Simpósio de PCE, bidirecional e ECD + Campo de teste IE

12 / 08 / 2025

CROSS-HOLE

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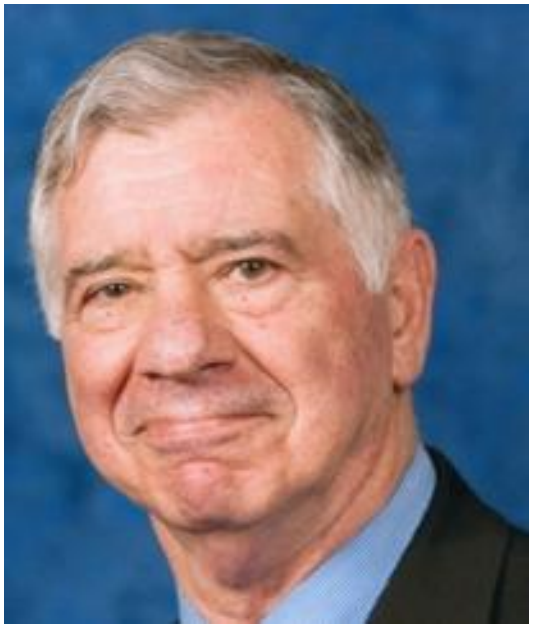

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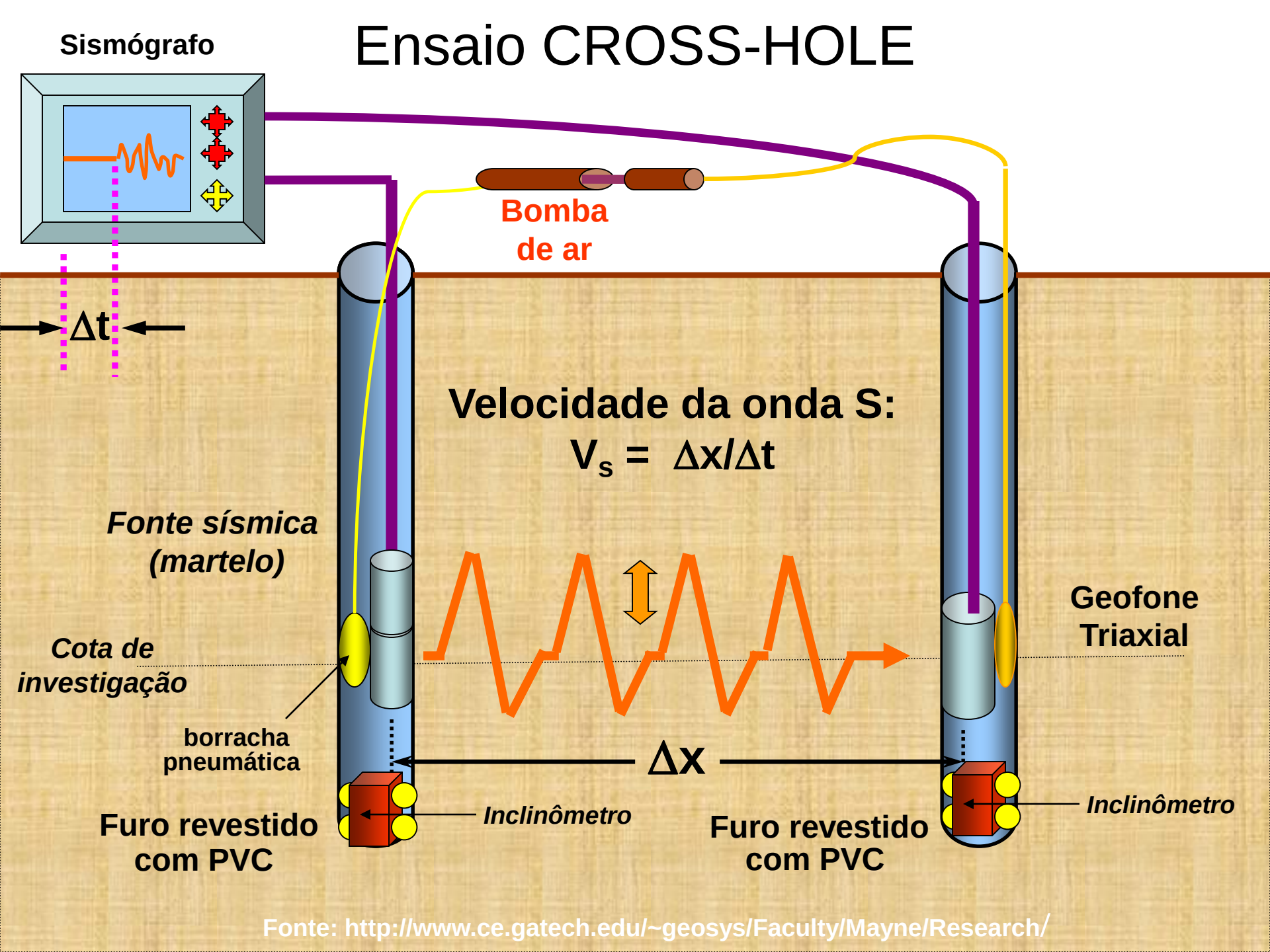
ORIGINAL PAPER

