Mori Building Comprehensive Earthquake Protection

Turning cities from places to flee in the event of an earthquake into places of refuge

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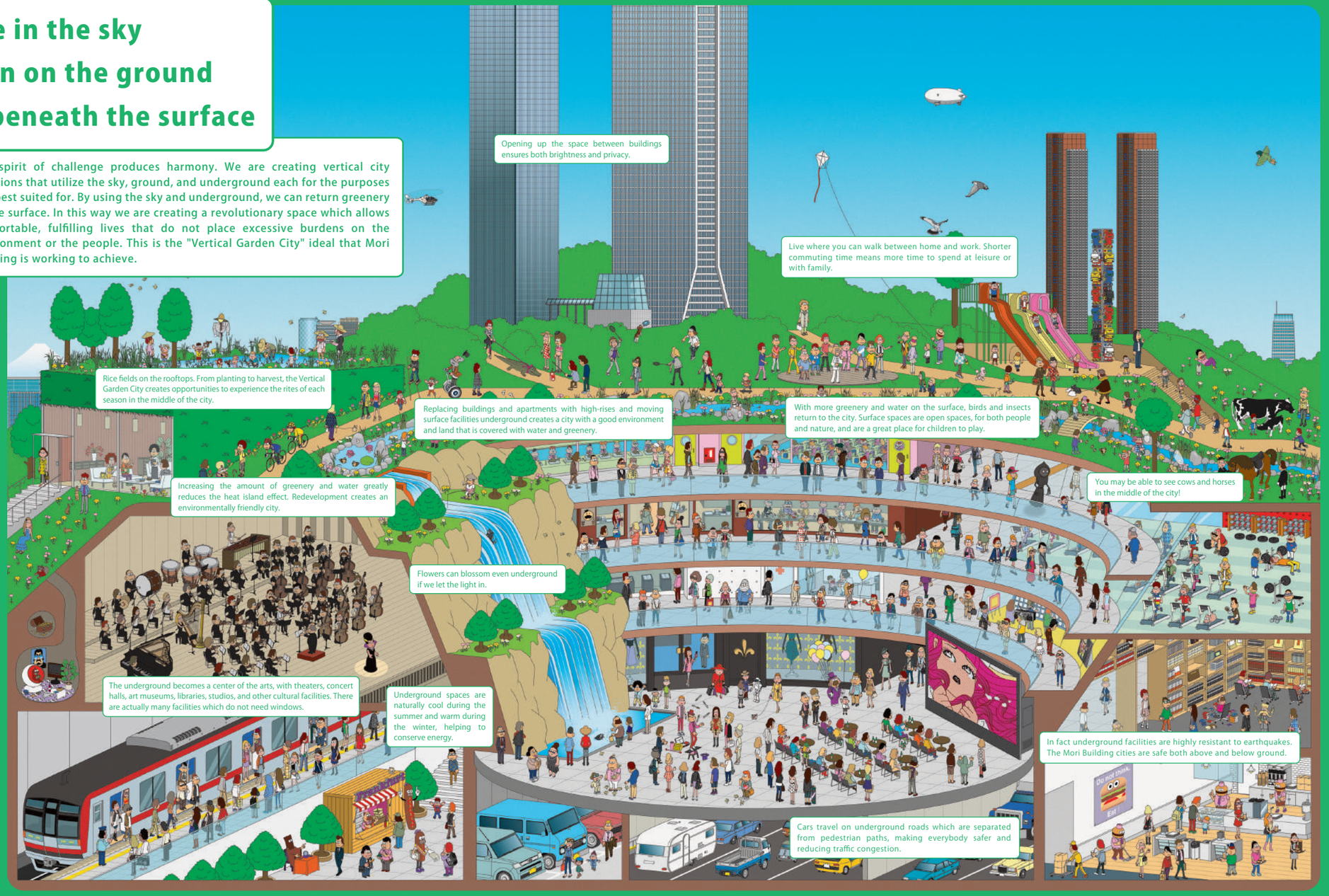
MORI

The Mori Building ideal of a "Vertical Garden City"

Hope in the sky
Green on the ground
Joy beneath the surface

The spirit of challenge produces harmony. We are creating vertical city functions that utilize the sky, ground, and underground each for the purposes it is best suited for. By using the sky and underground, we can return greenery to the surface. In this way we are creating a revolutionary space which allows comfortable, fulfilling lives that do not place excessive burdens on the environment or the people. This is the "Vertical Garden City" ideal that Mori Building is working to achieve.



Vertical Garden City concepts

Safety and security

Together with the urban infrastructure needed to support continuity of business and everyday lives, including buildings with superior earthquake resistance and dependable energy supply systems, we are preparing organizational systems and human elements such as emergency supplies to serve as a center for disaster readiness in order to create a safe and secure city.

Environment and greenery

We are actively working for greater urban greening as we aim for a harmony between cities and nature, creating expansive cityscapes that are rich with vegetation and water on the surface. We are also using the latest technologies and working to create good environments that are also highly energy efficient.

Culture and arts

A creative city always overflowing with the most advanced information and arts gives rise to inspiration and new values. The city itself can also be used as a form of media, creating lives that are filled with intellectual stimulation.

Global

As a global standard urban environment that is suitable for a new international city center, we develop a stage where a variety of players can be active, regardless of nationality, promoting a diverse range of communications and new connections.

Community

The city is full of places and opportunities for encouraging communication among the local community that has developed there over generations and new residents, visitors, and others.
A true, mature community is a powerful support for a city, and it instills love for and pride in the city.

Working to create cities that are places of refuge in the event of a disaster

Safety and security are two of the most important and urgent issues which face Japan as a nation that is frequently subject to natural disasters such as earthquakes and typhoons. The likelihood of an earthquake directly striking the capital of Tokyo is growing, and in order to protect our lives and property, and also in order to gather people, products, finance, intellect, and information from around the world, it is essential that we regenerate Tokyo as a highly disaster-resistant city.

The idea of city disaster-readiness also means changing a city from a place to escape in the event of a disaster to a place where one can find refuge. By creating a grand design for the city and then conducting redevelopment and other work in stages based on the design, we can reorganize and rebuild the aging urban infrastructure and narrow alleyways of the city while using global top-class vibration-damping technology to make the city into a center of disaster-readiness.

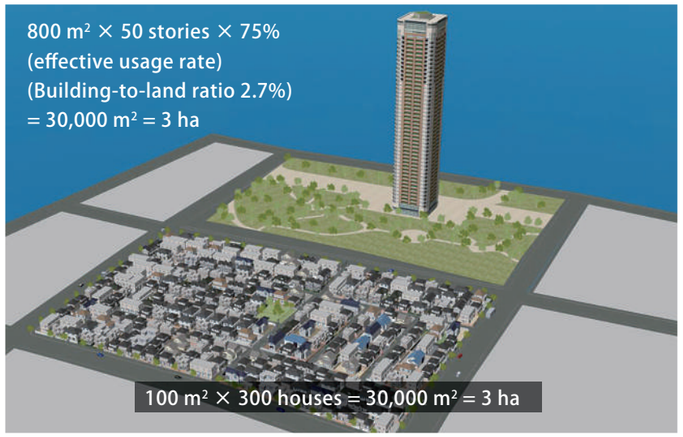
We have declared our intention to make the city a place where one can find refuge in time of disaster, and are taking steps to carry it out.

