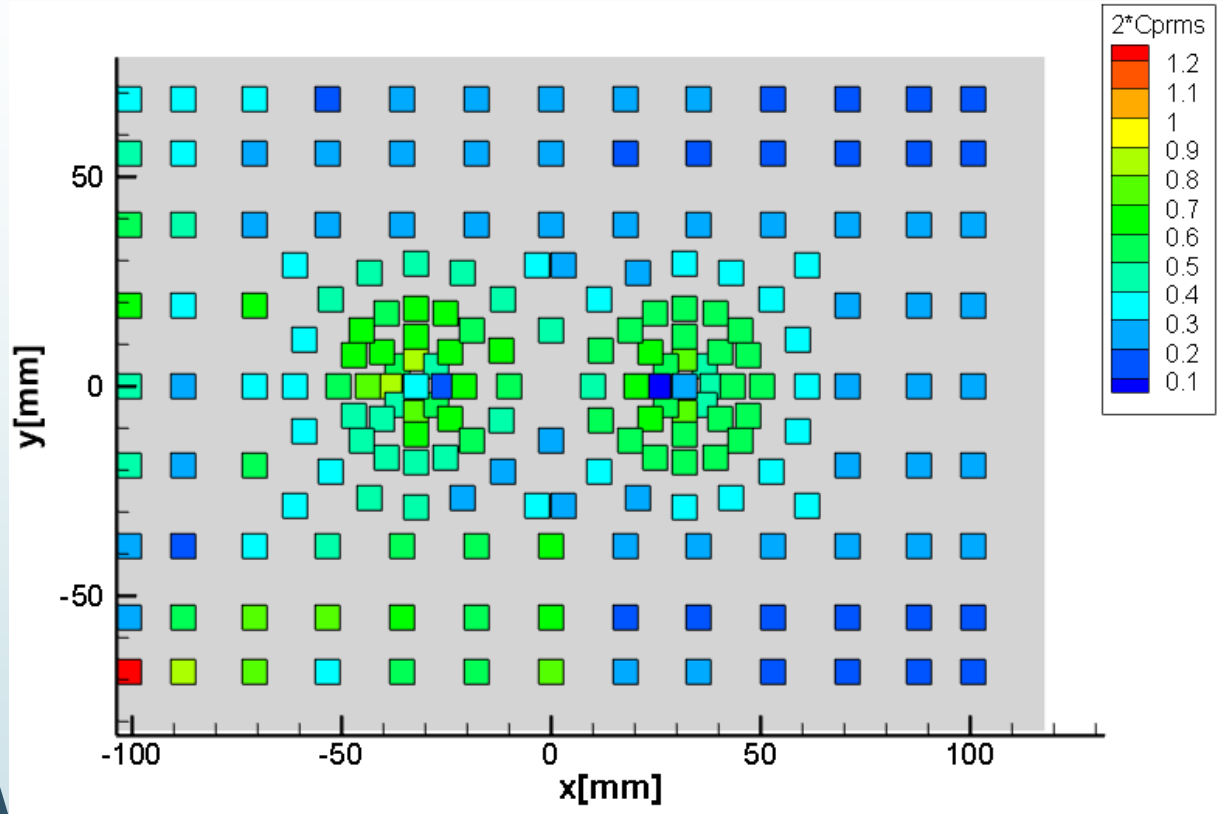
$$c_{pmean} = \frac{\Delta p_{mean}}{p_{dynref}} = \frac{\Delta p_{mean}}{\rho / 2 \cdot v_{ref}^2}$$