Use of Shear Wave Velocity for Foundation Design

Harry G. Poulos

Ensaio CROSS-HOLE



Fonte: http://www.ce.gatech.edu/~geosys/Faculty/Mayne/Research/

Norma ASTM D4428

(American Society for Testing and Materials)

Designation: D 4428/D 4428M – 07

Standard Test Methods for Crosshole Seismic Testing[1]

This standard is issued under the fixed designation D 4428/D 4428M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

O ensaio cross-hole é normalizado pela ASTM D4428

1. Scope*

1.1 These test methods are limited to the determination of horizontally traveling compression (*P*) and shear (*S*) seismic waves at test sites consisting primarily of soil materials (as opposed to rock). A preferred test method intended for use on critical projects where the highest quality data must be obtained is included. Also included is an optional method intended for use on projects which do not require measurements of a high degree of precision.

1.2 Various applications of the data will be addressed and acceptable interpretation procedures and equipment, such as seismic sources, receivers, and recording systems will be discussed. Other items addressed include borehole spacing, drilling, casing, grouting, deviation surveys, and actual test conduct. Data reduction and interpretation is limited to the identification of various seismic wave types, apparent velocity relation to true velocity, example computations, effective borehole spacing, use of Snell's law of refraction, assumptions, and computer programs.

1.3 It is important to note that more than one acceptable device can be used to generate a high-quality P wave or S wave, or both. Further, several types of commercially available receivers and recording systems can also be used to conduct an acceptable crosshole survey. Consequently, these test methods primarily concern the actual test procedure, data interpretation, and specifications for equipment which will yield uniform test results.

1.4 All recorded and calculated values shall conform to the guide for significant digits and rounding established in Practice D 6026.

1.4.1 The procedures used to specify how data are collected/recorded and calculated in these test methods are regarded as the industry standard. In addition, they are representative of the significant digits that should generally be retained. The procedures used do not consider material variation, purpose for obtaining the data, special purpose studies, or any considerations for the user's objectives; and it is common practice to increase or reduce significant digits of reported data to be commensurate with these considerations. It is beyond the scope of these test methods to consider significant digits used in analysis methods for engineering design.

1.4.2 Measurements made to more significant digits or better sensitivity than specified in these test methods shall not be regarded a nonconformance with this standard.

1.5 These test methods are written using SI units. Inch-pound units are provided for convenience. The values stated in inch pound units may not be exact equivalents; therefore, they shall be used independently of the SI system. Combining values from the two systems may result in nonconformance with these test methods.

1.5.1 The gravitational system of inch-pound units is used when dealing with inch-pound units. In this system, the pound (lbf) represents a unit of force (weight), while the unit for mass is slugs. The rationalized slug unit is not given, unless dynamic ($F = ma$) calculations are involved.

1.5.2 It is common practice in the engineering/construction profession to concurrently use pounds to represent both a unit of mass (lbm) and of force (lbf). This implicitly combines two separate systems of units; that is, the absolute system and the gravitational system. It is scientifically undesirable to combine the use of two separate sets of inch-pound units within a single standard. As stated, these test methods include the gravitational system of inch-pound units and do not use or present the slug unit for mass. However, the use of balances or scales recording pounds of mass (lbm) or recording density in lbm/ft^3 shall not be regarded as nonconformance with this standard.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 653 Terminology Relating to Soil, Rock, and Contained Fluids

