

## Principal Research Results

# Establishment of the overall Lightning Protection Design for Circuit mounted Distribution and Telecommunication and Customer Systems – Aspect of Lightning Current According to Grounding System of Customer –

### Background

As the information-oriented and computerized society progresses, reducing power failures in electric power companies and securing the reliability of telecommunications in telecommunications companies become important problems. Moreover, communication lines are electrically connected with distribution lines through telecommunications equipment in customers. Under these circumstances, individual measures of power equipment, communication equipment, and customer equipment are insufficient for lightning protection design. Therefore, it is necessary to examine lightning protection design overall by thinking of these equipment as one circuit when examining the grounding method and arrangement of telecommunications system arresters and rating of arresters installed in power equipment and communication equipment.

### Objectives

For the establishment of overall lightning protection design, this study aims to clarify the effect of various lightning protection design in circuits where the distribution equipment, the customer equipment, and the communication equipment are included, from the viewpoint of the branch aspect of lightning current

### Principal Results

An experimental examination concerning lightning protection design in the circuit where the distribution equipment, the customer equipment, and the communication equipment were included was executed as shown in Fig.1. The main results are as follows.

#### 1. Earth system for customer equipment \* 1

When the earth system for the customer equipment is common earth or concatenation earth, current that passes telecommunications equipment becomes small compared with an individual earth. Therefore, it becomes advantageous for lightning protection design as shown in Fig.2.

#### 2. Method of distribution and communication line leading-in

When the distribution and the communication line are drawn in from the same pole, current that invades the customer from the pole direct lightning hit through indoor electric wire, current that passes to avoid a lightning protection device installed at customer's entrance, and current that passes through telecommunications equipment are smaller than in the case of leading in from another pole. Therefore, it becomes advantageous for lightning protection design as shown in Fig.3.

#### 3. Direct lightning hit point

When lightning directly hits the antenna, about 40% of lightning current passes in the surge protective device established between lines of antenna equipment and telecommunications equipment. Therefore, care is needed to prevent damage occurring in the customer's equipment.

### Future Developments

The effects of sharing earth of customers and earth of electric power and communication lines and necessary performance of surge protective devices built into customer equipment are examined. Based on this result, lightning protection design guidelines will be established for the circuits where the distribution equipment, the customer equipment, and the communication equipment are included.

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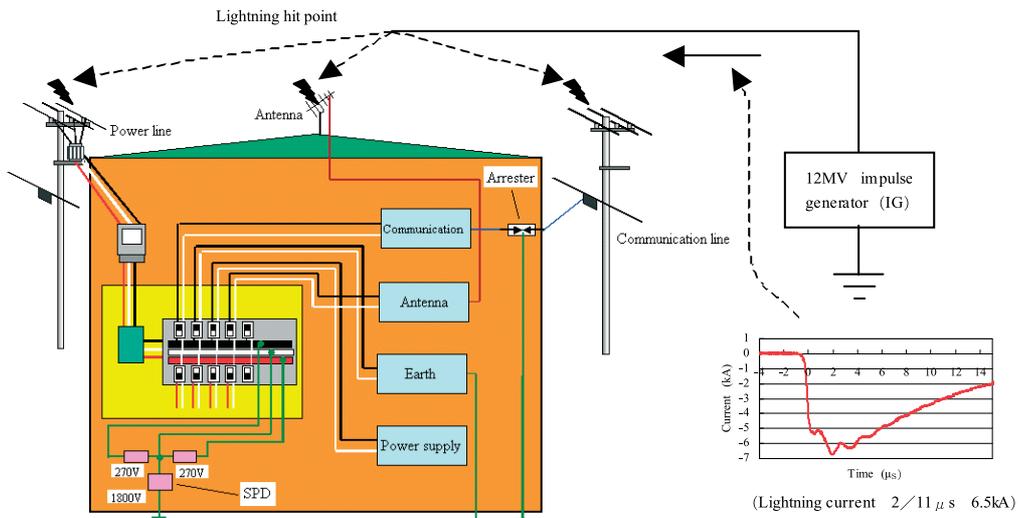
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### Reference

