

A Guideline for the Installation of Contact Wires for High-Speed Train Operation

Mizuki TSUNEMOTO

Assistant Senior Researcher, Contact Line Structures, Power Supply Technology Division

Ideally trolley wires (contact wires) are installed at a constant height and with high precision. In laying contact wires, however, installation errors cannot be avoided in practice. Despite the fact that installation errors can adversely affect the current collection performance, no concrete guidelines for allowances for installation errors are specified, except in recent years for Shinkansen which has an allowance for "span slope" where trains are running at 300km/h or over. To ensure stable current collection for high-speed operation of Shinkansen trains, therefore, we have proposed a new guideline for the installation of contact wires, hereinafter referred to simply as a "guideline" (a standard allowance for installation errors), by following the steps (1) to (4) below.

(1) Conduct a simulation of high-speed train operation in a Shinkansen section using the measured heights of contact wires.

(2) Statistically analyse the relation between the following (i) and (ii)

- (i) The span slope of contact wires and the supporting point slope (as an index of installation errors)
- (ii) Evaluation items for current collection performance (contact loss, uplifts and strains at supporting points)

(3) Extract installation error evaluation items that are significantly correlated to current collection performance (Fig. 1)

(4) Compile a guideline to restrict the values of evaluation items for current collection performance within the specified limits to ensure satisfactory train running performance

Figure 2 indicates the evaluation items in the guideline and, as an example shows the target values for installation errors at 300km/h operation. The five indices for evaluation in

the new guidelines are the currently specified span slope and newly added "Difference of span slope," "sag ratio," "supporting point slope" and "supporting point curvature."

Figure 2 indicates that the span slope of 0.3%, which is currently in effect and which was specified for 210km/h operation at the start of commercial service of Shinkansen, is no longer valid for the revenue service operation at over 300km/h.

It is thought that the guidelines contribute to the improvement of performance, reliability, security, extension of life and efficiency of maintenance of contact wires and further to the speedup of Shinkansen trains. It is also possible through a similar manner to introduce a new set of guidelines for a narrow-gauge railway, simplify facilities and introduce new maintenance methods selectively for different sections.

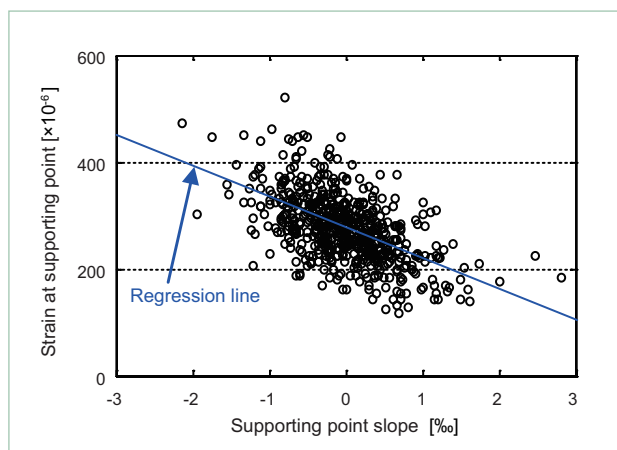
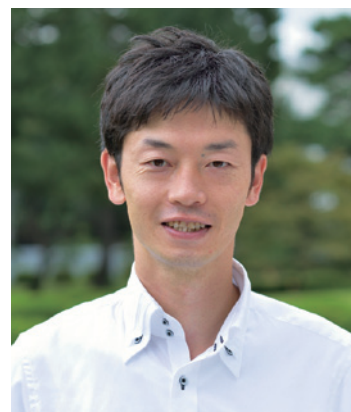


Fig. 1 Relation between the strain at supporting point and the supporting point slope

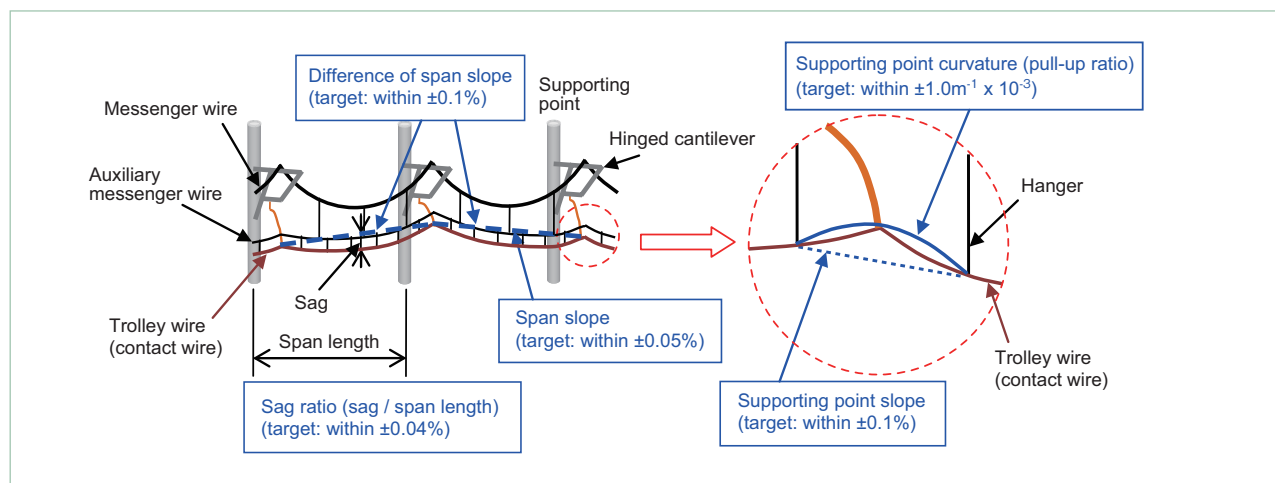


Fig. 2 Indices and targets for installation errors (for 300km/h operation)