

Section 1 Earthquake safety measures

1 Precautions against earthquakes

(1) General suggestions

a Heavy items (e.g., bookshelves, shelves, and safes) should be installed on walls and/or beams to prevent them from tipping over or sliding. Check with the facilities section before securing them. Items that are not secured should be considered to be in motion. For example,

- Safes: They are quite heavy that they are difficult to move under normal circumstances; however, during an earthquake, even heavy objects are subjected to acceleration. Thus, considerable force is required to secure them.

- Suspended objects: When shaken with large amplitude, they may fall by colliding with surrounding objects or the ceiling.

b To secure the evacuation passage, no objects should be placed in corridors, emergency exits, and stairways. In addition, never fasten objects across fire doors or place objects in front of the doors as they may limit the doors to prevent the spread of fire and smoke.

c Take precautions against the spread of fire.

d Always keep a flashlight in the laboratory.

(2) Consider safety measures in laboratories

a Protection for laboratory equipment and machinery against earthquakes

Tall or unstable objects may topple over, and heavy objects may slide out. In addition, piping and wiring may come off owing to misalignment between devices. Therefore, these objects should be secured with sufficient holding power.

b Safety measures for high-pressure gas cylinders

As leakage of high-pressure gas owing to overturned cylinders is extremely dangerous, which may lead to human casualties, in the event of an earthquake, cylinders should be securely fastened to the wall at two points (upper and lower) with chains to prevent them from overturning. (It is advisable to use sturdy anchor bolts.)

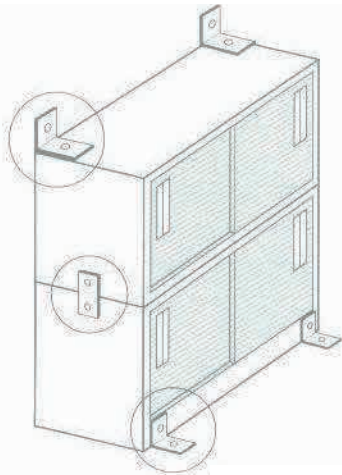
c Take measures to prevent falling of lockers, etc. and scattering of glass.

Measures to prevent falling of lockers, etc. and scattering of glass

a. Measures to prevent falling of lockers, etc.

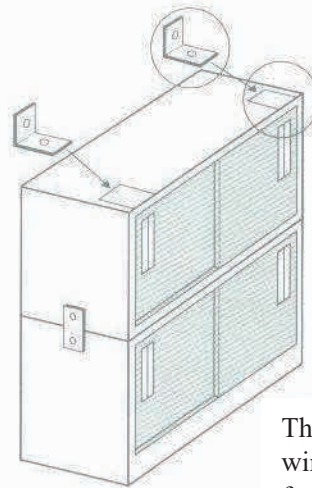
壁にとめる方法 How to fasten to the wall

Fasten with L-shaped steel hardware and anchor bolt.



Furniture weighing more than 200 kg should be equipped anti-skid.

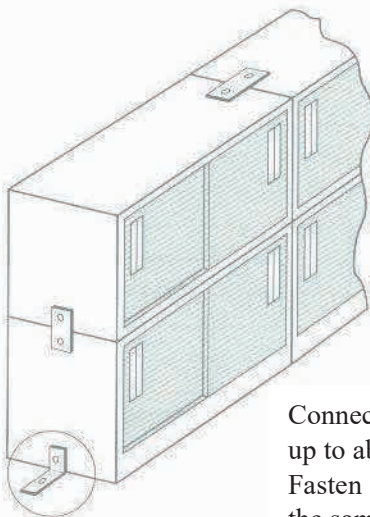
If the weight of the furniture is less than 200 kg, it may be fastened with two No. 16 steel wires (diameter 1.5 mm) and L-shaped steel hardware.



The angle between the wire and the top of the furniture should be less than 30 degrees.