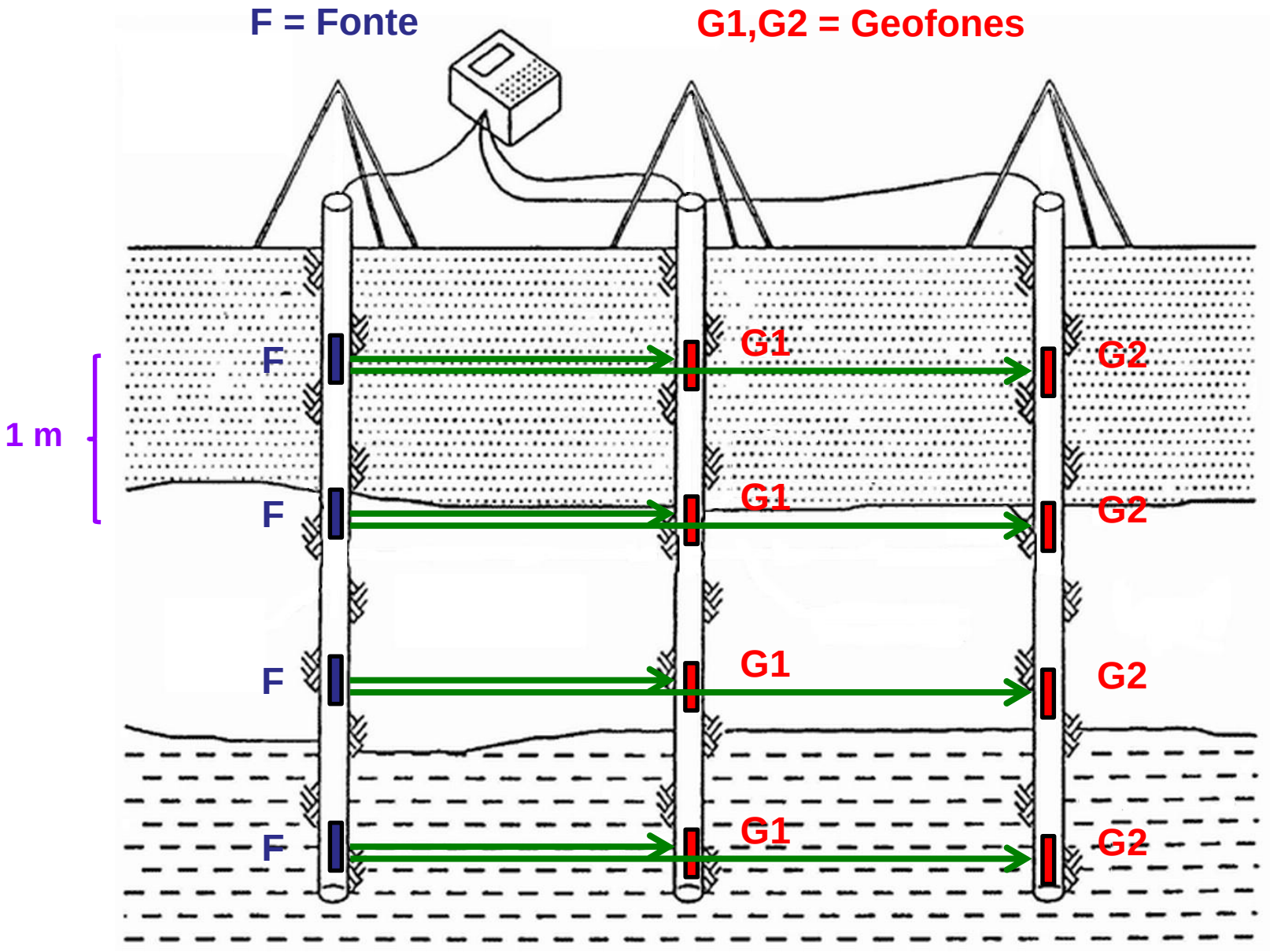
D 3740 Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

[1] These test methods are under the jurisdiction of ASTM Committee D18 on Soil and Rock and are the direct responsibility of Subcommittee D18.09 on Cyclic and Dynamic Properties of Soils.

Current edition approved July 1, 2007. Published August 2007. Originally approved in 1984. Last previous edition approved in 2000 as D 4428/D 4428M – 00.

*A Summary of Changes section appears at the end of this standard.

Como é realizado o ensaio CROSS-HOLE: ?



Fonte de ondas e os geofones são posicionados na mesma cota

A precisão e a resolução do ensaio CROSS-HOLE é igual para todas as profundidades; com os ensaios de superfície, a precisão e a resolução diminuem com a profundidade