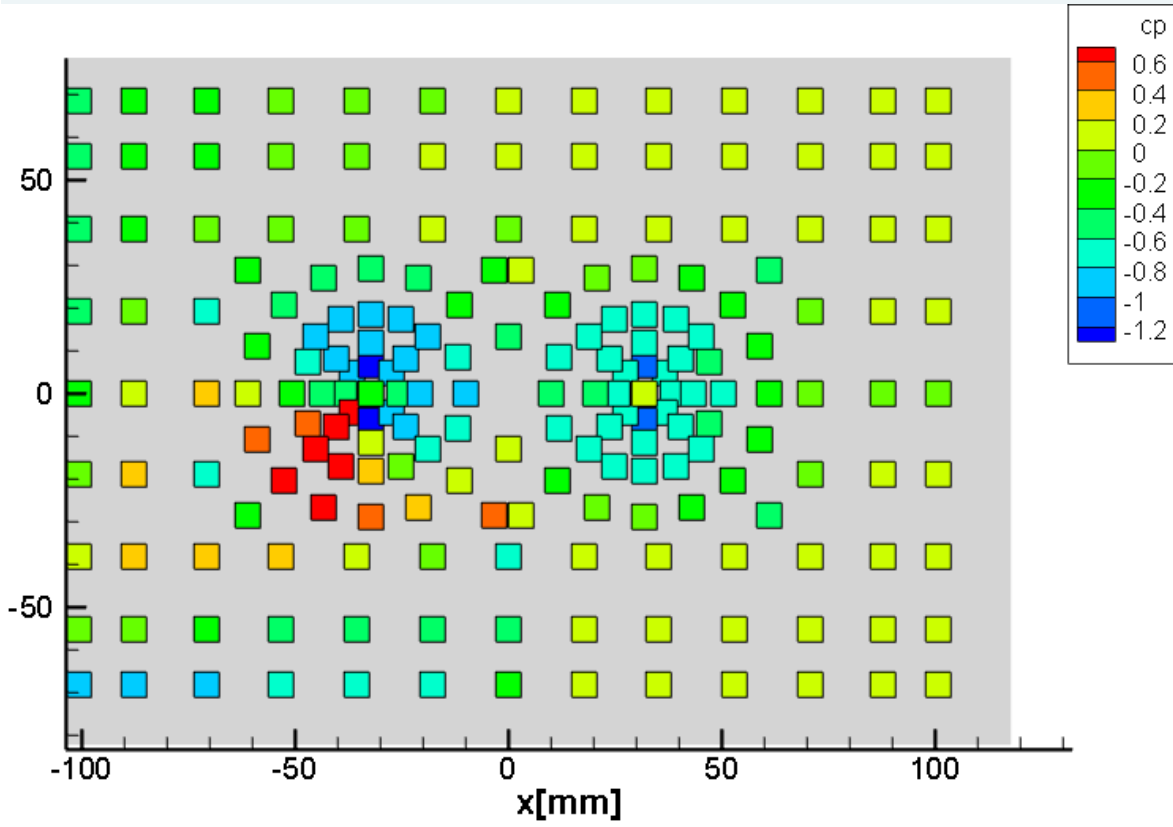
$$c_{prms} = \frac{p_{rms}}{p_{dynref}}$$

