

**Crosshole Sonic Logging » ASTM D6760-08 | ACI 228.2R**

*Crosshole Sonic Logging is the most accurate and reliable technique for assessing the integrity of deep foundation elements constructed on-site from concrete or grout.*



**The Crosshole Sonic Logging (CSL)** system is designed for Quality Assurance (QA) testing of newly placed critical drilled shaft foundations and auger cast piles, but can also be applied to slurry walls, mat foundations, and mass concrete pours. Using water-filled access tubes, CSL testing provides assurance that the foundation concrete is sound with no defects such as soil intrusions, necking, sand lenses, voids, etc. Where defects exist, the extent, nature, depth, and approximate lateral location of the defects can be determined with the CSL method and further refined with **Tomographic Imaging Software**, which is sold by Olson Instruments (see page 14).

A variation of the CSL method, called Single-Hole Sonic Logging (SSL) can also be used on smaller diameter drilled mini-piles and auger cast piles. The Single-Hole Sonic Logging method is used in cases where only a single access tube can be placed in a deep foundation, and tests the concrete quality in the region around the single access tube (see graphic on next page).

**Features**

- One or two logs per pull (CSL-1 or CSL-2)
- System design allows for fast and accurate field measurements
- Hydrophones (42 KHz) are interchangeable as both source and receiver
- Tests up to 20 ft (6.5m) through concrete
- Real-time waveform and log results display while testing
- Alternate CSL log display formats available at a key stroke
- Sensitive enough to detect small defects
- Software allows for Automatic Log and optional Report Generation in Microsoft Word
- Capable of identifying multiple defects in a single shaft
- Meets ASTM and RILEM standards
- Plastic Test Block to check system operation
- Tomographic Imaging Software option available

<b>» Applicable On:</b>
Drilled Shafts (Bored Piles)
Slurry Walls and Diaphragm Walls
Mat Foundations and Seal Footings
Mass Concrete Pours
Pressure Injected Footings
Auger Cast Concrete Piles
Water Saturated Media
Cemented Radioactive Wastes
<b>» Test For:</b>
Cracks
Voids
Soil/Water Intrusions
Uncured or Weak Concrete
Necking
Sand Lenses



Model	Advantages
CSL-1 Model	Single Log System
CSL-2 Model	Double Log System for large shafts and walls
Option	Advantages
Tomo-1 Software	Allows the user to perform and display tomographic inversions of CSL data, giving 2-D or 3-D velocity images of anomalies



# Crosshole Sonic Logging » ASTM D6760-02 | ACI 228.2R

## Method

The CSL method is typically performed in access tubes (steel or PVC) of 1.5 inch I.D. (35 mm) or greater which are tied to the rebar cage and cast into the shaft at the time of construction. The test can also be performed using coreholes, if available.

## Data Collection

The user friendly CSL software is written and tested at Olson Instruments' corporate office in Colorado. We do not outsource any tech support questions and, should you require software support, we welcome your questions and comments.

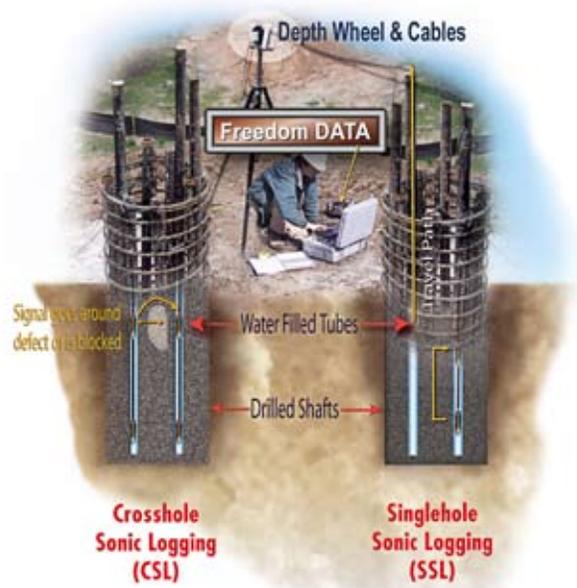
## Available Models

The Crosshole Sonic Logging system is available in two different models which can be run from the Freedom Data PC Platform:

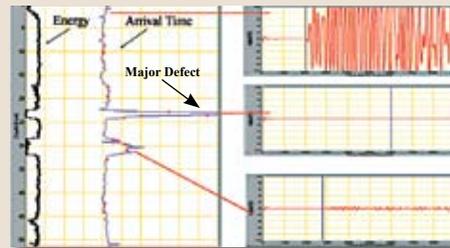
1. Crosshole Sonic Logging - 1 (CSL-1)
2. Crosshole Sonic Logging - 2 (CSL-2)

The **CSL-1 Model** is the base model and is most frequently used for quality assurance of newly placed drilled shafts. Includes two hydrophones for testing one tube pair per log pull.

The **CSL-2 Model** includes three hydrophones for faster data acquisition by testing two tube pairs per log pull. This feature provides a significant advantage to users who are testing a great number of shafts, large diameter shafts involving numerous test tubes, and slurry/diaphragm walls.

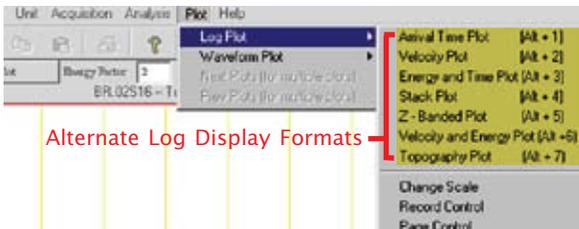
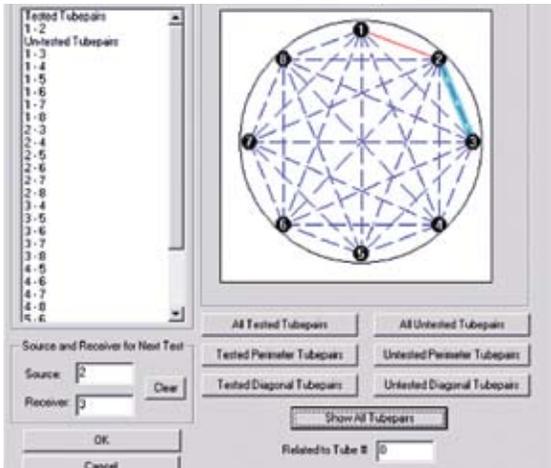


## Data Example » 1



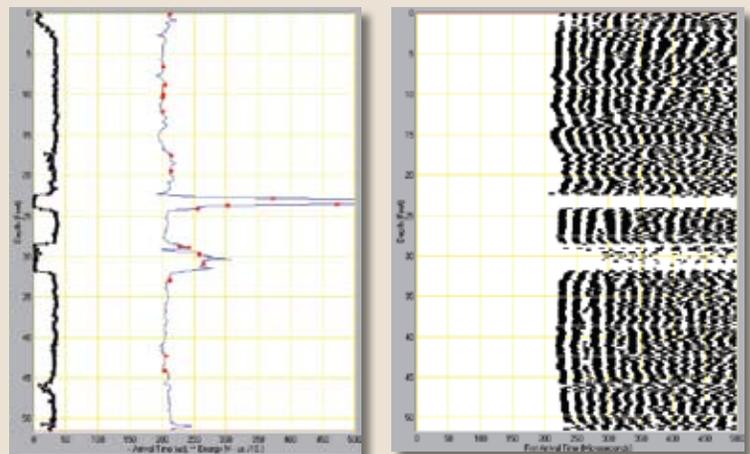
Example CSL Result - Anomalies

The image to the left shows a CSL log with two defects: a major defect at about 23 ft and a more minor defect at about 30 ft. The ultrasonic signals (time vs. voltage) illustrate the differences between the sound, major defect and minor defect results. The defect at approximately 23 ft is considered to be more severe because the signal is completely lost between the transmitter and receiver.



Alternate Log Display Formats

## Data Example » 2



CSL Result - Arrival Time and Energy

vs.

Waterfall Plot

The plot on the right is sometimes called a Z-banded plot or waterfall plot. This plot is another way of showing the CSL results. It is basically a waveform stack plot, but instead of plotting the whole waveform, it plots all the positive values. If the amplitude is positive, it plots a straight line. If the amplitude is negative, there is no line.