



Hotel Zao, Yamagata city, Yamagata prefecture

### **1. Characteristics of the fire**

The bell of the automatic fire alarm system in this hotel was turned off as it often sounded when there was no fire. Therefore, even though the alarm system was fully operational when the fire emerged, the bell did not sound, and as a result the fire was discovered late. The fire propagated and burned 7 buildings in the vicinity of the hotel, killing 11 and injuring 2.

### **2. Overview of fire outbreak**

- (1) Time and date of emergence  
After 03:00 on February 21, 1983 (Monday)
- (2) Time and date of detection (detection method)  
03:52 on February 21, 1983 (Monday) (119 call placed)
- (3) Time and date of extinguishment  
06:40 on February 21, 1983 (Monday)

### **3. Outview of fire origin**

- (1) Location  
2 Zao Onsen, Yamagata city, Yamagata prefecture
- (2) Name of the building where the fire emerged  
Zao Hotel, Ltd.
- (3) Structure and configuration of the building where the fire emerged
  - ① Date of construction

Around 1929

- ② Status of structural extension and alteration  
Completed inspection on December 15, 1960 of a new separate annex
- ③ Target use of the building  
Hotel (Article 5a)
- ④ Structure  
Main building Wood and mortar, 4 stories  
Separate building Wood and mortar, 3 stories
- ⑤ Area (Building area, total floor area)  
Total floor area of the main building 1,596 m<sup>2</sup>  
Total floor area of the separate building 668 m<sup>2</sup>  
Total 2,264 m<sup>2</sup>
- ⑥ Number of guests at the time when fire emerged  
(a) Hotel Zao 99  
(b) Kashiwaya Inn 83  
(c) Ebiya Inn 10  
Total 192
- ⑦ Area and use per floor of the building where the fire emerged  
Main building

Floor	Area	Use	Floor	Area	Use
4	120.6 m <sup>2</sup>	Guest rooms	3	208.7 m <sup>2</sup>	Guest rooms
3	443.2 m <sup>2</sup>	Guest rooms	2	208.7 m <sup>2</sup>	Guest rooms
2	511.7 m <sup>2</sup>	Dining room, guest rooms	1	208.7 m <sup>2</sup>	Reception hall
1	520.7 m <sup>2</sup>	Office, baths, etc.	B1	41.9 m <sup>2</sup>	Storage
Total	1,596.2 m <sup>2</sup>		Total	668.0 m <sup>2</sup>	

- ⑧ Others  
Relevant fire certification issued: December 1, 1982

- (4) Status of installed fire extinguishment and prevention facilities
  - ① Fire extinguishment facilities  
Internal fire hydrants, fire extinguishers
  - ② Alarm systems  
Automatic fire alarm system, short-circuit fire alarm system
  - ③ Evacuation facilities  
Evacuation equipment, guiding lights

(5) Status of fire prevention measures

- ① Fire prevention manager  
Notification of selection from March 25, 1981
- ② Fire prevention plan  
Completed report from November 9, 1981
- ③ Evacuation drills  
Conducted on September 7, 1982

**4. Weather conditions**

- (1) Weather  
Snowy
- (2) Wind direction, speed  
Southwesterly, speed 10–15 m/s
- (3) Temperature, humidity  
Temperature: -7°C, relative humidity: 83%
- (4) Weather warnings, bulletins, etc.  
None

**5. Cause of fire**

- (1) Ignition source  
It is assumed that the fire was produced by an electric heater used in the lavatory of "Clover Room" on the 2nd floor.
- (2) Ignited substances  
The wall and other combustible materials inside the lavatory (assumed)

**6. Fire damage**

(1) People

- ① Fatalities      11
- ② Injured        2

(2) Property

- ① Building where the fire emerged
  - (a) Number of buildings    2
  - (b) Degree of burning      Completely burned
  - (c) Burned area
    - Main building    1,596 m<sup>2</sup>
    - Separate Annex   668 m<sup>2</sup>
    - Total            2,264 m<sup>2</sup>
  - (d) Cost of damage        308,563,000 yen
- ② Structures to which the fire spread
  - (a) Number of buildings    5
  - (b) Degree of burning      Completely burned
  - (c) Burned area            1,318 m<sup>2</sup>

