SESSION 1

Application areas

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The Earthquake Strengthening Construction Case of the Pier Foundation by Using the Micropile.

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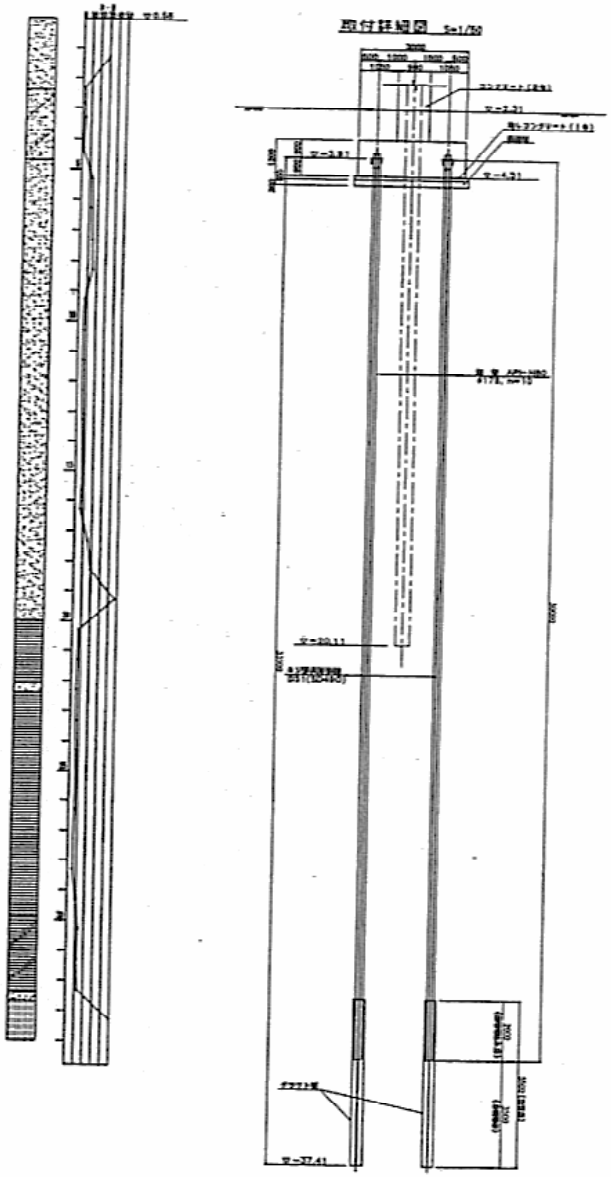
ABSTRACT

The Great Hanshin-Awaji Earthquake occurred in Japan 1995, and it caused the considerable damage for the civil engineering structure. On the newly established structure, by this, the review of the seismic criterion is attempted, so it has been enable to design at the new standard.

However, on earthquake strengthening of the established structure, it stays in steel winding length in the bridge pier division, etc., and on the reinforcement of the base, it has just begun.

And, unlike the newly establishment, since the constraint of approach structure and bridge clearance space, etc. is received, in urban area in conventional increase pile and soil improvement, condition is also considered, and the development of the appropriate method is desired to be developed.

With this background, this report described about the disaster recovery construction of



マイクロパイル構造詳細図（その1）

Fig-1 The Structural Detail Figure

the bridge base by the micropiles and as a reference, a case of the micro pile work method,

1. INTRODUCTION

(1) A case of construction applied to earthquake strengthening of the pile vent bridge pier.

This earthquake strengthening construction was ordered to build the facilities, which stand the large-scale earthquake with the reform of the road bridge specifications in 1996.

Each bridge pier is a pile vent system with nine steel piles (L=20m) of diameter of 400 mm. Ten micropiles (L=36.6m) are to be placed in the circumference in these pile vents. (Fig-1) The construction place is on route 9 in Shimane Prefecture. This bridge which was completed in 1964, has three spans each of 13.5m, effective width is 8m, and length of bridge span is 40.6m.

Position and ground property of the bonding zone must have been examined beforehand, when it is designed because the micropiles is supported by the surface friction of the pile. The green line of this histogram is an N value of the design in the beginning. The red line shows a survey result of the boring. There were some differences in the data of the fixing layer. So, it was required to change the fixing layer in mudrock formation in below 30m, since bearing capacity can not be expected in as of the design in the beginning.

Load sharing which affected the pile after the reinforcement was more carried out of the assumption following.

- Normal superstructure dead load is borne in the steel pipe established.
- The other load (increments such as bridge pier and footing) is borne in the micropiles.
- When earthquake occurs, it is borne in both of micropiles

