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Message from The Rector



First of all, I would like to thank Allah SWT for His generous and countless blessings that has enabled us to gather here today this purpose. I would offer my humblest gratitude and deepest thanks to Honorable Prof. M. Nasir, Ph.D., for officiating the first International Conference on Technology, Innovation and

Society (ICTIS) 2016.

I would like to express my heartiest congratulations to conference administration for organizing this conference. The theme of ICTIS 2016 "High & Smart Technologies for Future Societies" reflect the Institut Teknologi Padang (ITP) commitment in research in this fast changing technology of the global economy. Innovation as the engine that drives economic growth is a transformation of scientific knowledge into products and processes through engineering research and technology development.

I sincerely hope that the conference will continue to act as a platform for research findings to be presented and shared among the all participants. I certainly believe that this sharing of information and knowledge will foster further research collaborations that will bring our research and innovation to a greater height.

My best wishes for a successful conference.

Hendri Nofrianto Rector Institut Teknologi Padang



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International Conference on Technology, Innovation, and Society

ICTIS 2016

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Differential Settlement of Rigid Pavement of 3-Pile Row Nailed-slab System on Soft Clay Sub Grade Due to Monotonic and Repetitive Loadings

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Abstract

A new kind of rigid pavement is Nailed-slab System. It is not a soil improvement method, but rather as an alternative method to improve the performance of rigid pavement on soft soils. This system consists of a thin reinforced concrete slab, and short piles attached underneath. The installed piles under the slab were functioned as slab stiffeners and anchors. This research is aimed to learn the deflection behavior of Nailed-slab System by conducting full scale testing model. The tested full scale model was 6.00 m x 3.54 m slab area with 0.15 m in slab thickness, and consists of 15 short micro piles (0.20 m in diameter, 1.50 m in length, and 1.20 m in pile spacing) as slab stiffener, piles and slab was connected monolithically by using the slab thickening (0.40 m x 0.40 m in area and 0.20 m in thickness), then in due with vertical concrete wall barrier on the two ends of slab. Nevertheless, the testing results show good performance. The model experienced very small deflection and has higher bearing capacity above 160 kN because of the linear elastic-response is kept until load 160 kN. Loading position was not significantly influenced to the maximum deflection and bearing capacity. Differential settlement due to monotonic loadings tend higher than the one caused by repetitive loadings for interior loading. All total and differential settlements were smaller than allowable deflections.

Keywords: soft clay; rigid pavement; nailed-slab system; differential settlement

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INTRODUCTION

Rigid pavement slab can be directly constructed on the soft sub grade and/ or on the base layer. But soft soils under the pavement tend to experience Differential settlement as the results of the differential loads distribution or differential in soil homogenous. The pavement would be loaded by cyclic loads from traffic and also temperature loads that cause the warping on the slab. These matters can cause undulating on the slab or damages on the pavement structures. Rigid pavement on soft soils needs higher slab thickness, with the result that the increasing in self-weight. Several construction methods were developed to overcome or to minimize the rigid pavement problems on soft soils, such as soil stabilization, soil reinforcement, embankment on piles, cobweb foundation (*fondasi sarang laba-laba*), or chicken foot foundation (*fondasi cakar ayam*). Hardiyatmo [1] proposed the changing of the shell of chicken foot foundation by short-friction piles for efficiency of construction implementation. This method is called Nailed-slab System.

The Nailed-slab System construction is proposed to be applicable for soft soils. This system consists of a thin pile cap that also serves as a rigid pavement, and short piles attached underneath. The composite system (consists of piles, slab, and soils surrounding the piles) is

expected to be formed to bear the loads. The mainly function of pile is as a nail to the slab so that the slab remains in contact with the subgrade. The installed piles under the slab also increase the slab stiffness [2]. Then the slab thickness can be decreased. The decreasing of slab thickness can reduce the weight of the structure and will be beneficial for soft soils [3]. Hence, a more durable pavement can be acquired with the result that the pumping could not take place and differential settlement could be reduced. Yet the consolidation problem of soft soils under the construction is not covered by the nailed-slab.