Mori Building Comprehensive Earthquake Protection

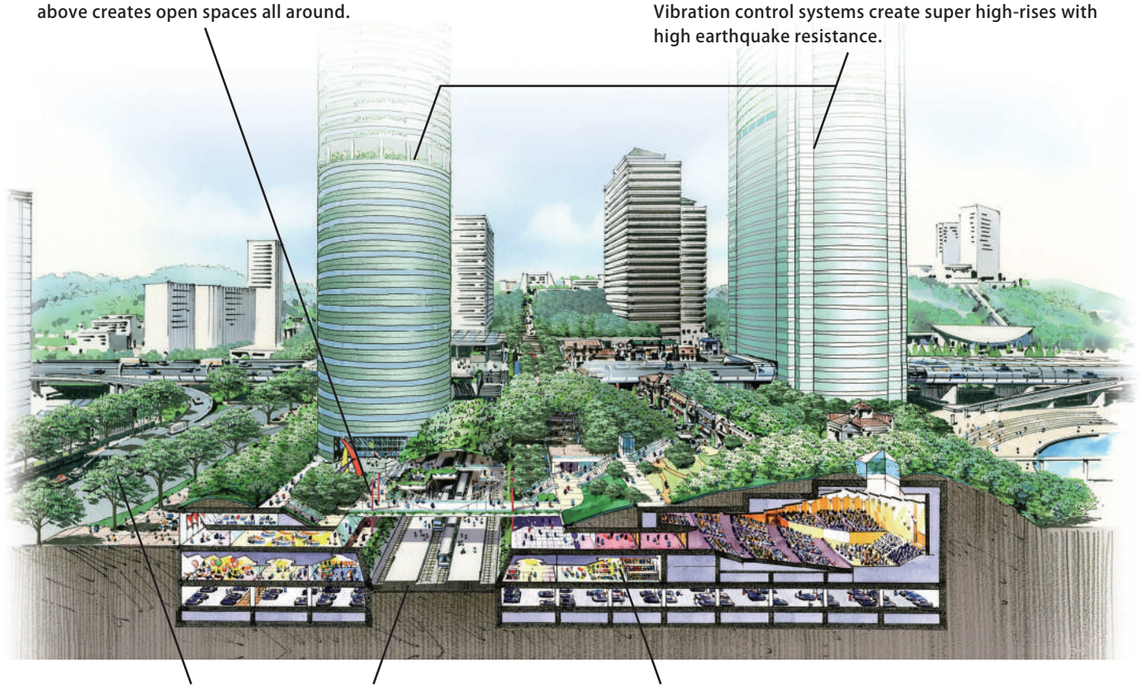
※ As of May 2017. Information in this document is subject to change without notice.

1-1 Safe and secure living achieved through redevelopment

The Mori Building redevelopment methods which rebuild the urban infrastructure are highly effective in increasing the disaster-readiness of a city, and produce improvements to areas of closely-packed wooden buildings. By consolidating areas of high-density low-rise buildings into super high-rise buildings that are highly resistant to earthquakes and fire, and also by conducting development that is integrated with regional roads and other infrastructure, it is possible to create a nearby place of refuge and to improve the disaster-readiness of the entire region.
Mori Building is working to make effective use of our limited city space and create spaces and areas of greenery where people can relax and where there is plenty of space to gather if necessary, in order to create safe and secure living for everybody.



300 densely-packed houses can be consolidated into one 50-story super high-rise. This results in ample open space at the base.



1-2 Examples of urban infrastructure construction: The Hills Series

An excellent example of urban infrastructure reconstruction can be seen in the Hills Series of large-scale multipurpose redevelopment projects.

ARK Hills (1986) ～The starting point of large-scale redevelopment in areas of densely-packed wooden buildings～

District area: Approx. 5.6 ha

ARK Hills was the first private large-scale redevelopment project in Japan, and turned an area of densely-packed wooden buildings into an advanced multipurpose city district.
The office building, ARK Mori Building, incorporates the most advanced vibration-damping systems of the time, and provides earthquake safety that is equivalent to the latest super high-rise buildings built after the year 2000.


Before redevelopment


After redevelopment

Roppongi Hills (2003) ～Creating urban infrastructure for a city that is a place of refuge～

District area: Approx. 12.0 ha

This urban redevelopment project was on the largest scale of any private project and involved the creation of a revolutionary new foundation for urban safety that includes roads and other infrastructure.
In preparation for a possible scenario in which 5,000 people are unable to return home, the largest private stock of emergency supplies has been prepared. The neighborhood association composed of local residents and workers also conducts general disaster readiness training every year, and it is preparing to be a center of regional disaster readiness in terms of both infrastructure and human capabilities.


Before redevelopment


After redevelopment

● Examples of infrastructure work during the Roppongi Hills project

This project not only replaced the buildings, but also improved the regional transportation network, separated the spaces for pedestrian and vehicle traffic, and involved other steps for the construction of a safe urban infrastructure.
Before the project, the area contained complex narrow streets where fire trucks could not enter in case of a fire, and was highly susceptible to disaster. By combining the fragmented properties and collecting the isolated buildings together into a super high-rise, it was possible to create larger roads and wide open spaces on the ground.


District before redevelopment


Construction of regional arterial roads, open spaces, and other spaces through redevelopment

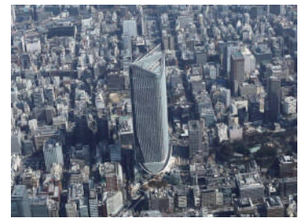
Toranomon Hills (2014)

～Model project for urban renewal through a public-private partnership making use of a Multi-Level Road System ～

District area: Approx. 1.7 ha

Making use of a Multi-Level Road System, this innovative project uses land effectively by constructing buildings in space above and below roads, redeveloped into a zone allowing construction. The Loop Road (Kanjo) No. 2, which connects central Tokyo and the oceanfront over its 14km length, runs underground beneath a 247m tall building. This is a model case for new urban development that makes maximal use of precious land and enables the creation of a multifunctional and advanced multi-level city within central Tokyo.

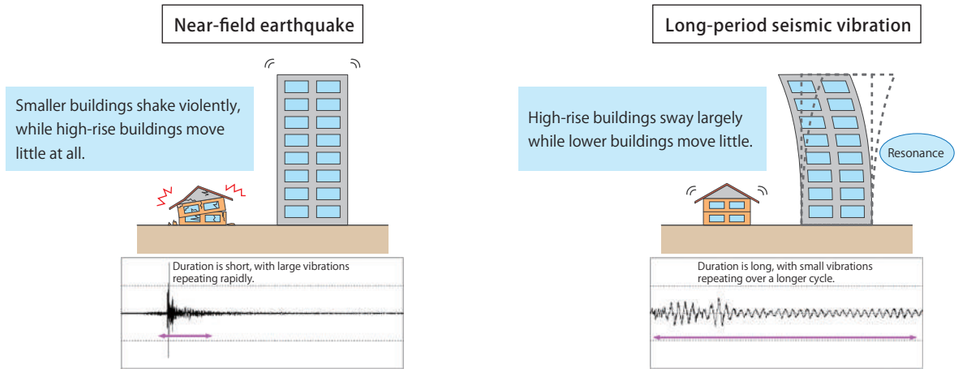

Before redevelopment


After redevelopment

* The project was undertaken by the Tokyo Metropolitan Government, with Mori Building acting as a "specified builder."

