

## **The fire disaster in the Tokyo-Nagoya Nihon-zaka tunnel**

**July 11th 1979 Shizuoka Prefecture**

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On July 11th 1979, at around 18:40, on the line (bound for Nagoya) of the Tokyo-Nagoya highway, a fire disaster occurred in Nihon-zaka tunnel at a location 400m from the exit of the tunnel as a result of a collision between four big trucks and two small passenger cars, and the fire expanded to the cars behind. Due to this disaster, seven persons died as their cars burned, two persons were injured, and 173 cars caught fire. Furthermore, damage of the tunnel itself and of the equipment for fire extinguishing had occurred. Finally, the disaster caused the major transportation artery connecting Tokyo and Nagoya to be shut down temporarily, resulting in a major confusion of the regional transportation network.

### **1. Event**

At around 18:40 July 11th 1979, on the Nagoya-bound line of the Tokyo-Nagoya Highway, in the 2045m long Nihonzaka-Tunnel at a location 400m from the Yaizu-side exit, a large truck with an Osaka license plate number collided with a large truck with a Nagoya number from behind. The passenger cars behind the truck and another large truck also collided with the first two trucks. It was thought that a fire had broken out from one of the passenger cars, and that the fire first expanded to all five trucks and cars, filling the inside of the tunnel with black smoke.

The driver of the car behind the location of the accident put his car into reverse and made a space of at least 70m from the fire, but the fire expanded and engulfed the following cars including his car.



Figure 1 : The location of Nihon-zaka (日本坂) tunnel

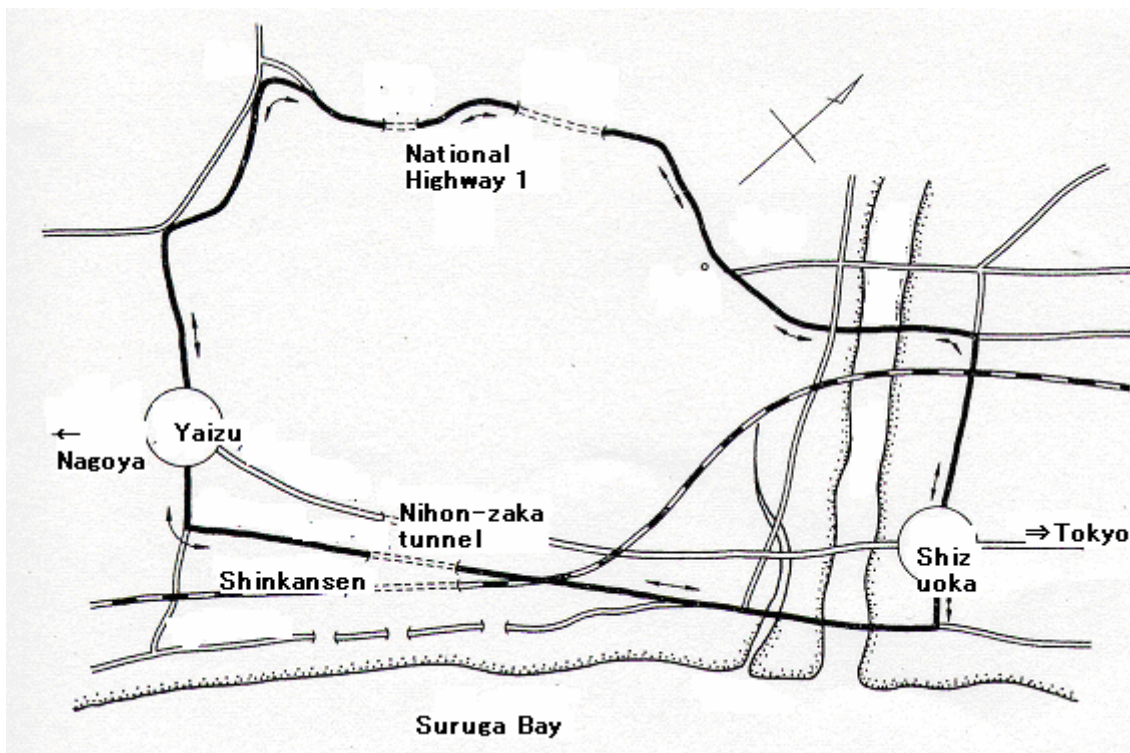


Figure 2 The location of Nihon-zaka tunnel (Source: Highway and car. The research community of highways, Nihon-zaka tunnel's fire disaster and its aid actions.)

