

NON DESTRUCTIVE TESTING FOR FOUNDATIONS

BACKGROUND:

Pile foundations have been in use for over 75 years now. The first piles used as foundations were not of concrete. Timber and steel was initially used as the construction material. The type of piling also has changed from driven to precast bored to cast insitu to precast prebored. With the increase in loads on foundation, increase in horizontal loads, vibratory loads and decrease in the construction friendly ground condition, pile foundations usage increased many fold. Today one can not imagine a project without pile foundations. With this increase, also a need to have quality control and assurance systems came in vogue. The structural engineer wanted to know more about his foundation and the Geotechnical engineer devised means and ways to provide this information. Today the structural engineer requires information about the construction history, integrity about each pile, load capacities of as many piles as possible. All this information is essential to him to enhance his confidence limits. Initially pile history would be the only means of providing this confidence limit to the structural engineer. Later many a times, when in doubt, the structural engineer would recommend exaction of top few meter of the soil surrounding the pile. Visual inspection of a very good pile shaft would render to him that confidence that other wise was missing. On excavation, sometimes it was found that the piles would show some form of defects in the shaft. Engineers then worked on the acceptance limits for such deformations. Deformations were of many types, shaft reductions, local voids, cracks in shafts, bottom reduction in bearing areas, increase and bulging in shaft. All these deformations reduced the confidence limits and the industry accepted the possibility of these defects. An effort to identify such defects, anomalies started. Wave theory and propagation of wave in a medium had solution in place. But means to do these complex calculations in a short time was not in place. One had to wait till the advent of computers and also of table top version of these super computing machines. Integrity assessment became possible. Integrity assessment used the solution of wave propagation analysis and used computers to solve the equation involved in such an exercise. The quest of solution did not stop at this. Later engineers started to test the piles by loading it over a period of time slowly increasing the loads physically to a level that the pile was designed to carry. This was an ultimate level of confidence for him. Then with more usage came few failures. Such failures made the engineer sit up and look at possible reasons of failure. He started to look at all possible causes of distress in piles and subsequently at possible reason of load capacity prediction techniques. Advent of integrity assessments and load capacity assessments tools based on Non-Destructive techniques is the result of this quest to have better control on the construction procedure.