Designing the Nailed-slab System is based on static load as we design the bridge, rather than the traffic load (axel load). A simple method to analyze the nailed-slab has been proposed by Hardiyatmo [4] and Puri, et.al. [5]. Puri, et.al. [5] simplified the Hardiyatmo method by considering tolerable deflection of rigid pavement. Both methods use equivalent modulus of subgrade reaction, and were validated by model tests ([6]; [7], [5], [8], [9]) and were also validated by full scale test by Puri, et.al. [10]. Puri, et.al. [11] discussed the vertical and differential settlement of the Nailed-slab by conducting the 3-pile row full scale test. The loadings were monotonic loadings. Puri, et.al. [12] also discussed the vertical deflection of the slab form the 3-pile row full scale test. The loadings were repetitive loadings. This paper will discuss the comparison of the differential settlement of slab for 3-pile row Nailed-slab System. Differential settlement is more important than total settlement. Differential settlement can cause damage rather than total settlement. For rigid pavements, the general guide is that [13]

$$D/T^2 = 2.5 \text{E} - 4/\text{m}$$
 (1)

where D is the depth of differential settlement and T is the half wave length of settlement.

INVESTIGATED 3-PILE ROW FULL SCALE NAILED-SLAB

Detail of the procedure on 3-pile row full scale Nailed-slab is presented in Puri, et.al. [11] and briefly described in Puri, et.al. [12]. In this paper, it will be presented again by comprehensively.

Soil Pond and Materials

A full scale of Nailed-slab was conducted on soft clay. A 6 m x 3.6 m soil pond was conducted by digging the existing soil until the depth of 2.5 m. On the 2 longer side was retained by masonry walls and supported by some temporarily bamboo girder. The anchorage system was built near the pond. Separator sheets were set on the pond walls and base to avoid the effects of surrounding existing soils. A 2.15 m of pond depth was filled by soft clay which took from District Ngawi, East Java, Indonesia. The soft clay properties are presented in Table 1. The slab and piles was reinforced concrete. The concrete strength characteristic of slab and piles was 29.2 MPa and 17.4 MPa respectively. The flexural strength of the slab was 4,397.6 kPa.

Dimension of Nailed-slab Prototype

The Nailed-slab System Prototype dimension was 6.00 m \times 3.54 m, 0.15 m in slab thickness, and the slab was reinforced by micro piles 0.20 m in diameter and 1.50 m in length. The spacing between piles was 1.20 m. All piles were installed under the slab and connected monolithically by using thickening slab connectors (0.40 m \times 0.40 m and 0.20 m in thickness). Each end of slab is equipped by the vertical concrete wall barrier. There was a 5 cm lean concrete thickness under the slab. The piles configuration and other Nailed-slab detail are shown in Fig. 1. The slab was loaded by compression loadings with different load positions. Loads were transfer to the slab surface by using circular plate with 30 cm in diameter (the plate represents the wheel load contact area). Then the instrumentations were recorded. Detail about testing procedure is presented in Puri, et.al. ([11], [12]). Some photographs in construction and testing are presented in Fig. 2.



Fig.1: Schematic diagram of Nailed-slab Prototype. A three pile rows of rigid pavement section [11].

600

b). Cross section

Concrete pile, D=20, L=150 Pond base-medium sand

Concrete

slab, h=15

50

Unit in cm. Without scale

/ 50 Thickening slab,

 $40 \times 40, h = 20$

No.	Parameter	Unit	Average
1	Specific gravity, $G_{\rm s}$	-	2,55
2	Consistency limits:		
	- Liquid limit, <i>LL</i>	%	88,46
	- Plastic limit, <i>PL</i>	%	28,48
	- Shrinkage limit, SL	%	9,34
	- Plasticity index, PI	%	59,98
	- Liquidity index, LI	%	0,36
3	Natural water content, w_n	%	50,49
4	Water content, w	%	54,87
5	Clay content	%	92,93
6	Sand content	%	6,89
7	Bulk density,	kN/m ³	16,32
8	Dry density, _d	kN/m ³	10,90
9	Undrained shear strength, $s_{\rm u}$		
	- Undisturbed	kN/m ²	20,14
	- Remolded	kN/m ²	11,74
10	CBR	%	0,83
11	Soil classification:		
	- AASHTO	-	A-7-6
	- USCS	-	CH

 Table 1: Soft Clay Properties [11]

RESULTS AND DISCUSSION

This paper only presents the P- δ relationships from testing results and discussion about them. There were 7 different tested loading positions. In this paper, it will be presented 3 of them that are centric load (point A), edge load (point C), and interior load (point D). Fig.3 shows the points of observation. Every load points were not loaded until failure, except reached the early of plastic zone. Discussion about *P*-u relationship was presented in Puri, et.al. ([11], [12]) and will be presented again in briefly.



Fig.2: Construction on Prototype of Nailed-slab System; a) cured soft clay on the pond, b) concrete reinforcement, c) finishing of concrete pouring, d) Loading test on the center of slab [11].