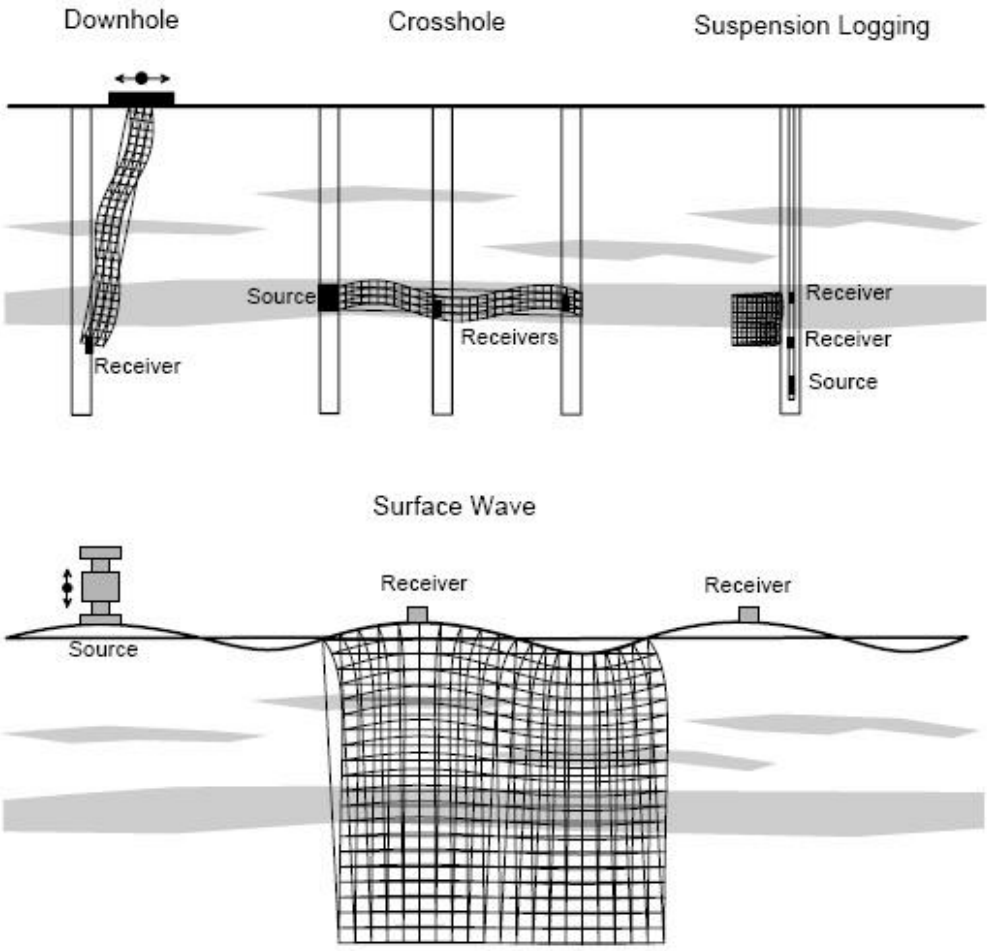


Figure 3.98: Difference in scale and resolution among various geophysical methods for measuring V_S.

Equipamentos do ensaio CROSS-HOLE

Fonte de onda S (cisalhamento)

