

Executive Summary

TRA's Train No. 3198 at Pingshan Lane Level Crossing

On April 10, 2020, around 13:12 hour, Local Train No. 3198 of Taiwan Railways Administration (TRA), MOTC, departed from Chaozhou to Houli, collided with a trespassing tractor-trailer on Nanzi Pingshan Lane level crossing. The train driver, one security and four passengers were injured.

According to the Transportation Occurrences Investigation Act, the Taiwan Transportation Safety Board is responsible for investigating major transportation occurrences that arise in the R.O.C. territory. This accident is considered as a major transportation occurrence within the scope of investigation. The Railway Bureau, TRA, Directorate General of Highways, Kaohsiung City Government, Da Lu Eco-Friendly Automobile Freight Transport Co., Ltd and Southeast Cement Corporation were invited to participate in the investigation.

The investigation report was approved by the 31st Board Meeting on October 1, 2021, and published on October 29, 2021.

After comprehensive investigation and analysis of the factual data, a total of seventeen conclusions and thirteen safety recommendations were obtained, which are detailed as follows:

Findings

Findings related to probable causes

1. As the semi-trailer entered the Pingshan Lane level crossing, the automatic level crossing alarm sounded because the train was about to

pass. The driver drove through the level crossing and made a 90-degree left turn to leave the level crossing. However, the driver may become nervous due to the sound of the alarm, causing a delay in turning and a smaller turning radius. As the boom barrier at the west entrance of the level crossing lowered, the driver made a slight adjustment by moving back and forth but failed to complete the turn. Moreover, the boom barrier at the west exit of the level crossing was stuck on the truck bed. The driver may have decided to stop the vehicle, as damage to the boom barrier would result in compensation. The semi-trailer remained partially within the west side of the track area of the level crossing in Pingshan Lane level crossing.

2. During the time the level crossing warning was activated from 1311:38 to 1312:19 when the train collided with the semi-trailer, the driver of the semi-trailer failed to press the manual emergency alarm button next to the level crossing which would have sounded the alarm through the train radio protection system and activated the first and second warning signal located on the wayside, thereby notifying the train driver to apply brakes due to obstacle at the level crossing.
3. At 1312:17, the train was about 148 meters away from the Pingshan Lane level crossing. The driver began to apply the brake when he spotted the abnormality at the level crossing. From 1312:18 onwards, the train driver put the brake valve handle in the emergency brake position. At 1312:19, the train collided with the semi-trailer with the front of the 8th car of the train and stopped 163 meters away from the level crossing on the west main line. A total of 7 bogies of car no. 8, 7 and 6 were derailed.

Findings related to risk

1. The “Safety and Defensive Driving Handbook” of Da Lu Eco-Friendly

Automobile Freight Transport Co., Ltd. covers emergency response content by pressing the manual emergency alarm button when the vehicle breaks down or cannot move on railway level crossings. According to the safety assessment records of the company, the Directorate General of Highways (DGH) found that the company had not implemented driving safety education and training.

2. DGH initiated on-site safety assessments of Da Lu Eco-Friendly Automobile Freight Transport Co., Ltd. due to a drunk driving case involving another driver. The result showed that the company failed to fill in the monthly self-checklist in line with the “Regulations for Safety Assessment on the Automobile Freight Industry, Automobile Route Freight Industry, and Automobile Container Freight Industry.”
3. The road on the east and west sides of the level crossing of Pingshan Lane is the only access road to Southeast Cement Corporation. Although it complies with the curve design specifications for large vehicles, there is a higher risk for them to drive on this section due to the existing geometric conditions, inverted S-curve, and railway level crossing.
4. The road to the east of the Pingshan Lane level crossing is managed by Kaohsiung City Government. The inspection showed that there were no broken yellow lines and transverse rumble strip markings, pavement edge lines, grade crossing pavement markings, do not block intersection markings, and railway crossing signs were all blurry. The road to the west of Pingshan Lane level crossing, managed by TRA, has no any signs and markings.
5. At 1311:44, the level crossing automatic boom barrier began to lower. At 1311:53, the boom barrier touched the truck bed of the semi-trailer and failed to be in a horizontal position. The centralized crossing monitoring system (CMT) sent an alert to the centralized signal

monitor system (CMS) in the local electrical engineer office of TRA, but TRA has not assigned corresponding monitoring and contingency responsibilities to staff responsible for receiving the alarm message when the boom barrier is not in the horizontal position.

