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**Artificial Freezing Technology:
A Key Technology for Evolution in Urban Infrastructure**

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Ground freezing has been broadly applied to construction and maintenance works of infrastructures because of its environmental friendliness. Since artificial freezing technology represented by ground freezing can improve the strength of soil as well as its water-tightness, it becomes an essential technology for construction and maintenance of urban infrastructures where the use of space in underground has already been highly integrated. In this paper, overview of the freezing technology is introduced with some important characteristics of freezing soil for practical application. In addition, freezing technology is used for interesting works which could not be completed without freezing, and the state of the arts in freezing technology is presented. A pipe-in-pipe, now the authors are developing, is an example to utilize the potential of frozen sand, and the effect of freezing is explained with experimental results.

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Education:

B. of Eng.	Hokkaido University, Hokkaido, Japan, 1980
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M. of Sci.	Stanford University, California, USA, 1990
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Experience:

1982-2000	Engineer & Researcher, Taisei Corporation, Tokyo (Except 1989-1990)
2000-2006	Associate Professor, Hokkaido University, Sapporo
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Recent Publications:

- [1] Teeranai Srimahachota, Hao Zheng, Motohiro Sato, Shunji Kanie and Hiroyuki Shima: Dynamics of washboard road formation driven by a harmonic oscillator, Physical Review E, Vol. 96, Issue 6, page 062904, Elsevier, Published 13, DOI: 10.1103/PhysRevE.96.062904, December 2017
- [2] Hao Zheng, Shunji Kanie, Fujun Niu and Anyuan Li: Application of Practical One-dimensional Frost Heave Estimation Method in Two-dimensional Situation, Soil and Foundations, Tokyo- 56(5), DOI: 10.1016/j.sandf.2016.08.014, September 2016
- [3] Shunji Kanie, Akihiro Hayashi, Yutaka Terada and Hao Zheng: Numerical Analysis of Pipe-in-Pipe Filled with Various Materials, Pipeline, Vol. 76, No. 6, pp461-480, ISSN 0373-1006, ASCE, 2015