DIV. 5002019 ONTARIO LTD

Urban Measurement of Seismic Site Class
Subject to Change Without Notice

MEASURING SEISMIC SITE CLASS - REMI

Introduction

Structural Engineers need to understand the seismic characteristics of the sites their buildings site on and in. The seismic site characteristic used to guide design is the average shear wave velocity in the 30m below the base of the structure.

Shear Wave Velocity

Velocity of everything from apples falling to a zebra running to earthquake waves moving is measured as distance travelled in a time interval divided by time interval. Some typical shear wave velocities for materials in the earth are

Shear Wave Velocity in Earth materials[+] [+](site specific values evaluated by on site values, conditions of soil and rock, water table)	
Material	Typical Shear Wave Velocity m/sec
Clay	100 to 600
Sand	200 to 700
Queenston Shale	800 to 1600
Limestone (Dolomite)	1500 to 1900

Calculating Average Shear Wave Velocity in Upper 30m (100feet)

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By Borehole

A sample calculation (based on a borehole consisting of 5m of clay (Vs=100m/s), 5m of sand (Vs200m/s), and the rest Queenston shale (800m/s) where the Vs are estimated from literature or local knowledge) shows the average shear wave velocity $Vs=\Sigma d_i/(\Sigma(d_i/V_i))$ is 30m/(5m/100m/s+5m/200m/s+20m/800m/s) or 300m/s. A seismic site class D is indicated. The borehole would likely end at 10m and cost about $4000 (2019).

By ReMi

ReMi uses geophones to measure background seismic noise (cars, people walking, buses, waves, factory hammers, elevator operations, trains, etc.). A line of 4.5 Hz Geophones is strung at a site. No drilling or permits are needed. No impact hammers. The geophones are setup and readings are taken. ReMi tools then directly calculate the average shear wave velocity and site class from the site response. A ReMi Survey can often be arranged in a day or two and will cost about $1000 to $2000 (2019).