## 7. Fire route (progression)

- (1) Overview of outbreak location
  - Status unknown
- (2) Progression up to fire detection
  - A number of guests noticed that there was fire around a heater in the "Clover Room"
- (3) Notification of fire department
  - ① A guest in "Violet Room" on the 2nd floor called 119 (first call).
  - ② The wife of the manager decided to call 119 and dialed the number of the Zao Onsen branch of the main fire station of Yamagata city.
  - ③ A guest in "Azalea Room" on the 3rd floor pressed the emergency button of the public phone in the hallway.
- (4) Initial firefighting attempts
  - ① Three persons (2 guests and 1 staff member) attempted to extinguish the fire with fire extinguishers.
  - ② The staff members used the fire hydrant in front of the staff room on the 1st floor, extended the hose, and dispensed water on the 2nd floor. They then retreated and continued dispensing water onto the staircase from the 1st floor, and eventually left the building via the entrance hall and proceeded to dispense water towards the 2nd floor from outside.
- (5) Fatalities
  - A total of 11 died in the building where the fire emerged (6 on the 1st floor, 4 on the 2nd floor, and 1 on the 3rd floor). They were found lying face down, and it is assumed that the cause of death was carbon monoxide poisoning.
- (6) Evacuation
  - Since the bell of the automatic fire alarm system did not sound and there was no internal announcement, the evacuation response was slow. However, 86 guests evacuated from the hotel by themselves.
- (7) Firefighting group activities
  - ① Evacuation guidance
    - (a) Guests residing in the new (separate) annex building were guided towards the gym.
    - (b) Guests staying on the 1st and 2nd floors of the new (separate) annex building were guided towards the gym.
    - (c) Guests who had descended from the 2nd floor of the main building were guided to the front, and guests in the corridor leading to the new annex building were led outside via the windows and guided to the gym.
    - (d) Three guests from the 2nd floor of the main building were led outside via the entrance hall.
    - (e) After guests on the 2nd and 3rd floors of the separate annex building were informed about the fire on the 1st floor, they were guided towards the gym.
- (8) Propagation of the fire
  - (a) The building where the fire emerged was made of timber.
  - (b) Influence of the weather conditions (snow storm with wind speed of 10–15 m/s).
  - (c) The automatic fire alarm system did not sound, which delayed discovery of the fire.
  - (d) The evacuation route was complex, and the corridor leading to the separate building resembled a chimney, which aided the expansion of the fire.

## 8. Firefighting activities undertaken by the fire department

### (1) Dispatched units

#### ① Dispatched vehicles

Fire station	Fire pump trucks	10
	Workshop trucks	1
	Ambulances	2
	Command vehicles	1
	Maintenance trucks	1
	Announcement trucks	4
Firefighting group	Small manual pumps	17
Workers	Total	36

#### ② Dispatched personnel

Firefighters	77
Members of firefighting group	184
Total	261

### (2) Firefighting and rescue activities

The groups which arrived first took actions to extinguish the fire in the main building of the inn where the fire emerged, the separate annex building and the western side of the corridor leading to it. The groups which arrived afterwards interrupted the expansion of the fire towards Ebiya Inn, after which they proceeded by containing the expansion of the fire towards Kashiwaya Inn. The southwesterly wind was strong (10-15 m/s), the temperature was  $-7^{\circ}\text{C}$ , and snow cover of around 2 m obstructed the extinguishment operations.

## 9. Problems, lessons learned

- (1) Although the fire certification of this hotel had been issued, the automatic fire alarm system bell had been turned off. In addition, the evacuation guidance provided by staff members was inadequate.
- (2) It is necessary to provide instructions on how to implement fire alarm systems which sound only in the case of fire.
- (3) It is necessary to provide instructions regarding a fire prevention management system via a manual for night-time fire prevention management in hotels and inns.

