Ultrasonic Pulse Velocity » ASTM C597-02, E494-95 | BSI 98/105795 | ACI 228.2R

Ultrasonic Pulse Velocity (UPV) investigations are performed to assess the condition of structural members such as elevated slabs, beams, and columns when access to both sides is available. Sonic Pulse Velocity (SPV) is performed on mass concrete over 10 ft (3 m) in thickness.

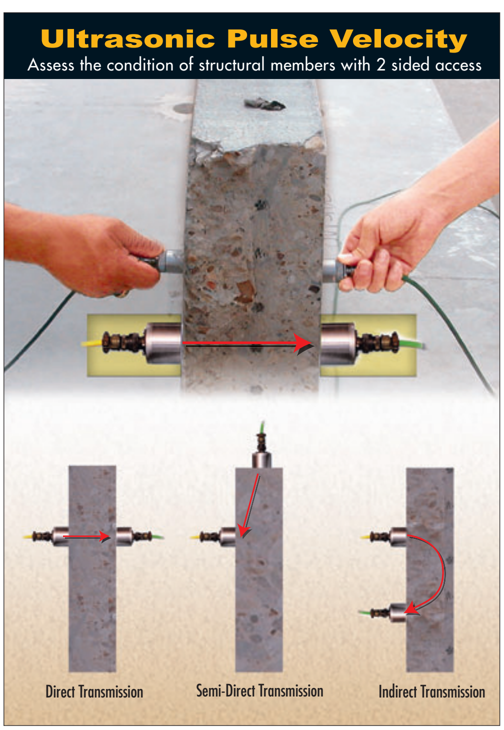
The Ultrasonic Pulse Velocity (UPV) systems are designed to identify and map voids, honeycomb, cracks, delaminations, and other damage in concrete, wood, masonry, stone, ceramics, and metal materials. UPV tests are also performed to predict strength of early age concrete. The UPV methodology relies on direct arrival of compressional waves, which are generated by sources with resonant frequencies ranging from 50 to 150 kHz. The highest resonant frequency sources/receivers are typically used with thinner structural members for higher resolution and smaller anomaly identification.

The test is performed by positioning the source and receiver on either side of the area in question, then the source sends a compressional wave through the region, and the receiver records the full waveform on the other side. The position of the two transducers can be varied such that direct, semi-direct, and indirect tests can be performed, which aids in mapping out the volume of the defect. Further tests can be performed if the user wishes to generate a 3-D rendering of the volume in question. This is done by testing many different "paths" through the medium and then using a tomographic inversion program to generate a model. For more information about the tomographic inversion software, see the ***Tomographic Imaging Section***, page 14.

Features:

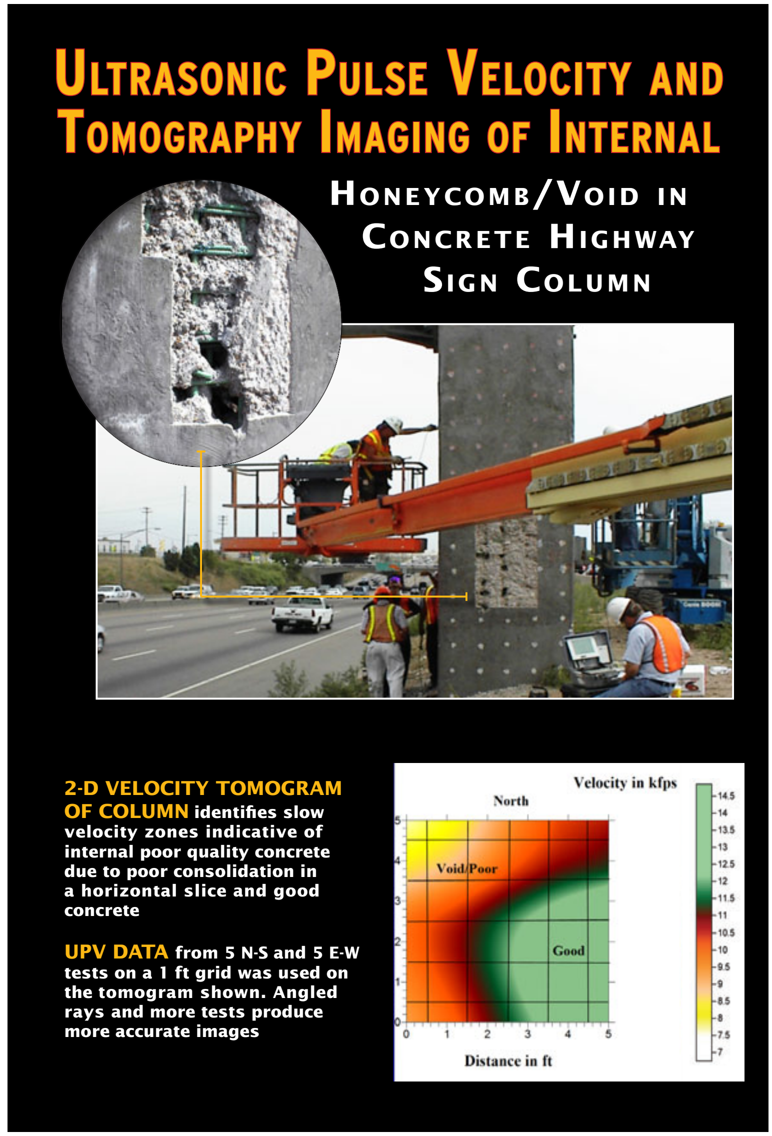
- Waterproof ~ 50 kHz UPV transducers standard
- Short learning curve for data acquisition and basic processing
- Real-time waveform display while testing
- System is compact, durable, and easily transported allowing for multiple tests per day
- 2-D maps are easily generated from data by exporting the tables from WinTFS into Excel
- Tomographic velocity images can be generated from this data giving the user a 2-D or 3-D visual tool of the region in question
- English or Metric units can be used
- System includes a calibration bar as per ASTM and other standards