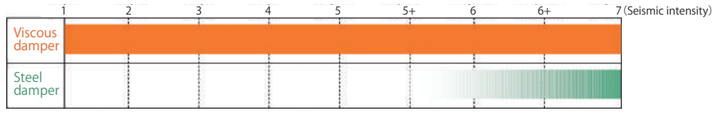
2-1 Earthquake resistance of super high-rise buildings

Although there is concern of an earthquake directly striking the Tokyo Metropolitan Area, it is already known that the short-frequency vibration of a near-field earthquake will not cause serious damage to super high-rise buildings. While approximately 240,000 mid- and low-rise buildings were destroyed or collapsed during the Hanshin-Awaji earthquake, which reached a maximum of 7 on the Japanese seismic intensity scale, no super high-rise buildings suffered major damage.
On the other hand, long-period seismic vibration occurs at locations farther from the epicenter, and moves the ground more slowly. Despite the slower acceleration, this causes super high-rise buildings to sway more than smaller buildings, producing the phenomenon known as resonance.

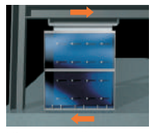


Vibration-damping systems which absorb seismic energy in super high-rise buildings

Vibration-damping systems are highly effective as a means of reducing the swaying of super high-rise buildings during an earthquake. Vibration-damping systems can be broadly divided into two types: viscous dampers in which the resistance of oil or a viscous fluid absorbs the vibration, and steel dampers which concentrate damage in vibration-damping material in order to protect pillars and beams. Viscous dampers are effective in absorbing all levels of movement from swaying caused by wind to major earthquakes, while relatively inexpensive steel dampers are particularly effective in major earthquakes. Using these vibration-damping systems in combination makes it possible to achieve broad-ranging effects while keeping costs down.
(Examples of use: Roppongi Hills Mori Tower, ARK Hills Sengokuyama Mori Tower, Toranomon Hills Mori Tower, etc.)

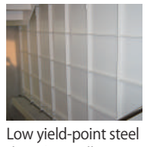


● Viscous dampers


Viscous wall damper


Oil damper

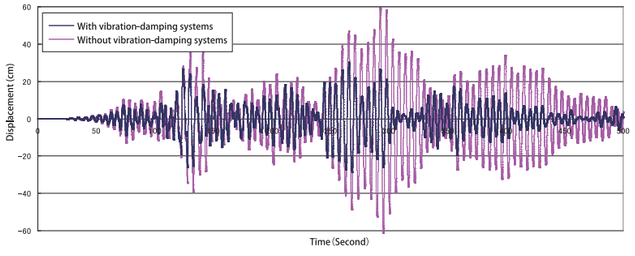
● Steel dampers


Low yield-point steel damping wall


Unbonded brace

Three effects of vibration-damping systems: Halving of building sway *

Analysis of readings from seismographs installed in key buildings reveals that seismic mitigation systems reduce three values in super high-rise buildings during an earthquake: the amplitude (deformation), duration, and speed (acceleration) of building movement.
Our company provided seismographic survey data, measured at the Roppongi Hills Mori Tower during the Great East Japan Earthquake, to Professor Kazuhiko Kasai, an authority on anti-seismic engineering and head of the Structural Engineering Research Center, Tokyo Institute of Technology. Together we engaged in joint research into seismic mitigation and vibration damping effects. The research demonstrated that vibration control devices halved building displacement (measured value of 32cm on one side)* and also showed an effect on early convergence of swaying.



Displacement measured at the top (54F) of the Roppongi Hills Mori Tower during the Great East Japan Earthquake.

* Amplitude of sway in the y direction measured in the Roppongi Hills Mori Tower during the Great East Japan Earthquake (30cm in the x direction). The amplitude of sway without seismic mitigation systems was estimated by computer simulation to be 61cm.

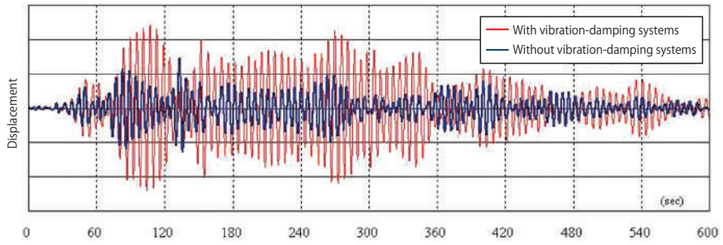
Vibration-damping systems that are also effective with long-period seismic vibration

The concern with long-period seismic vibration is that a high-rise building will resonate, producing large movement and causing repeated deformation of the building over a long period of time. In this case as well, vibration-damping systems can have a large effect. Although the effects depend on the types and number of vibration-damping systems used, it is possible to reduce movement due to long-period seismic vibration by 50%.

It is now said that a Tonankai earthquake is likely, and will produce strong long-period seismic vibrations in the Kanto area. Simulations show that in the event of a maximum magnitude Tonankai earthquake, the vibration-damping systems will reduce movement on the 54th floor of the Roppongi Hills Mori Tower by approximately half.

Results from Tonankai earthquake simulation for Roppongi Hills Mori Tower With vibration-damping systems Without vibration-damping systems Displacement

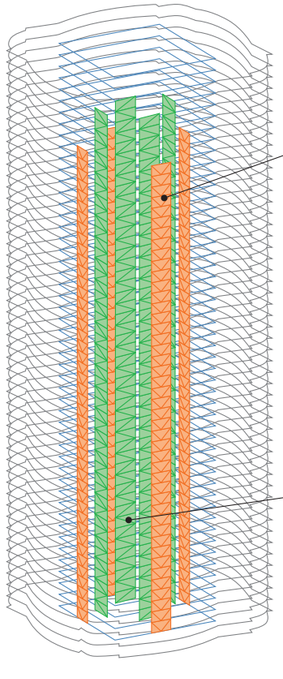
● Results from Tonankai earthquake simulation for Roppongi Hills Mori Tower



2-2 Roppongi Hills Mori Tower: The highest grade of earthquake resistance performance in Japan

Roppongi Hills Mori Tower utilizes a combination of semi-active oil dampers (viscous dampers) and unbounded braces (steel dampers) to achieve the highest grade of earthquake resistance performance in Japan, ensuring that the building will continue to function even in the event of an earthquake on the same level as the Great Hanshin-Awaji Earthquake Disaster. These systems greatly reduce building movement, whether swaying due to wind or movement due to major earthquake, delivering high levels of safety and comfort to the residents. During the Great East Japan Earthquake, at the restaurant on the 51st floor not a single wine glass fell over.


Roppongi Hills Mori Tower



Semi-active oil dampers
356 installed in the building

Electrical control adjusts the flow of oil inside the dampers, absorbing all kinds of movement from swaying caused by the wind to major earthquakes.

Unbonded braces
192 installed in the building

These braces use a soft steel that has the ability to stretch, and is effective in absorbing energy when an earthquake occurs.