## 2. Course

In the truck and cars that collided and caused the fire, there were three passenger car

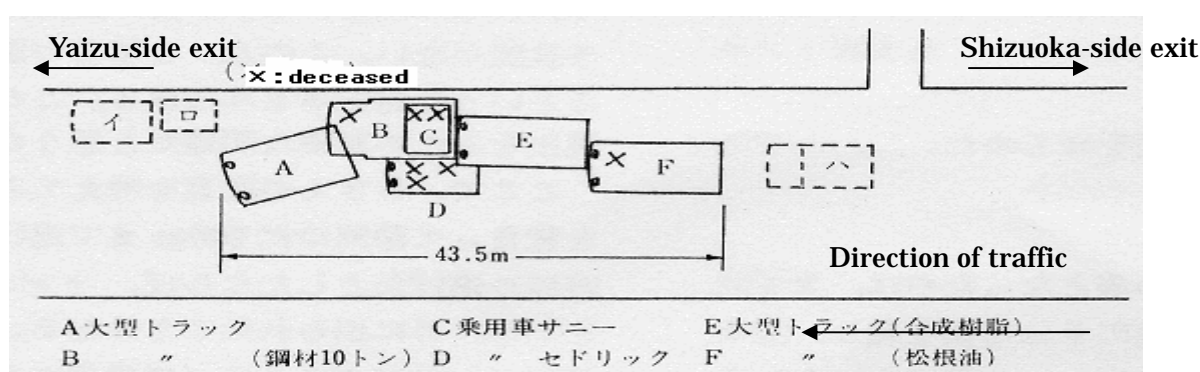
drivers and one truck driver. The drivers of the other cars tried to rescue them, but it was impossible because of the fire and smoke. So they walked to the Nihon-zaka parking area 3km from the place of the accident and informed the officials there of the accident.

### 3. Cause

The second large truck (B) ( please see Figure 1) collided with the first truck (A) from behind, and the following two passenger cars (C) and (D) collided with the truck (B) one by one. Next, the sixth vehicle, truck (F), collided with the fifth vehicle, passenger car (D), at a speed of about 100km. Because of these circumstances, the passenger cars were crushed between the trucks, then a crack was made on the gasoline tank, and the fire and explosion occurred due to an electric circuit short.

The cause of the first collision was the sudden braking of truck (A), due to the lateness of the traffic jam. The truck stopped just touching a van and a truck located in front of it. The traffic jam was caused by a small accident where two trucks had collided close to the Yaizu-exit. These two trucks were quickly moved away, but not before a traffic jam was generated around the exit. Truck (A) braked suddenly 100m away from this traffic jam, and the following truck (B) collided with truck (A) from behind. In addition, before this accident, a traffic accident had occurred in this tunnel close to the Shizuoka-side. After the occurrence of the accident close to the Yaizu side, the alert on the entrance was activated, but about 80 cars and trucks still entered into the tunnel after that activation. Actions in a highway accident occur on the scale of minutes and seconds.

Please look at Picture 1 showing the condition of the disaster location after the fire.