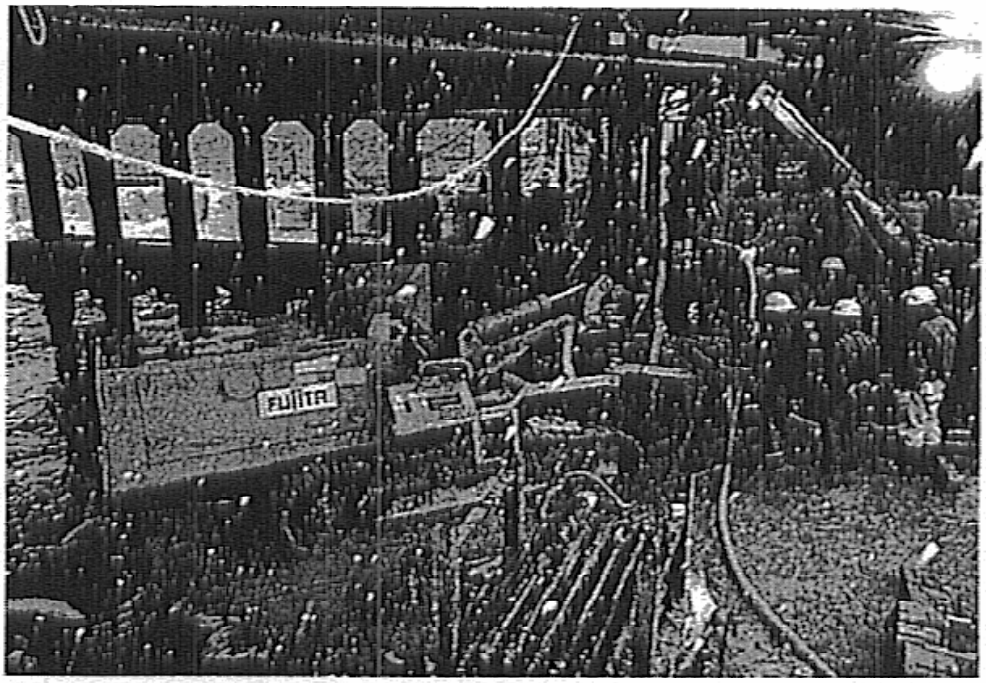


Photo-1 The construction situation
(the drilling situation)

and steel pipe established.

Though there are problems such as the improvement of the support machine for raising the construction efficiency remain, the workability is excellent even in very narrow construction place that of the shortest width of 2.5m and the clearance between the surface of the foundation and lower bridge deck of 4m. (photo-1□2)

Photo-2 The Construction Situation
(the steel pipe set)

(2) A case of disaster-recovery construction of the bridge base by using the micropiles

This is an example that the bridge which drastically dropped in washing pier foundation by the high flow of the Hurricane in last year. Micropiles are installed to the pier foundation from the deck of the same bridge. The construction place is Hiroshima prefecture. It was restored by the micropiles in temporary because schedule was changed two years after. This Bridge has seven spans each of 10.5m,effective width is 5.4m, and length of bridge span is 73.3m.

The place of the construction is the one in total of six bridge piers. The pile, each side of three, and totals of six are

Photo-3 The Construction Situation

placed. The pile length is 18m, with grouting length of 3 m.

By emptying the hole in the slab, the construction was carried out on the bridge. (Photo-3)

It was possible to cheaply restore in the short period by a top of the established bridge, though reclamation or work assembly base are founded generally, and though the construction is carried out, and placing the micropiles, and doing the jackup using the micropiles. (Photo-4)

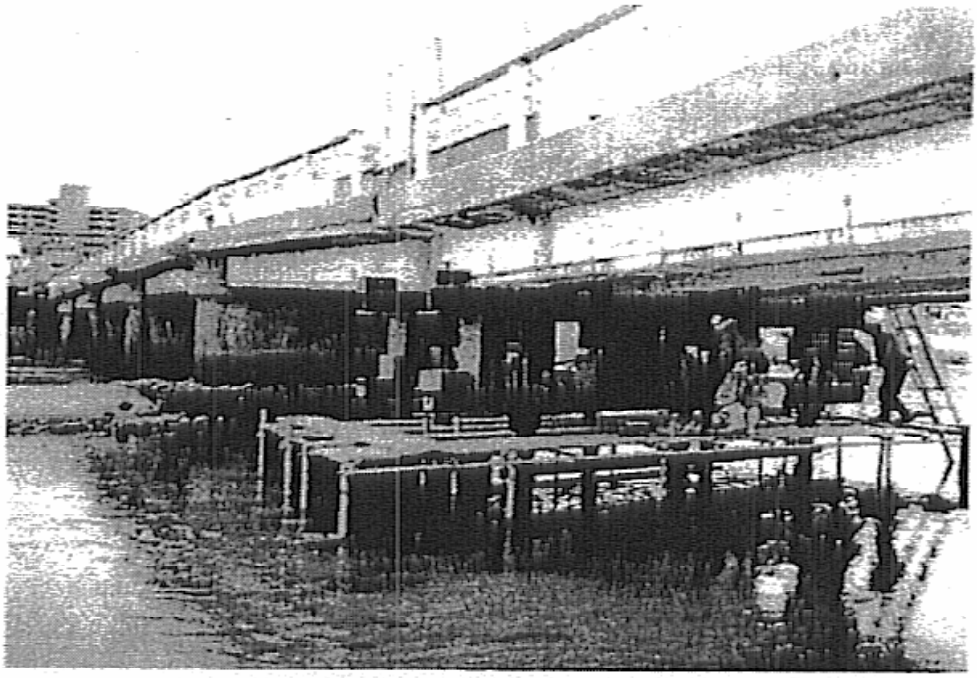


Photo-4 The Jackup Situation

2. CONCLUSION

In this report, two construction cases were introduced, and the workability which the base of the condition of constraint of the construction width and clearance between under deck and ground surface was excellent to work done.

By the improvement on construction machine and supporting machine, the construction efficiency will be also improved in the future, and it is regarded to be participated more for earthquake strengthening.

REFERENCE

1)Kishishita et al.: A Case of the foundation of earthquake strengthening by the micropile that proof against high stress. Proceedings of The 54th Annual Conference of The Japan Society of Civil Engineers,2000.