Report 2013-Overseas activity of Fudo Tetra Corporation

January 2014
International Department/ Fudo Tetra Corporation

1. Our overseas activity and future forecast of construction market

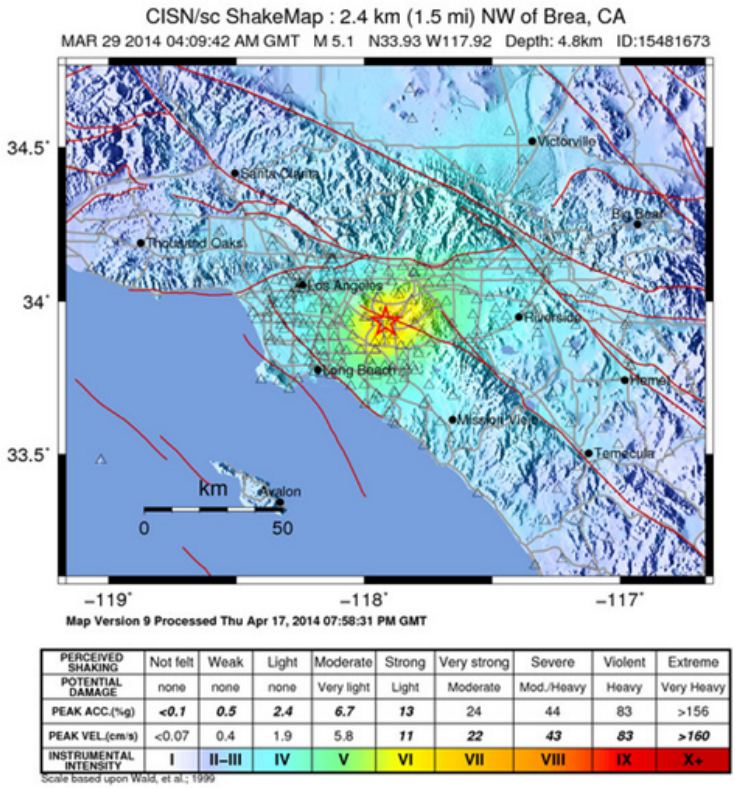
We specialize in the soft ground improvement work such as Deep Soil Mixing, Gravel Compaction Pile, Sand Drain method and MVT (Mammoth Vibro-Tamper for shallow densification), which is our best field of construction since 1950's, and we have a resource of manpower who are able to make design, analysis and other engineering works. We intend to receive both public and private works as a subcontractor in overseas. Ground improvement works that consist of nine projects (Deep Soil Mixing) in Vietnam, eleven projects (Sand Compaction Pile; SCP and Deep Soil Mixing) in the U.S.A., one project (Offshore SCP) in South Korea and one project (Offshore Deep Soil Mixing) in Hong Kong have been completed so far until the end of 2013.

(1) U.S.A.

Fudo Tetra Corporation has established its U.S. subsidiary "Fudo Construction Inc. (FCI)" (URL:http://www.fudo-const.com) in San Mateo, California in 2005. FCI has performed some liquefaction mitigation works using the Sand Compaction Pile (SCP) and non-vibratory sand compaction pile method (called as SAVE-Compozer) for foundations of urban facilities in CA, WA states. There was no settlement/sand boiling in the improved area of UPS Cerritos project site where is so closed to the epicenter, during the earthquake on Mar. 29, 2014 in Los Angels.

Magnitude	Mw 5.1
Region	GREATER LOS ANGELES AREA, CALIF.
Date time	2014-03-29 04:09:42.0 UTC
Location	33.93 N ; 117.94 W
Depth	10 km

UPS Cerritos, in LA (Apr. 3, 2014)
(There is no sand boiling and induced settlement after the earthquake.)



