



# Acoustic Concrete Tester

## ACT

*Evaluation of concrete thickness using Ultrasonic Echo Technology.*

The Acoustic Concrete Tester helps assess if a concrete structure is free of defects such as delaminations, spalls, honeycombing, and horizontal flaws. In addition, the ACT can evaluate the thickness of structural elements such as concrete pavements, slabs, retaining walls, tunnel liners, foundation footings, and more. The ACT tests structures as thin as 75 mm and as thick as 900 mm. ACT uses sophisticated Ultrasonic Echo Technology to take the uncertainty out of concrete thickness determination. No need to manually generate an impact. No need to assume a wave speed.



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### Applications:

- Tunnel linings
- Underwater concrete structures
- Grout-filled precast concrete structural shells or hollow brick walls to confirm adequate filling
- Polystyrene-filled "Super-T" concrete beams
- Silo walls
- Concrete pavements
- Foundation footings
- Retaining walls
- Concrete slabs / Concrete columns

## How it Works

For a given structural element and material there is a one-to-one relationship between resonant (dominant) frequency and thickness.

The ACT easily determines the resonant frequency. Its transmitter emits a broad band wave field that contains all frequencies necessary to test structures between 75mm and 900 mm thick. Most of these frequencies get dissipated, but the one matching the resonant frequency of the concrete element remains, is amplified and gets picked up by the receiver.

An unexpected or an additional dominant frequency indicates a discontinuity (possible defect) in the structural element.

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## Ultrasonic Echo Technology

The ACT transmitter administers a broadband wave field to the concrete surface. The wave field, unlike the mechanical impact used in the impact Echo Method, is independent of the surface condition and includes all frequencies required to obtain a test result. This versatility makes it possible to use the same set of sensors to test structures with a wide range of material properties and thicknesses.

The wave field generated by the ACT transmitter propagates through the concrete, setting up cyclical reflections in the structure. The ACT then processes the received signal using a high sampling rate, and converts it into the frequency domain using real time Fast Fourier Transform (FFT). This process identifies the resonant frequency corresponding to a period  $T$  of twice the travel time along the shortest path within the structure, or twice its thickness. The ACT displays the calculated thickness.

Discontinuities in the structure, like spalls, delaminations, or horizontal flaws are detected when the ACT displays an unexpected thickness or identifies additional dominant frequencies.

The ACT actually measures the concrete wave speed of the concrete structure. This eliminates the need to assume a wave speed or to core the structure to back calculate a wave speed. Avoiding wave speed assumptions makes ACT results exceptionally reliable, while avoiding coring makes its use feasible in a vast array of applications.

## Testing with ACT

- Place two probes on the structure (directly or using the ACT Telescoping Pole)
- Touch ACT screen to generate signal
- Structure thickness is displayed in real time
- Test data is saved for later printing and reporting



Inspection Instruments, Inc.