

Golden Shopping Center in Front of Shizuoka Station in Shizuoka City,
Shizuoka Prefecture
(Accident Involving Underground Explosion of Gas)



1. Characteristics of the fire

This is an explosion incident at the Golden Shopping Center in front of Shizuoka Station. The primary explosion occurred when combustible gas which had accumulated underground ignited. In addition, the primary explosion ruptured a gas pipe, igniting the gas which leaked out of the pipe, causing a secondary explosion. As a result of the secondary explosion and the subsequent fire which emerged in the underground shopping center, 15 people died, including 5 fire fighters who were attempting to extinguish the fire, and 223 were injured.

2. Overview of fire outbreak

(1) Time and date of emergence

First explosion around 09:30, second explosion and fire around 09:56 on August 16, 1980 (Saturday)

(2) Time and date of detection (Detection method)

Around 09:30 on August 16, 1980 (Saturday) (119 call placed)

(3) Time and date of extinguishment

Around 15:30 on August 16, 1980 (Saturday)

3. Overview of fire origin

(1) Location

7-16 Koyamachi, Shizuoka city, Shizuoka prefecture

(2) Name of building where the fire emerged

First building of the Golden Shopping Center

(3) Structure and configuration of building where the fire emerged

① Date of construction

Completed in December 1964

② Target use of the building

Multi-purpose fire-resistant structure (Article 16 a)

③ Structure

Fire-resistant construction of 6 stories above ground and 1 story below ground

④ Area (Building area)

Building area: 719.85 m²

Floor area: 3,510.24 m²

⑤ Number of accommodated people

712

⑥ Number of workers

Unknown

⑦ Number of tenants: 88 stores (49 inside the first building, 39 in the underground shopping center)

8 partial owners (including Dairakuten and Owada)

⑧ Use and floor area for each floor of the building

Floor	Area	Use
6	137.95 m ²	Shops
5	533.74 m ²	"
4	533.74 m ²	"
3	533.74 m ²	"
2	533.74 m ²	"
Above ground 1	533.74 m ²	"
Below ground 1	703.59 m ²	"
Total	3,510.24 m ²	

(4) Status of installed fire extinguishment and prevention facilities

① Fire extinguishment facilities

Fire extinguishers, internal fire extinguishment facilities

② Alarm systems

Automatic fire alarm system

③ Evacuation facilities

Guiding lights, evacuation equipment: one slow elevator each on the 4th and the 5th floors

(5) Status of fire prevention measures

Established following the conventional regulations for shared fire prevention management for the Golden Shopping Center underground shopping area in front of Shizuoka Station

① Fire prevention managers

Notification of selection from December 1971 (organization of a shared fire prevention management committee and selection of supervising fire prevention managers)

② Fire prevention plan

Completed report

③ Evacuation drills

Performed several times as block units of fire training

4. Weather conditions

(1) Weather

Cloudy

(2) Wind direction, speed

Southerly, speed 1.8 m/s

(3) Temperature, humidity

Temperature: 26°C, relative humidity 78%, effective humidity 73%

(4) Weather warnings, bulletins, etc.

5. Cause of fire

(1) Ignition source

First explosion: the flame of a gas stove

Second explosion: unknown

(2) Route

First explosion: gas accumulated inside an underground hot water tank (combustible gas, possibly methane), which was ignited by the flame of a gas stove

Second explosion: the first explosion caused a crack to appear in a town gas distribution pipe inside the building. As a result, the gas which started leaking into the underground shopping area was eventually ignited by one of the fires.