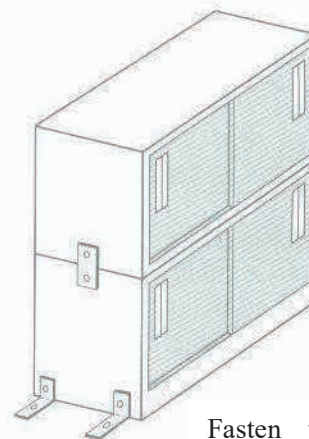
床にとめる方法 How to fasten to the floor

Fasten two places with L-shaped steel hardware and anchor bolt.



Connecting furniture is up to about 3. Fasten the other side in the same way.

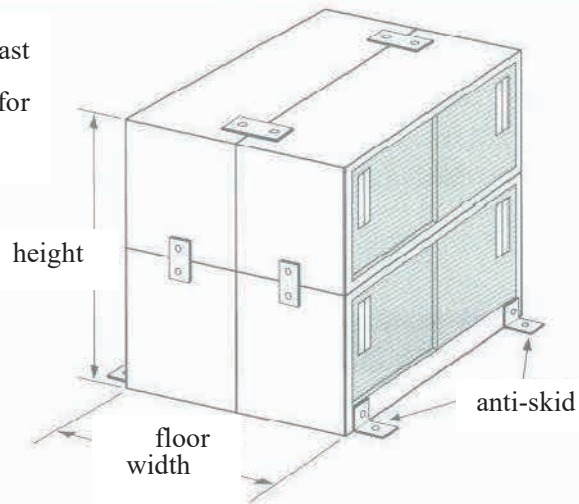
Fasten two places with L-shaped steel hardware and anchor bolt.



Fasten the other side in the same way.

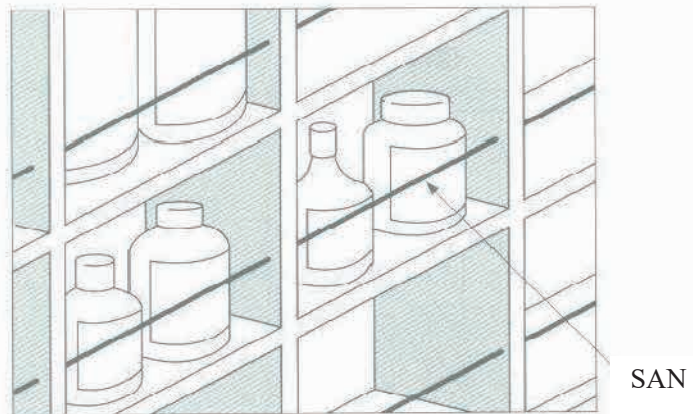
家具を連結する方法 How to connect furniture

If connecting so that the width is at least half the height, it becomes difficult for furniture to fall.

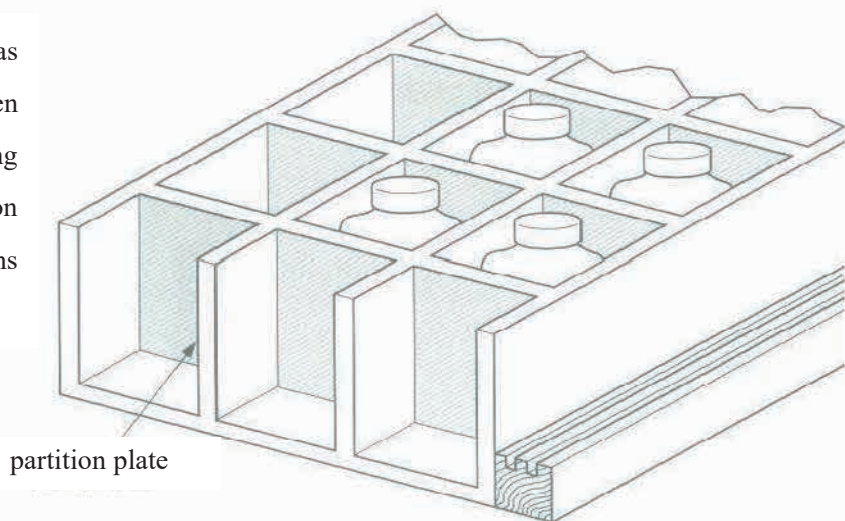


棚のとめ方 How to fix shelf

Fix the shelf to the wall, spread soft mat to avoid slide and fall items on the shelf, and attach "SAN".



