EPS ADAPTIVE EXAMPLE FOR HOLLOW PIER (EFFORTS TO SHORTEN THE TERM OF CONSTRUCTION WORK USING AN EPS WEIR)

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ABSTRACT

A hollow structure is generally adopted for high bridge piers to reduce the dead load. For construction of the hollow part, the form is assembled and disassembled and the scaffolding is installed and removed in a narrow space at a high place, so efficiency and safety of work must be taken into consideration.

For the "Yamada Viaduct" in the Sanriku right across roadway, an EPS block is used for the hollow part as the weir and also as the scaffolding at the same time. A favorable result was obtained for shortening the construction term and improving safety .

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1. INTRODUCTION

The Sanriku coastline where the construction of the Sanriku right across roadway is proceeding is characterized by the Ria coastline. The land form is complicated and V shaped valleys are formed in many places, and the bridge pier is generally higher. Therefore in many cases a pier of a hollow structure is used taking economical efficiency into consideration. However, in the lower part of the bridge pier construction work using a hollow structure, efficiency in the construction work of the hollow structure and improvements of safety are problems.

This report details shortening of the construction term and the tackling of safe construction work using the EPS weir in the lower part of the construction work of the Yamada Viaduct of the Yamada Road as a part of the Sanriku right across roadway.

2. Outline of Yamada Viaduct

Yamada Road is a 7.8 km long roadway from Funakoshi, Yamada-cho, Shimohei gun, Iwate to Sekiya-chinai to relieve traffic congestion in Yamada-cho and to secure traffic safety. It also contributes to the promotion of inter-regional exchange and activation of the community by reducing time and distance.

The Yamada Viaduct is 470m long and 10.5m wide and the upper part construction has 2 rows of 4 span continuous steel box girders and the lower part construction has 2 reversed-T-type abutments and 7 brattice type piers.

A Section of the pier is a rectangle with 7m long sides and 4m short sides. The wall thickness is 1m and the inside has a hollow structure of 5m x 2m. The maximum height of the pier is 39m and the height of the hollow part is 26m.

3. Application of EPS to the pier hollow part

In the case of the Orikasa Viaduct (which is within Yamada Road), lower part construction work where general weir and scaffolding are used, for construction work of a bridge pier of a hollow structure, the following 2 problems exist.

(1) It takes time to install and remove the scaffolding, support and weir.

(2) The risk is high since working at high positions in closed narrow spaces is unavoidable.

In this construction work, to solve these problems, the EPS form is adopted for the construction work of the hollow structure referring to the case of the Sakarigawa Ohashi for effeciency of construction and improvements in safety.

3-1 Working method when adopting the EPS weir

In the case of the general working method, it is necessary to install the scaffolding, and install and remove the inner weir for the hollow part. However, in the case of construction work using the EPS weir, the EPS weir plays both roles of scaffolding and form, so procedures can be simplified and also the process to remove the inner weir can be omitted.

The working procedures per lift for the general working method and the working method using the EPS weir are shown below.

And also after completing the construction work of the hollow part, in the case of the general construction work, the scaffolding of the hollow part must be removed, however in the case of the construction work using the EPS weir, the construction work of the upper part can be started immediately.

According to the provisional calculation, in the working method using the EPS weir, a working process of about 1.5 months can be actually reduced in total compared to the general working method as shown below.

4 days per lift x 7 lifts = 28 days

Scaffolding of the hollow part does not need to be removed = 14 days

3-2 Advantages and cautions of EPS weir

Advantages of the EPS weir are as shown below.

1. The working process can be reduced.
2. The inner scaffolding is not necessary and the construction work is carried out quickly.
3. Since the EPS can be easily processed, it can be securely adopted for complicated shaped forms,so working precision are expected of the inner form.
4. It is not necessary for inner scaffolding and inner forms to be installed and removed and safety work is improved.
5. In the case of cold districts, due to adiathermancy of the EPS, heat retaining effects of the concrete can be expected.
6. After completion, effects to absorb noise and to prevent resonance in the hollow part can be expected.
7. Since the weight is ultra light, it is not necessary to consider the increments of a dead load.

Whereas, the following are cautions when adopting EPS.

1. Measures for flying by wind must be taken since the weight is ultra light.
2. Although the EPS is flame retardant, care should be taken against fire.
3. Since it easily melts and contracts from heat, it must be protected when pressure welding.
4. Measures should be taken not to lift up when placing the concrete.

4. Conclusion

As an engineer involved in the provision of social overhead capital, to create a good object quickly, cheaply and safely is an eternal subject. This time as for both scaffolding and form of bridge pier hollow part, EPS is adopted. As a result, outstanding effects on process reductions were confirmed and safety was greatly improved. The cost was slightly higher than the general working method since the material cost of the EPS

became the dominant factor. However, from the point of view of total cost including the process reductions and improvements in safety, it can be considered that cost reductions was also realized.

From now on, adding such mechanisms and improvements as adopting mechanical joints of reinforcing bars, and preventing the lifting up of the EPS using reinforcing bars, we would like to accomplish a more rational working method.

