

Analysis of Standard Tramway Surge Protection Methods Based on Real Cases

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Abstract : The study is based on lightning and surge standards mainly the EN series 62305 for facility protection, EN series 61643 for Low Voltage Surge Protective Devices, High Voltage surge arrester standard en 60099-4 and the traction arrester standards namely EN 50526-1 and 50526-1 dealing respectively with railway applications fixed installations D.C. surge arresters and voltage limiting devices. The more severe stress for tramways installations is caused by direct lightning on the catenary line. In such case, the surge current propagates towards the various poles and sparkover the insulators leading to a lower stress. If the impact point is near enough, a significant surge current will flow towards the traction surge arrester that is installed on the catenary at the location the substation is connected. Another surge arrester can be installed at the entrance of the substation or even inside the rectifier to avoid insulation damages. In addition, surge arresters can be installed between + and - to avoid damaging sensitive circuits. Based on disturbances encountered in a substation following a lightning event, the engineering department of RATP has decided to investigate the cause of such damage and more generally to question the efficiency of the various possible protection means. Based on the example of a recent tramway line the paper present the result of a lightning study based on direct lightning strikes. As a matter of fact, the induced surges on the catenary are much more frequent but much less damaging. First, a lightning risk assessment is performed for the substations that takes into account direct lightning and induced lightning both on the substation and its connected lines such as the catenary. Then the paper deals with efficiency of the various surge arresters is discussed based on field experience and calculations. The efficiency of the earthing system used at the bottom of the pole is also addressed based on high frequency earthing measurement. As a conclusion, the paper is making recommendations for an enhanced efficiency of existing protection means.

Keywords : surge arrester, traction, lightning, risk, surge protective device

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