Hazardous materials such as chemicals should be taken measures to prevent falling and attached gridded partition board to prevent collisions between containers.



b. Measures to prevent scattering of glass

①Renovate not to scatter if glass brake.

- Use wired glass

(Note: It may cause cracking if rainwater get in from cross section of glass and rust occur, so be careful with waterproofing during construction.)

- Stick Shatterproof Film inside of the glass.

②Use adhesive tape. (emergency measure)

If warning declaration has been issued, window that did not take renovation or scatted prevention should be sticked adhesive tape that are effective in breakage prevention of window as emergency measure.

粘着テープの貼り方 How to stick the adhesive tapes

○The tapes should be sticked inside of the window.

Does not sticked well if dirt or moisture is left, so stick firmly after removing them sufficiently.

○ How to stick is the most effective when sticked vertically and at equal intervals like figure A.

The smaller space between individual tapes, the more effective.

○ There is also how to stick like figure B, but it is better to stick like figure A if the amount of tapes is same because the effect is small.

Figure A

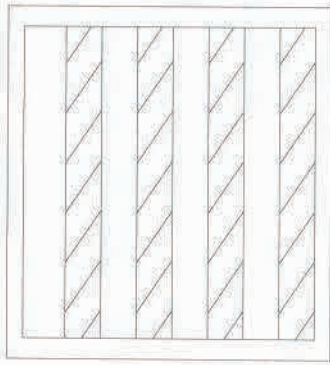
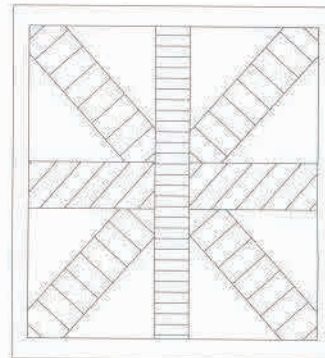


Figure B



d Storage of chemicals

During an earthquake, chemical containers on shelves or laboratory tables can fall or break, causing chemicals to spill or scatter. In such a situation, depending on the conditions, the mixture of chemicals may cause ignition, and if there are combustibles in the vicinity, the intensity of the fire will increase and cause severe damage.

The following preventive measures should be considered:

- (1) Noncombustible chemical cabinets should be used (as much as possible) and secured to walls to prevent them from tipping over.
- (2) Chemical containers should be placed in separate storage cases and secured to the cupboard.
- (3) Ignition chemicals should be sorted and stored separately.
- (4) Keep chemical containers away from the laboratory table as far as possible.

2 If an earthquake occurs

(1) If you feel an earthquake

The strength of seismic motion is determined based on the earthquake scale (magnitude) and distance from the epicenter.

If the distance from the epicenter is short, even if the earthquake scale is not so large, the seismic motion will be significant, which indicates the feeling of the first vertical wave.

If the distance between the epicenter and seismic scale is large, it is common for large earthquakes to be followed by long-period large lateral shaking without vertical motion.

The most important thing to remember is that, when you feel an earthquake, do not panic; however, you should act first and foremost to ensure your safety.

(2) Quickly put out fires and hazardous materials

If an earthquake is felt to be strong, it is necessary to take measures to prevent fires from being started or dangerous gases from leaking out by shutting down equipment or preparing to shut down as quickly as possible, stopping experiments, putting out fires, and deactivating cylinders. However, if a large tremor suddenly occurs, one's safety should be prioritized.

(3) Sheltering in a safe location

Move to a safe place. If you feel the earthquake is large or are working in a hazardous area, quickly leave the area. Physical safety should be your priority.

If you are in a reinforced concrete building, find a large empty space and stay there as long as possible. Steel furniture and bookshelves may topple over; therefore, do not lean against them. Be aware of falling objects (from above) and broken glasses; it is safe to get under desks. In rooms with vinyl floor tiles, furniture may slip and move. Heavy furniture is especially difficult to move in normal circumstances; however, during an earthquake, it can easily slide and may get stuck between walls or other objects, making it difficult for you to move in that space.