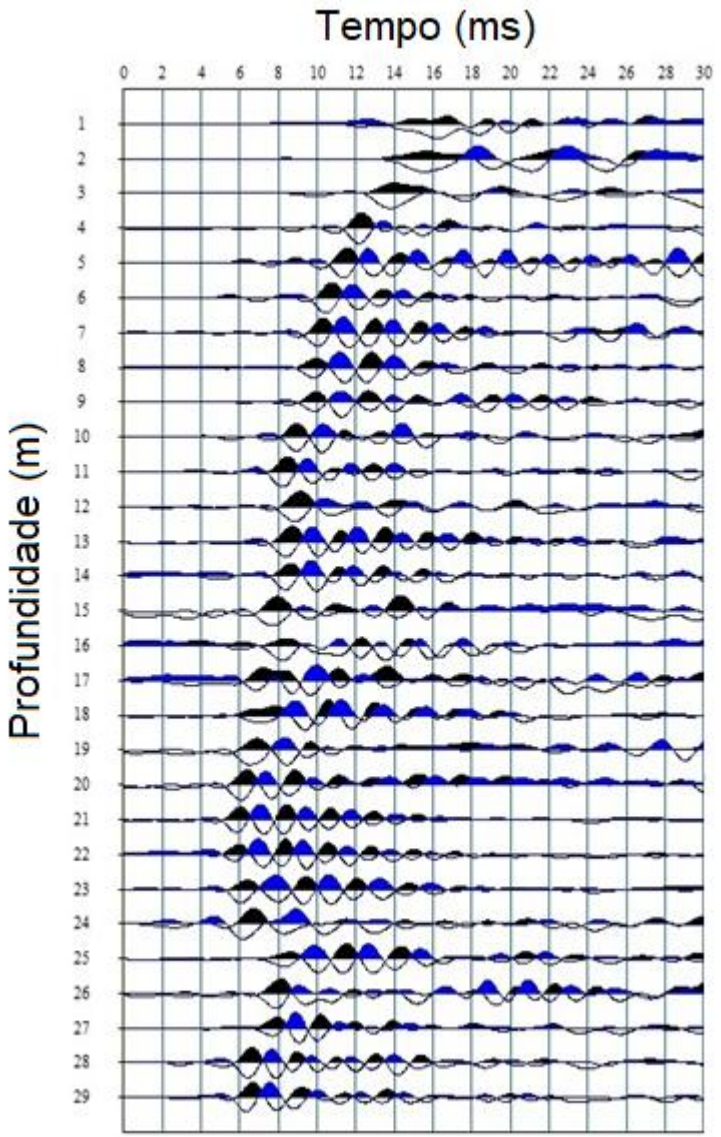
Batedor corrediço que golpeia

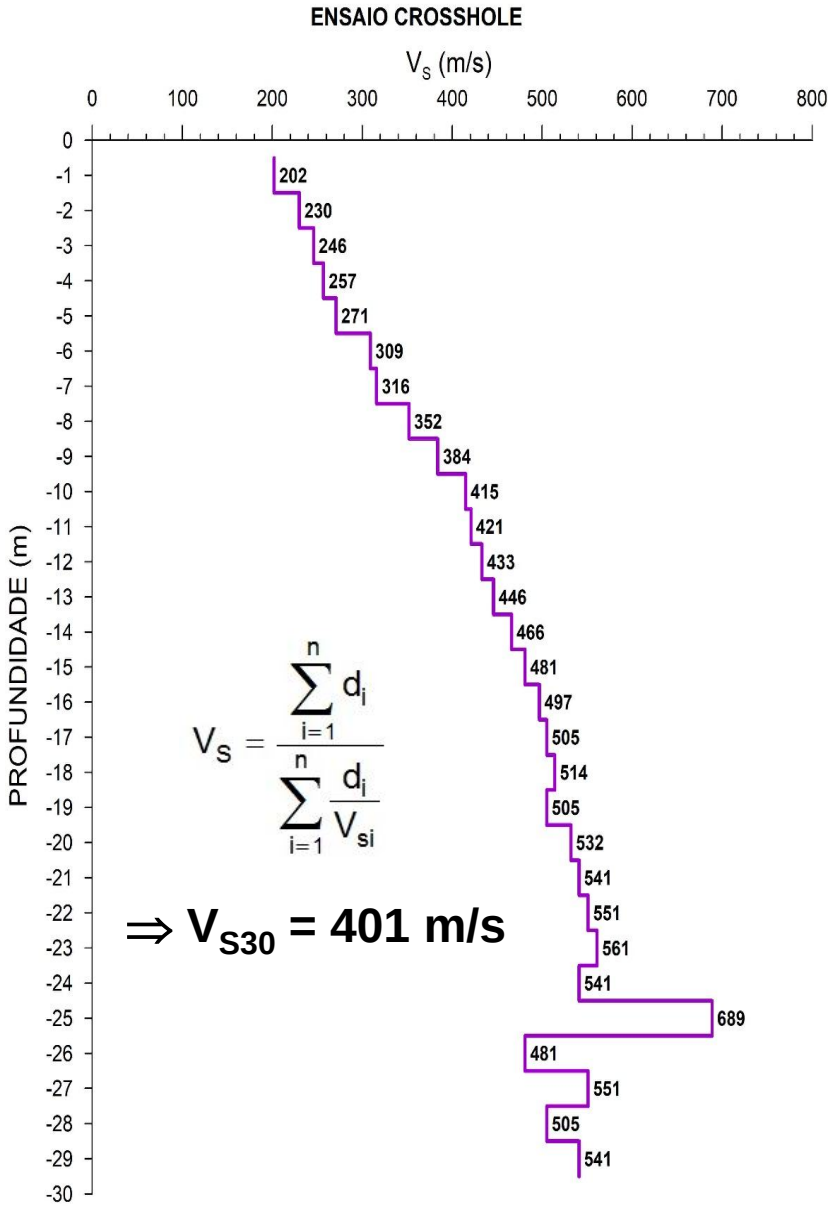
Pastilha transdutora piezoelétrica

Corpo que fica fixado na parede do furo