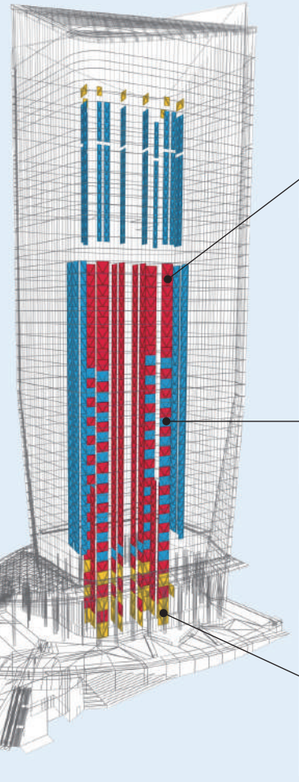
2-3 Earthquake countermeasures to match the characteristics of the building

In accordance with our own earthquake resistance standards, our company selects a variety of construction methods according to advantages in development and utilization of space.

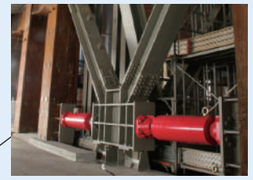
Toranomon Hills Mori Tower (2014)

This building employs three types of vibration control device: oil dampers, brake dampers, and unbonded braces. These achieve advanced anti-seismic performance allowing continuity of business without major damage, even in the event of a major earthquake on par with the Great Hanshin-Awaji Earthquake or the Great East Japan Earthquake. By adopting such vibration control devices, Toranomon Hills Mori Tower achieves JSCA* "Special Grade" seismic resistance performance.

* Japan Structural Consultants Association



Oil dampers (516 units installed)



These exert an effect in controlling vibration from strong wind or even major earthquakes, by absorbing the energy of vibration through fluid resistance.

Brake dampers* (620 units installed)

The frictional force of the braking material converts the vibration energy into frictional heat, lessening damage to the building.

* Has properties similar to those of steel dampers

Unbonded braces (steel dampers) (82 installed in the building)

These braces use a soft steel that has the ability to stretch, and is effective in absorbing energy when an earthquake occurs.

ARK Hills Sengokuyama Mori Tower (2012)

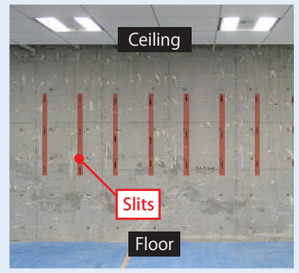
The dual use of viscous wall dampers, which are effective for a wide range of movements from wind-induced swaying and small- and medium-scale earthquakes to large earthquakes, and brake dampers, which are particularly effective for large earthquakes, as vibration control devices makes it possible to control not only unpleasant swaying caused by the wind but also small to large earthquakes and long-period earthquake vibrations, the impact of which on super-high-rise building are a source of concern.

Brake dampers

Viscous wall dampers

ARK Mori Building (1986)

This building was designed so that in the event of a major earthquake, vibration is concentrated in the "slit wall" vibration-damping systems in order to protect pillars and beams, minimizing structural damage.



Slit wall

Motoazabu Hills (2002)

Focusing on living comfort of the housing complex, a base isolating structure was used, however because there were also concerns that swaying of a super high-rise building during an earthquake could pull the building out of its foundations, additional steps were taken such as the use of high-strength base isolation rubber and broadening of the building's base.

Base isolation rubber

Omotesando Hills (2006)

Intermediate vibration dampers were installed between the residence floors and shop floors. This created a different span between the housing and commercial spaces and prevented noise from cleaning of the shops below form reaching the residences, while also improving the earthquake resistance performance of the entire building.

Intermediate vibration-damping systems

Shanghai World Financial Center (2008)

Following the September 11 terrorist attacks in New York City, the design plan for this building was reviewed and a dual tube structure (megastructure on periphery and a steel-reinforced core wall at the center) was adopted. The structure will prevent the entire building from collapsing even if localized damage occurs in excess of expectations.

Structural model

Atago Green Hills Forest Tower (2001)

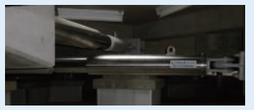
Ordinarily 50 – 100-ton oil dampers were used in residence buildings of this size, however in order to obtain larger vibration-damping effects, we made use of the large installation space available and installed 200-ton dampers.

200-ton oil damper

Roppongi Hills Keyakizaka Complex (2003)

This building uses Mori Building original green mass dampers – dampers which use the 3,650 tons of soil in the rooftop garden as a counterweight. Ordinarily considered a disadvantage, the weight of the soil was instead put to good use.

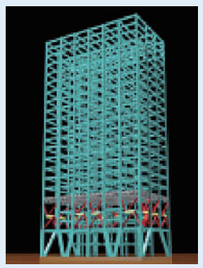
Base isolation rubber



Damper

ARK Hills Front Tower (2011)

Utilizing the characteristics of the floor structure which places parking areas on floors 3 – 5, at same height as the neighboring Tokyo Metropolitan Expressway, large numbers of vibration dampers were placed in these floors instead of the usual balanced arrangement on standard floors. Collecting the dampers on these floors makes more effective use of the standard floors possible.



Vibration-damping systems collected on three floors (shown in red)

2-4 Original earthquake resistance standards that exceed the new earthquake-resistant design standards required by regulations

Mori Building uses its own original high standards for earthquake resistance in all the large-scale buildings which we operate and manage (total floor space more than 10,000㎡). All of them feature earthquake resistance performance that is at or above the new earthquake-resistant design standards required by regulations.

Building name	Year completed (renovated)	Earthquake resistance performance			Adoption of vibration control devices	Disaster damage estimation system: e-Daps	Emergency earthquake warning system	ELV long-period earthquake countermeasures *4	Emergency wells	Other
		Level exceeding new seismic performance level *1	New seismic performance level *2	Old seismic performance level *3						
GINZA SIX	2017	○			○		○	—		Space available for installation of tenant generators. Emergency power generator (installed).
Toranomon Hills Mori Tower	2014	○			○	○	○	○	○	Emergency power generator for shared tenant use (installed).
ARK Hills South Tower	2013	○			○		○	○	○	Emergency power generator for shared tenant use (installed).
ARK Hills Sengokuyama Mori Tower	2012	○			○	○	○	○	○	Emergency power generators for business continuity
ARK Hills Front Tower	2011	○			○		○	○	○	Space available for installation of tenant generators.
Hirakawacho Mori Tower	2009	○			○	○	○	—	○	Space available for installation of tenant generators.
Holland Hills Mori Tower	2004	○			○		○	—	○	Space available for installation of tenant generators.
Roppongi Hills Mori Tower	2003	○			○	○	○	○	○	Power supplied by specially designated power supply business facility.
The Prudential Tower	2002	○			○		○	○		Space available for installation of tenant generators.
Atago Green Hills Mori Tower	2001 (2007)	○			○	○	○	○	○	Emergency power generator for shared tenant use (installed).
Roppongi Hills Gate Tower	2001	○			○		○	○		
Akasaka Tameike Tower	2000	○			○		○	—	○	Space available for installation of tenant generators.
Koraku Mori Building	2000	○			○		○	○	○	Space available for installation of tenant generators.
ARK Mori Building	1986 (2005)	○			○	○	○	○	○	Space available for installation of tenant generators.
Roppongi First Building	1993		○				○	—		Space available for installation of tenant generators.
Toranomon 37 Mori Building	1981 (1999)		○				○	—	○	
Toranomon 36 Mori Building	1981 (2004、2012)		○				○	—		Emergency power generator for shared tenant use (installed).
Toranomon 35 Mori Building	1981 (2001、2011)		○					—		Emergency power generator for shared tenant use (installed).
Toranomon 33 Mori Building	1977 (1999、2007)		○					—		
Toranomon 30 Mori Building	1975 (2007)		○					—		
Roppongi Hills North Tower	1971 (2004)		○				○	○		
Toranomon 15 Mori Building	1969 (2010)		○ Renovation for earthquake resistance					—		

