Disaster Prevention Measures at Chikusei City

Chikusei City General Affairs Department

Fire Safety & Disaster Preparedness Division

Part 1 History of Storms, Floods and Other Natural Disasters in Chikusei City

Floods are the most frequent natural disaster in the area. The lower zone, surrounded by the Kokai River and its tributaries, especially near their meeting points, has been repeatedly flooded. Major factors of the floods have been rain in the rainy season in addition to torrential rain following typhoons. The most devastating flood in recent years was that caused by Typhoon No. 10, in August 1986.

The flood led to the Emergency Project to Prevent Frequent Severe Flood Disasters (EPPSFD) for the Kokai River and the Gongyo River, implemented over five years from 1986 to 1990. Under this project, a total of 109 homes in five settlements near the meeting point of the Kokai River and the Oya River, where damage was especially severe, were relocated onto a high embankment. In addition, the Hakojima flood control basin was constructed by banking about 160ha of land, including the site of the relocated settlements, and banks from the Kokai Bridge to Yousan Bridge have been repaired. In the Gongyo River EPPSFD, embankment improvement and river bed deepening works were implemented along about 1.8km.

Past Weather Disasters in Chikusei City (since 1980)

Time	Type	Description of damage
October 1981	Flood	18 houses were flooded below floor level, 25ha of farmland was submerged, and one bridge was washed away due to torrential rain following Typhoon No. 24
August 1, 1982	Storm/flood	Strong wind and heavy rain during a typhoon caused heavy damage to agricultural products.
September 1982	Flood	22 houses were flooded above floor level, 123 houses were flooded below floor level, and more than 110ha of farmland was submerged due to torrential rain following Typhoon No. 18

July 27, 1983	Hail	Hail caused heavy damage to agricultural products.
September 1983	Flood	A 60m section of road was submerged (up to 30cm) and 50ha of farmland was submerged due to Typhoon No. 10
April to May 1984	Drought	Abnormal drought
June 30 to July 2, 1985	Flood	3 houses were flooded above floor level, 103 houses were flooded below floor level, and 132.85ha of farmland was submerged due to torrential rain following Typhoon No. 6.
August 4–5, 1986	Flood	The Kokai River overflowed due to torrential rain caused by Typhoon No. 10 and the subsequent low pressure (381mm precipitation; maximum rainfall per hour was 64mm) and about one fourth of the city was submerged (1,365 houses above floor level, 860 houses below floor level, and 1,151ha of farmland was submerged)
July 15, 1996	Wind	Down burst (maximum wind speed of 50-69m/s), a thunderstorm, and hail caused one death and 18 injuries, 85 completely-destroyed houses, 66 partially-destroyed houses, 1,961 damaged houses; one building was flooded below floor level, and agricultural products, such as pears, were damaged in about 140ha of farmland.
May 6, 2012	Wind	Gusts (estimated wind speed is 33–49m/s), a thunderstorm and hail caused one injury, damaged 113 houses, completely destroyed one unoccupied house, and damaged 56 unoccupied houses and 82 plastic greenhouses, and agricultural products in 0.7ha (known as of June 6, 2012.)

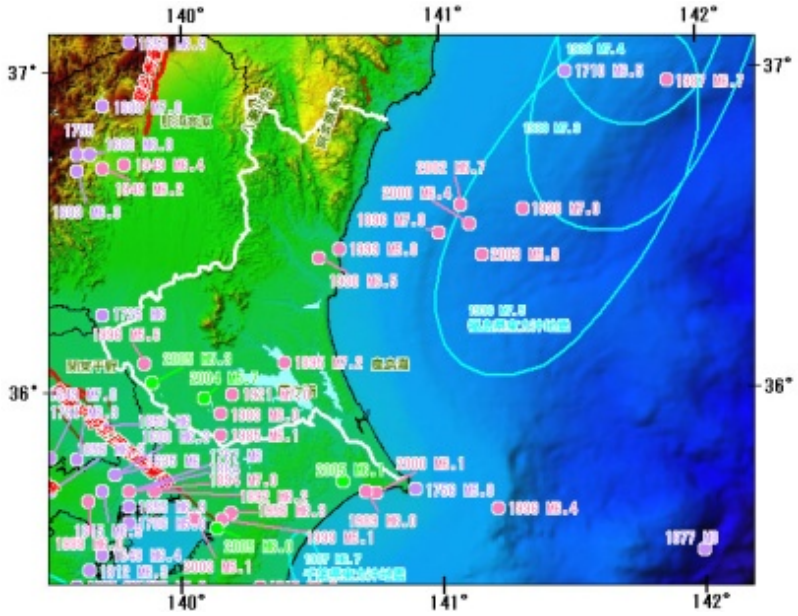
Part 2 History of Earthquake Disasters in Chikusei City

1.History of Earthquake Disasters

Earthquakes that cause damage in Ibaraki Prefecture originate near the plate boundary running from the sea off the east coast of Kanto through Sagami Bay to southeast of the Boso Peninsula or originate deep or somewhat deep under the land.

