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**BUTSURI-TANSA(Geophysical Exploration)**

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[\[Image PDF \(1254K\)\]](#) [\[References\]](#)**Development of subsurface positioning system using electromagnetic method**Kenitiro Kusunoki<sup>1)</sup>, Shouzou Iemura<sup>2)</sup>, Ryusuke Ishii<sup>2)</sup> and Fujio Matsueda<sup>3)</sup>

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**ABSTRACT** It is useful to employ jacking method for construction of lifelines. We have developed an electromagnetic positioning system of underground pipes at the depth between 10 and 15 m. This system consists of a receiver coil on the ground surface and a transmitter coil in the subsurface pipe. The used frequency is approximately 1 kHz and the magnetic moment of the transmitter coil is around 50 ATm<sup>2</sup>.

The prototype system estimates a transmitter position as a cross point of detected magnetic lines at some receiver points. The estimation error of 0.5~2.0 m resulted from the field tests is higher than the requested one. The improved system synchronizing a receiver clock with a transmitter and limiting a search area small over the transmitter was developed. This system has two measuring modes of rough and detail search. In the first mode, the maximum voltage induced in the vertical receiver coil indicates the transmitter position roughly. In another mode, an exact position is found as a point indicating zero voltage in the horizontal receiver coil. An exact point is shown visibly and easily in the graphic screen on the receiver.

Results obtained in some jacking pipe sites proved that the improved system achieved the tolerance below 5 cm horizontally.

**Key words:** electromagnetic methods, magnetic field, subsurface pipe

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