Tekron Services *Inc.*

Information Sheet 1

Impact-Echo Technology

Impact-Echo technology was first developed at Cornell University in the early 1990's. Our impact-echo instrument is the latest miniaturized version of this technology. The equipment is highly portable and battery driven enabling it to be used in the most congested or least accessible spaces. The miniaturized design has not compromised its capabilities. The unit has two very fast data aquasition channels enabling it to perform all published impact-echo applications including ASTM C1383-98a "*Standard Method for Measuring the P-Wave Speed and the Thickness of Concrete Plates Using the Impact-Echo Method*".

Impact-Echo Test Equipment

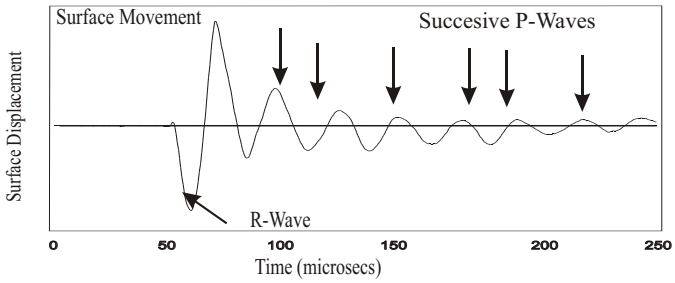

Figure 1. P-Wave capture shown in time domain format

A tap on the surface of materials such as stone, concrete, steel and asphalt will generate transient elastic waves including a compression wave known as a P-wave. The major significance of this wave is that it will travel through heterogeneous materials such as concrete without any significant distortion or reflection by aggregates. They are however reflected by any sudden change in acoustic impedance such as occurs at the back face of the concrete or by the presence of a crack, where in both cases there is a change from concrete to air. On arrival back at the surface, it again meets a sudden change from concrete to air and is reflected back into the concrete. This forces the P-wave to oscillate between the two surfaces with gradually diminishing energy producing vibrations at the surface of the concrete.

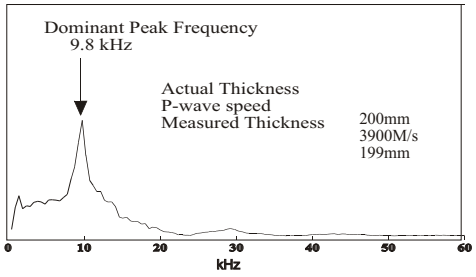

Figure 2. Dominant peak capture in frequency mode

The impact-echo instrument is designed to record both the magnitude and the time sequence of this movement. An illustration of a typical surface movement record is given in figure 1. Immediately after it is recorded, this signal is automatically computed by Fast Fourier transformation into frequencies. In solid materials this produces a single frequency peak, known as the dominant peak frequency, illustrated in figure 2. There is a simple mathematical relationship between the dominant peak frequency obtained by this calculation and the length of travel of the P-wave. To relate this frequency to the actual thickness of the material being tested, the speed of travel of the P-wave material must be known. This is readily measured by testing a known thickness of the material. Recent research has provided an additional method of evaluating the P-wave speed by using two test heads and measuring the speed of travel of surface waves between the two heads.

Applications

- **Slab thickness**
- **Detection of delamination**
- **Depth of surface cracks**
- **Shotcrete thickness**
- **Detection of honeycombing**
- **Evaluation of bond quality**

Specialists in NDT and Computer Monitoring of Structures

For Further Information Contact

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Testing masonry for bond to concrete

Testing parking garage soffit for bond to topping

Testing a bridge deck for delamination

Testing retaining wall for internal cracking

Testing aqueduct concrete below water level

Testing bridge soffit for defects

NDT Techniques

Impact-echo

Ground Penetrating Radar

Schmidt Hammer
- Standard
- Pendulum

Boroscope

Corrosion mapping
- -Half-cell
- -3D half-cell
- -Electrical resistance
- -Rebar detection

Moisture and humidity detection

Dynamic measurement of physical properties

-Linear displacement transducers
-Telltale
-Demeg gauge
-Vibrating wire strain gauge
-Vibrating wire water pressure transducers
-Vibrating wire tilt meters
-Miniature single and multiple channel data loggers including the following sensors:-

Temperature
Humidity
Light intensity
Voltage
Motor on/off vibration sensor
Motor on/offA/C sensor

Company Profile

Tekron Services is a Canadian company providing specialized inspection and testing of construction materials. Incorporated in 1987, the company offers a wide range of inspection and non-destructive testing services to evaluate structures and construction materials. Since the formation of the company our goal has been to incorporate emerging technology into tools and techniques for the construction industry.

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