New Concrete Integrity System

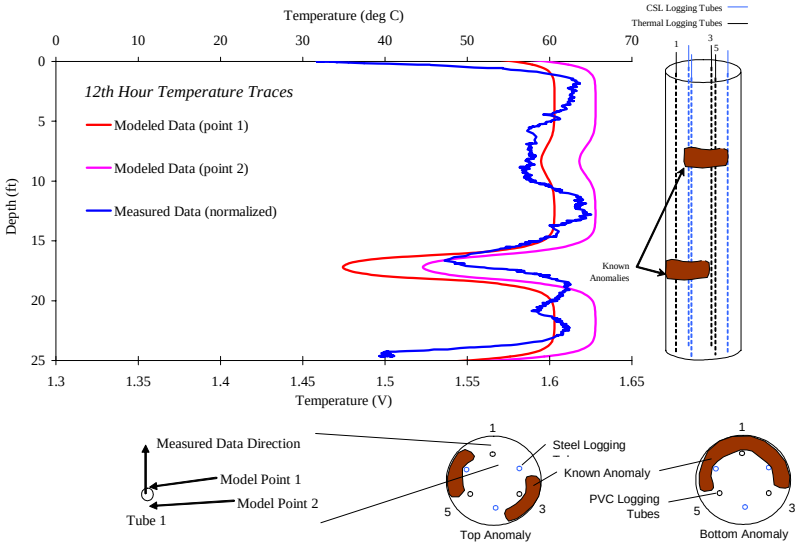
Many of today's bridges are founded on large diameter cast-in-place concrete elements known as drilled shafts. The concrete placement of these shafts is largely blind construction deep beneath the ground surface and as such raises the likelihood of anomalous soil inclusions or cross-sectional variations.

Ringling Causeway Bridge Pier founded on two, 9ft diameter drilled shafts (Sarasota, FL).

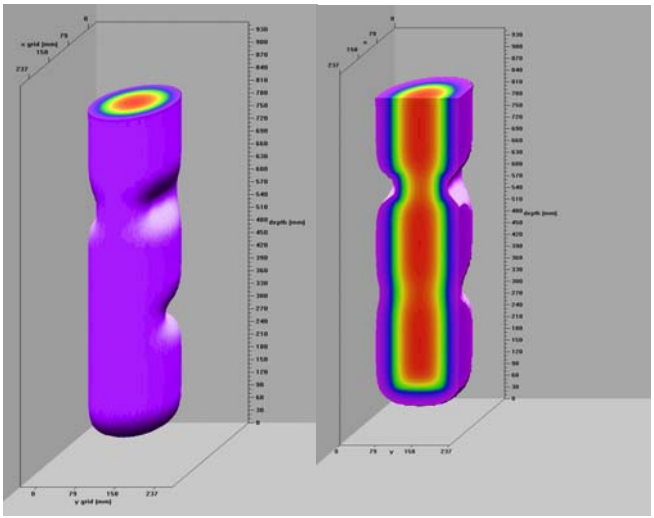
To address these concerns, USF's Department of Civil and Environmental Engineering has developed a new method of assessing the insitu concrete via a down-hole infrared probe that measures the temperature of the curing concrete to assure it is intact and free from voids, inclusions, or cave-ins. In cases where anomalies exist, the cooler non-heat producing materials (such as soils) show up as regions of lower temperature. The amount of temperature reduction and the extent over which it exists is used to quantify the size and shape of the anomaly.

The method makes use of full-length logging tubes already cast into the shafts and measures the wall temperature of the tubes in four directions. With these readings from multiple tubes, temperature profiles throughout the shaft can be obtained.

Using a 3-D thermal model, also developed by USF researchers, the exact shape of the anomalies can be determined such that the resultant modeled temperature traces match those measured.



Measured and modeled results from 4' diameter shaft with known anomalies, shown in brown (Clearwater).



Modeled shape and internal temperature distribution from shaft with anomalous infrared sounding results.

This system has been developed by Drs. Gray Mullins and Stan Kranc and has been patented by USF (US Patent No. 6,783,273). Contact gmullins@eng.usf.edu for further information.