From those dynamic pressure is calculated P_dyn  from P_ref and U/Uref

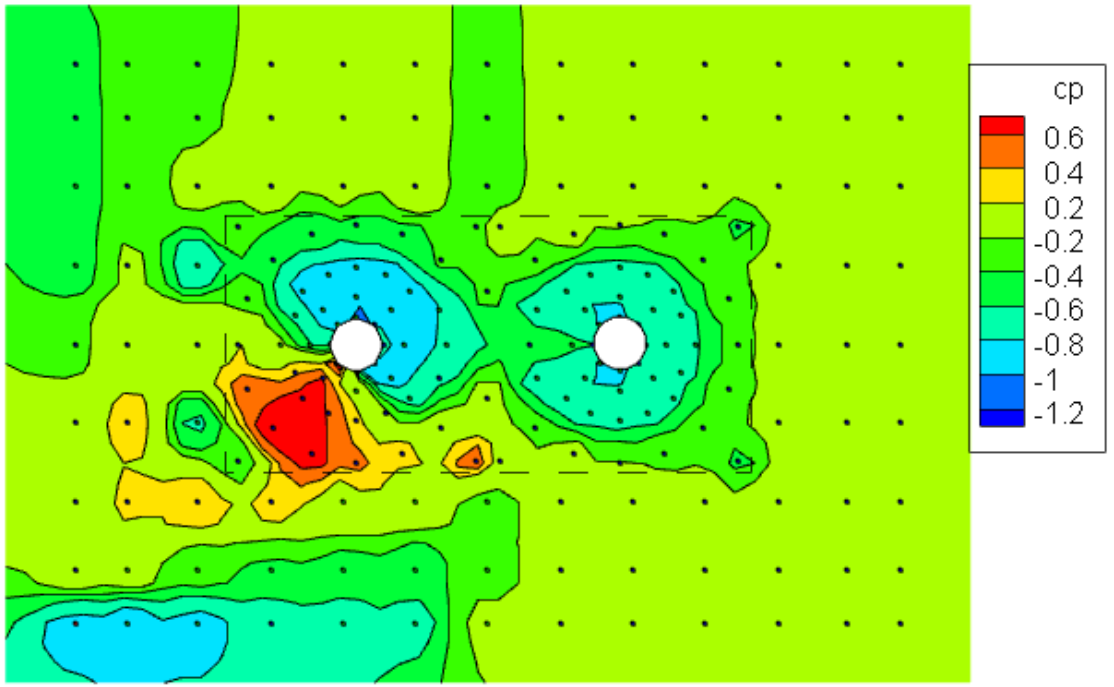
Pressure coefficients are calculated as ration of P_mean to P_dyn and P_RMS to Pdyn

