

Railway accident investigation report

Tramway operator : Nagasaki Electric Tramway Co., Ltd.

Accident type : Vehicle derailment

Date and time : About 21:29, October 11, 2015

Location : At around 921 m from the origin at Nagasaki Eki-Mae tram stop, between Suwajinja-Mae tram stop and Kokaido-Mae tram stop, double track, Sakuramachi branch Line, Nagasaki City, Nagasaki Prefecture

SUMMARY

On October 11, the 375 tram, composed of one vehicle, started from Hotarujaya tram stop bound for Akasako tram stop of Nagasaki Electric Tramway Co. Ltd., departed from Suwajinja-Mae tram stop on schedule, 21:27. While the vehicle was passing through the right curved branch line to Nagasaki Eki-Mae tram stop, of the turnout in the Kokaido-Mae intersection, the tram driver noticed the tram turned to the different direction from the scheduled route and applied brake to stop the vehicle. The driver got off the tram and checked and found that the all two axles in the rear bogie derailed to left of the rail. There were 4 passengers and the driver onboard the tram, but there was no casualty. Here, the accident site was in the intersection of roads with tramway, but the derailed tram did not contact nor collide with automobiles etc., before and after the derailment.

PROBABLE CAUSES

It is probable that the accident occurred as follows, while the tram was running in the right curved branch line in the turnout, as the back side of the right wheel of the first axle in the rear bogie was contacting with side surface of the rail, having the role of guard rail, in the diamond crossing, the back side of the right wheel climbed up the guard rail and derailed to left, and after that, the left wheel of the first axle climbed up the left rail and derailed to left, furthermore, the second axle on the rear bogie also derailed to left.

It is probable that the right wheel of the first axle in the rear bogie derailed due to the increased derailment coefficient against the derailment from the back surface of the inner wheel, as the wheel load decreased and the lateral force on the back surface in the right wheel increased in the diamond crossing existed in the very small radius curve, also, due to the derailment coefficient exceeded the critical derailment coefficient as the critical derailment coefficient against derailment was decreased.

It is somewhat likely that the decrease of the wheel load and increase of lateral force acting on backside of wheel in the right wheel was effected by that the tram's running speed was fast when the tram passed around the start point of derailment, and the variation of the check gauge and the flangeway width in the running direction of the tram were large before the start point of derailment. Also, it is somewhat likely that the wheel load of the first axle was small compared to the second axle in the rear bogie, and there was the possibility of further reduction of wheel load by the powering operation, because the driving device of the tram was the axle hung type in which the

motor was mounted from outside of the axle and drove single axle, were also effected.

It is somewhat likely that, when the accident occurred, the critical derailment coefficient was decreased by the effects of increase in the coefficient of friction between back surface of wheel and guard rail at around the start point of derailment due to variation of lubrication oil in the wheel and guard rail, and decrease of the contact angle between back surface of wheel and guardrail decreased due to the wear of guardrail at around the start point of derailment.