TEPSCO Develops Precast Foundation for Special High-Voltage Transmission Towers to Improve Productivity at Construction Sites

February 22,2023

Tokyo Electric Power Services Co., Ltd.

Tokyo Electric Power Services Co., Ltd. (Headquarters: Koto-ku, Tokyo; President: Yasuhiro Kubo) has developed a precast cap for the mono-pile foundation that supports special high-voltage transmission towers (hereafter “transmission towers”) and this product is now available for purchase. We believe that this development will help to reduce the number of specialized workers required for the construction of pile foundation slabs. Even less skilled and less experienced workers will be able to install tower leg components with a high degree of precision, thus significantly reducing the time needed for installation.

1. Development Background

In Japan, approximately 1,000 transmission towers are built each year to support electricity transmission lines.

(Reference: https://www.occto.or.jp/iinkai/kouikikeitouseibi/2016/files/seibi_18_01_02.pdf)

7According to the “Basic Policy for Realization of GX: Roadmap for the Next 10 Years” approved by the Cabinet on February 10, the national grid will be developed on a scale more than eight times that of the past 10 years. However, the power transmission construction industry is currently facing a lack of construction capacity and there is an urgent need to improve productivity through mechanization and other means.

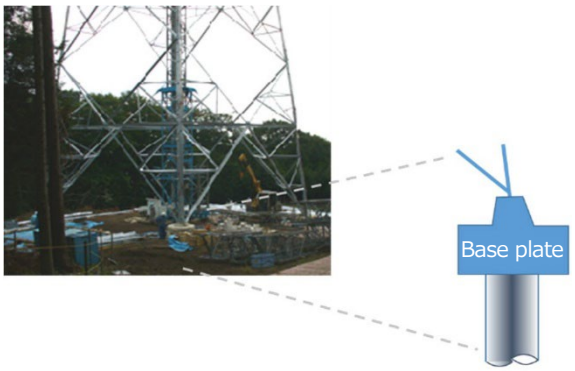

Figure 1: Pile and pile foundation slab

The transmission tower is supported by 4 legs on independent footing (Figure 1). The slab of the pile foundation is constructed according to the procedure shown in Figure 2.

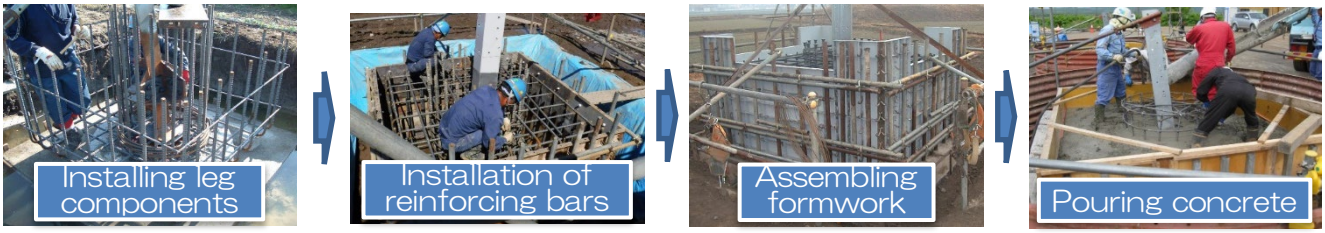

Figure 2: Construction Procedure of Pile Foundation Slab

The construction of a transmission tower foundation requires the expertise of a power transmission worker who possesses extensive experience and skills in following the procedures outlined in Figure 2. This step is particularly challenging because leg components must be installed to ensure that the height, position, angle, and direction of the tower are within permissible values, in order to prevent interference with the tower assembly after the foundation has been constructed. This process demands skilled power transmission engineers.

However, as in other industries, the aging population and the difficulty in filling positions with younger workers have led to a severe shortage of specialized workers needed for constructing transmission lines. To address this issue, the Ministry of Land, Infrastructure, Transport, and Tourism has been promoting “i-Construction”* as a solution to the shortage of human resources in bridge and other construction sites. They have also identified the introduction of total optimization (standardization of concrete work standards, etc.) as one of the three main pillars (issues) for the construction industry to prioritize.

To promote i-Construction at transmission line construction sites, we have developed a precast foundation for constructing the slab of transmission towers that is manufactured in a factory and then assembled on-site, eliminating the need to order customized foundations for each site. This approach has resulted in a significant reduction of on-site work and improved productivity, while also addressing the shortage of specialized workers by standardizing work processes.

*The i-Construction initiative is led by the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT), with the goal of enhancing productivity at construction sites across the entire project process, including surveying, design, construction, inspection, and maintenance.

2. Outline of Precast Foundation Development

Figure 3 provides a comparison between the installation procedures of conventional pile foundations and the newly developed precast method. With the new approach, the pile foundation components (cap) are pre-manufactured in the factory as precast components (Fig. 4), and then assembled on-site. Specifically, the inner precast components are installed at the pile head, followed by the outer precast components in the order of 1 and 2. Finally, concrete is poured into the gaps between the inner and outer components to complete the construction of the pile foundation slab.