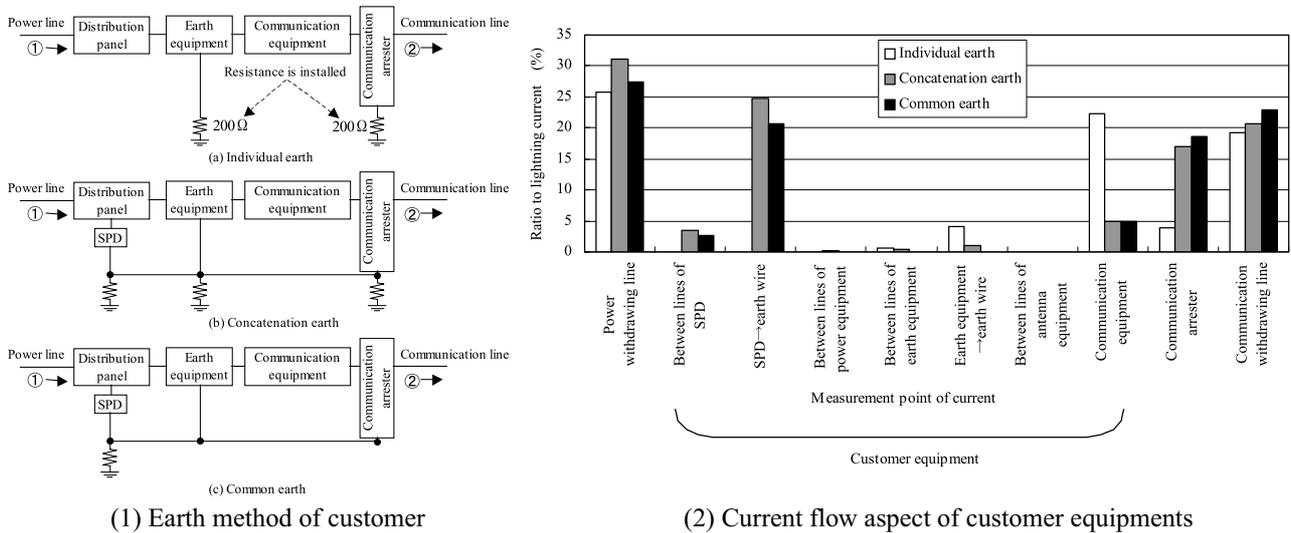
A. Asakawa, et.al., 2008, "Experimental Study of Lightning Surge Aspect for the Circuit mounted Distribution and Telecommunications and Customer Systems. - Branch Aspect of Lightning Current According to Grounding System of Customer", CRIEPI Report H07011 (in Japanese)

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\* 1 : Customer equipment: It is classified into (1) earth equipment, (2) power supply equipment, (3) antenna equipment, and (4) telecommunications equipment.

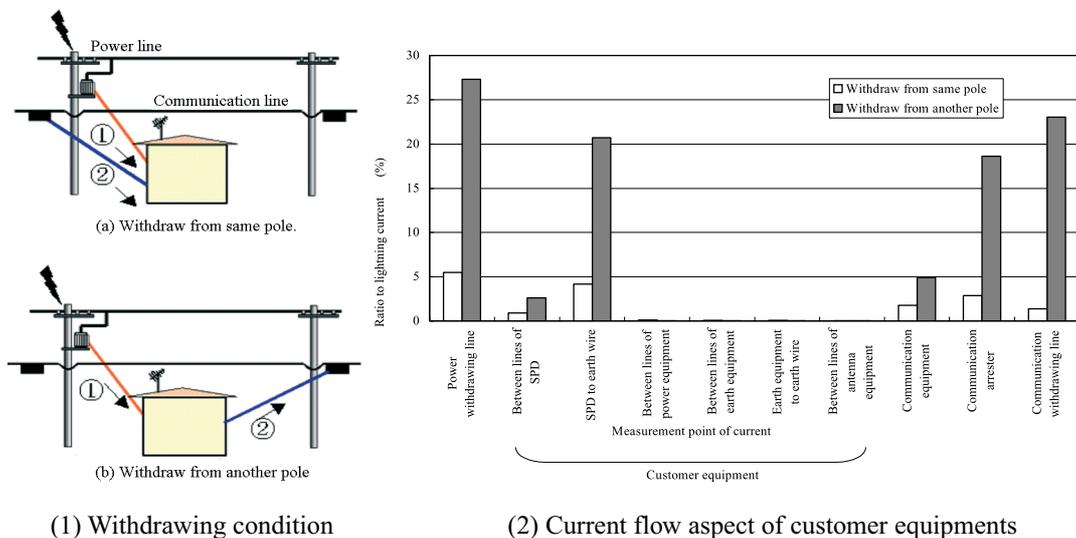


**Fig.1** Customer circuit and lightning hit point.



**Fig.2** Influence of customer's earth method.

(Withdraw the power and communication line from another pole and direct hit to the pole withdrawing the power line.)



**Fig.3** Influence of withdrawing condition of power and communication lines.

(Direct hit to the pole withdrawing the power line and common earth.)