(3) Ignited substances

First explosion: gas (combustible gas, possibly methane)

Second explosion: town gas

6. Fire damage

(1) People

① Fatalities

15 (4 firefighters; 1 firefighting group member; 10 others)

(1 other person died after 48 hours)

② Injured

223 (28 firefighters; 2 firefighting group members; 193 others; 223 total)

(2) Property

① Building where the fire emerged

(a) Damage incurred by explosions or fire

First building: 44 shops and offices, total building area of 719 m², total floor area of 3510.24 m² and 2 cars completely burned

(b) Damage incurred by the blast

58 buildings, 131 shops and offices Names of buildings with most damage

Golden Shopping Center first building

(completely burned)

Seibu Department Store } damaged

Shinwa Building }
}

(c) Cost of damage 554,226,000 yen

② Structures to which the fire spread

Seibu Department Store, Shinwa Building - partially damaged

7. Fire route (progression)

(1) Overview of outbreak location

Although it is considered that the fire emerged in a shop on the 1st floor, due to the large area affected by the explosions, it is impossible to determine whether it emerged inside the shop or in the ceiling.

While firefighters and rescue teams were working onsite after the first explosion, a second explosion occurred with catastrophic consequences.

(2) Situation up until the outbreak

Although some combustible gas (possibly methane) exploded in an underground shop around 09:27 after being ignited by the flame of a gas stove, it did not lead to the outbreak of fire. This explosion caused a town gas distribution pipe to rupture, and the gas leaking

from the pipe flowed underground and into the shop through ducts. It is assumed that the gas exploded after being ignited by an unknown fire source, which caused an outbreak of fire.

(3) Progression up to fire detection

Around 09:30, there was a call to 119 of an explosion in a restaurant on the 1st floor of the first building.

(4) Notification of fire department

There was a call to 119 from a shoe store called "Diana" located on the first floor of the first building in the Golden Shopping Center. Later, the second explosion was announced using a wireless alarm.

(5) Initial firefighting attempts

Although there was no outbreak of fire after the first explosion, the firefighters took measures to ensure that water could be dispensed if a fire did occur as they approached the site. Upon detecting gas leakage into the underground shopping area, directions for evacuation were given, and while operations for ventilating the area were being prepared, a second explosion occurred.

(6) Fatalities

Those who died in the second explosion were neighbors as well as firefighters and firefighting group members, all of whom were performing rescue operations after the first explosion.

(7) Evacuation

People evacuated themselves or received evacuation guidance from the rescue teams.

(8) Firefighting group activities

They were unable to take any systematic action.

(9) Propagation of the fire

Since town gas is lighter than air, it accumulates in spaces with poor ventilation, such as overhead storage spaces and air conditioning ducts, and it is considered that the gas travelled upwards from underground via the elevator shaft and filled the building. In addition, since a gas pipe was ruptured by the first explosion, the second explosion affected both the underground shopping area and the 1st floor simultaneously. Although it seems that there were several explosions after the outbreak of fire, it is assumed that this was due to the time needed to close the pipe completely.

8. Firefighting activities undertaken by the fire department

(1) Dispatched units

① Dispatched vehicles

Dispatched fire trucks	4
Tank fire trucks	7
Chemical fire trucks	2
Rescue operation trucks	1
Hook-and-ladder trucks	3
Communications fire trucks	8
Fire prevention trucks	1
Ambulances	6
Firefighting groups	11
Total	43

② Dispatched personnel

Firefighters with ranks up to director of fire department	332
Firefighting group members	376
Total	708

(2) Firefighting and rescue activities

The firefighting units entered the underground shopping area in readiness to dispense water in case a fire occurred. After checking for people, at 09:35 they placed "Fire strictly prohibited" and "Please evacuate the premises" signs around the area in case of fire. At that time, they detected gas on the landing of an internal staircase going to the 1st floor which was isolated from the point of the initial explosion by a concrete wall, a mechanical room and another concrete wall. Subsequently, the officers who detected the gas focused on determining the place of origin, the scale and the area affected by the gas leakage. After searching for people and providing evacuation guidance to those found on the 1st floor, the firefighters proceeded with ventilation, and the second explosion occurred immediately after evacuation of the 1st floor was complete.

① Firefighting activities

The second explosion caused a fire, and people who were standing around waiting for orders were injured. As a result, fire extinguishment operations were undertaken when reinforcement units arrived. The gas pipe was completely closed at 14:10 and the fire was extinguished at 15:30.