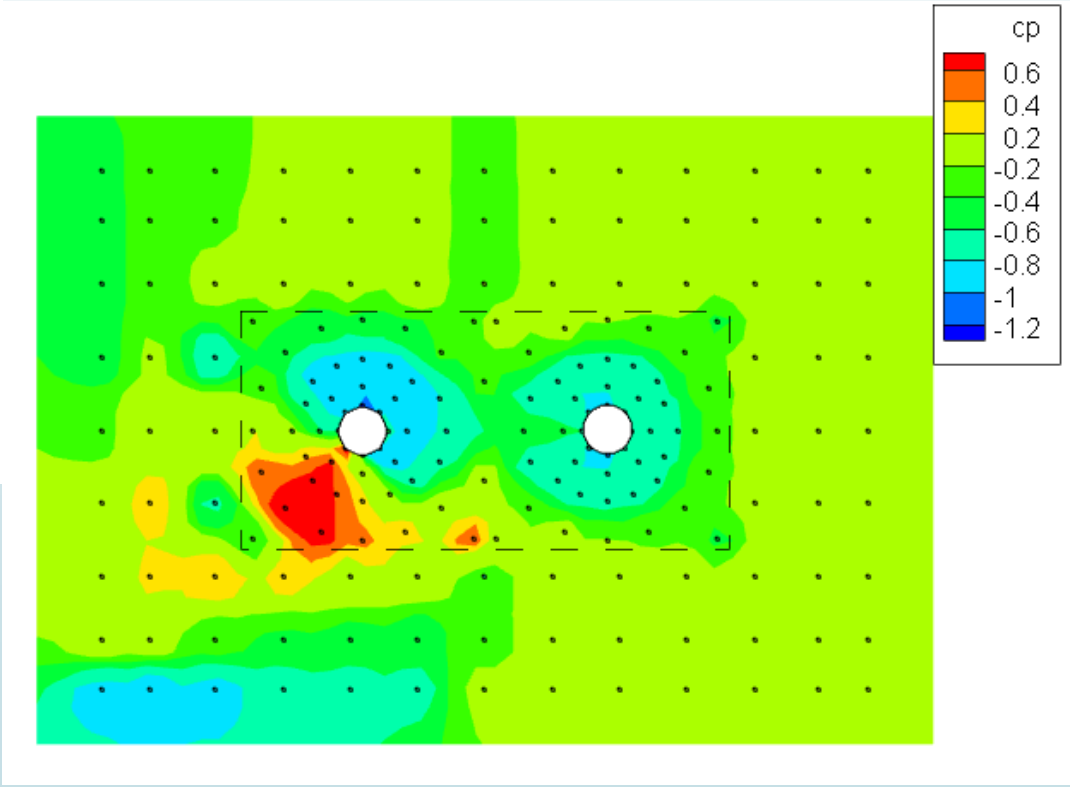
# PRESSURE COEFFICIENT AT PRESSURE TAPS



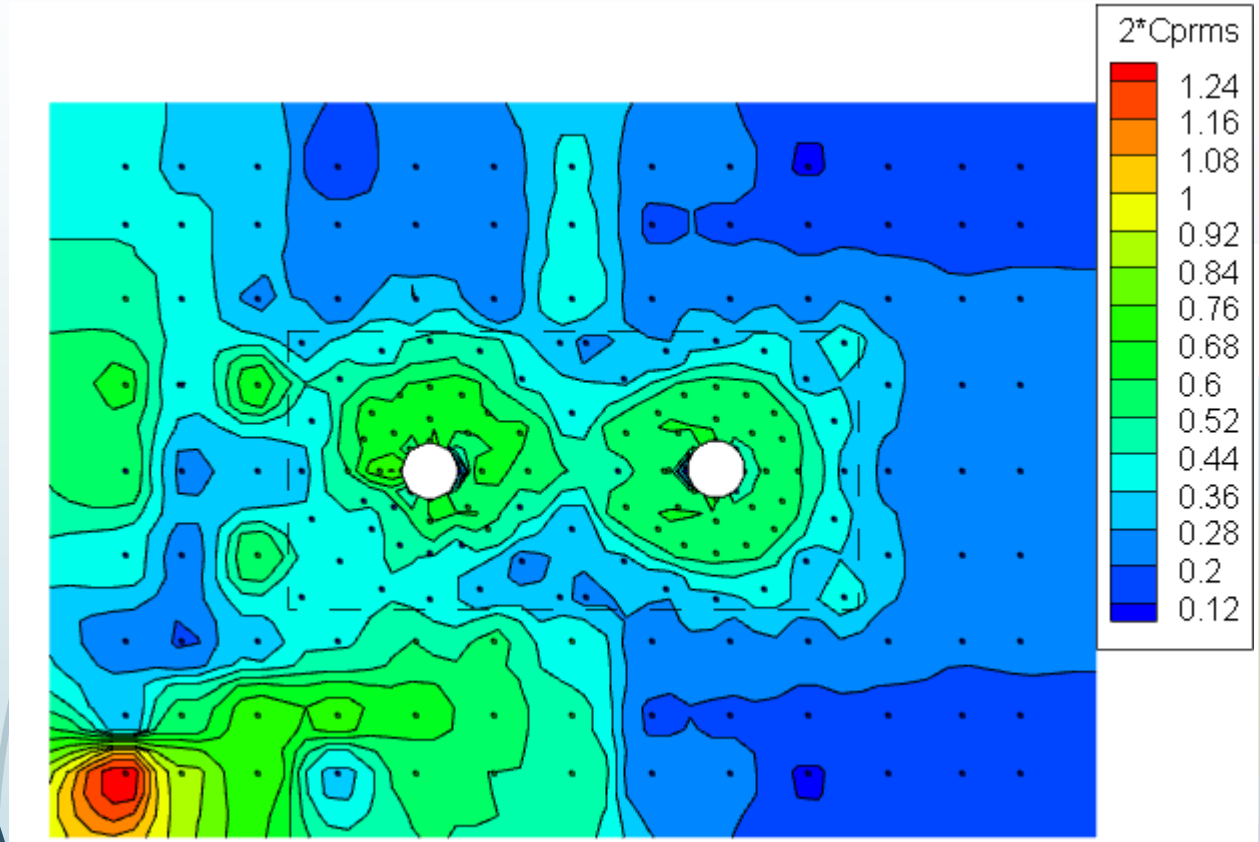



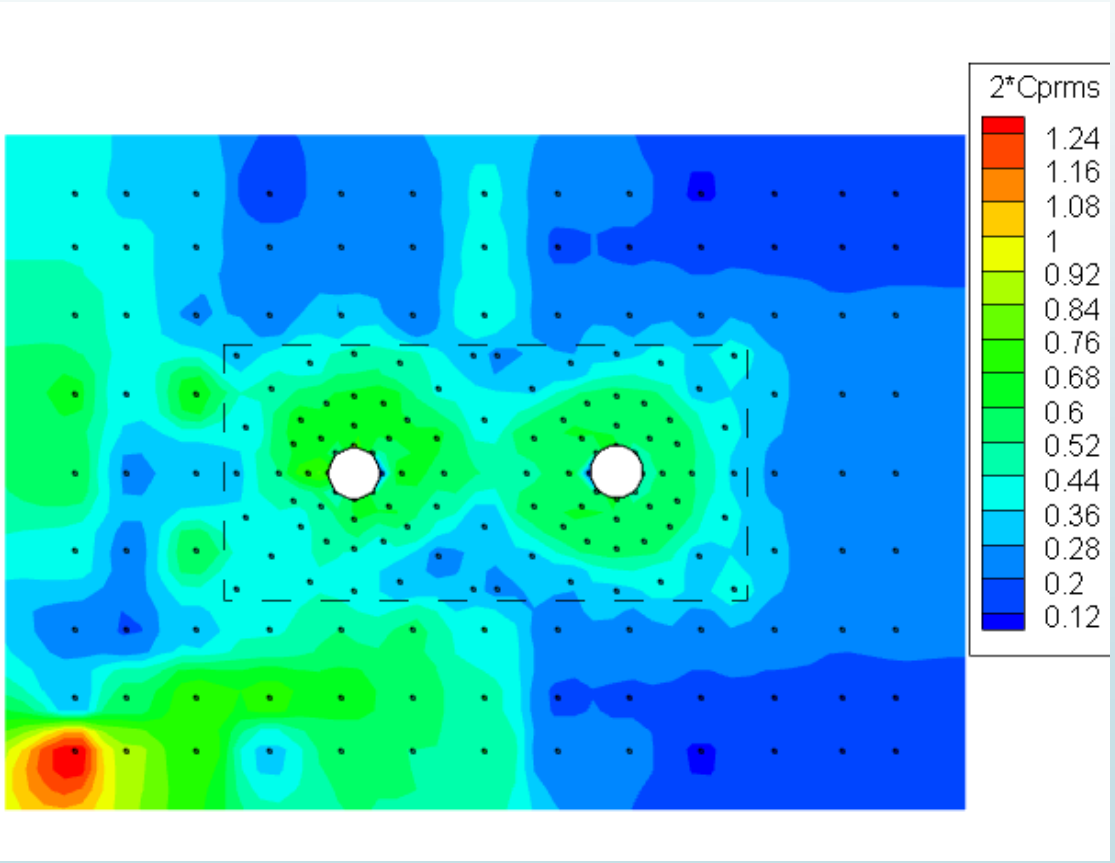
