

EVALUATION OF EFFECTIVE AREA OF PIER

Ronald F. Reed, P.E.

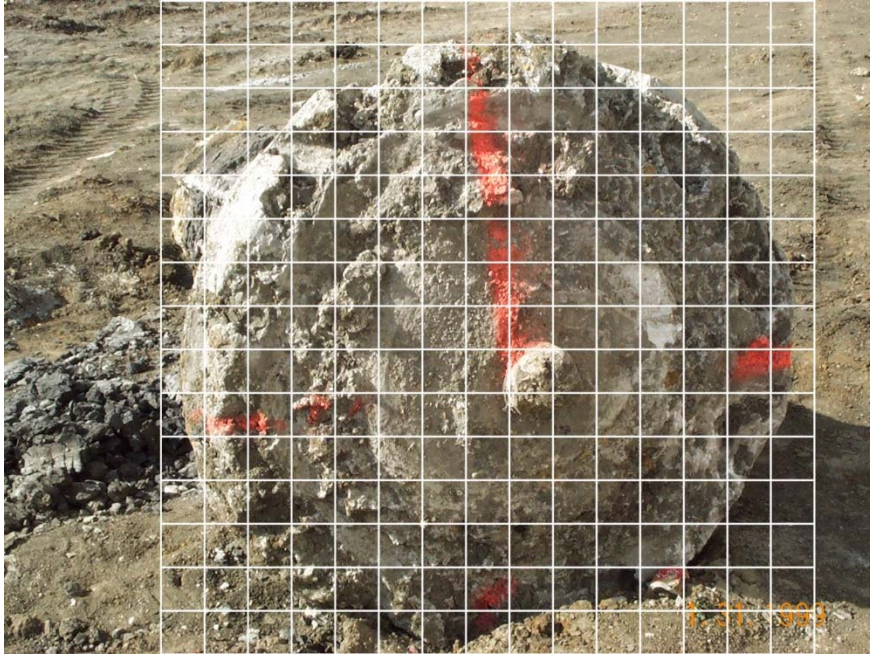
reed@reed-engineering.com

Cleaning of loose soil is important during construction of underream piers because loose soil effectively reduces the area of bearing. The photograph shown below is the bottom of a pier that was exhumed for the purpose of measuring the constructed diameter of the bell and to evaluate if loose materials were present at the time the concrete was placed.

The large irregular surfaces along the perimeter of concrete are locations where clay clods were present at the time the concrete was placed. By measuring the diameter of the underream, the full constructed area can be determined.



To evaluate the reduction in the surface area associated with voids, a grid can be superimposed over the photograph as shown in the following photograph.



Underream pier with superimposed grid.

To evaluate the reduction in area, the number of boxes in the grid which overly the underream are counted. The total count is then divided into the calculated area, resulting in an approximate area per box. The number of boxes where voids are observed are then counted and multiplied by the area per box. Subtracting the area representing the voids from the total surface area gives the effective area of bearing. Dividing the effective area into the load provides the actual bearing pressure, which can then be used to evaluate settlement.

In the above example, the diameter of the underream was determined to be 54 inches, resulting in an area of 15.9 square feet. The total number of grid boxes is counted to be approximately 152. The number of grid boxes overlying observed voids is estimated to be 22, resulting in an approximate reduction in area of 14%. This results in an effective area for bearing and settlement purposes of approximately 13.9 square feet.