※1 Level exceeding new seismic performance level: Earthquake resistance performance that exceeds the standards determined by the current Building Standards Law
※2 New seismic performance level: Earthquake resistance performance that meets the standards determined by the current Building Standards Law
※3 Old seismic performance level: Earthquake resistance performance that meets the standards prior to revision of the Building Standards Law in 1981
※4 ELV long-period earthquake countermeasures are installed according to the length of elevator shaft (measures to prevent ropes becoming caught when resonance occurs).

Renovation for improving earthquake resistance as well as renovation of the exterior and other elements has been completed at all operating buildings which were constructed before the new seismic performance standards were established in 1981, and all are operating at full capacity following the renovations.

Renovated building name	Compleated	Completion of renovation
Toranomon 11 Mori Building	1966	2010
Nishi-Shimbashi 2-chome Mori Building	1966	2008
Toranomon 15 Mori Building	1969	2010
Edomisaka Mori Building	1974	2009

Renovation of the Toranomon 15 Mori Building

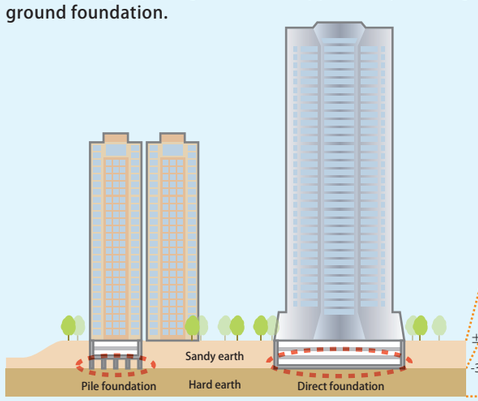
Geographical characteristics of Minato City

Nearly all of our buildings are located on high ground in areas where liquefaction is unlikely to occur. In addition, the buildings are supported by stable structures and a sturdy ground foundation.

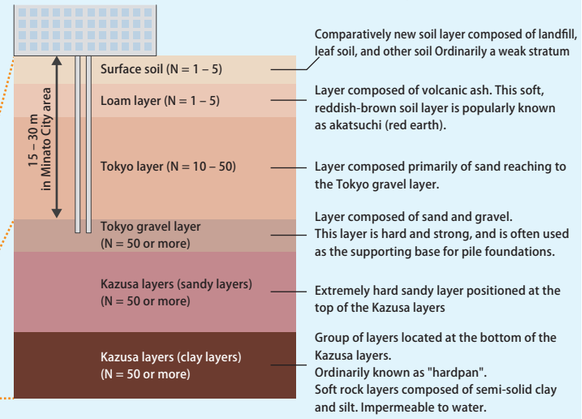
● Topographical map of ground height above sea level in Tokyo Metropolitan Area

Source: Geographical Survey Institute

Mori Building super high-rises are supported by a strong ground foundation.



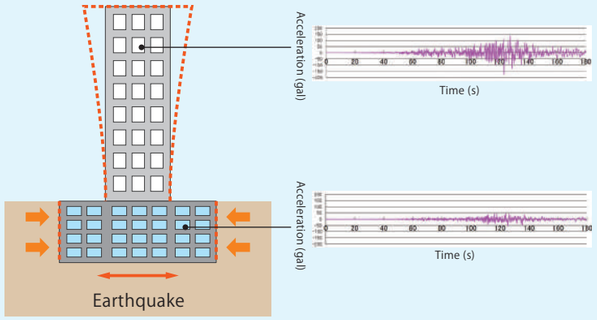
● Reference: Ground structure in area around Minato City



Highly earthquake-resistant underground spaces

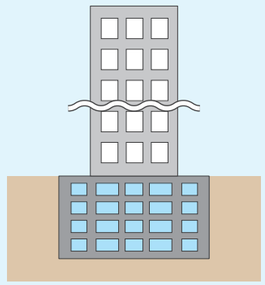
Little earth movement

Because deformation of underground spaces in the lateral direction is limited by the densely packed ground, movement during an earthquake is small. This performance was verified from the results of earthquake measurement during the Northwest Chiba Earthquake (July 23, 2005).



Underground structures are sturdy.

Because underground structures are built to resist soil pressure, the outside is surrounded by a thick wall, creating a strong structure like a concrete box. During the Great Hanshin-Awaji Earthquake Disaster, there was less damage to subways and other underground facilities compared with the heavily-damaged above-ground structures.

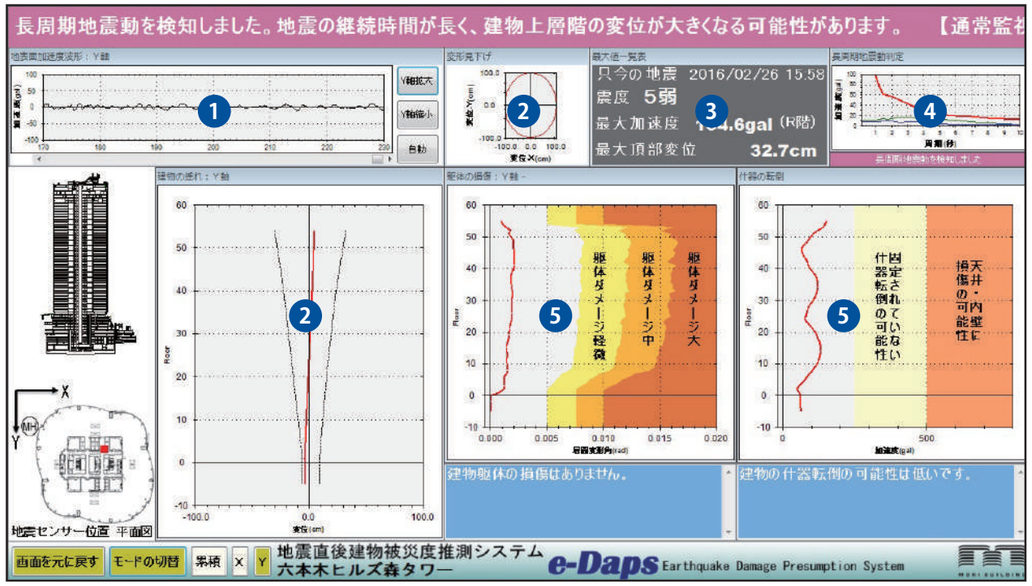


2-5 Post-earthquake building damage estimation system: e-Daps ～New measures taken following the Great East Japan Earthquake (1)～

Our company has developed e-Daps (Earthquake Damage Presumption System), a system able to make preliminary assessments of damage to buildings immediately following an earthquake. We have adopted the system in Roppongi Hills, Toranomon Hills, and other major buildings. e-Daps automatically performs real-time analysis of acceleration of sway and deformation in a building, based on the building's specific structural properties and data from seismographs installed inside. Where assessment of structural safety is difficult to perform visually, the system enables assessment on the basis of measurement data, allowing first response with priorities ordered.
By building in a unique mechanism that can immediately determine the presence of long-period earthquake vibrations to which high-rise buildings are vulnerable, we have equipped the system with functions to issue warnings before shaking becomes significant. The ability to perform measurement-based safety checking immediately following a large earthquake contributes to tenants' BCP and to the safety and security of residents, and is an effective aid when sheltering stranded persons.