# MEAN PRESSURE COEFFICIENT



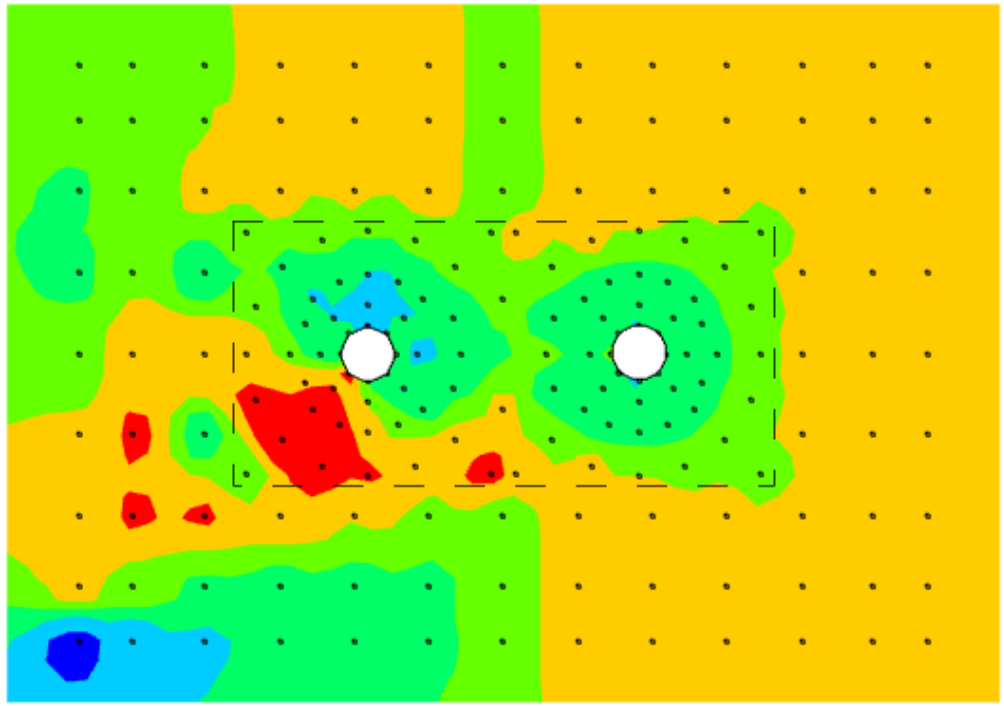



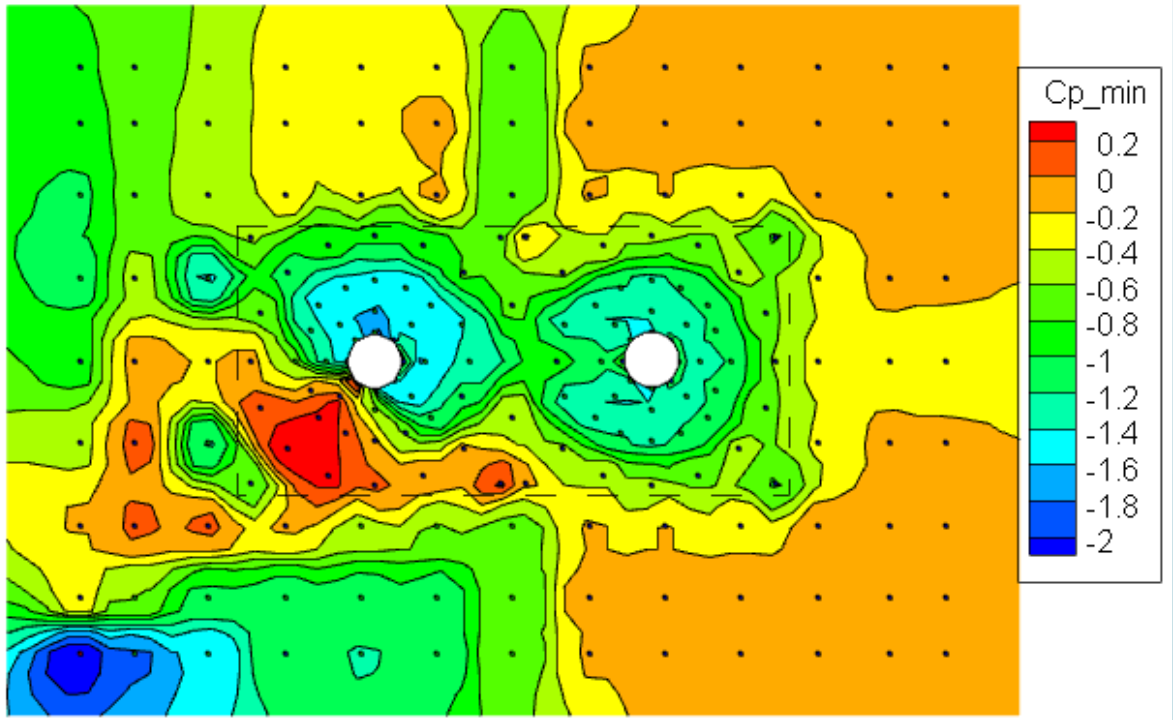
# PRESSURE FLUCTUATION COEFFICIENT