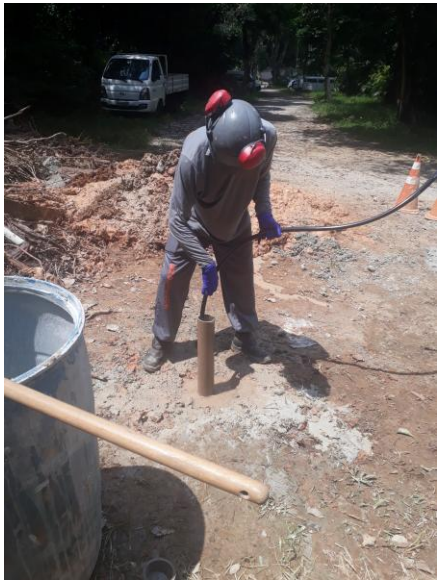
Sismógrafo

Resultados do ensaio CROSS-HOLE



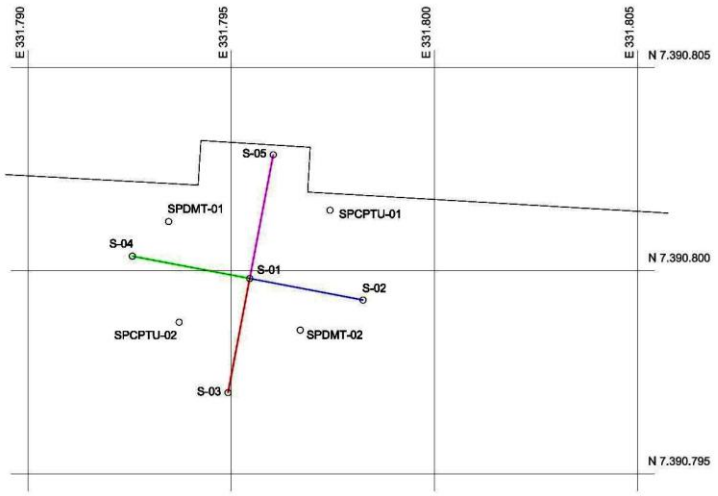


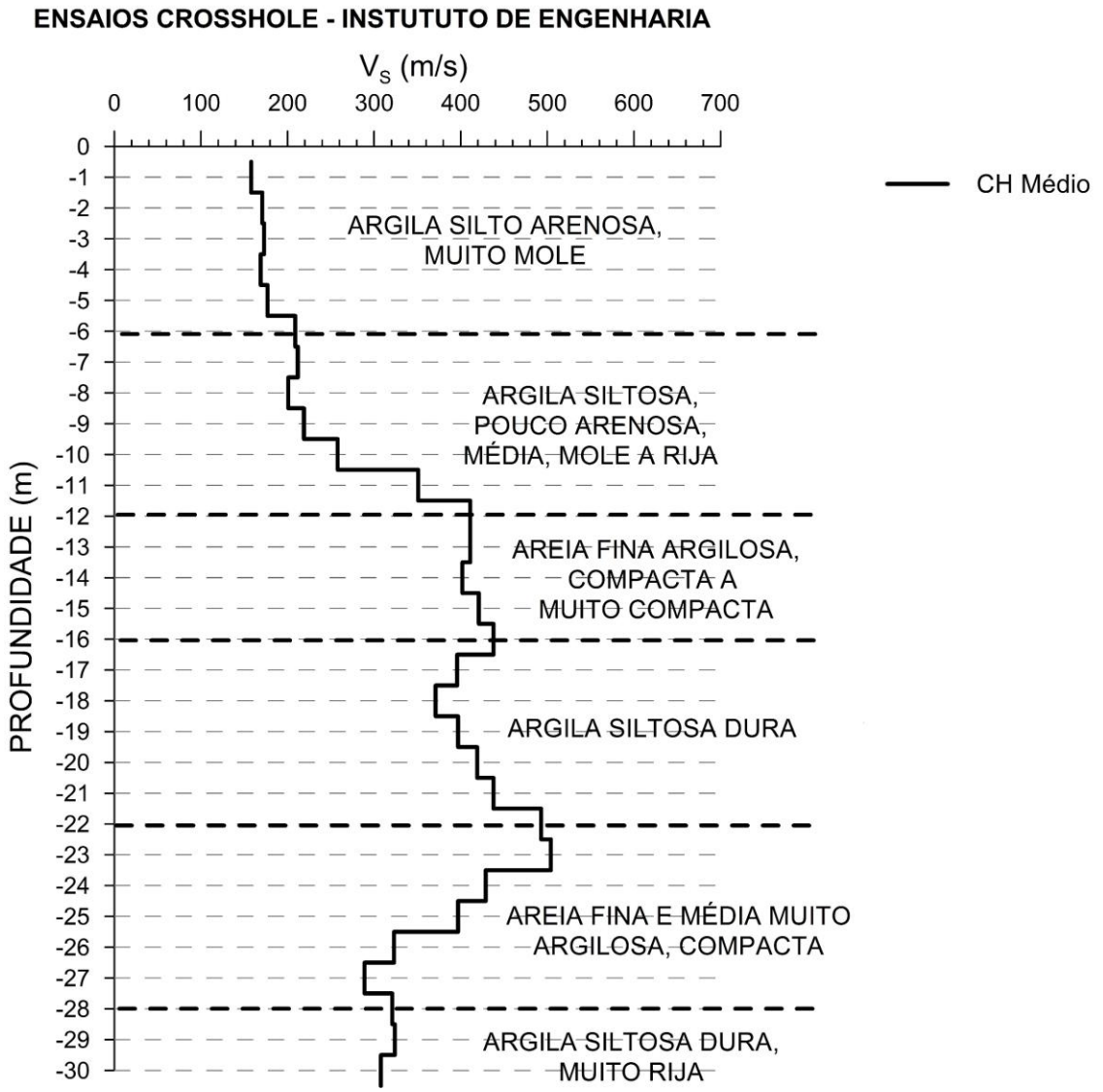
Preparação dos furos do ensaio CROSS-HOLE