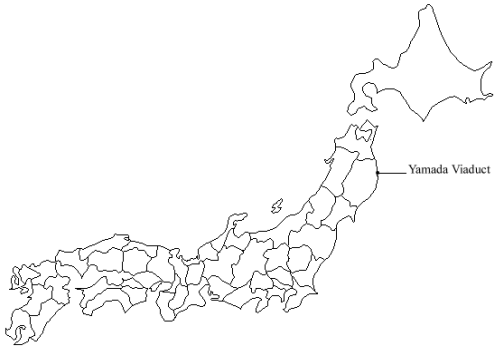

Fig.1 Location of Yamada Viaduct

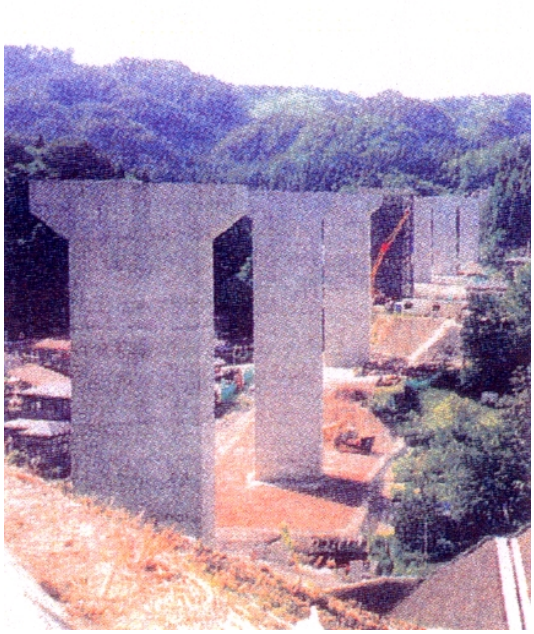

Fig.2 View of the Yamada Viaduct

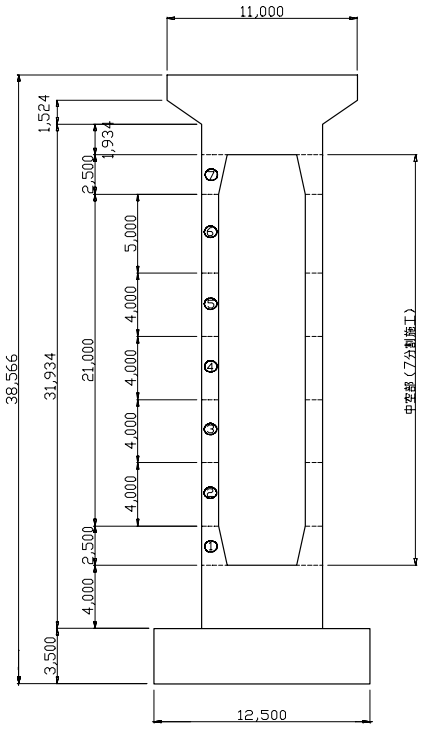

Fig.3 Structural plan of pier

Table - 1 Working procedures per lift

Working method using the EPS form	**General working method**
(1) Installing outer scaffolding	(1) Installing outer scaffolding
	(2) Installing inner scaffolding
(2) Assembling column reinforcing bars	(3) Assembling column reinforcing bars
(3) Installing EPS form	(4) Installing inner form
(4) Installing outer form	(5) Installing outer form
(5) Concrete placement	(6) Concrete placement
(6) Curing	(7) Curing
	(8) Removing inner form
(7) Removing outer form	(9) Removing outer form

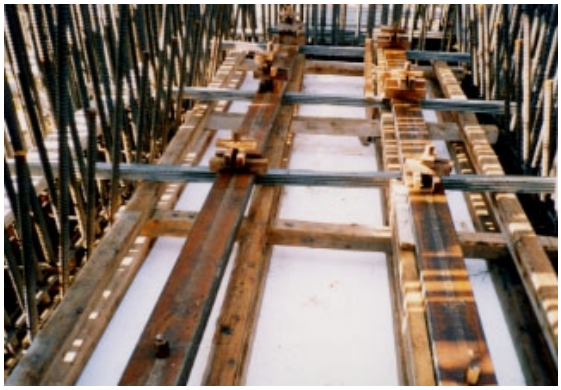

Fig.4　Placement of EPS blocks

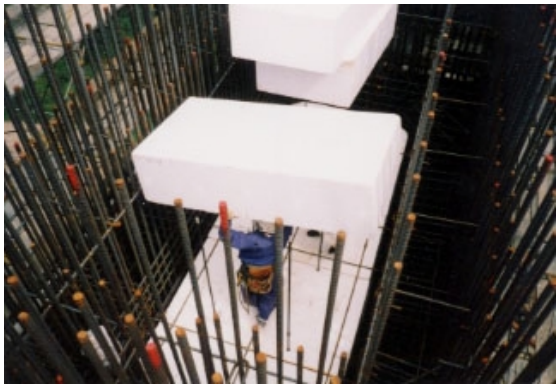

Fig. 5　Placement of EPS blocks