There are very few records of heavy earthquake damage in the area around Chikusei City. According to *Shinpen Nihon Higai Jishin Soran* (*Comprehensive List of Earthquakes that Caused Damage in Japan, new edition*) and *Ibaraki Prefecture Regional Disaster Prevention Plan: Earthquake* the following earthquakes may have caused relatively strong shaking in the area around Chikusei City:

November 11, 1855: Ansei-Edo earthquake	M6:9
January 18, 1895: earthquake around Kasumigaura	M7.2
January 17, 1897: earthquake in middle stretches of the Tone River	M 5.6
February 13, 1898: earthquake in southwest Ibaraki Prefecture	M5.6
December 8, 1921: earthquake around Ryugasaki	M7.0
September 1, 1923: Great Kanto Earthquake	M7.9
February 16, 2005: South Ibaraki earthquake	M5.4
May 8, 2008: earthquake off the coast of Ibaraki Prefecture	M7.0
March 11, 2011: Great East Japan Earthquake	M9.0



2. The Great Kanto Earthquake

On September 1, 1923, a great earthquake hit the southern part of Kanto, claiming the lives of more than 105,000 people and causing unprecedented damage: 109,000 houses totally collapsed and 212,000 were burnt down. It is said that the total cost of damage amounted to 16 months of the national budget at the time. In Tokyo, Yokohama and other urban areas, fire followed the earthquake and greatly exacerbated the damage. The damage to Ibaraki Prefecture was not so heavy compared with Kanagawa and Tokyo but there were deaths, injuries, 517 totally-collapsed houses, and 630 partially-collapsed houses, mostly in the southern area.

3. The Great East Japan Earthquake

At 14:46, March 11, 2011, the Tohoku Area Pacific Offshore Earthquake, originating at Oshika Peninsula, Miyagi Prefecture, was the largest earthquake in Japan's recorded history, with a magnitude of 9.0 and an intensity of 7. The focal zone covered a wide area of about 500km north-south and 200km east-west from off the coast of Iwate to off the coast of Ibaraki. The earthquake caused a huge tsunami, with wave heights of over 10m in some places and a maximum run-up elevation of 40.5m, wreaking catastrophic damage upon the Pacific Coast of Tohoku. In addition, the shock of the earthquake, liquefaction, subsidence, dam collapsing, etc. caused damage over a broad area of Hokkaido, Tohoku and Kanto, including cutoffs of the supply of water, electricity and gas.

Tokyo Electric Power Company's Fukushima No. 1 nuclear power plant was damaged and lost its reactor-cooling function, which led to a series of grave crises, including hydrogen explosions, fire, leak and scattering of radioactive materials, worker exposure, and the leaking of radiation-tainted water. On April 12, one month after the earthquake, the Nuclear and Industrial Safety Agency, Ministry of Economy, Trade and Industry, ranked the accident "level 7."

□Damage caused by the Great East Japan Earthquake (as of August 10, 2011: data of the National Police Agency)

[People]

15, 689 deaths, 4,744 missing, 231 serious injuries

1, 503 slight injuries

[Houses]

112,761 total collapses, 143,973 partial collapses, 11,288 houses flooded above floor level, 12,342 houses flooded below floor level, 512,535 damaged houses

□Damage to Chikusei City (as of May 25, 2012)

[People]

One death, one serious injury, 5 slight injuries

[Houses]