After shaking subsides, if there are any tasks left to be performed, e.g., putting out fire, do it quickly.

(4) If fire breaks out, extinguish it first

Even in universities, the risk of fire requires special attention.

When fire is caused by a major earthquake, it may spread outside the university, and thus firefighters putting in effort may not be able to focus on their targeted region; therefore, they should call out everyone and try to extinguish the fire in the initial stages.

Although initially firefighting is important, aftershocks continue; thus, your safety should be prioritized.

(5) About evacuation

If a fire in the building cannot be extinguished or if hazardous gases are present, evacuate the building immediately.

While evacuating, use the stairs instead of the elevator.

3 Post-earthquake procedures

(1) Caution for aftershocks

The main shock is followed by aftershocks. Several aftershocks occur within the epicenter of the main shock (several hundreds per day) when they are felt. The number of aftershocks gradually decreases; however in the case of a major earthquake, they may continue for several months. Aftershocks are smaller in magnitude than mainshocks; however, if they occur together, they can cause a significant impact. However, aftershocks are usually weaker than the main quake.

Aftershocks may damage or topple buildings; thus, please take extra precautions with regard to your safety.

(2) Maintaining order

Maintaining order after a disaster is especially important. In other words, it is necessary to assume various situations in advance and consider measures to deal with them (e.g., maintaining order in terms of security, preventing confusion caused by rumors, and dealing with the movements of evacuated citizens and the university's response to them).

(3) Measures to be taken in laboratories

After the disaster, cleanup and other measures in each laboratory should be promptly considered, with emphasis on the following points:

- a Treatment of fire hazards
- b Ensure that all electrical switches and main gas and water valves are turned off.
- c Disposable items that may topple over, especially the damaged ones.
- d Before cleaning up damaged laboratory equipment and other related items, click pictures of the damaged items and save them as evidence. This can be later used as documents to request disaster recovery expenses.

(4) Building and equipment inspections

Inspect the damage to buildings in your vicinity and contact Division of Facilities Affairs if any abnormality is found. In particular, report any damage, large or small, that is deemed to be in danger of falling or collapsing. In addition, the pictures of the damaged site shall be preserved as documentary evidence.

Piping and wiring attached to the building should be inspected and reported. Electricity, gas, and water may not be supplied to the end of the line until the buildings and facilities have been inspected.

Section 2 Earthquake and fire safety measures

1 Fire caused by an earthquake

Figure 11-1 shows the causes of fire caused by main urban earthquakes in Japan. A large percentage of the causes were related to heater and electricity (electrical equipment, wiring, etc.). Moreover, fire caused by chemicals cannot be ignored. During the Kanto, Niigata, and Miyagi earthquakes, the percentages ranged from 22% to 27%. Careful attention should be paid to chemical fires, ignition of leaked gas, and ignition of combustible materials by heating equipment or other fires.