Large truck (A) passenger car (C) Large truck (plastic) (E)  
 Large truck (Iron 10t) (B) Passenger car (D) Large truck (plant oil) (F)

Figure 3 Sketch of the location of the disaster (Source: Fire disaster Japanese academy of fire disaster “The fire disaster of Nihon-zaka tunnel)



Picture 1 The condition 1240m from the Shizuoka-side Exit (Source: Highway and car. The research community of highways, Nihon-zaka tunnel's fire disaster and its aid actions)

#### 4. Immediate Action

This accident occurred in a tunnel that was equipped with a disaster-prevention facility of rank A. The actions of the administration offices related to this accident were as follows.

**18:39** the vehicle accident was recognized.

**18:39** From the emergency call in the tunnel to the Control office in Kawasaki, information was made available that a fire accident from a vehicle collision had occurred. The information was passed on to the fire fighting department of Shizuoka. At the same time, the control room of Shizuoka also recognized the accident from the alert bell and it observed the fire on the ITV system due to the fire occurrence alert. Each of the fire prevention facilities were operated in the following order; display of the "Do not enter" alert on the alert board of the tunnel entrance, activation of the sprinklers as well as all of the lights and ventilation fans.

**Around 19:05** A malfunction of the ITV and the lights was shown in the control room. After this time, only the ventilation fan for escaping was working. All other facilities, including lights and fire extinguishers, were not functioning because the

cables were burnt; the fuses were blown out and so on.

**Around 19:45** The pump was restarted by hand in the east ventilation tower.

**Around 19:50** The patrol car arrived at the site of the accident and started to lead the evacuation.

**Around 20:05** The 170t of water in the main tank was exhausted.

**Around 21:30** 208 passenger car drivers in the tunnel were rescued and moved into the Shizuoka control office.

## 5. Countermeasure

From July 14th, the investigation of the accident was started, and improvements of the fire extinguishing facilities and the regulations inside the tunnel were begun. These operations were completed around August 8th to September 5th. For the electric circuits of a quarter of the lights, the escape leading lights and the sprinklers, fire-proof cables were installed. This measure was not required by the regulations at that time, but was installed as a drastic measure in this case. \*10 water taps for extinguishing fires were installed for every 200m of the tunnel. Before this accident, these were installed only on the entrance and exit. \*Self-powered exit lights that can shine for 30 minutes after a loss of power were installed in three places, and escape leading lights were installed in eight places. \*Two alert boards (one is 700m ahead of entrance, the other is at entrance ) were installed. According to the regulations, one alert board 200m ahead of the entrance was enough. \*The speed limit in the tunnel was fixed at 70km/h. \*Lane changes in the tunnel were made illegal. \*Distance confirmation sign and it on the road were made. \*For the alert, thin pavement on the entrance were made.

## 6. Sequel

Repair costs paid for this tunnel disaster and the costs for the improvement of the disaster prevention equipment are totally 3.4 billion yen. And profit reduced by the suspension of traffic caused by this accident was estimated 3.3 billion yen. If we could prevent the disaster by effective disaster prevention equipment, as the result, the investment would become the effect of plus.

## 7. Knowledge

This vehicle accident would not have occurred, or at least would have been much smaller, if the trucks and cars had maintained space between the vehicles and if the other cars had obeyed the alert on the tunnel entrance. Considering that there are a lot

of trucks that contain dangerous and inflammable materials, the ability to prevent all accidents by improving the fire prevention facilities is limited. In fact, this accident had occurred in a tunnel with a ranked fire prevention facilities. In addition to the hardware side of fire prevention, the software side of it, such as increasing the sense of caution of the drivers, is also important.

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<Reference>

**Nihon-zaka tunnel disaster and its civil responsibilities.**

Kazurou Kunii, Jurist Yuuhikaku 1979. 10

**Nihon-zaka tunnel's fire disaster and its aid actions**

The research community of highways. Highway and car. 1979. 12

**Repair of the Nihon-zaka tunnel**

Toshitaka Samezima, Kimiaki Akai, Norio Yamada

Japan society of civil engineering 1980. 04

**Lesson from the Nihon-zaka tunnel disaster**

Motokazu Hoshi Highway and car The research community of highways

1980. 07