5 total collapses, 156 partial collapses, and 5,363 damaged houses

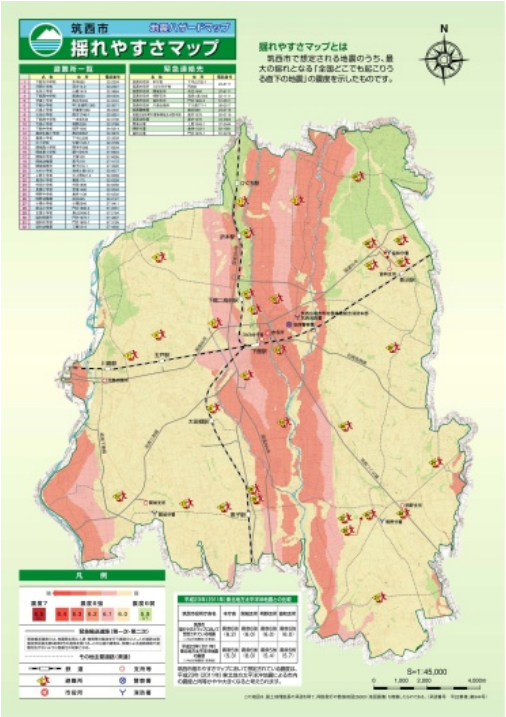
In addition to houses, many public facilities were damaged in various ways, including caved-in roads, ruptured water pipes, uneven bridge girders blocking traffic, collapsed brick walls, the municipal hospital was closed due to cracking in its outer walls, and the north schoolhouse of Shimodate Kita Junior High School was also closed due to tilted pillars.

4. Creating and Distributing Earthquake Hazard Maps

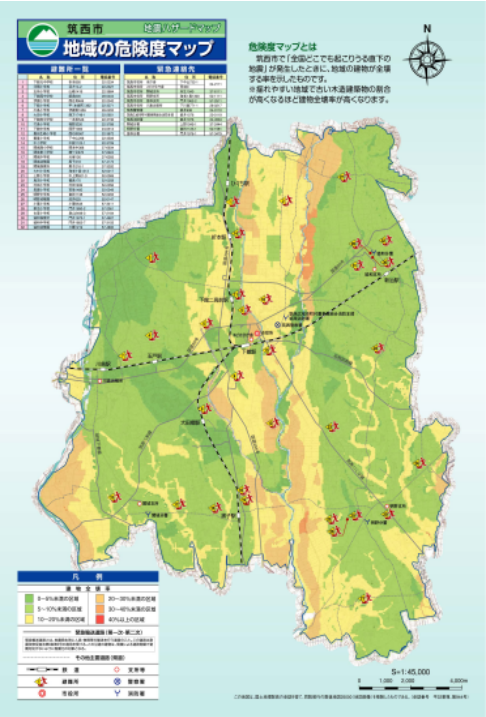
Chikusei City set target earthquake resistance rates for buildings owned by the City and private buildings, and formulated the Chikusei Earthquake Retrofitting Promotion Plan to promote efficient and systematic earthquake protection. In conjunction with the plan, the city created two earthquake hazard maps—one for ground motion prediction and the other for hazard degree—showing different degrees of hazard in the Chikusei area in FY2009 and distributed them to individual homes.

The Chikusei earthquake hazard maps show, in different colors, hazard levels (seismic intensity and building collapse ratio) in the case of a near-field earthquake of magnitude-6-upper level. The maps include such information as knowledge on earthquakes, daily preparedness, seismic diagnosis, and evacuation sites.

It is important to know the characteristics of the area using the maps as reference and to keep a constant state of preparedness, including seismic diagnosis and securing of furniture, bearing in mind that an earthquake can occur anytime.



Map of Ground Motion Prediction



Hazard Degree Map

5. Earthquakes that Can Cause Damage in Ibaraki Prefecture

A complicated stress concentration at the contact interfaces between the continental plate, the Philippine Sea plate, and the Pacific Plate indicates the possibility of a near-field earthquake (magnitude-7 level) hitting the metropolitan area. The Central Disaster Prevention Council assumes that an earthquake in the southern region of Ibaraki Prefecture (magnitude 7.3) could cause damage in the prefecture.

Part 3 Flood Control Measures

1. Promoting River Improvement Projects

Eleven Class-A rivers flow through the city. In response to encouragement for river improvement, repair and new construction works, including banks, revetments, drainage sluiceways, and intake sluiceways were conducted along about 11km: on the left bank in the Shimodate and Kyowa districts, and on the right bank in the Shimodate and Ninomiya districts.

