Fire in the subway station in Teagu-city, Korea

【February 18th,2003　Korea, Teagu-city】

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In the First-Line Subway in Teagu-city, Korea, a fire occurred due to arson by a passenger in the first car at Tyuoji station.

The fire rapidly spread throughout the entire train. Moreover, one minute later, an oncoming train came into the station and the fire leaped across to the oncoming train.

The loss of power happened right after the fire occurred.

As a result, two trains and twelve rolling stocks were all burned.

The accident caused 192 deaths and 146 injuries. In the oncoming train, there were 142 dead bodies.

The reason is that the driver of the oncoming train left the train without opening the doors, so many people could not escape.

Figure.1 Map of Korea

1. Event

In the subway in Teagu-city, Korea, a fire occurred in a train due to arson by a passenger. Moreover, an oncoming train came into the station, and the fire leaped across to the oncoming train. Two trains and twelve rolling stocks were all burned. The fire, smoke and poisonous gases caused 192 deaths and 146 injuries.

2. Course

On 18th of March, 2003 at about 9:53am, when a train having six rolling stocks came into the Tyuoji station on the First-Subway-Line, a man age 56 riding in the train suddenly spread inflammable liquid (5 liters of gasoline) from several pet bottles that he was carrying and set the liquid on fire using his lighter. First, the clothes of the arsonist and seat sheets caught fire, and then the fire began to burn rapidly. The passengers tried to escape immediately.

There is a hard-and-fast rule that if a fire breaks out, the oncoming train has to stop or pass through the scene. Each train is connected to the commanding officer in the headquarters of the subway company with a wireless telephone. In the case of an emergency, the commanding officer of the subway company had to control the situation. However, in this accident the commanding officer of the station had not grasped what was happening, and he failed to order the trains near the station to stop. As a result, at 9:56a.m., the oncoming train-no.1080- came into the station. The commanding officer and the subway company did not anticipate so much damage, so they tried to make the passengers escape in the station.

The driver of the oncoming train shut the doors and tried to start the train in order to escape from the fire. However, at 9:57a.m., the fire sensing system operated and stopped the electricity in the station automatically. Then, the fire leaped across to the oncoming train （Figure.2）. The electric power operator tried to start the electric power to the train no.1080 so that the train could pass through the station, but it failed. The wireless telephone to the commanding officer was cut off, the emergency lights did not work, and the station became completely dark. These factors contributed to the confusion of the passengers.

The driver of the oncoming train got out of the train because he had judged that it would be difficult to put out the fire. When the driver got out, he locked the master key of the train. If he had not locked the master key, the doors would have opened when the power was cut. However, when the master key is in the locked position and the electric power supply is cut, the doors are automatically kept closed. The emergency battery power did not operate.

The passengers in the oncoming train were left inside the burning train. In two of the six rolling stocks, there were staff members of the company and the railway agency among the passengers. They succeeded in opening the emergency doors by manipulating the valve lever under the seats.

The fire spread quickly from the lowest floor to the upper floors. The passengers in the station had to escape by using the stairs; so many people could not escape in time (Figure.3).

The passengers in the oncoming train could not escape immediately, and they became victims of the fire, smoke and poisonous gases from the burning materials in the train. In the oncoming train, there were 142 dead bodies. (There were no dead bodies in the

rolling stocks of the train where the arson was committed) This was 79% of the estimated number of the passengers on the oncoming train and 74% of the total number of deaths from the fire.

There were 50 dead bodies in the station. Many of them were around the ticket gates on the subbasement, which was one floor higher than the platform.

3. Cause

The direct cause of the fire was the arson committed by the passenger. However, the reason for the arson is not discussed here. The reasons why the accident caused such a large amount of damage are described.

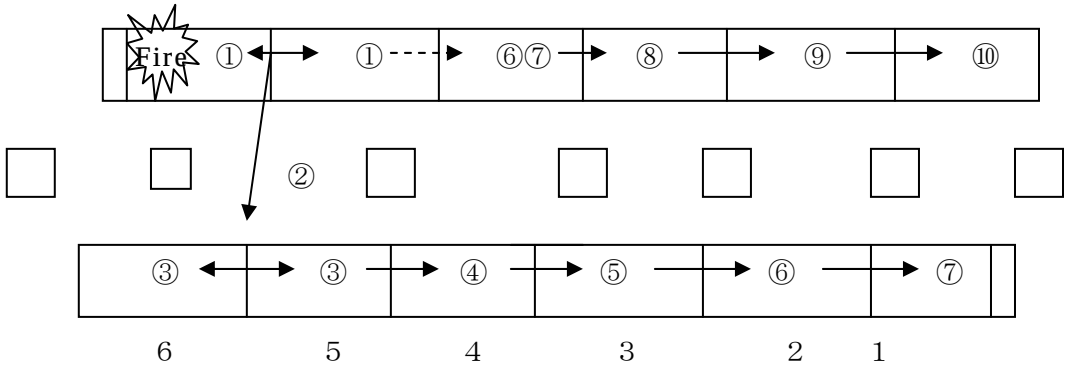
1. The materials of the train

One of the indirect causes of the damage is that the materials used in the train were not fireproof but fire-resistant in order to lighten the weight of train. These materials rapidly caught fire and produced a large amount of smoke and poisonous gases.