② Rescue activities

The fire propagated to the upper floors, and the debris produced by the second explosion considerably obstructed extinguishment. For this reason, hook-and-ladder trucks were used in order to prevent the fire from propagating further and to provide evacuation guidance. The central ladder truck unit rescued 2 persons (females) from the roof, and the southern unit rescued 1 person (female) from the roof.

In addition, other units rescued many individuals underground and on the 1st floor who were trapped under debris produced by the explosion.

Hospitalizations

177 were admitted to hospital (9 hospitals), 31 accepted at clinics

9. Problems, lessons learned

(1) Extinguishment operations in cases of gas leakage

① Taking precaution measures

(a) The procedures for placing warnings in a dangerous area, prohibiting entry and performing thorough evacuation should be known to everyone.

② Public announcements

It is necessary to undertake studies regarding the public announcement of prohibition to use fire in areas where there is a danger of fire.

(2) Safety measures with regard to gas

It is necessary to promote measures such as strengthening the smell of town gas and installing gas leakage alarm systems, gas detectors and linked emergency cut-off valves.

10. Documents

Fig. 1 Layout

Guide map

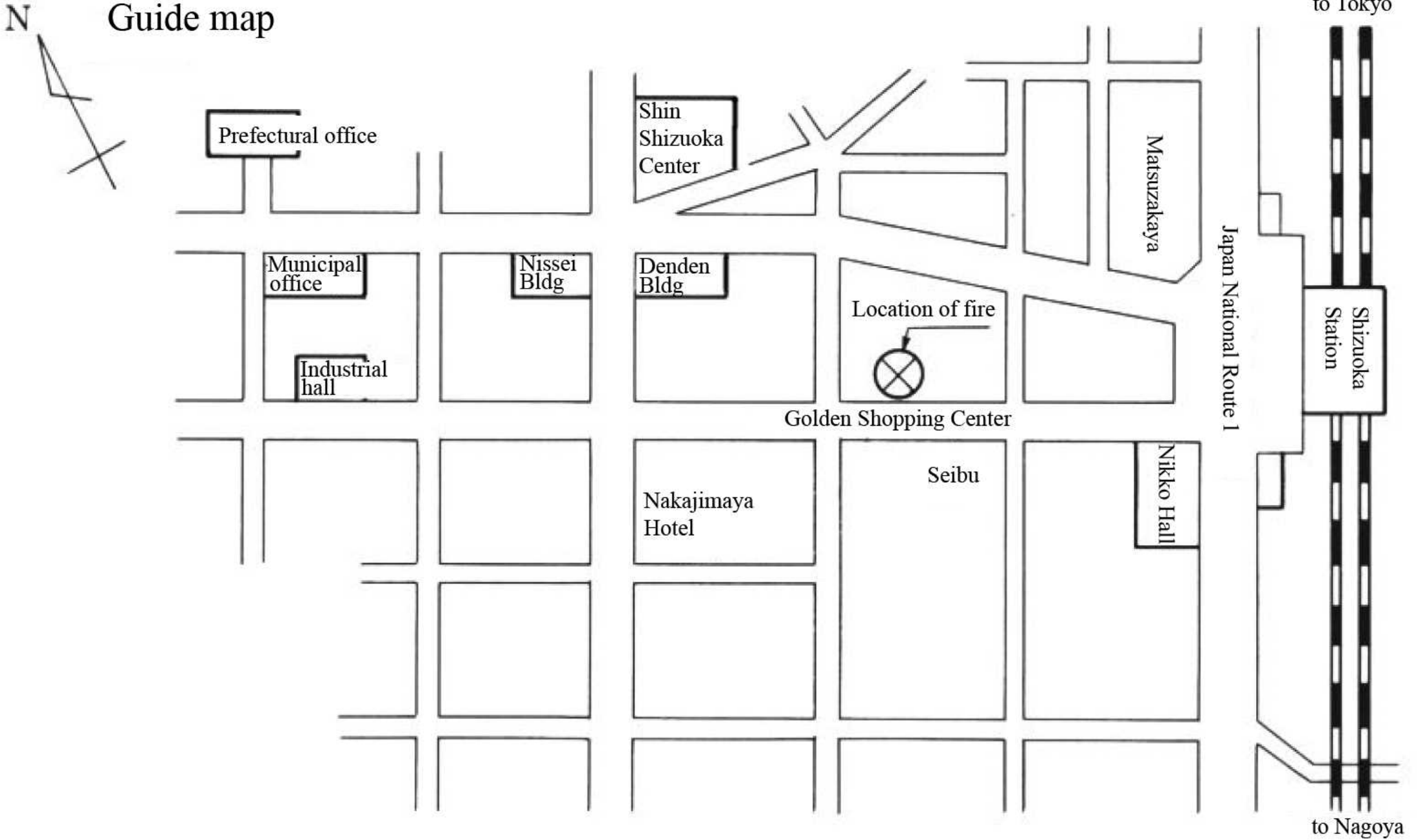
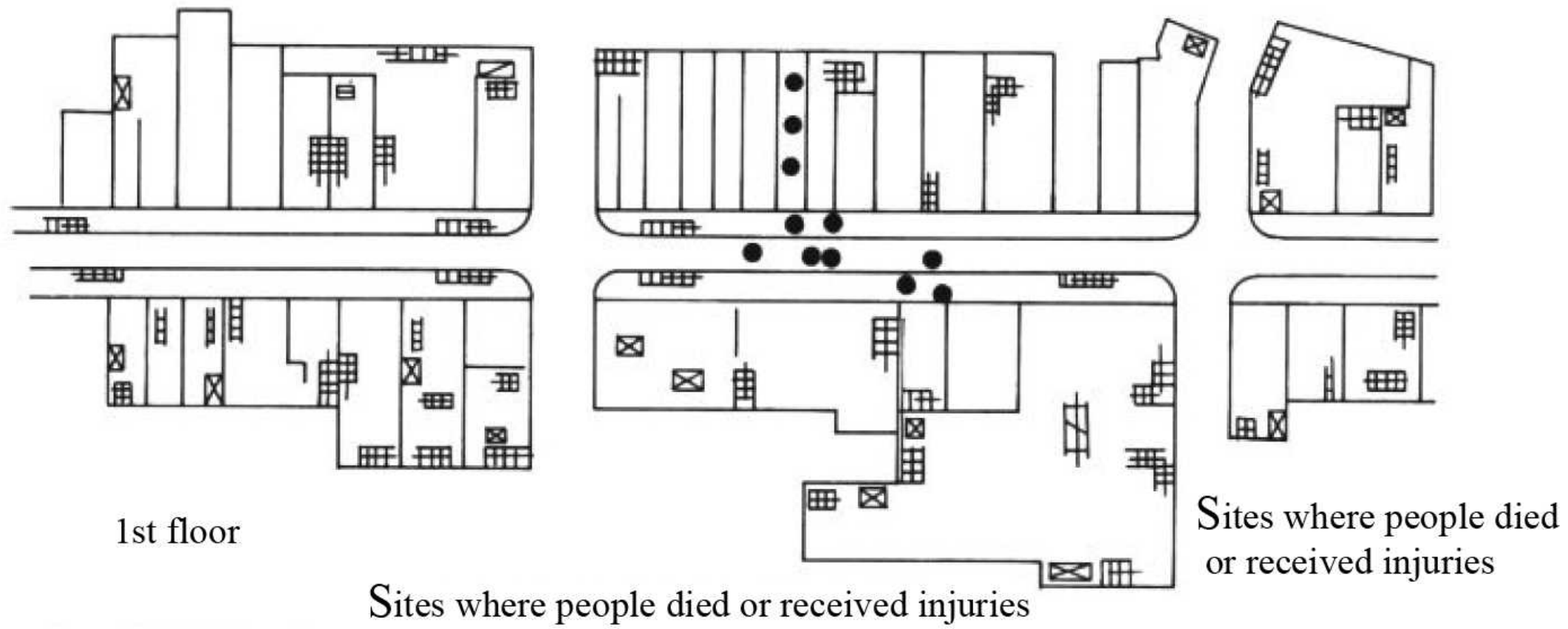