2. Landside Water Measures

Chikusei City deploys two movable self-priming sump pumps for inland water, each of which pumps three tons per minute, and five medium-size self-priming sump pumps for inland water (pumping more than 1.5 tons per minute) to handle inland water due to a typhoon, etc. Every year before the flood season the city implements training on sump pump operation for municipal employees (of the General Affairs and Civil Engineering Departments) to prevent inundation damage.

3. Creating and Distributing a Flood Hazard Map

The flood hazard map (evacuation map) clearly shows information, such as the area that could be damaged by an overflowing river, the degree of the possible damage, and the evacuation area mainly to ensure the quick and safe evacuation of local residents.

Chikusei City created a flood hazard map for the Kinu River, the Kokai River, the Gogyo River, the Otani River, and the Sakura River, and distributed 33, 500 copies to individual homes.

4. Consolidating an Evacuation System

Means for conveying information about evacuation

For the communication of flood forecasting, information on preparation for evacuation, evacuation advisories, etc., the city uses its sound vehicles, the fire station and volunteer fire companies, its wireless disaster prevention information system, and other means, while at the same time providing the information to news organizations so as to ensure the safety of the residents of the risk area. The city uses the same means to convey information concerning evacuation to welfare facilities in the risk area used by people vulnerable to disaster, such as the elderly, to ensure prompt and safe evacuation.

	Issued when	Action expected from residents
Information on preparation for evacuation	○The risk of harm to people has increased, and when it is necessary for people who need more time for evacuation, including people vulnerable to disaster, to start evacuation.	○People who need more time for evacuation, including people vulnerable to disaster, start to evacuate to the planned evacuation area (evacuation supporters begin support action) ○Others start preparations for evacuation, including communicating with family members and preparing items to carry.
Evacuation advisory	○The risk of harm to people has clearly increased and people who can evacuate normally need to start evacuation.	○People who can evacuate normally start evacuating to the planned evacuation area, etc.
Evacuation instruction	○The risk of harm to people is deemed very high based on predictive phenomena or an emergency situation. ○The risk of harm to people is deemed very high based on the local characteristics, such as adjacent dikes. ○People have been harmed.	○Residents who are in the process of evacuating following the issuance of an evacuation advisory promptly complete secure evacuation. ○Risk area residents who have not yet evacuated immediately start to evacuate or, if this is not possible, take action to protect their lives.

5. Designated Evacuation Area

Thirty-one elementary/junior-high schools are designated as evacuation areas in case of a major disaster, such as an earthquake. Check them so that you can take prompt and appropriate action in case of an emergency.

In addition, 132 facilities, including community halls, are designated as backup evacuation areas.

Part 4 Earthquake Disaster Countermeasures

1. Implementing Emergency Drills

In preparation for major earthquakes, Chikusei City implements emergency drills every year at three to four of the 20 elementary schools in the city, assuming a magnitude-6-upper earthquake, so that every student can experience a drill at least once while they are in elementary school.

These drills are conducted not only for elementary school students and personnel but also for a wider range of participants, including members of PTA and residents' associations in the school area.

Drills include evacuation guidance, smoke experience, putting out fire in early stages using fire extinguishers and a bucket brigade, as well as viewing fire fighting and rescue training using a ladder truck or a disaster-relief helicopter.

2. Voluntary Antidisaster Organizations

Precious lives have been lost due to earthquakes, typhoons, torrential rain, and other natural disasters and fires in the past. In particular, people vulnerable to disasters, including elderly persons, persons with disabilities, infants, pregnant women, and women with infants, are often not quick enough to respond to a disaster due to the difficulty in physical movement and other reasons, which increases their risk of suffering major harm. It is necessary to prepare a framework to enable the greater community to support such people.

Because almost all residents would have been afflicted just after a major earthquake disaster, it would be difficult for public disaster prevention organizations to serve all of them. Also, limiting the extent of damage is often beyond an individual or family's ability, so it is important for people of the entire community to work together. Voluntary antidisaster organizations are community disaster prevention groups that operate on a routine basis.

Immediately after the Great Hanshin-Awaji Earthquake, about 95% of the people who were trapped under a collapsed house or locked in a building escaped on their own or were rescued by their family members, friends or neighbors, whereas only 1.7% of them were rescued by fire services or other public services.

Recognizing that disaster prevention activities by voluntary antidisaster organizations contribute to alleviating disaster damage, the Chikusei city has been promoting such organizations since 2008 with its subsidy system for forming such organizations. The subsidy may be used for the creation of a disaster prevention map and the procurement of disaster prevention equipment/materials (e.g. fire extinguishers, stretchers, megaphones and flashlights).