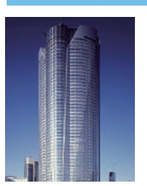
Simple display and voice-based announcements that are intuitively understandable even to non-experts

e-Daps display



❶ Display of seismograph data waveforms
❷ Real-time display of building sway
❸ Display of ground surface maximum acceleration; maximum acceleration and displacement inside the building, and ground surface seismic intensity
❹ Display indicating presence of long-period earthquake vibrations
❺ Elevation display of building damage estimation analysis (building frame damage, toppling of household goods)

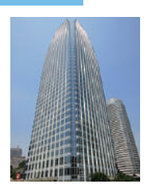
Buildings with e-Daps disaster damage estimation system in operation (Total: 12)


Roppongi Hills Mori Tower


Toranomon Hills Mori Tower


ARK Hills Sengokuyama Mori Tower

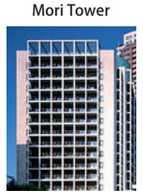

ARK Mori Building


Atago Green Hills Mori Tower


Hirakawacho Mori Tower


Motoazabu Hills Forest Tower

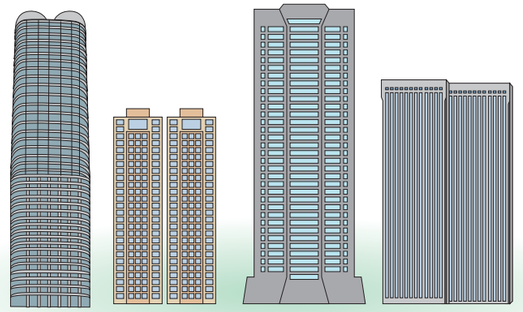

Roppongi Hills Residence C


Roppongi Hills Residence D


Atago Green Hills Forest Tower


ARK Towers


Omotesando Hills

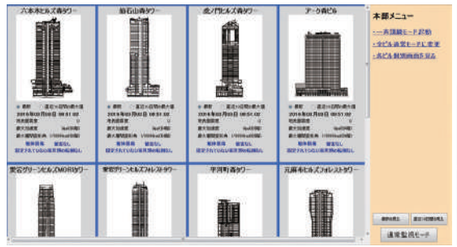


Full-time monitoring of earthquake vibration in the Security Control Center of each building

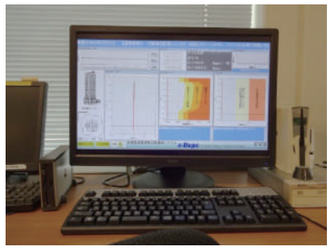
Occurrence of earthquake

Real-time deployment using dedicated lines

Disaster Response Headquarters



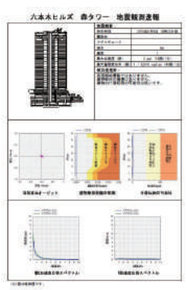
Design and Engineering Division



The Disaster Response Headquarters and Design and Engineering Division are able to view the displays for all e-Daps-equipped buildings.

Immediately communicate determination results

The system enables speedy and effective disaster readiness and response by automatically e-mailing reports to concerned parties and by linking with the proprietary Disaster Portal Site system that enables centralized online management of the damage status of buildings managed and operated by our company.



Bulletins

Assessment results are automatically converted to an A4-sized report for immediate use by tenants and other concerned parties as briefing materials.

Automatic email sending feature

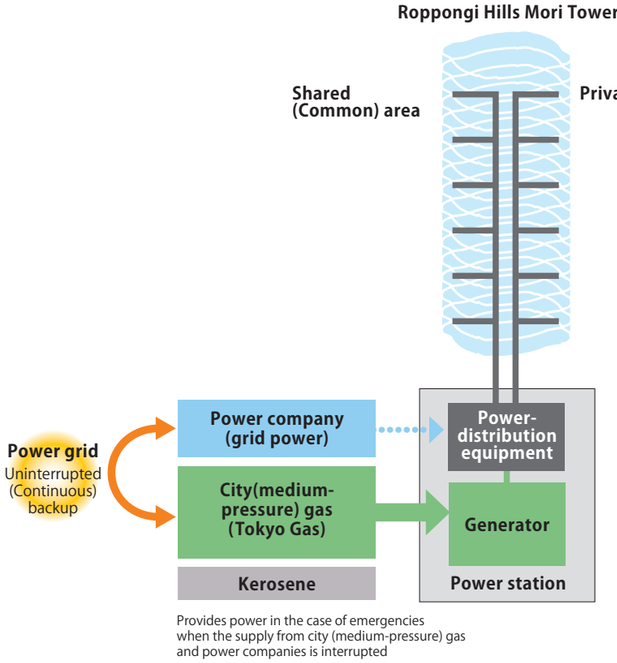
Along with a PDF-based bulletin, an email containing the assessment results is automatically sent to all concerned parties. This enables immediate understanding of the situation even from remote areas.

Linkage with the Disaster Portal Site

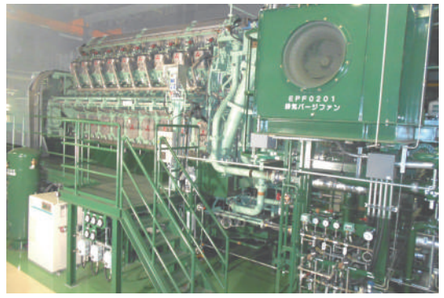
By linking with our own disaster information collection system, the system indicates floors to be given high-priority checking, and is effective in wide-area damage estimation and support from neighboring buildings.

2-6 Stable supply of power from an independent power station (Roppongi Hills)

Roppongi Hills uses its own energy plant (specially designated power supply business facility) to supply electrical power to the area.
Because this plant uses city gas (medium pressure gas) as the fuel, it is not affected by power restrictions on the use of electricity and is able to provide an extremely stable supply of electrical power .
The use of a power supply with triple redundant safety allows us to construct a power supply system with high reliability exceeding that of ordinary S-class buildings.



