

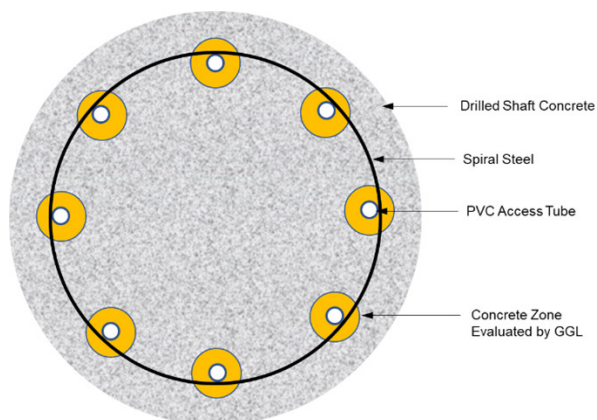


Gamma Gamma Logging Services

Gamma-Gamma Logging (GGL) is a non-destructive test method used to assess the concrete integrity of drilled shafts inside and outside of the reinforcing cage. A test probe containing a low-level radioactive source at the probe tip and a shielded detector located 15 inches away is lowered into a PVC access tube to assess the concrete density surrounding the tube. GGL is a relatively quick test with no depth restrictions that is typically performed three to seven days or more after concrete placement.

Foundation Preparation

Drilled shafts are prepared for GGL testing by attaching 2-inch O.D., Schedule 40, PVC access tubes to the steel reinforcing cage prior to cage insertion into the shaft excavation and concrete placement. In general, the access tubes should be located at least two inches from longitudinal reinforcement, with several tubes installed in a pile to allow for multiple readings. The watertight PVC access pipes are uniformly spaced along the spiral steel with a center to center spacing as measured along the spiral steel of not more than 2.75 ft. In cases where GGL testing was not initially planned, it can be performed in core holes drilled through the concrete. The GGL method is one of the two integrity test methods that can evaluate concrete quality both inside and outside the reinforcing cage.



Benefits of GGL

- Objectively evaluates integrity and relative concrete quality inside and outside of the reinforcing cage through a gamma-density correlation
- Provides highly repeatable test results
- Assess the relative homogeneity of shaft concrete
- Identifies location of potential shafts anomalies through statistical analysis

GRL Engineers, Inc.

Corporate Office
Ohio

Office Locations

California	Georgia	Louisiana	Pennsylvania
Colorado	Hawaii	Massachusetts	Texas
Florida	Illinois	North Carolina	Washington



Test Procedure

The GGL test probe houses a low-level radioactive source (Cesium-137) at the probe tip and a shielded detector located 15 inches away to assess the concrete density surrounding the access tubes or core holes. The 4 foot long GGL probe is lowered into each access tube using an electric winch. Gamma radiation counts in counts per second (CPS) are logged as the probe is raised at a typical rate of 10 feet per minute. GGL assesses the bulk density of the concrete from the center of the access tube outward for a radial distance of about three to four inches using the low energy source. Profiles of the average bulk density in pounds per cubic foot versus depth can they be presented based on calibration data.



GGL system consisting of winch and data collection software

Data Analysis and Reporting

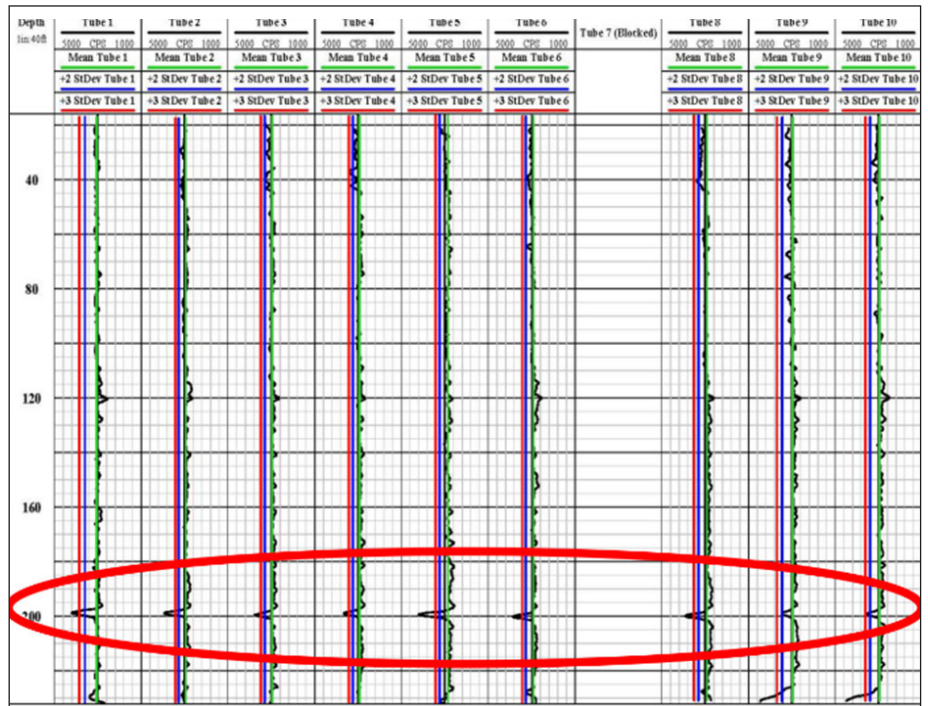
For each access tube, the GGL density count per second is plotted versus depth with the mean value, two standard deviation, and three standard deviation lines displayed. Substantial drops in average bulk density in excess of the standard deviation thresholds identify anomalous concrete zones as indicated at a depth of 200 feet in the data presented below.

CALTRANS CT-233 Test Standard.

GRL engineers perform Gamma-Gamma Logging results on a density vs depth plot following the CALTRANS test specification.

GRL prepares a summary report of the GGL test results for all of the GGL tested foundations noting the depths where any anomalous zones were encountered as well as the severity of the anomaly based on statistical evaluation.

For additional information on Gamma Gamma Logging (GGL) or any other GRL Engineers service please contact info@GRLengineers.com or visit us at www.GRLengineers.com.



Gamma-Gamma Logging results on a density vs depth plot