3. Chikusei City's Stockpiles

The city stores food, drinking water, blankets, underwear, blue tarps, knockdown toilet kits, toilet tissue, and other supplies in preparation for a disaster. A large variety of emergency food is stored, including cooked and dry-packed rice (assorted rice, rice gruel, and pilaf), soft bread (chocolate or caramel flavored) and kenchin soup, all of which have a shelf life of more than five years.

List of stored foods As of March 14, 2012

Item	Quantity
Cooked and dry-packed rice (assorted rice and pilaf)	7,350 Servings
Rice gruel (with pickled *ume*)	900 Servings
Soft bread (chocolate, caramel, or mixed flavored)	3,600 Servings
Kenchin soup	8,760 Servings
Total	20,610 Servings

4. Project to Improve the Wireless Disaster Prevention Information System

Considering a means of conveying information at the time of disaster as the highest priority issue, Chikusei city deployed a wireless disaster prevention information system covering the entire city for three years from 2007. The system was operated in the Sekijo, Akeno and Kyowa districts, where aging analog equipment was replaced with digital equipment. In the Shimodate district, digital equipment was newly installed. We started full-fledged operation of the system covering the entire city on February 1, 2010.

The system consists of a master station, remote control station (at the firefighting headquarters), nationwide real-time warning system, 142 new stations in Shimodate district, 66 stations in Sekijo, 66 in Akeno, and 45 in Kyowa districts, bringing the total number to 319 stations.

We will use the system to issue disaster prevention information, including evacuation advisories, when disaster is expected to occur or when a flood, earthquake or other disaster emergency strikes; to ask fire companies for help in fighting a fire; to request a search for or information on missing people (especially the elderly); to provide information about prolonged water/electricity failure, stoppage of phone lines, and prospects for their recovery; to sound a time tone at noon and in the evening; to broadcast to elementary and junior-high school students for crime prevention when they are returning home; and to publicize a variety of administrative information.

In addition to the wireless disaster prevention information system, we have a nationwide real-time warning system (so-called J-ALARM). Upon an emergency such as a wide-scale disaster or foreign armed attack, J-ALARM instantaneously conveys emergency information that is provided by the government and necessary to protect the people through a communication satellite and automatically starts up the wireless disaster prevention information system to broadcast an alarm.

(1) Process until the broadcasting of an alarm

i) The Cabinet Secretariat or the Meteorological Agency recognizes the occurrence of an emergency situation.

ii) Information on the emergency is conveyed to the Fire and Disaster Management Agency.

iii) The Fire and Disaster Management Agency broadcasts emergency information nationwide through a communication satellite.

iv) The wireless disaster prevention information system of each town automatically starts and broadcasts an alarm.

(2) Alarm is broadcasted upon

i) an emergency situation such as an invasion

・Alarm in case of a ballistic missile attack

・Alarm in case of an aerial assault

・Alarm in case of a guerrilla attack

・Alarm in case of a large-scale terrorist attack

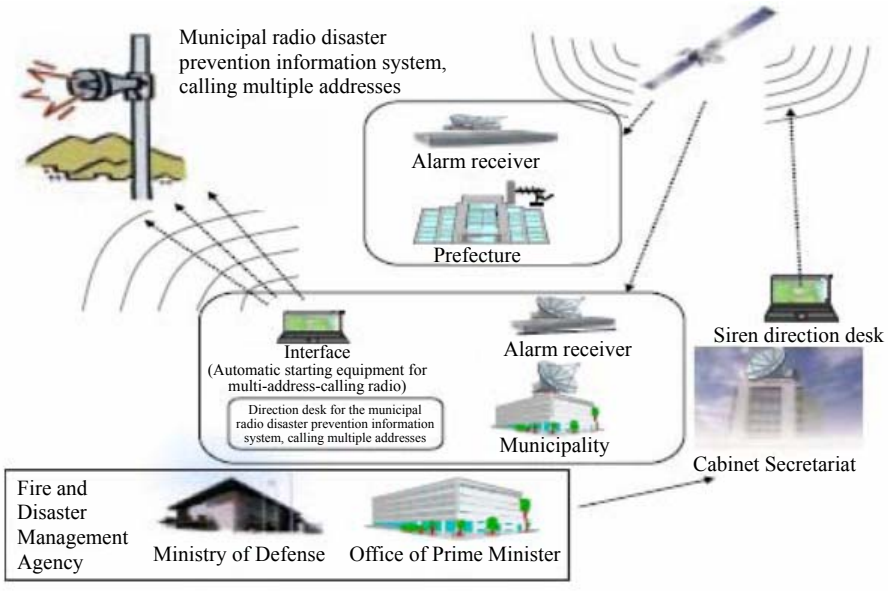
ii) a possible occurrence of a wide-scale disaster