## 10. Documents

10. Materials

Fig. 1 Layout

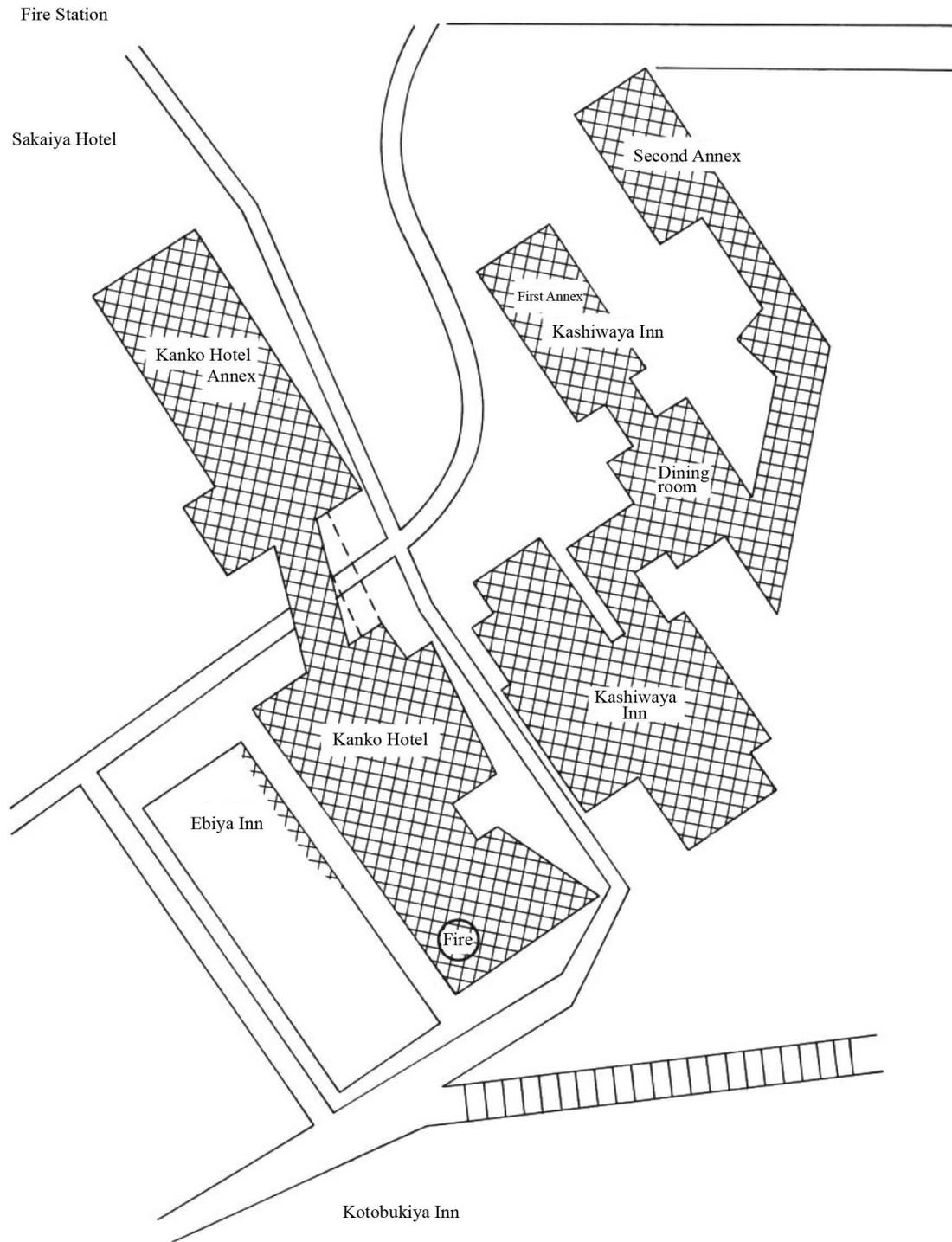


Fig. 2 1st floor of the main building

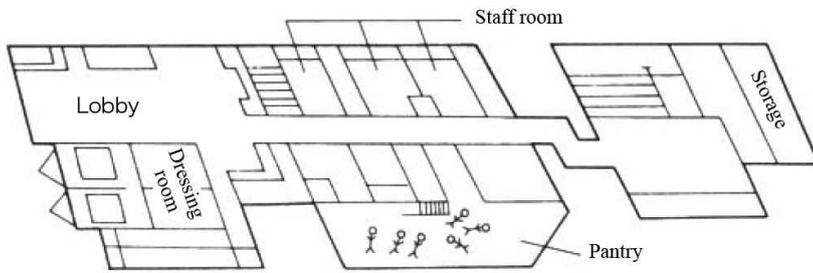
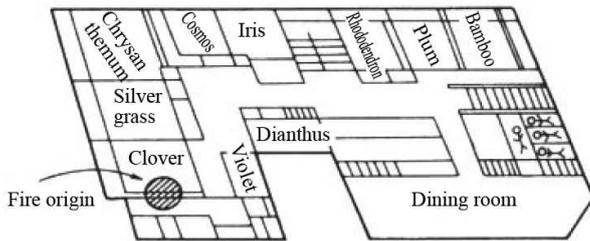


Fig. 3 2nd floor of the main building



1st floor of the separate building

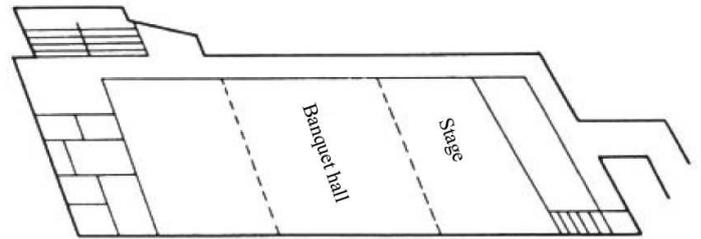