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<0.1*	*0.5*	*2.4*	*6.7*	*13*	24	44	83	>156
PEAK VEL.(cm/s)	<0.07	0.4	1.9	5.8	*11*	*22*	*43*	*83*	*>160*
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

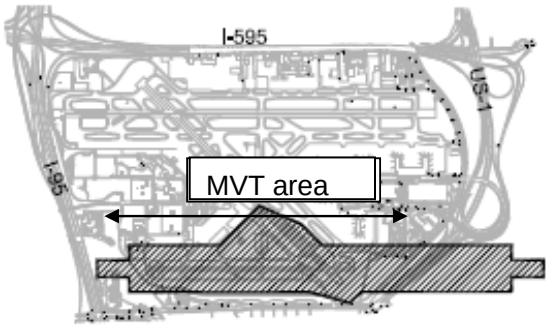
Scale based upon Wald, et al.; 1999

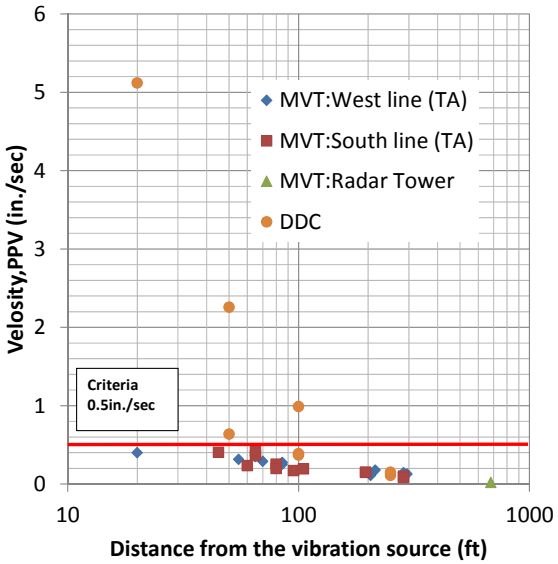
 # Shallow Compaction (MVT)

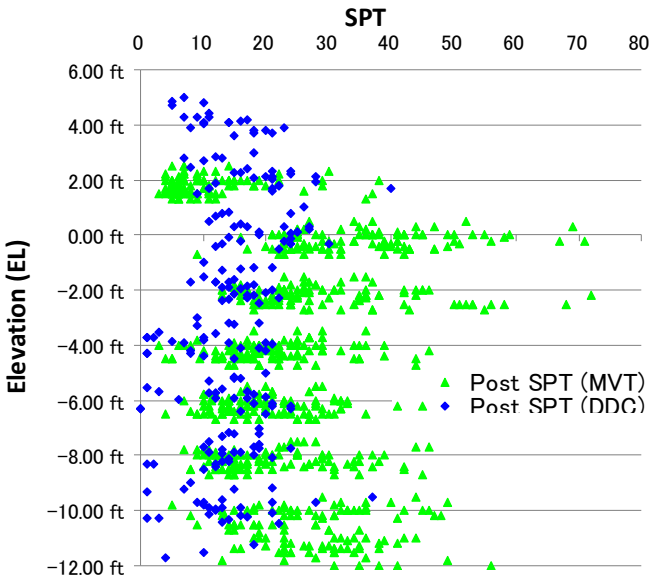
In addition, we have already completed the huge densification project in Fort Lauderdale airport runway expansion project (2012-2014), in Florida by using MVT (Mammoth Vibro-Tamper) system. MVT is capable of compacting loose sandy ground up to -10 to 15ft (3-4.5m) in depth by using a heavy steel plate and a strong vibrator on it. MVT was developed by Fudo Tetra Corporation and has been receiving superior reputation in both Japan and U.S. We have compacted around 567,800 square yards (474,700m^2) of the runway area within 10 months (1,000-1,500sy/shift/rig).

Vibration level (velocity) was measured less than 0.5in/sec at 25ft distance from tamping plate while 0.2in/sec at 50ft distance. It is definitely lower than DDC (Conventional Deep Dynamic Compaction). Accordingly, we could perform tamping work adjacent to the existing structure.