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$\stackrel{\mathbb{E}}{\stackrel{ }{\underset{d}{\overset{ }{\atop}}}} \stackrel{\mathbb{C}}{\underset{d}{\overset{ }{\atop}}} \stackrel{\mathbb{C}}{\underset{d}{\overset{ }{\atop}}}$	C ₁₂	24 C 13	25 C ₁₄	
		Notes: A=8: B	=20: C=19: E=	=22: G=27

Fig.3: Plan view of observation points, loading points and pile position [12].

Centric loads (point A)

The repetitive loading was conducted gradually by the increment loads was two times the previous one. Loading intensity was increased gradually from P = 0 kN became P = 5 kN, then decreased became P = 0 kN (with it was repeated 5 times). Then similar procedure was conducted for P = 10 kN, 20 kN, 40 kN, 80 kN, 160 kN respectively. The monotonic loading was conducted by increased gradually from P = 0 kN became P = 5 kN, then increased by twice previous load. Deflection results are shown in Fig.4.

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At the load intensity P = 40 kN (design single wheel load for highway), the maximum deflection under the load is 0.48 mm and followed by others points with smaller deflections around 0.11-0.25 mm (Fig.4a). Slab deflection responses were fulfilled the expectation, which more and more from loading point the deflections tend to experience smaller deflection. And the deflected-bowl shape closes a symmetrical shape (Fig.4b). Besides, every loads were unloaded, the deflection in each points were close to zero. It indicates that the system (micro piles, concrete slab, and thickening slab which connected the slab and pile) worked perfectly. It can be seen in Fig.4a that the response of the system is very close to the linear-elastic. The linear response is clearly seen at the curve for load up to 160 kN, which the load 160 kN is quite enough (reached $\pm 4 \times 40$ kN design single wheel load). Deflection responses for others points

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are not discussed since they have smaller deflection values. Fig.4a also shows that the differentiations between each repetition are not significant, only about 0.15 mm at the P = 160 kN, and tend to be smaller by decreasing the loads [12].

Puri, et.al. [12] summarized the repetitive center loading as follows: (a) the load repetition was not significantly influence the deflection response, (b) installed piles under the slab which embedded into the soils was stiffer enough as a slab stiffener, the higher stiffness, i.e. at load 40 kN the deflection experienced only 0.48 mm, (c) shape of deflected bowl shows the symmetrical shape which indicate that the all installed piles were able to response similarly in 3D, and (d) Prototype Nailed-slab has higher bearing capacity above 160 kN (expected 427 kN, simply calculated from 20.14 kPa x 21.24 m²) because of the linear elastic-response is kept until load 160 kN.

The deflection response for monotonic loading is little bit more critical than the repetitive one (Fig.4b). But then they have almost similar linear-elastic response up to load P = 160 kN (Fig.4a). Deflection shape along the slab (cross section in field condition) shows in Fig.4b. It is seen that deflection shape is a bowl shape. However, the end of slab was not uplifted. It is caused by the contribution of uplift resistance from installed piles under the slab. It will not be the problem for field application. This deflection will be decreased significantly by longest the pavement length.

Differential settlement of slab was slightly small for both loadings (Fig.4c). Although the higher one is for monotonic loading. Repetitive loadings tend to have lower effect to deflection. It is shown also in the value of angular distortion (Fig.4d). This value was for slab length 3,00 m (a half of total length of slab). To avoid the pavement crack, maximum differential settlement is taken 5 mm. According to Bjerrum [14], for maximum differential settlement in the clay, the ratio of u/L maximum is 1/1,600 or 0.000625. All angular distortion for load 80 kN (twice single wheel load) were less than 0.000625. And according to Eng-Tips Forum [13], all angular distortion was very small which less than 2.5E-4. It can be concluded that the pavement is in good performance.

Edge loads (point C)

Loading intensity was increased gradually from P = 0 kN became P = 5 kN, then decreased became P = 0 kN (with it was repeated 5 times). Then similar procedure was conducted for P =10 kN, 20 kN, 40 kN, 80 kN, 120 kN respectively. Deflection results are shown in Fig.5. At the load intensity P = 40 kN (design single wheel load), the maximum deflection under the load is 0.92 mm and followed by others points with smaller deflections less than 0.54 mm (Fig.5b). Slab deflection responses were fulfilled the expectation, which maximum deflection occurred under the load and more and more from loading point the deflections experienced smaller deflection. Besides, every loads were unloaded, the deflection in each points were close to zero. It indicates that all components of the system (micro piles, concrete slab, and thickening slab which connected the slab and pile) worked perfectly and the response of the system is very close to the linear-elastic. The linear response is clearly seen at the curve for load up to 80 kN, which the load 80 kN is quite enough (reached $\pm 2 \times 40$ kN design single wheel load). Fig.5b also shows that the differentiations between each repetition are not significant, only about 0.27 mm at the P = 160 kN, and tend to be smaller by decreasing the loads. The deflection response for repetitive loading is little bit more critical than the monotonic one (Fig.5b). But then they have almost similar linear-elastic response up to load P = 80 kN [12].