Fig. 2 Floor plan of 1st floor



1st floor

Sites where people died or received injuries

Sites where people died or received injuries

Fig. 3 Floor plan of below-ground floor

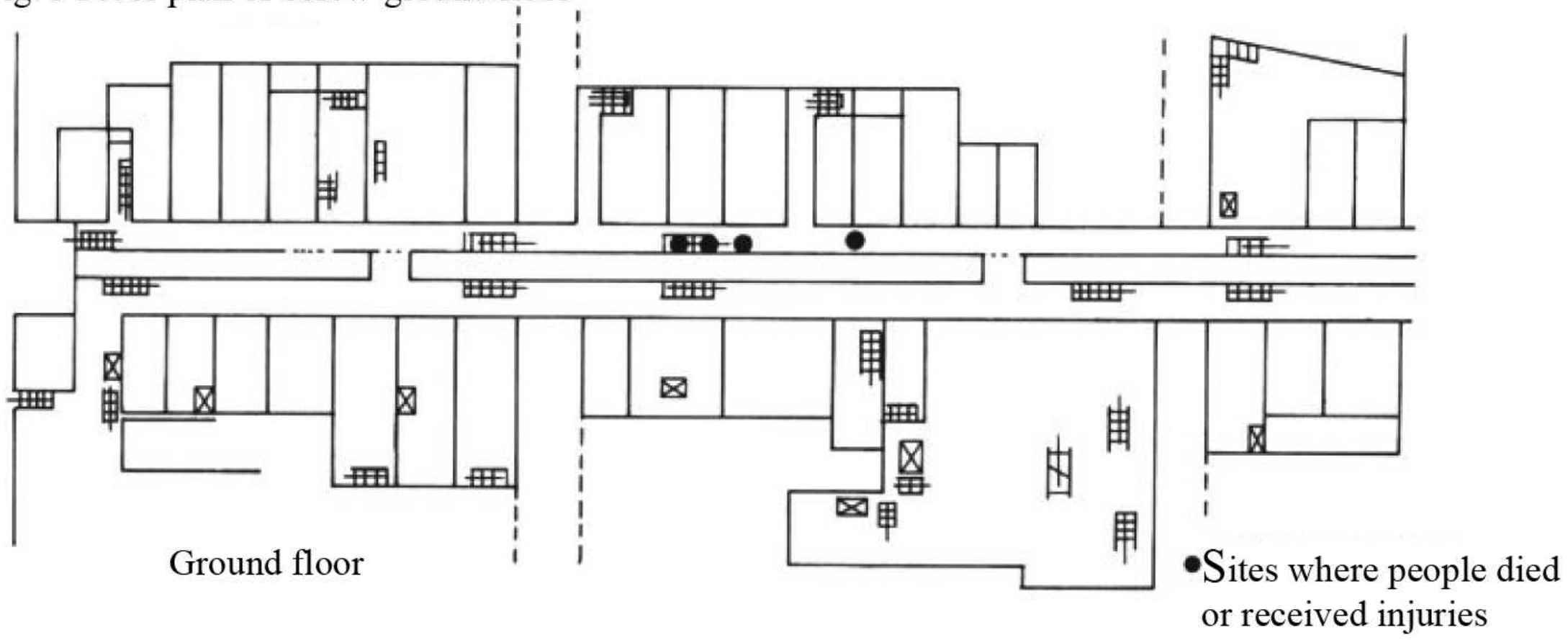


Fig. 4 Floor plan of below-ground floor

