

First Supply of Cold Shrinkable Joint for 275 kV XLPE Insulated Power Cable

1. INTRODUCTION

As a straight joint box for domestic underground power transmission lines (CV cables) use, a rubber block joint (RBJ), which is superior in workability, becomes common for application in the power transmission lines of 66-77 kV and 154 kV. The RBJ is also applied to the power transmission line of 400 kV overseas.

On the other hand, a prefabricated joint (PJ) is adopted as the straight joint box for the domestic 275 kV CV cables.

This time, we had the first supply of 275 kV RBJ (hereinafter, Cold Shrinkable Joint, CSJ), which has silicone rubber as a main insulation material and is superior in workability than the PJ, to the Suruga Higashi-Shimizu Line of Chubu Electric Power Co., Inc.

2. OUTLINE OF SURUGA HIGASHI-SHIMIZU LINE

Suruga Higashi-Shimizu Line is the double circuits power transmission line of 275 kV, connecting between Suruga

Electric Power Substation and Higashi-Shimizu Electric Power Substation, and the underground power transmission line portion is approximately 3 km from Suruga Electric Power Substation, within the total route of approximately 16 km.

We used CSZV cables of 275 kV, 1 x 2500 mm² for the underground power transmission lines and they are jointed at two points by the CSJs. VISCAS Corporation supplied and installed the cables and the joint boxes on the second circuit of the double circuits power transmission line.

The construction outline is shown in Figure 1.

3. OUTLINE OF 275 kV CSJ

As a rubber block insulation material of the CSJ, we have used a silicone rubber which has been used for domestic use up to 154 kV.

Since the silicone rubber is superior to a stress relaxation characteristic, an enlarged diameter in factories is possible.

The outline of the CSJ structure is shown in Figure 2.

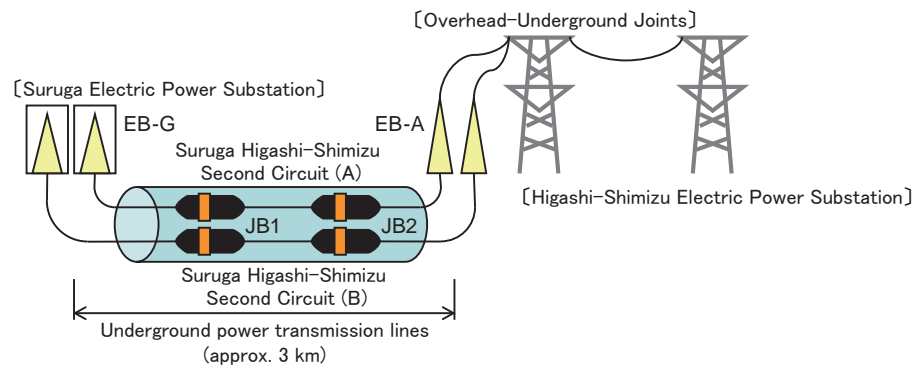


Figure 1 Outline of Suruga Higashi-Shimizu Second Line.

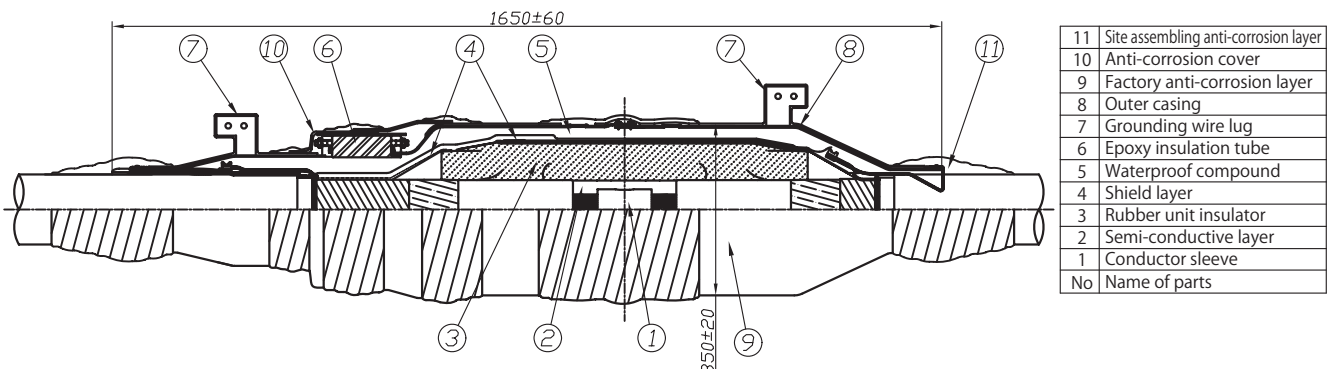


Figure 2 Construction of the Cold Shrinkable Joint (CSJ) for 275 kV XLPE Insulated Power Cable.

4. CONSIDERATION FOR THE IMPROVEMENT OF CONSTRUCTION QUALITY

We considered the following points to clarify the construction management level that can secure the stable quality for the supply of 275 kV CSJ to Suruga Higashi-Shimizu Line:

- 1) Consideration for the annealing condition of the cable

As compared to EP rubber, the silicone rubber is superior in flexibility and has a high followability for cable bend. Therefore, severe controls for the annealing of the cable such as a prefabricated joint, are not required.

For the quality control in the construction, we used a 3.5 mm/500 mm with similar bending radius as a bend control value which has been used for 154 kV CSJs, however, we have conducted the bend test on actual products to validate the control value.

From the test results, there is no interfacial irregularity with a cable bend twice as much as the control value, and then, it is confirmed that no problem will affect the electric performances.

- 2) Consideration of interface performance

The control value of the foreign metal substances on the interface between the cable insulator and the rubber unit was predetermined as less than 600 μm , calculated in accordance with the publication, vol. 51, No. 1, published by Electric Technology Research Association. To assess the validity of this control value, we conducted a verification test on actual products.

From the result of the verification test, it is confirmed that no problem will affect the electric performances even if foreign metal substances of acceptable level are inserted. On the other hand, for the non-conductance foreign substances, small sizes of the foreign substances will not be harmful because voids are eliminated by the interface oil. However, it is confirmed that the large sizes of the foreign substances will be harmful.

In the construction of the actual power transmission line, the cable is X-rayed (sensitivity of detection: 300 μm) to check for foreign metal substances on the interface after a rubber unit is applied. Non-conductance foreign substances which will be harmful with their size can be also eliminated by the process control during the construction.

5. COMMISSIONING TEST

We had the first supply of 275 kV CSJ to Suruga Higashi-Shimizu Line.

A power-frequency withstand voltage test and a partial discharge test were conducted as the commissioning test and since, Suruga Higashi-Shimizu Second Line (A) and Suruga Higashi-Shimizu Second Line (B) have started operation without any report of trouble respectively in April 2013 and October 2013.



Figure 3 View of CSJ in Suruga Higashi-Shimizu Second Line.

For more information, please contact
 Accessories Engineering Department
 Power Cable Division
 VISCAS Corporation.
 TEL: +81-3-5783-1855 FAX: +81-3-5783-1870
 E-mail: info@viscas.com