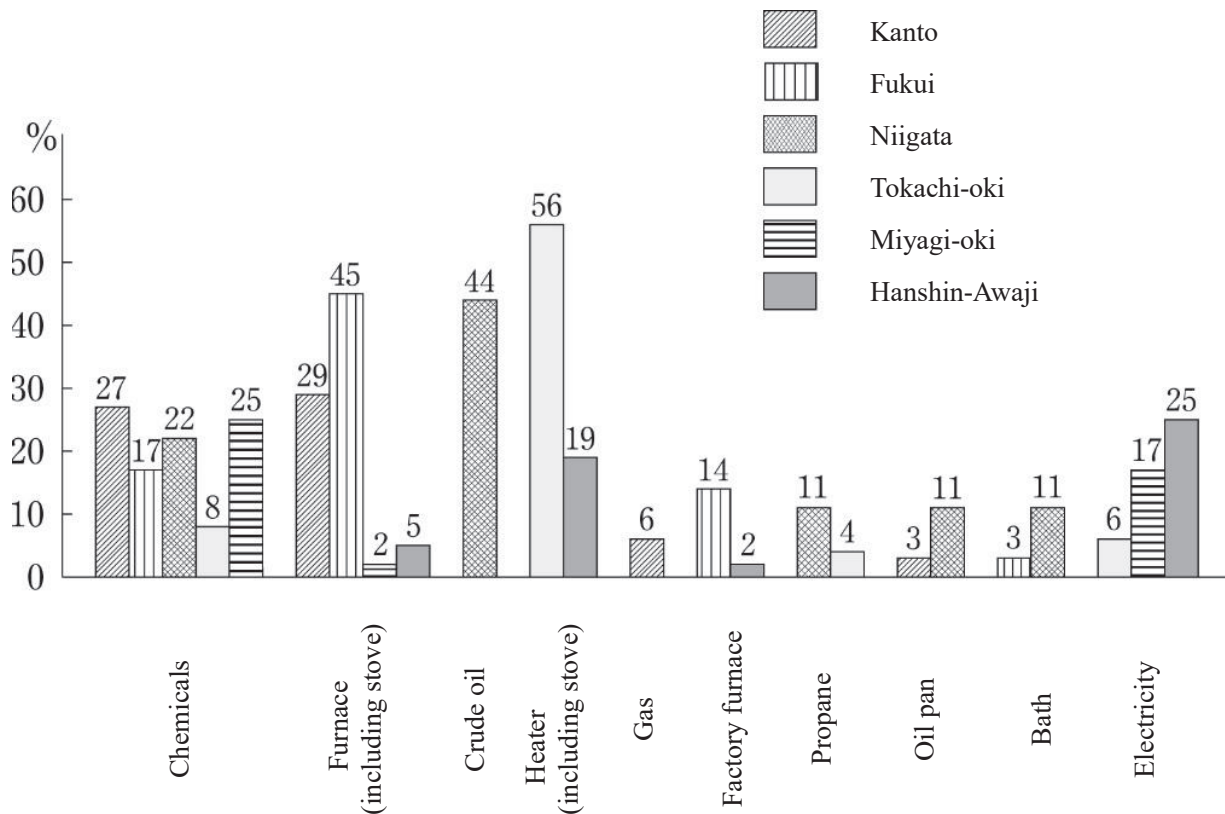


Figure 11-1 Major causes of fires due to earthquakes in Japan

2 Earthquake fire safety measures under normal circumstances

(1) Normal preparations in the event of an earthquake

- a Fire extinguishers and firefighting methods
- b Information systems and training
- c First aid equipment
- d Leakage control (chemicals and gases)
- e Evacuation measures

(2) Safety measures for chemical storage cupboards

The following points should be considered as measures with regard to chemical storage cupboards.

- a The cupboards should not fall over.
- b Chemical containers should not fall.
- c Chemical bottles should not break on the shelves, and even if they do break, the inner boxes should be designed in a way so that chemicals do not flow out.

(3) Management of chemicals and oils

The following items should be managed under normal circumstances based on the sufficient knowledge of chemicals described in Chapter 5.

- a Information of the actual storage conditions of chemicals
- b Assessment of the hazardousness of chemicals
- c Proper storage arrangement of chemicals
- d Proper storage arrangement of oils

(4) Evacuation route(s)

- a In the case of ignition or explosion of chemicals, leakage of hazardous chemicals, or fire caused by gas or heating equipment, and considering the occurrence of accidents (e.g., toppling of laboratory equipment, cupboards, and bookcases and cracking of window glasses), in the event of an earthquake, determine in advance secure escape routes of each laboratory.
- b Do not place hazardous materials, cupboards, lockers, and/or other furniture items in front of corridors, stairways, or other passageways.
- c Confirm the locations of emergency ladders and emergency exits if the designated evacuation routes (e.g., corridors and stairways) become impassable.