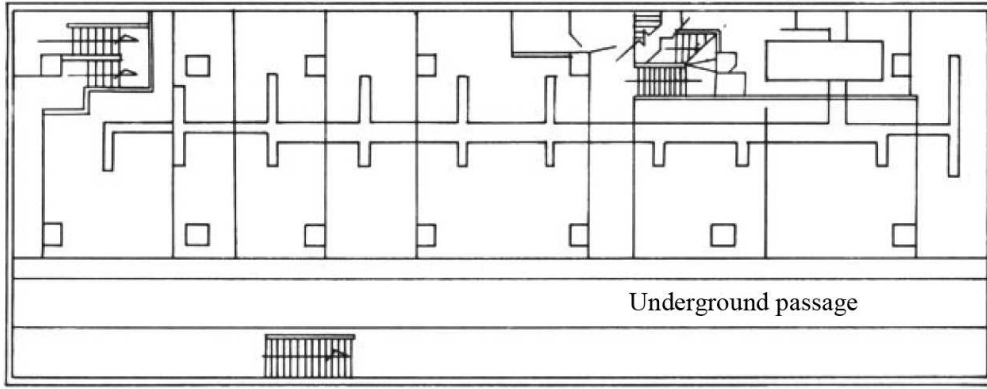


Fig. 5 Floor plan of 1st floor

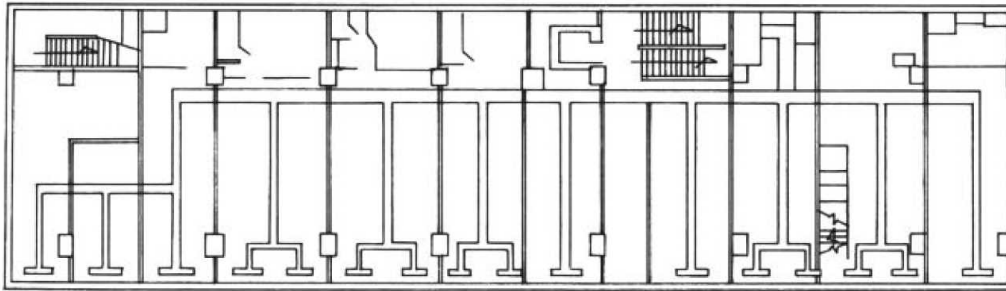


Fig. 6 Floor plan of 2nd and 3rd floors

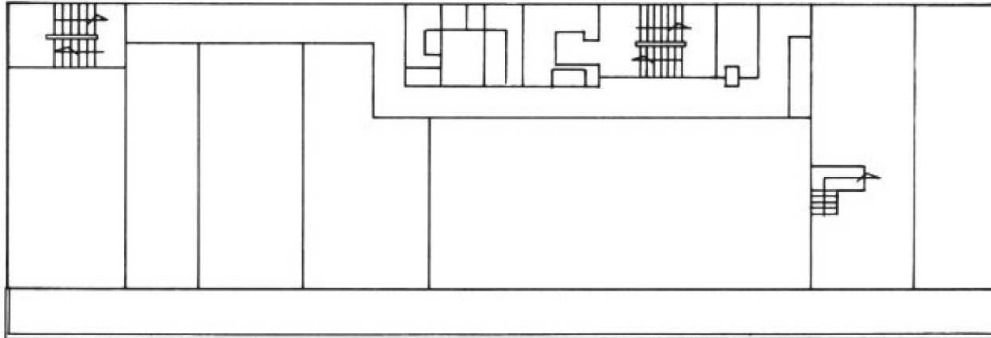


Fig. 7 Floor plan of 4th floor

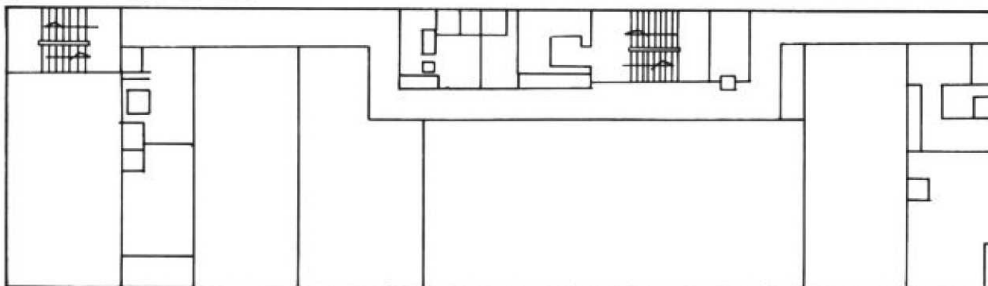


Fig. 8 Cross-section