In addition, higher densification level was achieved comparing with conventional deep dynamic compaction method.







(2) **Vietnam**

Since 2006, Fudo Tetra has performed the deep soil mixing work in Vietnam by using FT's machine and equipment. In particular, three offshore works have been conducted. In 2014, we have completed the huge amount of offshore deep soil mixing work in Vietnam with using three local flat barges. These barges have been mobilized in Vietnam by our special techniques.

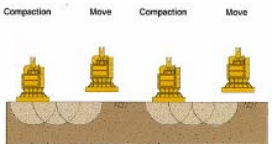
In Ninh Binh city, just around 130km south from Hanoi, we are performing the CDM-LODIC work, which is patented method and can be reduced the lateral deformation through the mixing work. So far there is no such deformation even in 3m apart from existing railway.

Project	Year	Location	Remarks
Can Tho airport	2006	Can Tho	Test of deep mixing (wet type)
Thermal Power Plant	2006	Can Tho	Deep Mixing, dia.1,600mm Q'ty:230,000m^3
Container Terminal	2007	Ho Chi Minh	Deep Mixing, dia.1,600mm, Depth:-39m, Q'ty:300,000m^3
Container Terminal	2008	Ho Chi Minh	Deep Mixing (ALiCC), dia.1,000mm-1,300mm, Depth:-33m, Q'ty:838,000m^3(partly offshore)
Container Terminal	2009	Ho Chi Minh	Deep Mixing, dia.1,300mm, Depth:-33m, Q'ty:182,000m^3 (partly offshore)
Container Terminal	2010	Ho Chi Minh	Deep Mixing, dia.1,300mm, Depth:-33m, Q'ty:97,000m^3
Railway (Hanoi-HCMC)	2012-2015	Ninh Binh	Deep Mixing (Low Displacement type, CDM-LODIC method), dia.1,000mm, Depth:-25m to -9m, Q'ty:26,500m^3
Container Terminal (Lach Huyen Port, Package 6)	2013-2014	Hai Phong, South of Cat Hai	Deep Mixing, dia.1,300mm, Depth:-36m, Q'ty:501,000m3 (all offshore)

Ninh Binh project

Lach Huyen Port project

2. Ground Improvement method for oversea project

Method	Features	Machine
Deep Mixing	Soil-cement mixing column with 1,000-1,600mm in diameter is installed by mixing blades. This method was developed in 1970's in Japan. Both laboratory mixing test and check boring are both required to keep its quality. Different from drain methods, this method does not need long curing time to obtain strength. Recently, special design technique called ALiCC method which realizes low DM improvement ratio (12-20%) has been developed so that we can achieve more economical design. In Vietnam, at a container terminal construction projects, we have assembled the DM special barge by renting local flat barge. Increase of stability of inclined river dike has been achieved by the DM method. In 2011, we completed offshore Deep Soil mixing test project in Hong Kong marine side. This is the first trial of Deep Mixing in Hong Kong.	 
Sand/Gravel Compaction Pile (SCP,GCP)	Very dense sand/gravel pile with 700-900mm in diameter is installed in both clayey and sandy ground. This method is effective for increasing stability of clayey ground and mitigating liquefaction of loose sandy ground. Recently, no-vibration (static) sand compaction pile machine has been introduced to the U.S. for mitigation of liquefaction in urban area.	
Off-shore Sand Compaction Pile	Large diameter sand pile (1600-2000mm) is installed by special barge. It is useful for foundation improvement at many harbor structures such as breakwater and various types of quay-wall. Construction speed is much faster than the other methods. Both gravel and sand are applicable as infilling materials; however, daily quantity of around 2,500m3 is required.	
MVT	Crawler crane and attachments are used to suspend the heavy vibrator and vibrating plate. This method has higher energy, higher productivity yet lower noise/vibration than conventional Dynamic Compaction.	

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