3 Fire suppression in the event of an earthquake

- a During an earthquake, immediately turn off the main valve and power source of gas taps; heaters e.g., stoves; and heating equipment, and evacuate to a safe place after confirming the safety of the place.
- b In the unlikely event of fire or other accidents, immediately notify the Energy Center (9290), follow their instructions, and take appropriate measures.
- c Initially extinguishing fire is important, and fire extinguishers or fire hydrants provided should be used to extinguish the fire.
- d If fire in a building becomes unmanageable in the initial stages of extinguishing the fire, immediately evacuate the building using the evacuation route as in other routes, there can be a possibility of gas, high-pressure gas cylinders, and/or chemical explosions.
- e Refer to Chapter 5, Section 1, Table 5-3 for fire types and applicable fire extinguishers.

Section 3 Fire prevention and suppression

1 Fire prevention

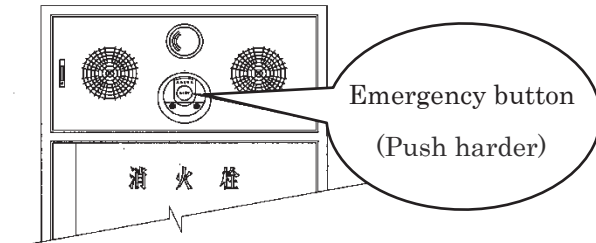
If fire breaks out, it can cause injuries to people and extensive damage to buildings and facilities; therefore, it is necessary to take additional precautions.

Therefore, the following precautions should be considered to prevent fire:

- a While using fires, keep combustibles at a safe distance and the surrounding area tidy constantly, and do not leave the area.
- b After using a fire extinguisher, completely put out the fire and check for safety.
- c Electrical wiring and gas piping must not be changed or installed without permission.
- d Familiarize yourself with the location and operation of fire extinguishers and hydrants, and do not place anything in the vicinity that may interfere with their operation.
- e Smoking should be prohibited on the premises including in the car.
- f Before leaving the premises, check and confirm the fire safety.
- g If any mismanagement of fire is found, take appropriate measures immediately.
- h The required amount of inflammable or combustible chemicals should be brought into the room and used and stored with the utmost care.

2 What to do in the event of a fire

- (1) If fire is discovered in a place, push the emergency button of a nearby fire alarm, repeatedly shout “Fire!”, and notify others in the same place or those who are nearby.
- (2) Extinguish fire using fire extinguishers or fire hydrants (initial fire extinguishing). (See Sections 4.2 and 4.3 for instructions on how to use fire extinguishers.)
- (3) Notify the fire department (119) of the type of accident (fire or emergency), location, name of the building, and fire conditions (location of fire, burning materials, whether or not anyone escaped, etc.), and call the Energy Center (9290) and the emergency call center (9999, after hours: 0258-47-9999 * Wait for a while as a hold music is played until the transfer is complete.)
- (4) Turn off power and gas sources, and quickly remove flammable materials from the area.



3 Evacuation

- (1) If initial firefighting proves to be ineffective and the situation becomes unmanageable, immediately evacuate to a safe place.
- (2) While evacuating, after shutting off the power and gas sources and disposing of hazardous materials, make sure no one is inside, and close windows and exit doors.

- (3) It should be ensured that evacuation routes in corridors are upwind of smoke movement.
- (4) Elevators should not be used.
- (5) It is necessary to consider evacuation routes and carefully examine emergency exits.
- (6) Even if a fire door in a corridor is closed, it can be opened by pushing or pulling lightly; thus, you should act calmly.
- (7) Do not place any object in front of fire doors to prevent them from closing. By closing fire doors, smoke and flames are blocked, and evacuation routes become secured in the event of fire. Moreover, it needs to be careful always not to place any objects in front of fire doors.