6. The “level crossing obstacles automatic detection system” had been installed at the Pingshan Lane level crossing. However, it had not been activated by TRA and therefore was not functioning at the time of the accident.
7. If the level crossing boom barrier is not positioned horizontally, the current alarm signal does not function like the manual emergency alarm button in the sense that it can activate the first and second warning lights near the level crossing and the train protection radio alarm, to alert the driver of an abnormal situation at the level crossing which the driver should apply the brake.
8. The existing video surveillance device at the Pingshan Lane level crossing is not equipped with a remote connection. If the external force of the accident causes damage to the host storage and retrieval equipment, the image may not be restored.

Other findings

1. The tachograph chart paper on the semi-trailer truck was unreadable due to repeated use.
2. The semi-trailer has insufficient brake lining thickness, insufficient tire tread depth, and insufficient rim number. The tachograph chart paper was not replaced daily, showing that Da Lu Eco-Friendly Automobile Freight Transport Co., Ltd. had not implemented proper self-management.
3. Prior to reaching Pingshan Lane from Kaohsiung Port, no evidence pointed out that there was any abnormality involving the vehicle’s

operations, brakes, or fuel system. According to the GPS, the semi-trailer did not stall at the time of the accident.

4. Prior to the accident, the train speed complied with the regulations. The driver did not receive the warning from the level crossing warning lights. After spotting the intrusion of the level crossing, he immediately applied the emergency brake complying with the regulations.
5. The driver suffered from the impact and lost the ability to activate the train radio protection system. The conductor and station staff reported and tackled the situation by dispatch radio, complying with the regulations for emergency response for a train derailment.
6. Prior to the accident at the Pingshan Lane level crossing, all functions were normal, including the operation of the automatic warning device, the operation of the automatic boom barrier, the alarm function of the manual emergency alarm button, the display of the warning lights, and the host of the train protection radio system. Among them, the activation timing of the automatic warning device was in line with the signal logic design.

Safety Recommendations

To Da Lu Eco-Friendly Automobile Freight Transport Co., Ltd.

1. Require the driver to fill in the checklist prior to departure in line with self-management items listed in DGH's "Regulations for Safety Assessment on the Automobile Freight Industry, Automobile Route Freight Industry, and Automobile Container Freight Industry" as well as implementing all items listed in the self-checklist monthly to stay updated with the status of the vehicle and ensure safety.
2. It is recommended to implement driving safety education and training for all drivers, especially regarding safe passing at level crossings.

To Directorate General of Highways, MOTC

1. Supervise the automobile freight industry to implement the requirement for drivers to fill in the pre-departure checklist and all items listed in the monthly self-checklist.
2. Increase the frequency of driving safety education and training in the freight industry safety management self-checklist and supervise the trucking companies to execute the implementation properly.

To Southeast Cement Corporation

1. Re-examine the integrity of the signs and markings on the road west of the Pingshan Lane level crossing as a guideline for road traffic.
2. Increase the turning tolerance value for large vehicles on the road west of the Pingshan Lane level crossing to improve driving safety at the level crossing and on the road.

To TRA

1. Accelerate the completion of the automatic obstacles detection system at Grade III level crossing and above, or add the function of automatically activating the warning lights and train radio protection warnings at level crossings when the level crossing automatic boom barrier is not in the horizontal position.
2. Develop the monitoring standard operating procedures and emergency response regulations upon receiving anomaly alarms from the level crossing monitoring equipment.
3. Update the existing level crossing video surveillance devices with the function for remote connection.
4. Coordinate with Southeast Cement Corporation to set up traffic signs and markings on the road west of the Pingshan Lane level crossing in line with the “The Regulations for Road Traffic Signs, Markings, and

Signals” to serve as the guideline for road traffic and increasing the turning tolerance value for large vehicles.

To MOTC

1. Supervise and review the geometric shapes of the road west of Pingshan Lane level crossing and the traffic entering and leaving Southeast Cement Corporation to improve the driving safety of level crossings and roads.
2. Revise relevant laws and regulations such as the Highway Act and the Regulations for Automobile Transportation Operators to enhance the authority of highway motor vehicle agencies inspecting the self-safety management of the automobile freight industry.

To Kaohsiung City Government

1. Re-examine the integrity of the signs and markings on the road east of the Pingshan Lane level crossing to serve as the guideline for road traffic.

Note: The language used in the occurrence investigation Final Report is in Chinese. To provide a general understanding of this investigation for the non-Chinese reader, the Executive Summary of the Final Report was translated into English. Although efforts are made to translate it as accurately as possible, discrepancies may occur. In this case, the Chinese version will be the official version.