» Applicable On:
Beams
Bridge Decks
Elevated Slabs
Shaft Tops
Walls
» Test For:
Cracks
Delaminations
Honeycomb
Velocity vs. Strength Correlation with Cores
Voids



Model	Advantages
UPV-1 Model	Complete system for testing compression wave velocity and flaw detection
SPV-1 Model	Test mass concrete up to 20 ft (6 m) in thickness
SPV-2 Model	Allows for larger impacts of mass concrete over 20 ft (6 m) in thickness
Options	**Advantages**
Tomo-1 Software	Allows the user to perform and display tomographic inversions of UPV/SPV data which provides 2-D or 3-D velocity images of the tested materials

Freedom Data PC or NDE 360 Required, Sold Separately



Method

Conventional UPV testing requires access to two surfaces, preferably two parallel surfaces such as the top and bottom surfaces of a slab or the inside and outside surfaces of a wall. This test can be performed, however, using the indirect method *(figure on previous page)* which does not require access to two surfaces. In defect areas, the compressional wave velocity is slower than in sound areas and signal amplitude is often lower. For structural members containing large, severe voids, signal transmission may be completely lost. In some defect areas, such as honeycombs, the compressional wave velocity may be almost the same as in sound areas, but distortion of the signal (filtering of high frequencies) may be used as an indication of a honeycomb defect.

Data Collection

The user-friendly UPV 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. For more information about the inversion program, GEOTOM®, and the visualization program, Slicer Dicer®, please feel free to contact our corporate office.

Available Models

The Ultrasonic Pulse Velocity system is available in a three different models which can be run from the Freedom Data PC or NDE 360 Platforms:

1. Ultrasonic Pulse Velocity - 1 (UPV-1)
2. Sonic Pulse Velocity - 1 (SPV-1)
3. Sonic Pulse Velocity - 2 (SPV-2)

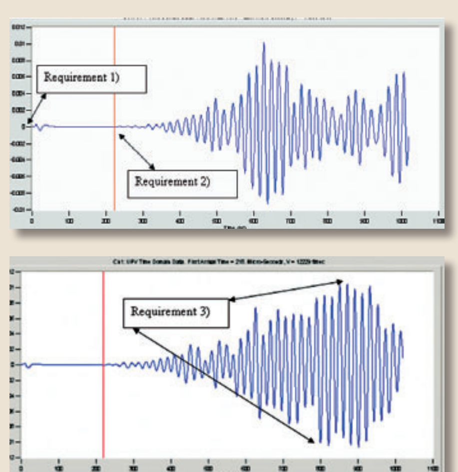
The **UPV-1 Model** includes a pair of waterproof 50 kHz transducers, the necessary cables and modules for running this system, and the acquisition/processing software. This system can be easily used to test a variety of "paths" through a medium and then create 2-D contour maps by importing the results table into a spreadsheet program.

The **SPV-1 Model** includes a 0.2 lb (0.1 Kg) impulse hammer and accelerometer receiver to test mass concrete up to 20 ft (6 m) in thickness. The SPV data can also be input into TOMO-1 to provide velocity tomograms.

The **SPV-2 Model** includes a pair of accelerometer receivers for larger impacts of mass concrete over 20 ft (6 m) in thickness. The SPV data can also be input into TOMO-1 to provide velocity tomograms.

Purchase the **Tomo-1 Option**, (tomographic imaging/visualization software) and your data can be inverted, and 2-D or 3-D models can be created of the volume in question. These renderings are often a valuable resource for isolating and repairing defects.

Data Example » 1



3 Requirements for Good Quality UPV Signals

A signal generated from the UPV test method can be considered a good signal if it meets all three of the following requirements as shown:

1) The signal should begin or originate at the origin, zero point, of the graph.
2) The arrival time of the wave should be very clear and apparent, regardless if it breaks up or down.
3) The signal should not be clipped.