While the doors connecting the cars of the train were closed in the train where the fire started, in the oncoming train, there were no doors in the connections between the cars. The oncoming train was moving fast. When the third rolling stock caught fire, the fire spread rapidly to all six rolling stocks. It is because the connecting part was open, so it was easy to spread and the cornice of the connecting part was made from synthetic resin which is not resistant to flames.

2. The structure of the station

The platform was on the B3 floor, the ticket gates on the B2 floor, and the underground shopping center on the B1 floor, although when the fire broke out, the shutter to the shopping center was closed. Furthermore, the layout of the stairs was very complicated, and it was difficult for the passengers to find the evacuation route. The safety design of the space had not taken into account the possibility of this kind of large fire. For example, the fire extinguishing facilities, the evacuation route, and the shelters were inadequate. The structure of the subway station was a closed space, and there were many air inflows throughout the tunnel. When the fire broke out, the structure of the subway station turned into an oven and chimney. (note3)



※ The circled numbers indicate the order of the spread of the fire

※ Figure 2 The situation of the fire (Source Fire and Disaster Management Agency)

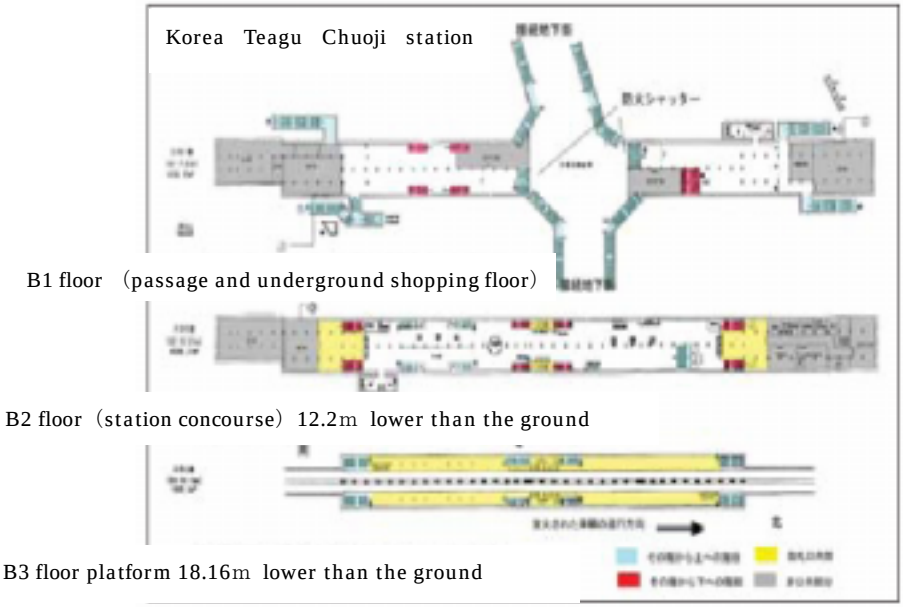


Figure 3, the structure of Chuoji station (Source Fire and Disaster Management Agency)

3. The human problems

In the subway public corporation, the various communications between the command center, the trains and the station became confused, so that effective countermeasures were not taken, the operation control failed, and the oncoming train came in to the area of the fire. The doors of the train could not be opened and the staff members of the subway company did not guide the evacuation for the passengers.

In the command room, the outbreak of the fire was displayed on the monitor, and the alarm bell also rang. However, they ignored these indications because of frequent malfunctions, and therefore the recognition of the fire came too late (note of 4).

Also, the commanding officer firstly found out the fire in the report from the station staff, since the driver of the train where the fire was started did not inform the command center of the fire immediately. The outbreak of the fire was informed to all the trains under operation, two minutes after the fire started. However, the commanding officer only worn the facing train and the shutdown order was not issued.

The driver of the oncoming train tried to close the doors that had been opened once in order to start the train, but he could not do that because the power had been cut. During that time, the commanding officer could not grasp the situation, but the driver waited for an order from the commanding officer, and he did not do anything for about five minutes. Afterwards, although the commander ordered the oncoming train driver to open the doors and made a broadcast in the train, the driver had pulled out the master key and taken refuge.

It can be said that the communication between the command center, the drivers of each line car, and the station staffs did not function and that there was a lack of both professional consciousness and safety consciousness.