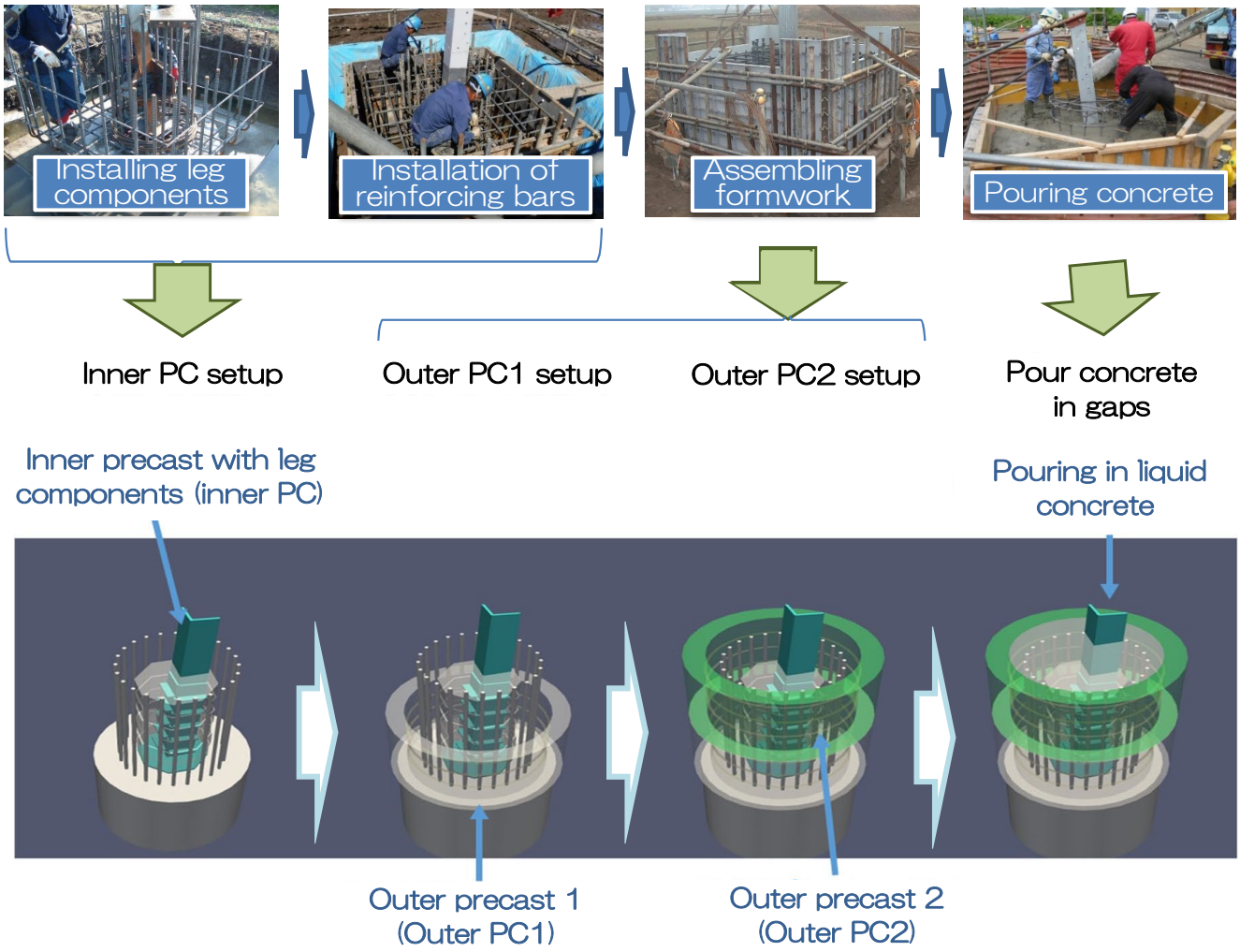

Figure 3: Usage of Precast Components (Comparison with Old Method)

Figure 4: Examples of Precast Components

Based on our test results, the accuracy of this method is well within the acceptable range for standard power line construction. Additionally, the number of man-hours required for installation can be reduced from 14 using conventional methods to 6, which is approximately a 60% reduction. By producing accurate precast components at a factory, it is a matter of simply assembling them on-site, eliminating the need for permanent on-site professionals to make delicate adjustments, and enabling inexperienced workers to build foundations on par with experienced ones. Furthermore, the reduction in on-site work will minimize the need for equipment to deal with site location and seasonal effects (such as high temperatures and snowfall), resulting in reduced transportation costs.

This method was employed at a TEPCO Power Grid, Inc. site in the Tsurumi Ward of Yokohama City, Kanagawa Prefecture, late last year, and other power companies are seriously considering introducing it. We plan to extend our sales activities to other industries that handle steel towers, thus supporting the construction industry in saving labor and resolving

the shortage of human resources by implementing this method.

Figure 5: Photos of Precast Foundation on Construction Site

《Inquiries》

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