Section 4 Disaster prevention equipment and alarms

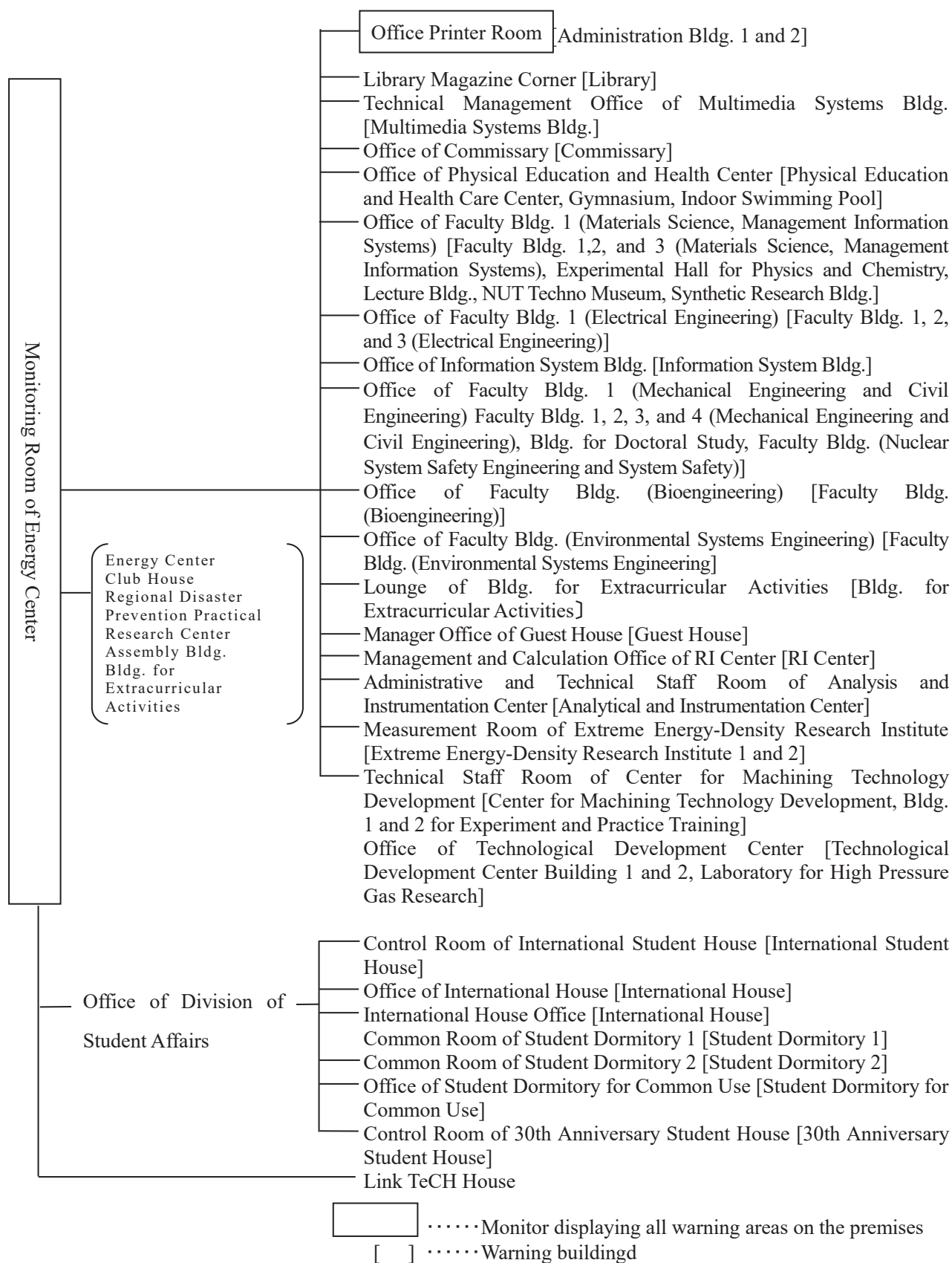
1 Fire alarm system

(1) Automatic fire detectors

Each room is equipped with a heat detector (differential spot type or constant temperature spot type) for automatic fire alarm, and smoke detectors are installed in the indoor stairwells, which are constantly monitored by receivers at the Energy Center. In addition, there are receivers or sub-receivers installed in the department offices, where fire can be located as well. As such, it is advisable to check the location and display content of the receivers on a daily basis.

When a detector is activated, the fire alarm bells and emergency broadcasts on that floor (the floor on which the fire broke out), and the floor above it (the floor directly above it) will generate sound. (All buildings with three or fewer floors ring simultaneously.) This is a measure to prevent confusion during evacuation.

