PAPWORTHS CONSTRUCTION TESTING EQUIPMENT

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IMPACT ECHO (IE) –Structural Analysis from one-side

Introduction

Impact Echo (IE) investigations are performed to access the condition of slabs, beams, walls, pavements, runways, tunnels and dams. In its simplest form it is used for measuring the thickness of elements from one-side. It can also be used to find voids, honeycombing, cracks, delaminations, and other damage in concrete, giving depth, lateral location and extent of a flaw or defect.

Applications

The applications for IE are varied:

- Structural investigations of structures where slab, wall thicknesses are unknown
- QA for tunnel, and tunnel linings
- Investigating structures that suffer from issues due to poor concrete placement
- Investigation of damage to structures
- Investigation of dilapidation of structural
- Location of voids in grouted post-tensioning ducts

Platforms Available

We offer a variety of devices available for the IE technique. These include the CTG, NDE360 and DataPC. These offer differing levels of mobility and on-site analsysis. Please see the individual brochures for more in depth specifications for the platforms.

NDE360 and Freedom DataPC Configurations

All three configurations are available with the Freedom DataPC and NDE360. These platforms allow the IE module to be added to the sytem and allow the user to add in additiona accoustic testing techniques as they go.

IE-1

The IE-1 system combines the Olsons test-head with automatic soleniod impactor with the NDE360 or Freedom Data PC. The test-head essentially makes the project a one man job. It is useful for elements up to 400mm. QA secondary impactor (ie hammer) can be used for greater thicknesses. Both platform's firmware allow multiple tests to be averaged for greater accuracy.

IE-2

The IE-2 system offers the Olson test-head with an additional accelerometer. This is particularly useful when investigating thicker structures.

IE-S

For large area investigations Impact Echo Scanner is available. The system combines a split ring transducer and wheel into the test-head. By rolling the test-head across the concrete surface data is recorded in 25mm increments. This is particluarly useful when investigation large surfaces or locating voids in post-tensioned ducts.


CTG

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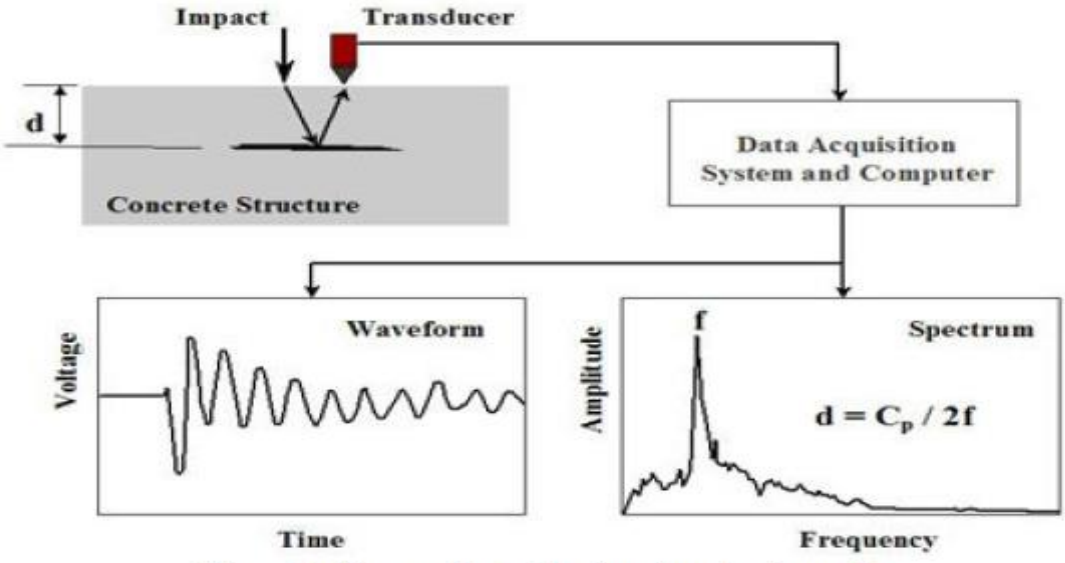
How Impact-Echo Works



CTG

For simple investigations on slabs, pipes, or walls where the overall thickness is the primary concern, Olson Instruments manufactures a hand-held Concrete Thickness Gauge (CTG) based on the IE principle, which quickly and easily provides the thickness of an unknown concrete elements. The advanced model can be used for simple IE analysis.

Advantages over other NDT's

The system affords the following benefits to the user:

- Only one surface needs to be accessible for testing.
- Quickly provides thickness of an unknown member, without coring.
- Detects defects in the concrete such as, voids, honeycomb, cracks and delaminations.
- Location of the defects depth and lateral location
- Can be used to predict early age strength

How it works

The impact is a short-duration mechanical tap, produced by tapping a small steel sphere or soleniod (in the case of the Olson test-head) against a concrete or masonry Surface. This produces low-frequency stress waves (up to about 80 kHz) that propagate into the structure and are reflected by flaws and/or external surfaces.

The wavelengths of these stress waves are typically between 70mm and 2m -- longer than the scale of natural inhomogeneous regions in concrete (aggregate, air bubbles, micro-cracks, etc.). As a result they are only weakly distorted, and propagate through concrete almost as though it were a homogeneous elastic medium.

Multiple reflections of these waves within the structure excite local modes of vibration, and the resulting surface displacements are recorded by a transducer located adjacent to the impact.

The IE time traces are transformed to the frequency domain via FFT for calculations of the transfer and coherence functions, and the auto power spectrum of the receiver. Spectrum data are used to determine the depth of reflectors according to the following equation:

D = VP / (2 x f1) where D is the reflector depth, f1 is the highest amplitude frequency peak identified in the response, and VP is the compressional wave velocity Which must be determined via a site based calibration.

About PCTE

PCTE have over 30years experience in the measurement and testing of concrete. With experience in research, consulting and construction they are able to assist you in reviewing the issues and developing solutions. PCTE can provide more than just the equipment. They can provide leading technical support for your business.