４. Immediate Action

The Fire-Defense Headquarters in Teagu city recognized the fire accident at 9:54a.m. This is only one minute after the outbreak of the fire. They began preparations to go to the site of the accident at 9:55, and the first fire-fighter group arrived at the fire at 9:58. The first report of the fire was given via a citizen's mobile telephone. There was no report from the driver to the commanding officer or from the commanding officer to the fire station.

After the fire fighting headquarters and the police received the first report of the fire from the citizen, they contacted the commanding officer, and then the commanding officer confirmed the train and the station. Therefore, the information flow was the reverse of the usual flow of information. The confusion of the communications system prevented the related parties from understanding the actual situation.

There was a Fire-Defense Headquarters near Tyuoji station. When it received the first report, black smoke could be seen through the window. This black smoke was also the obstruction to the rescue activity.

After the fire fighters arrived, they recognized that there were many dead and injured people and that it was difficult to enter into the underground floors. Therefore, they undertook first aid and rescue operations first. After the rescue operations, they tried to fight the fire.

5. Countermeasure

As a result of the posteriori verification, it was determined that the reason why such a simple incident caused so much damage was the failure of the staff members to act in a natural way.

However, the policy of the government had been focused on improving the facilities, for example, raising the fire-safety-standard of the train materials to the advanced nation level, achieving a total of 6036 rolling stocks by 2007, and establishing emergency lights, fire extinguishing facilities, direct evacuation stairs, and light emitting guidance displays in tunnels and stations.

Of course, the training of the staff members for handling situations involving fire, poisonous gas, and train collisions also played more vital role than before, but it would not be sure whether it is really safe even in the field. The Seoul metropolitan railway public corporation is the most excellent of the Korea subway companies. In the company, extracted training is carried out one or two times a month. It is done by only staffs and they only do the manual way checks.

And, the plan to complement is based on the audit by the construction traffic division, etc. The cost was 1.353 trillion won, which is equivalent to about 135.3 billion Japanese yen (note of 2).

However, the government supports is only 40% for the interior material in all cost. The government shifted the rest money to each subway company to raise the subway charge or improve finance structure.

Like them, the plans to complete the facility are like just ordered without financial covers, so there is much doubt as to the plans.

6. Knowledge

① Safety design should be carried out assuming the worst case. Facilities should be provided to handle the largest-scale accident that can be considered. The lives and safety of the people must not be ignored in favor of economic efficiency. Human life and safety is the most important.

② At the workplace where human lives are at risk and should be secure, even if high-grade machines or information systems are available, the workers should be required not to put too much trust in them. It is important to touch the actual tings and ascertain the reality on the spots.

③ The managers and workers should pay attention to risk management and make efforts to enhance the reliability.

④ Investigation not only by the operating or related organizations, but also by a third

party is necessary.

⑤ Passengers need to think of the measures to defend themselves. Examples include “to have attention and interest to the neighbor, and prevent the disaster previously”, “to simulate the situation that occurs when the accident happens”, and “to know the way to defend oneself in a fire”.

7. Background

In Korea, for about 10 years, from 1990 to 2003, large accidents have occurred frequently including this subway fire accident, the fire in the Sampun department store, the collapse of the Sonsu bridge collapse, and the ship “Perry” that sank in the Yellow Sea. The frequency of these accidents is caused by the rapid modernization over a short period of time in Korea.

The interests were focused on only the economical results that could be achieved in the short period of time. They began to have a social sense of values in which they were indifferent to the safety issues that did not produce visible economic effects easily.

Therefore, this systematic characteristic of Korea society caused the frequent large accidents that they should have been able to prevent.

The development of the private network made from relatives and same school, same province relation conflicted with the formal system, and they did not become to protect various safe rules.

8. Sequel

The driver of the oncoming train reported to the police about twelve hours after the accident. In the interval between the accident and his reporting to the police, the driver had met with the senior staff of the subway public corporation regarding about the way that he should make his testimony to the police. The audit chief director of the subway public corporation had removed the video tape recording the premises of the station right after the accident. In addition, the station had cleaned up the station rather than leaving it the way it was as they should have done, after the damaged trains were moved to the garage.

The Teagu subway public corporation showed an inclination to conceal evidence and evade their responsibility for the damages. They appeared not to have tried to learn a lesson from this failure for the future because they had made no disclosure of information regarding the causes and procedure of the accident. At the first trial of the justice, the five commanding officers of the station, both drivers, and a station staff member, a total eight persons, were convicted.

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note2) 100 won ＝10 yen

note3) In the case of fire occurring in an underground floor, an oblong space has the danger of becoming a flow route for the smoke like a chimney. This flow is generated by the buoyancy of the hot smoke, and it is called the chimney effect.

note4) This is the phenomenon of the boy who cried wolf boy effect: because erroneous warnings had been given before, the confidence in the warning fell.

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