According to the observation on the linear-elastic response of the deflection under the load up to 120 kN (\pm 3 x 40 kN design single wheel load), it can be summarized as follows [12]: (a) the load repetition was not significantly influence the deflection response, (b) installed piles under the slab which embedded into the soils was function as a slab stiffener with enough stiffness, (c) shape of deflected bowl shows that more and more from loading point the deflections experienced smaller deflection, (d) deflection under the load 40 kN was very small (only 0.92 mm), (e) Prototype Nailed-slab has higher bearing capacity above 120 kN because of the linear elastic-response is kept until load 80 kN, and (f) the loading position was not significantly influence the maximum deflection and bearing capacity.

Deflection shape along the slab (cross section in field condition) shows in Fig.4b. It is seen that deflection shape is a half bowl shape. However, the end of slab across the load position was not uplifted. It is caused by the contribution of uplift resistance from installed piles under the slab. This deflection will be increased significantly by longest the pavement length. All angular distortion for load 80 kN (twice single wheel load) were less than 0.000625 and were very small which less than 2.5E-4. It can be concluded that the pavement is in good performance.

Interior loads (point D)

Loading intensity was increased gradually from P = 0 kN became P = 5 kN, then decreased became P = 0 kN (with it was repeated 5 times). Then similar procedure was conducted for P =10 kN, 20 kN, 40 kN, 80 kN, 160 kN respectively. Deflection results are shown in Fig.6. At the load intensity P = 40 kN (design single wheel load), the maximum deflection under the load is 0.51 mm and followed by others points with smaller deflections less than 0.46 mm (Fig.6a). Slab deflection responses were fulfilled the expectation, which more and more from loading point the deflections tend to experience smaller deflection. And the deflected-bowl shape closes a symmetrical shape. It is seen that the point B and 23 have similar deflection. Besides, every loads were unloaded, the deflection in each points were close to zero. It indicates that the system (micro piles, concrete slab, and thickening slab which connected the slab and pile) worked perfectly. It can be seen in Fig.6b that the response of the system is very close to the linearelastic. The linear response is clearly seen at the curve for load up to 80 kN, which the load 80 kN is quite enough (reached $\pm 2 \times 40$ kN design single wheel load). The differentiations between each repetition are not significant, only about 0.44 mm at the P = 160 kN, and tend to be smaller by decreasing the loads [12]. In this case, monotonic loading tends to be critical than repetitive one.



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Fig.6: Results for interior monotonic and repetitive loadings.

Deflection shape along the slab (cross section in field condition) shows in Fig.6b. It is seen that deflection shape is a bowl shape. However, the end of slab across the load position was not uplifted. It is caused by the contribution of uplift resistance from installed piles under the slab. Each corner of slab near the loading point experienced little bit significant deflections about 0.34 mm. It will not be the problem for field application. This deflection will be decreased significantly by longest the pavement length. All angular distortion for load 80 kN (twice single wheel load) were less than 0.000625 and were very small which less than 2.5E-4. It can be concluded that the pavement is in good performance.

Comparison of Differential Settlement

Differential settlement for various loading position is shown in Fig.7. It can be seen that the differential settlement at single wheel load 40 kN for all loading positions are not significant for both loading type. Linear elastic-response for centric load is kept until load 160 kN while for edge and interior monotonic loading are kept until load 80 kN. Differential settlement for repetitive loading tends to be smaller than monotonic loading. Monotonic loading tends to cause more negative effect to pavement slab. In this case the differential settlement for interior load behaved little bit unstable.



Fig.7: Differential settlement for various loading position; a) monotonic, b) repetitive.

CONCLUSIONS

The prototype of Nailed-slab System was conducted and tested. According to loading test results (repetitive and monotonic) and discussion, several important conclusions can be concluded that the tested prototype of Nailed-slab System shows

- 1. load repetition was insignificantly influenced the deflection response,
- 2. installed piles under the slab which embedded into the soils was stiffer enough as a slab stiffener,
- 3. shape of deflected bowl indicated that the all installed piles were able to response similarly in 3D, and occurred deflection due to loading was very small (about 0.92 mm for edge repetitive load intensity P = 40 kN),
- 4. loading position was not significantly influence to the maximum deflection and bearing capacity,
- 5. the prototype of Nailed-slab System had good performance according to differential settlement. And repetitive loading tends to cause less negative effect to pavement slab.

