SERVICES

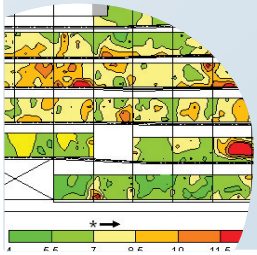
Impulse Response *Testing*

For more than 40 years, CTLGroup has been involved in development and practical application of nondestructive testing. CTLGroup specialists use nondestructive testing for existing condition assessment, material property evaluation, and quality assurance testing. The Impulse Response method can be applied to a variety of situations that require rapid, accurate, and cost-effective nondestructive condition assessment.

Applications

Problems detected by the Impulse Response test include:

- voiding beneath concrete pavements and slabs
- delamination of concrete around steel reinforcement
- low-density concrete (honeycombing)
- cracking in concrete elements
- integrity of drilled shaft foundations
- debonding of asphalt and concrete overlays
- stress transfer across joints in concrete slabs
- anchorage of cladding elements



Advantages

The Impulse Response test has several advantages over other nondestructive testing methods, including the robust nature of the apparatus,

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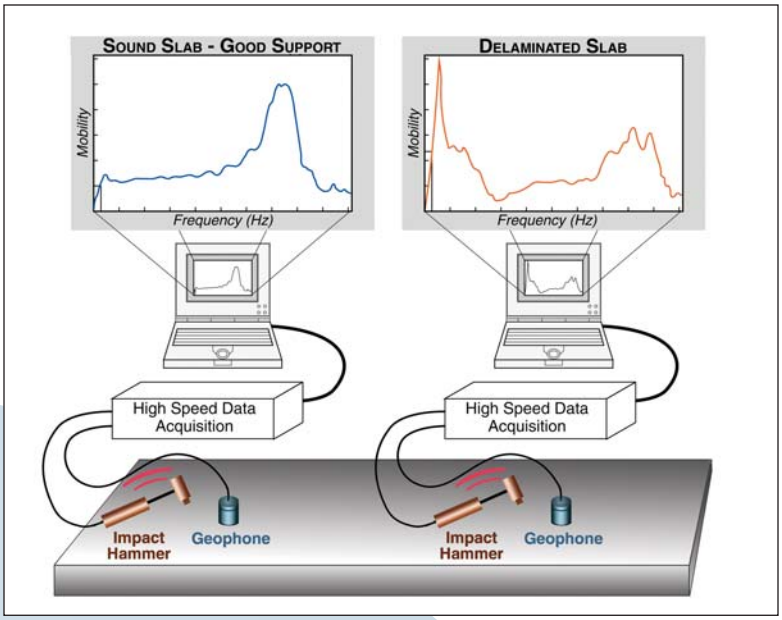
which can be used to test relatively rough concrete surfaces; its fast output, with a test rate of a point every minute in ideal access conditions; and the repeatability of test results. Structures with very difficult access, such as chimneys, silos, tunnels and dams, have been tested economically using the Impulse Response method as the principal evaluation tool.



Impulse Response Testing Equipment

The method uses a low-strain impact to send a stress wave through the tested element. The impactor is usually a 1-kg sledgehammer with a built-in load cell in the hammer head. The maximum compressive stress at the impact point in concrete is directly related to the elastic properties of the hammer tip. Typical stress levels range from 5 MPa for hard rubber tips to more than 50 MPa for aluminum tips. The response to the input stress is normally measured by a velocity transducer (geophone). Both the hammer and the geophone are linked to a portable field computer for data acquisition and storage.

Method Description

Both the time records for the hammer force and the geophone velocity response are processed in the field computer using the Fast Fourier Transform (FFT) algorithm, and the resulting velocity spectrum is divided by the force spectrum to obtain a transfer function, referred to as the mobility of the element under test. The test graph of mobility plotted against frequency over the 0 to 1 kHz range contains information on the condition and the integrity of the concrete in the tested elements, obtained from the following measured parameters:

- Dynamic Stiffness
- Mobility and Damping
- Peak/Mean Mobility Ratio

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ENGINEERS & CONSTRUCTION TECHNOLOGY CONSULTANTS

www.CTLGroup.com

Main Office 5400 Old Orchard Road, Skokie, Illinois 60077-1030
Phone 847-965-7500 Fax 847-965-6541

Mid-Atlantic Office Phone 410-997-0400 Fax 410-997-8480

New England Office Phone 603-516-1500 Fax 603-516-1510

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