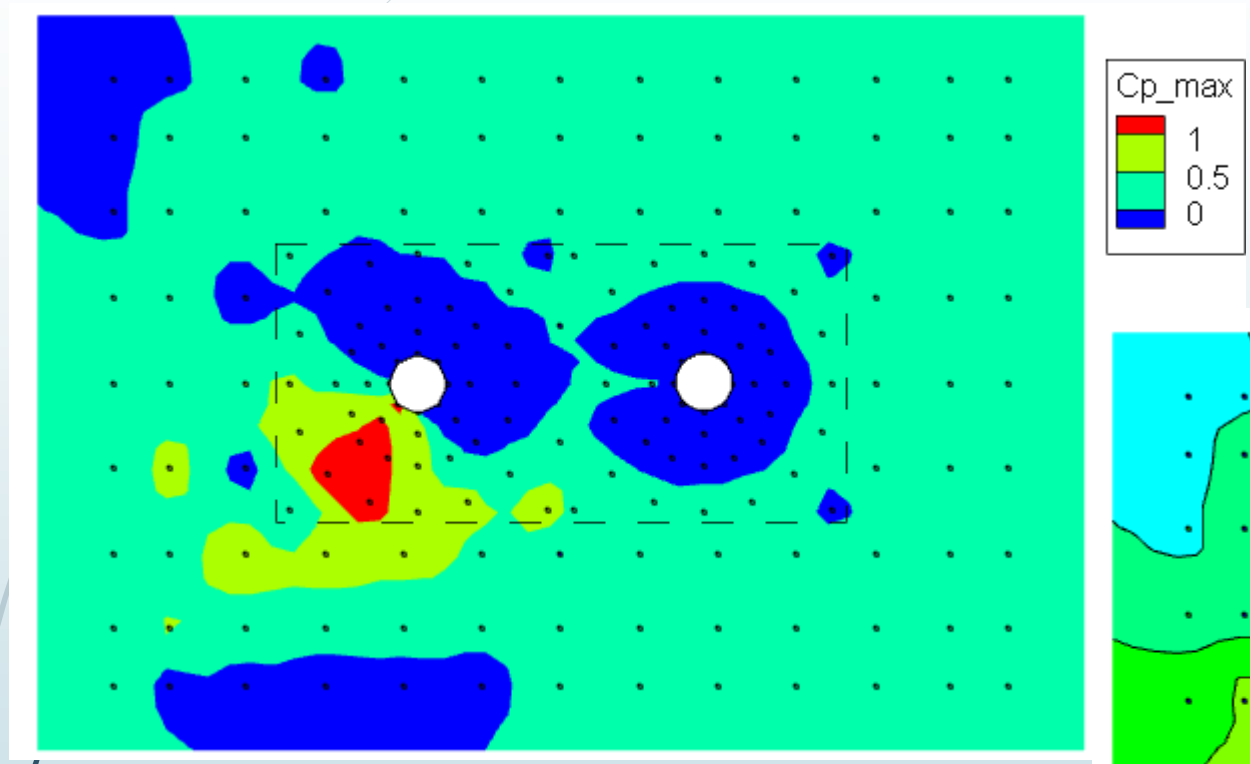



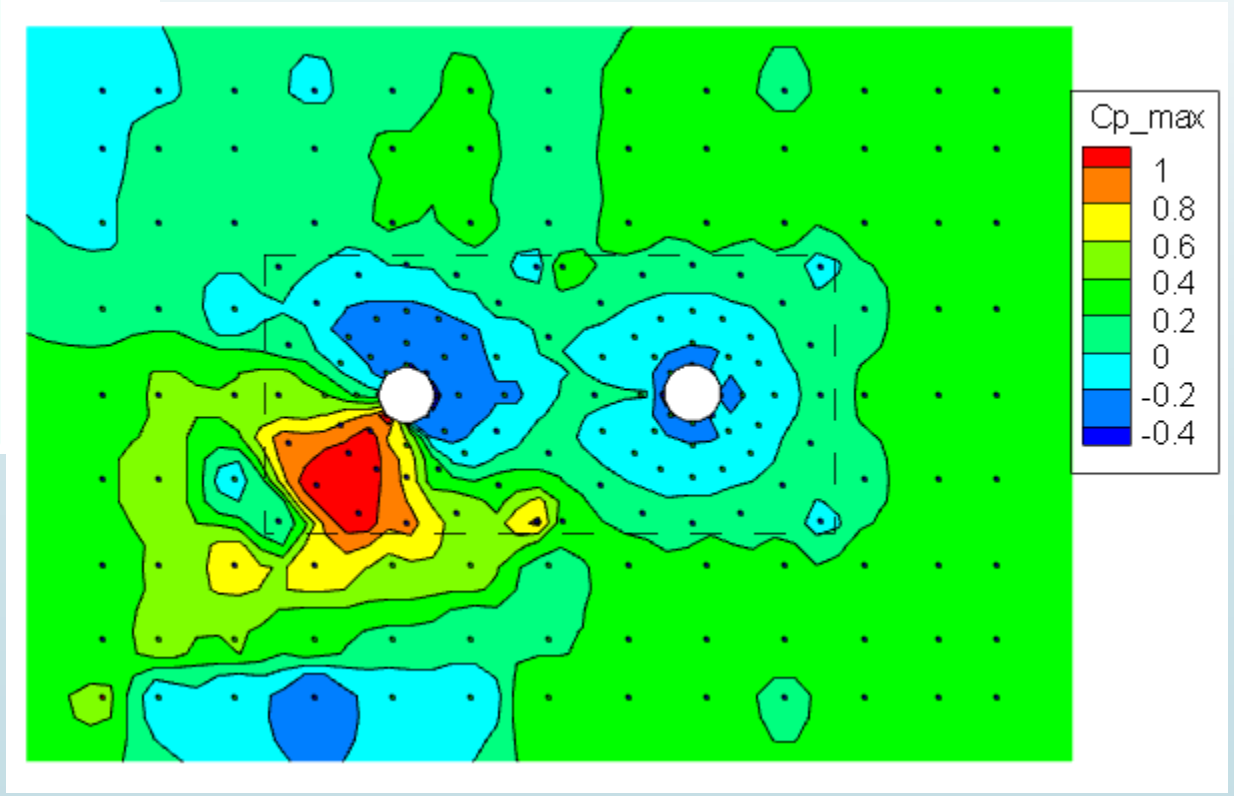
# MEAN PRESSURE COEFFICIENT- Min



# MEAN PRESSURE COEFFICIENT- Max



# CONCLUSION

- The measurement were taken in the wind tunnel using the software. From the measurement readings, pressure coefficients were calculated and Contour plots were made

- Positive pressure coefficient  is observed in the wind direction and depression where there would be flow separation

# THANK YOU