REFERENCES

- [1] Hardiyatmo, H. C., 2008, Nailed-slab System for Reinforced Concrete Slab on Rigid Pavement, Proc. of National Seminar on Appropriate Technology for Handling Infrastructures, MPSP JTSL FT UGM., Yogyakarta, Indonesia, pp. M-1—M-7.
- [2] Puri, A., Hardiyatmo, C. H., Suhendro, B., dan Rifa'i, A., 2011. Experimental Study on Deflection of Slab Which Reinforced by Short Friction Piles in Soft Clay, Proc. of 14th Annual Scientific Meeting (PIT) HATTI, HATTI, Yogyakarta, 10-11 Februari, pp. 317-321.
- [3] Hardiyatmo, H.C., and Suhendro, B., 2003, Pile Foundation with Thin Pile Cap as an Alternative to Solve Problems of Building on Soft Soils, *Report of Competitive Grant Research of Higher Education*, Institute for Research and Community Service, Gadjah Mada University, Yogyakarta, Indonesia.
- [4] Hardiyatmo, H. C., 2011, Method to Analyze the Deflection of the Nailed Slab System, *IJCEE-IJENS*, Vol 11. No. 4, pp. 22-28.
- [5] Puri, A., Hardiyatmo, H.C., Suhendro, B., and Rifa'i, A., 2012, Application of The Additional Modulus of Subgrade Reaction to Predict the Deflection of Nailed-slab System Resting on Soft Clay Due to Repetitive Loadings, *Proc. of 16th Annual Scientific Meeting* (*PIT*) HATTI, Jakarta, 4 December, pp. 217-222.
- [6] Hardiyatmo, H. C., 2009, Method to Analyze the Slab Deflection by Using Equivalent Modulus of Subgrade Reaction for Flexible Slab Structure, *Dinamika Teknik Sipil*, Vol.9 No.2, pp. 149-154.
- [7] Puri, A., Hardiyatmo, H.C., Suhendro, B., and Rifa'i, A., 2012a, Determining Additional Modulus of Subgrade Reaction Based on Tolerable Settlement for the Nailed-slab System Resting on Soft Clay, *IJCEE-IJENS*, Vol. 12 No. 3, pp. 32-40.
- [8] Puri, A., Hardiyatmo, H.C., Suhendro, B., and Rifa'i, A., 2013, Pile Spacing and Length Effects Due to the Additional Modulus of Subgrade Reaction of the Nailed-Slab System on the Soft Clay, *Proc. of 13th International Symposium on Quality in Research (QiR)*, Yogyakarta, 25-28 June 2013, pp. 1032-1310.
- [9] Puri, A., Hardiyatmo, H.C., Suhendro, B., and Rifa'i, A., 2013, Deflection Analysis of Nailed-slab System Which Reinforced by Vertical Wall Barrier under Repetitive Loading, *Proc. the 6th Civil Engineering Conference in Asian Region (CECAR6)*, Jakarta, 20-22 August 2013, pp. TS6-10—TS6-11.
- [10] Puri, A., Hardiyatmo, H.C., Suhendro, B., and Rifa'i, A., 2013c, Application of Method of Nailed-slab Deflection Analysis on Full Scale Model and Comparison to Loading Test, *Proc. the 7th National Conference of Civil Engineering (KoNTekS7)*, Universitas Negeri Sebelas Maret, Surakarta, 24-26 October 2013c, pp. G201-G211.
- [11] Puri, A., Hardiyatmo, H.C., Suhendro, B., and Rifa'i, A., 2013, Behavior of Fullscale Nailed-slab System with Variation on Load Positions, *Proc. 1st Intl. Conf. on Infrastructure Development (ICID)*, Surakarta, 1-3 November 2013, pp. 26-36.

- [12] Puri, A., Hardiyatmo, H.C., Suhendro, B., and Rifa'i, A., 2014, Behavior of Nailed-slab System on Soft Clay Due to Repetitive Loadings by Conducting Full Scale Test, *IJCEE-IJENS*, Vol. 14 No. 06, pp. 24-30.
- [13] Eng-Tips Forums, 2006, *Tolerable Settlement of Rigid Pavement*, 26 April 2006, http://www.eng-tips.com/viewthread.cfm?qid=152937 &page=3, accessed by 11 July 2011.
- [14] Hardiyatmo, H. C., 2002, *Foundation Engineering part I*, 2st ed., Gadjah Mada University Press., Yogyakarta.





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