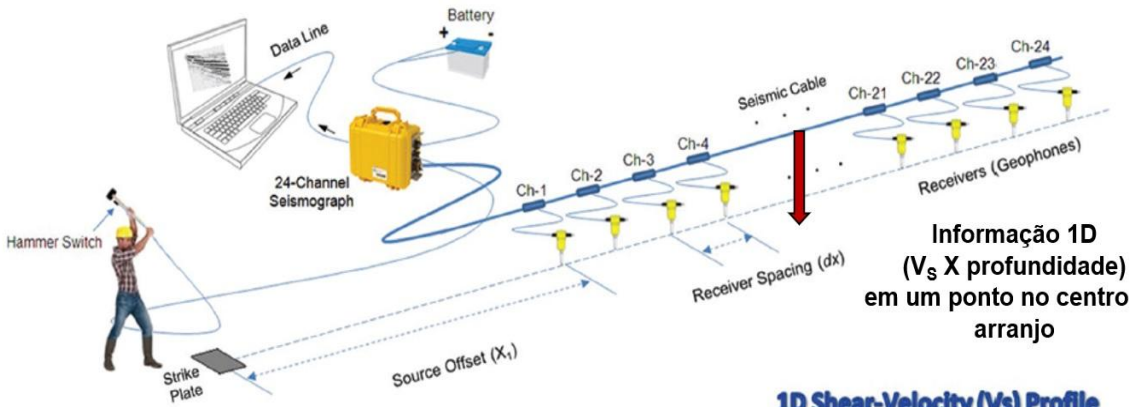
Execução do ensaio CROSS-HOLE

Resultados do ensaio CROSS-HOLE

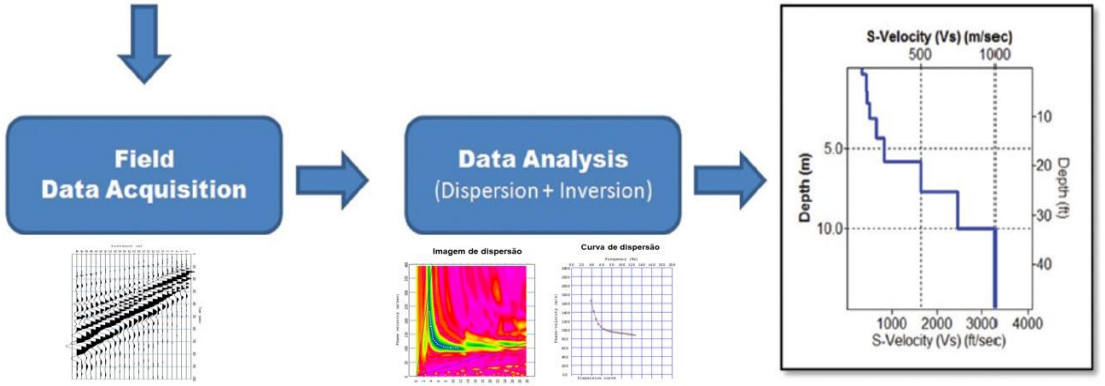




Ensaio MASW (superfície)