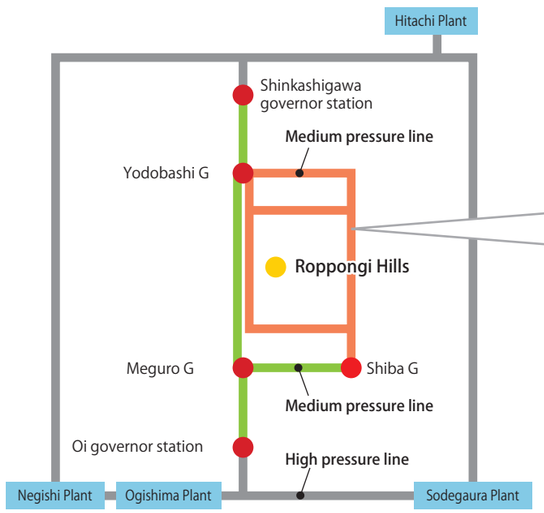
Provides power in the case of emergencies when the supply from city (medium-pressure) gas and power companies is interrupted



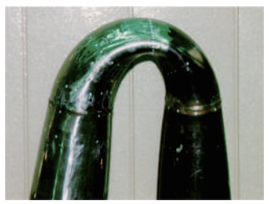
High reliability of city gas (medium pressure gas) supply

A looped and networked supply route is used for the city gas (medium pressure gas) that is used as fuel for power generation (normal power generation) at Roppongi Hills. In addition, the city gas medium pressure lines are more resistant to earthquakes than the electrical power infrastructure, and are a highly reliable utility infrastructure.

● System diagram of city gas supply network



Medium pressure gas lines were not damaged during the Great Hanshin-Awaji Earthquake Disaster



Does not break even when bent 180°

Supply of power from Roppongi Hills to TEPCO

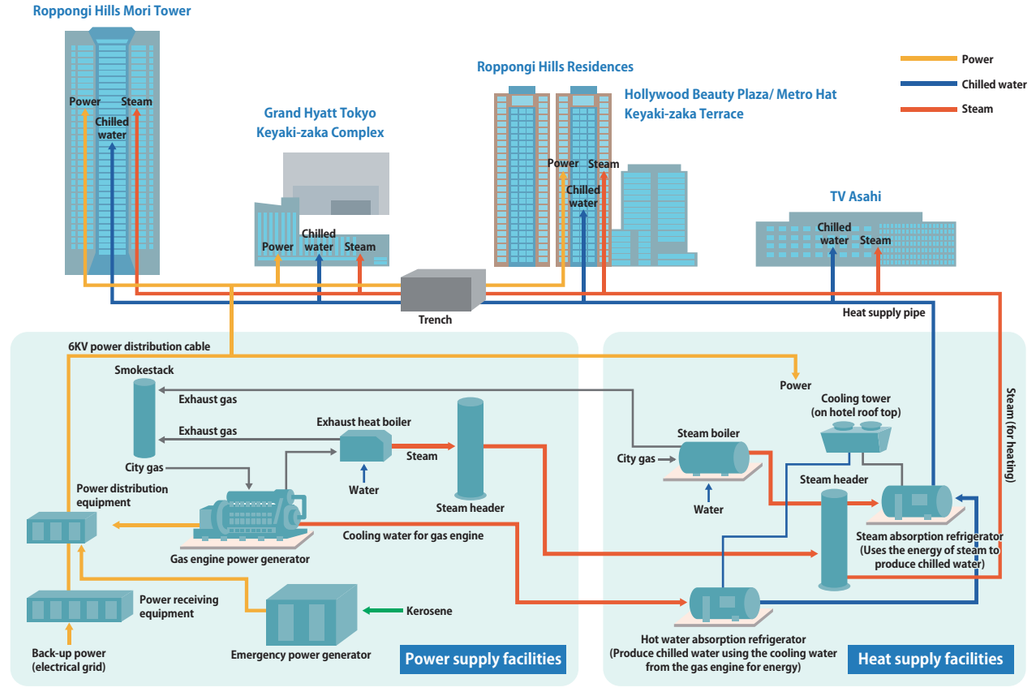
By combining excess capacity and energy-conservation, power was supplied from Roppongi Hills to TEPCO following the Great East Japan Earthquake at times when demand was compressing supply as shown below .

Supply period	March 18 – April 30, 2011	July 1 – September 22, 2011
Supply hours	24 hours	
Supplied power	6:00 – 20:00: 4,000 kW 20:00 – 06:00: 3,000 kW	6:00 – 20:00: 5,000 kW 20:00 – 06:00: 4,000 kW

(4,000 kW = Amount of power consumed by 1,100 ordinary households)

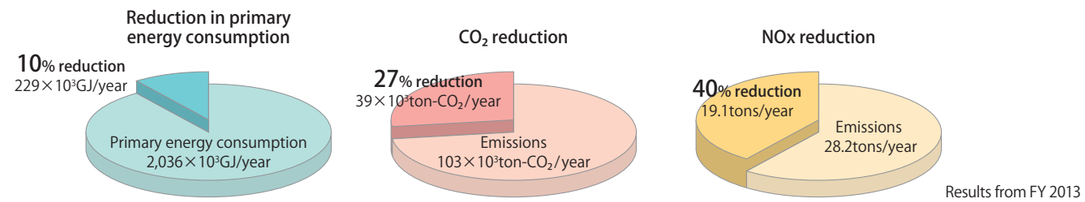
Area use of private power generation and exothermic energy systems

Roppongi Hills has constructed an energy network covering the entire area, and uses energy efficiently everywhere. A system known as "large-scale gas cogeneration + district heating and cooling (DHC)" has been introduced. With this system, electrical power is generated by medium pressure gas at the underground energy plant, and the waste heat is used for heating and cooling of offices, hotels, and commercial facilities within the area.



(For reference) Environmental characteristics

Roppongi Hills is composed of offices, residences, commercial facilities, a hotel, and other multipurpose facilities. Because demand for power and heat is stable and peak power demand is equalized, efficient energy use is achieved.
Moreover, the cogeneration system produces both electricity and heat together, and the waste heat from power generation is put to best use, reducing energy consumption by 16% and CO_2 emissions by 18%.
A 42% reduction in emissions of the NOx (nitrogen oxides) which are a cause of air pollution is achieved by the use of gas turbine denitrification equipment and low NOx boilers. The system we have constructed has an extremely low environmental impact.



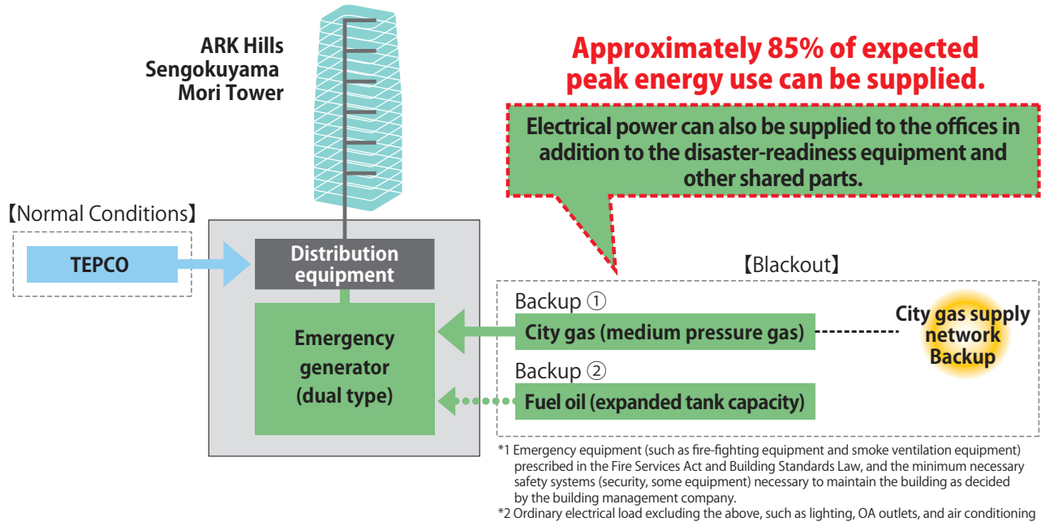
Results from FY 2013

2-7 Emergency power generation system using city (medium-pressure) gas ～New measures taken following the Great East Japan Earthquake (2)～