・Earthquake early warning

・Preliminary earthquake intensity report (intensity-5-lower or stronger)

(3) When an earthquake early warning is broadcast

Appropriate evacuation using an earthquake early warning depends on your keeping calm and ensuring your own safety as the situation demands. Earthquake early warning is information to alleviate earthquake damage using the very short time between the beginning of an earthquake and the start of a strong jolt, so it is extremely difficult to escape to outside a building, for example. When an earthquake early warning is provided, keep calm and ensure your own safety as the situation demands."



5. Disaster Aid Agreement

An administrative organ signs an agreement with private businesses, groups or other administrative bodies to secure manpower and goods at the time of a disaster.

In recent years, major earthquakes, floods, and other wide-scale natural disasters have been hitting the country and many other places in the world frequently, causing the loss of many lives and properties.

To ensure early response to major disasters, including the provision of food and daily commodities to victims, transportation of critical materials, and facility restoration work, it is essential to ensure cooperation of various groups, including private businesses. to cooperate.

6. Keep Your Family Safe

The whole family needs to cooperate at the time of a disaster. So it is advisable to have family talks about disaster prevention on a routine basis. It is important to hold a disaster prevention meeting regularly, once about a month.

(1) Family disaster prevention meeting

Discuss and take the following matters and actions on a routine basis and define the roles of each member so that everyone can act calmly at the time of an earthquake

- ○ Where is the safest place to be in the house?
- ○ Check first aid medicines and beware of fire
- ○ Who takes responsibility for evacuating infants/elderly members?
- ○ For families with elderly members/children, how to evacuate them at the time of an earthquake, in particular.
- ○ Walk to the temporary gathering spot and the evacuation area.
- ○ Who will take out what when evacuating? Where to place emergency packs?
- ○ Define the roles of each member for daytime and for night.

(2) How to confirm the safety of family members

- ○ Decide in advance where to meet at the time of an earthquake.
- ○ Choose relatives, acquaintances, etc. (who live in a distant place) to relay information to about the well-being of family members at the time of an earthquake.
- ○ Learn how to use NTT Disaster Emergency Message Dial (171) and the emergency messaging service of cell-phone companies.

(3) Preparing emergency supplies

○ Food: at least for three days (preferably foods ready to eat without heating)
hardtack, canned bread, biscuits, crackers, chocolate, powdered milk for babies, baby food

○ Information: portable radio to obtain correct information (with enough standby batteries)

○ Lighting: one flashlight for every member (with enough standby batteries)

○ Lighting: one flashlight for every member (with enough standby battery)

○ Fuel: portable gas cooker and solid fuel

○ Other: leather gloves or thick cotton gloves, clothes, rain gear, thick socks, shoes, 10-yen coins for pay phones, medicine including nonprescription drugs, masks, towels, bathroom tissue, wet tissues, a whistle for calling for help, matches or a lighter, candles, all-purpose knife, aluminum sheets to keep warm, plastic sheets, photo of family members (for searching after getting separated), writing utensils, ropes, plastic containers or buckets, waterless shampoo, paper underwear, disposable body warmers

* Put emergency supplies in rucksacks so both your hands will be free, and place them somewhere known to all family members, where they can be taken from easily.

* It would be useful to have emergency supplies also in the car in case your house collapses.

(4) Safety measures in your house

- Ensure safe layout of furniture. Place furniture in less-used rooms. Don't place furniture in a bedroom. If necessary, avoid places where furniture could fall onto you.
- Take measures to prevent tumbling /falling of furniture

  Don't leave gaps between furniture and walls/pillars. Prevent tumbling or falling using L-shaped brackets, furniture joining brackets, fall prevention sheets, etc.
- Apply glass safety film to windowpanes. Apply glass safety film not only to windows but also to glass used in cupboards and frames.

本資料は、筑西市総務部消防防災課発行の「筑西市の防災対策」の抜粋を英訳したものである。
作成年月日：平成 24 年 9 月 1 日