Location of fire alarm receivers



2 Fire extinguishers

They are installed in the corridors of each building (and some in the laboratories) and are very effective as a means of initial firefighting in the event of fire.

Most fire extinguishers on the premises are ABC powder extinguishers, which can be used to extinguish ordinary fire, oil fire, and electrical fire.

It is important to be familiar with the usage instructions (which are indicated on the extinguishers) and to confirm the location of the extinguishers. Moreover, it is necessary to actively participate in fire drills to become familiar with its operation.

How to use the fire extinguisher

How to use the fire extinguisher

- 1 Pull out the safety plug (yellow ring).
- 2 Hold the part near the end of the hose and point it toward the fire.
- 3 Squeeze the lever firmly.
- 4 Aim directly at combustion and spray in a wide arc, as if sweeping with a broom.

3 Indoor fire hydrant system

Major buildings at the university are equipped with indoor fire hydrants.

While using these hydrants, because the water pressure is stronger than expected, three or more people should familiarize themselves with the following procedures before operating them. (These instructions are indicated on the back of the hydrant box door.)

How to use indoor fire hydrants

- 1 Press the transmitter button on the top of the hydrant box.
(The hydrant pump starts, the indicator light blinks and the fire alarm bell rings.)
- 2 Open the door of the fire hydrant box.
- 3 Hold the nozzle and extend the hose.
- 4 Open the valve to release water.

4 Outdoor fire hydrant system

Outdoor fire hydrants are installed in the Lecture Bldg., Faculty Bldg. 1 (Materials Science, Management Information Systems), Experimental Hall for Physics and Chemistry, Gymnasium, Commissary, Center for Machining Technology Development, and Student Dormitory.

As the pressure is higher than that of indoor hydrants and the volume of water is larger, three or more people need to be familiar with the following procedures before using the hydrants:

How to use outdoor fire hydrants

- 1 Open the door of the fire hydrant box.
- 2 Hold the nozzle and extend the hose.
- 3 Press the activation button inside the hydrant box.
- 4 Open the valve to release water.

5 Halide fire extinguishing system

A halide fire extinguishing system is installed in the Particle Beam Laboratory of Extreme Energy-Density Research Institute 1.

In case of fire, Halon 1301 is released by operating the manual activation device.

Before the release, a synthesized voice will broadcast an evacuation advisory, so evacuate immediately.

6 Broadcasting equipment

Broadcast loudspeakers are installed throughout the premises and can be used for broadcasting during an emergency or at any time.

Broadcast amplifiers are installed in the offices of each department, Physical Education and Health Care Center, Analysis and Instrumentation Center, and Technological Development Center, to enable broadcasting to each area. In addition, Energy Center and Administration Bldg. 1 are equipped with broadcasting equipment that can select each area and simultaneously broadcast to the entire campus.

7 Fire door equipment

Fire doors are installed in the middle of corridors (for the flat sections of buildings) and stairway entrances (for vertical hole sections) for fireproof compartments. The doors are automatically closed in conjunction with smoke detectors, and during evacuation, the doors are opened and closed as necessary to secure the passage. The operating status of the fire doors is notified to the control panel in the office of the department (combined receiver with fire alarm) and the receiver in the energy center by a light indicator and buzzer.

8 Elevator control operation

(1) Fire control operation

When fire breaks out, the elevators in the building enter the fire control operation mode; they are forced to go directly to the evacuation floor (1st floor), and the doors open once and then close to stop. The operation panels inside and outside the elevator indicate that the elevator is in the fire control operation mode, and an announcement is automatically made inside the elevator.

(2) Earthquake control operation

When an earthquake occurs, elevators in premises automatically go into earthquake-controlled operation. When the elevators enter earthquake-controlled operation, they are forced to stop at the nearest floor, open the doors once, then close them, and come to a stop. (*To open the doors again, press the “Open” button on the operation panel inside the elevator.) The operation panels inside and outside the elevator indicate that the elevator is in earthquake-controlled operation, and an announcement is automatically made inside the elevator.