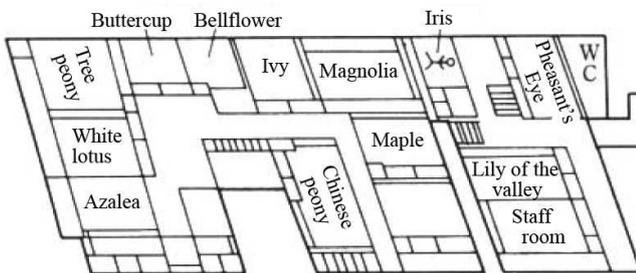


Fig. 4 3rd floor of the main building



2nd floor of the separate building

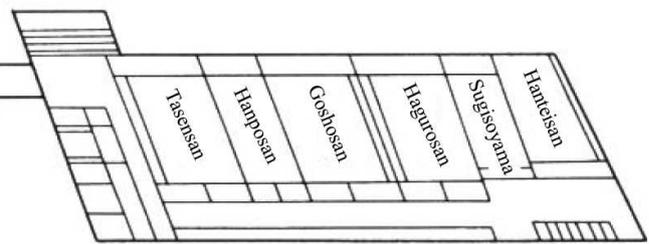
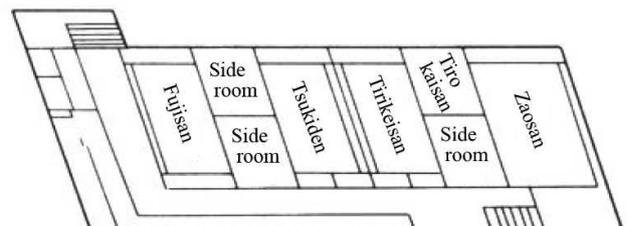
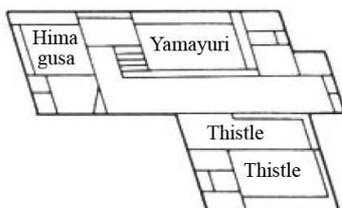


Fig. 5 4th floor of the main building



Locations dead bodies were found