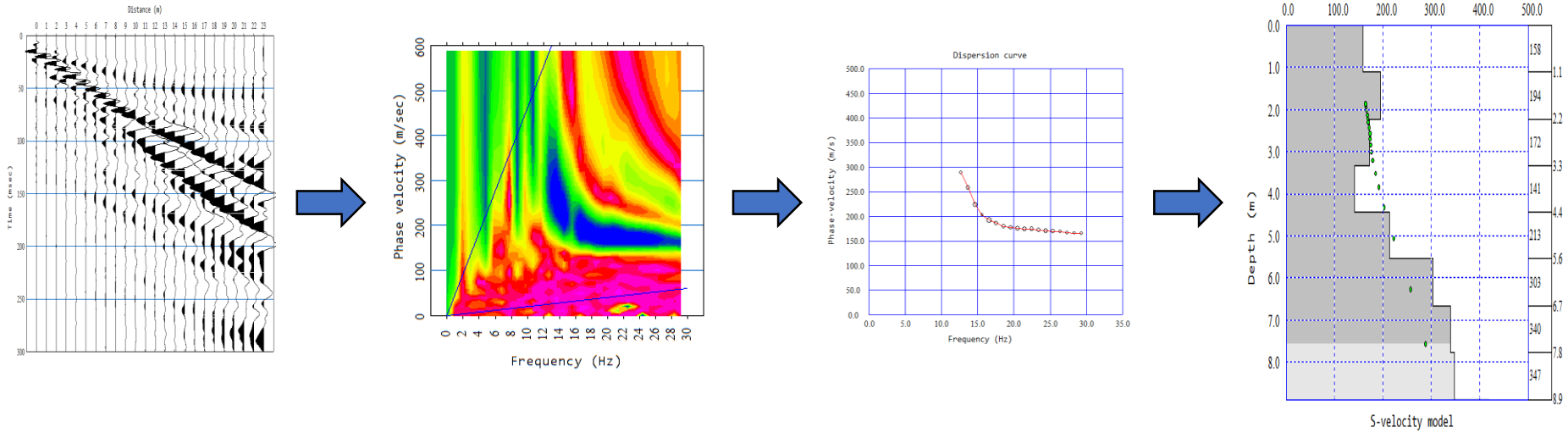


Informação 1D
(V_S X profundidade)
em um ponto no centro do arranjo

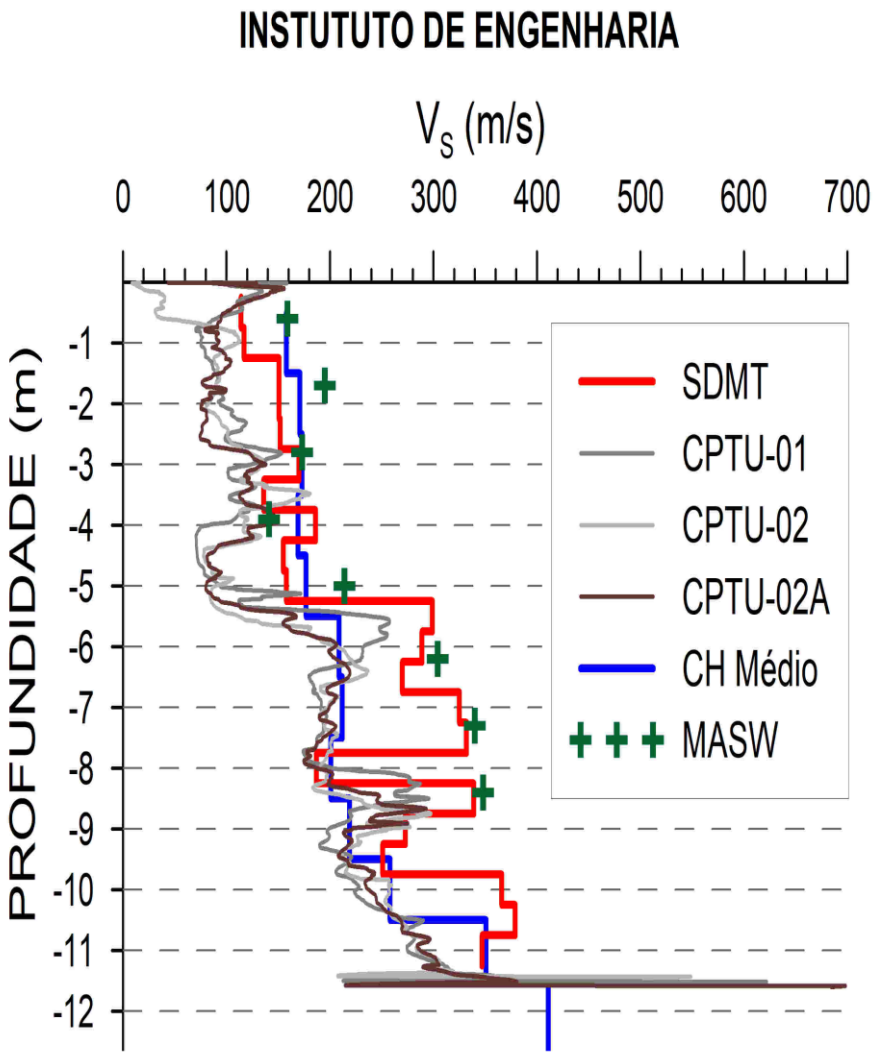


Modificado de
Park, C. et al. 2018. MASW applications for road construction and maintenance. The Leading Edge - Special Section: Infrastructure assessment

Resultados do ensaio MASW



Resultados do ensaio MASW



CROSS-HOLE & SDMT

Maximum shear modulus of a Brazilian lateritic soil from in situ and laboratory tests

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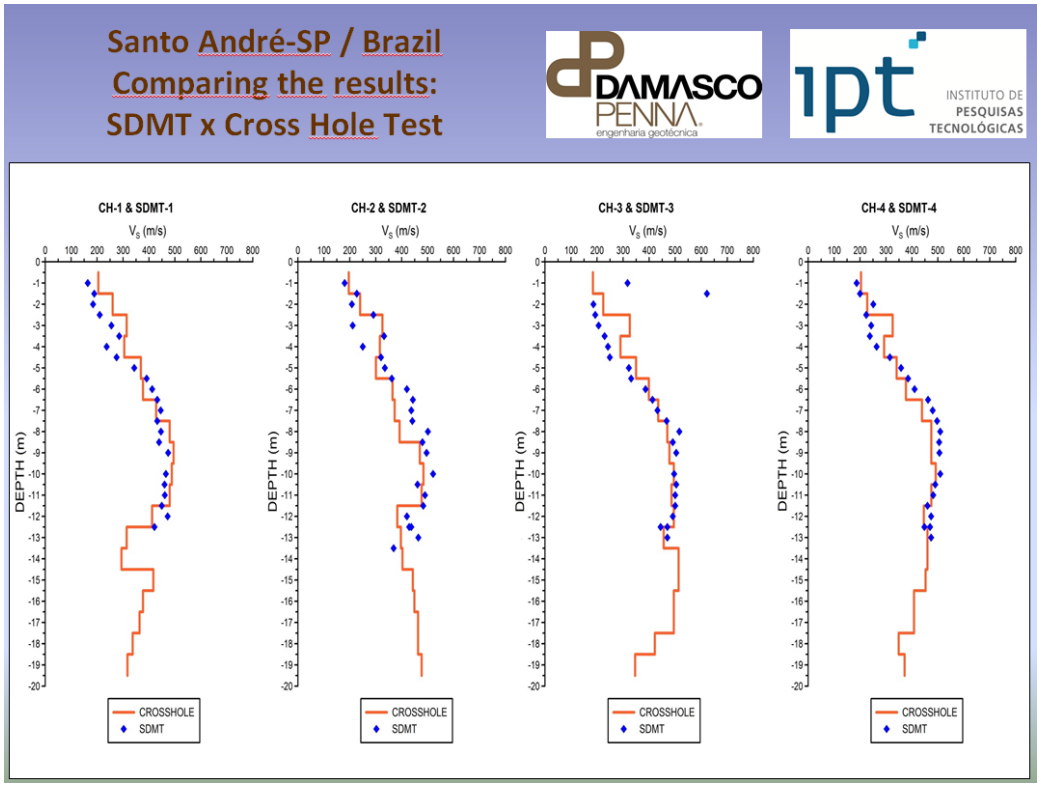

COBRAMSEG 2022

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SDMT & MASW

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