Introduction of emergency private power generation to enable business continuity in the ARK Hills Sengokuyama Mori Tower Project

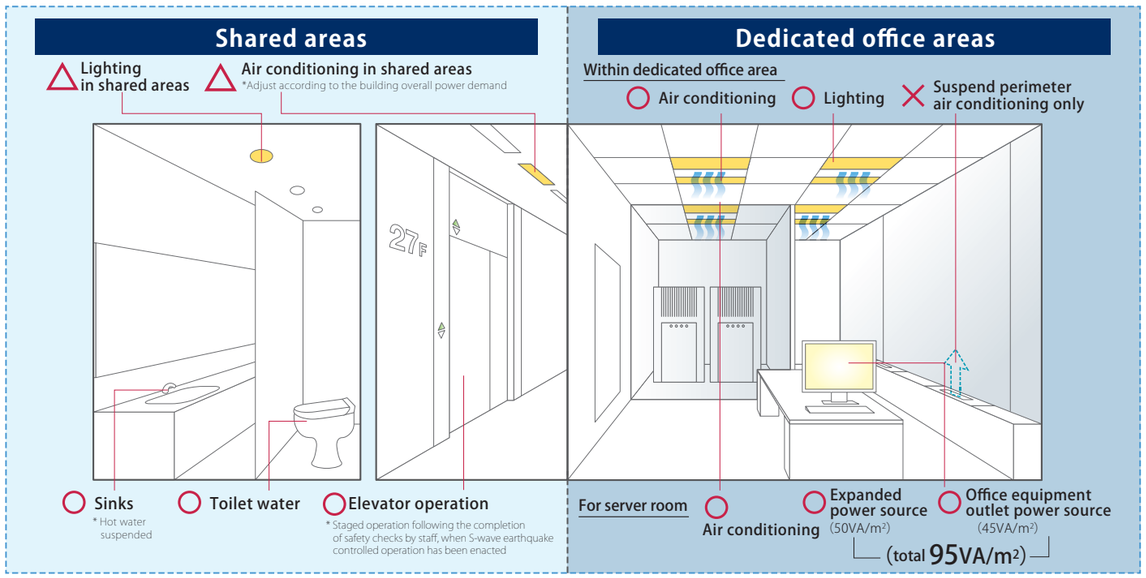
ARK Hills Sengokuyama Mori Tower (completed in August 2012) has adopted an emergency power generation system through design changes made after the Great East Japan Earthquake. The system allows tenant companies to continue with business as usual during a power outage by supplying electricity privately generated using city (medium-pressure) gas. Because of this, we have constructed an electrical supply system that can fulfill 85% of the ordinary demand for electrical power in an emergency, supporting the BCP of companies by ensuring extremely high dependability that exceeds the levels offered by ordinary high-grade buildings.

Power supply on standard office floors during power outages



*1 Emergency equipment (such as fire-fighting equipment and smoke ventilation equipment) prescribed in the Fire Services Act and Building Standards Law, and the minimum necessary safety systems (security, some equipment) necessary to maintain the building as decided by the building management company.
*2 Ordinary electrical load excluding the above, such as lighting, OA outlets, and air conditioning

Power supply on standard office floors during power outages

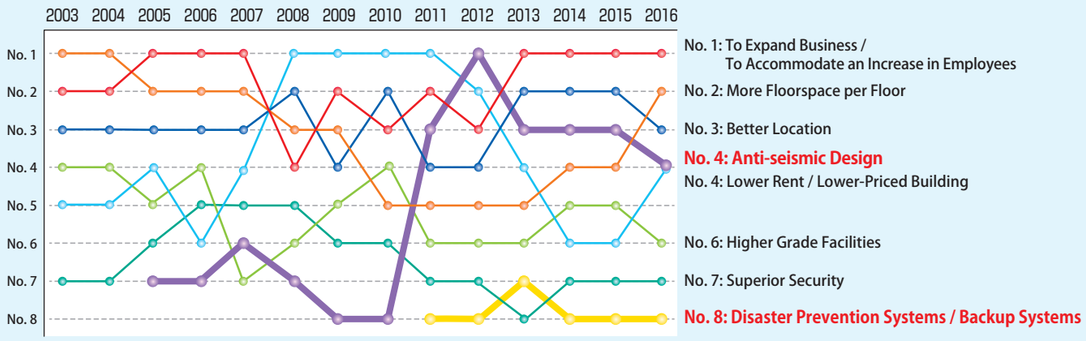


Changes since the Great East Japan Earthquake: The growing need for safety and the state of companies' BCP (business continuity plan) formulation

Since 2003, our company has conducted The Survey of Office Needs in Tokyo's 23 Cities* to assess office market demand trends. Following the Great East Japan Earthquake, the survey has revealed a growing desire for seismic resistance and safety in tenant buildings, as well as office environments that support business continuity.

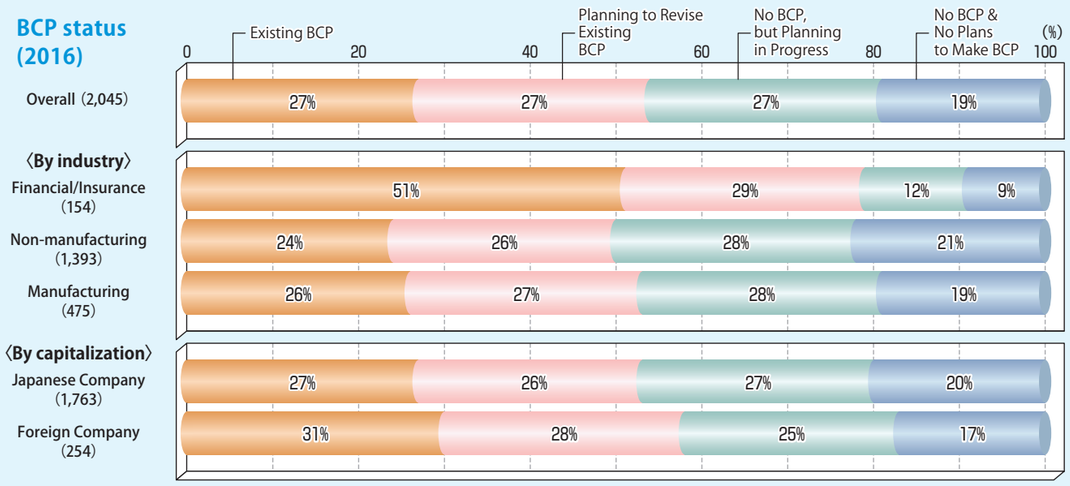
*A questionnaire-based survey concerning office demand, targeting the top 10,000 companies (by capitalization) that have headquarters located within the 23 Cities of Tokyo. Conducted in October 2016.

Reason for new lease plans change in ranking *Top 8 of 17 items

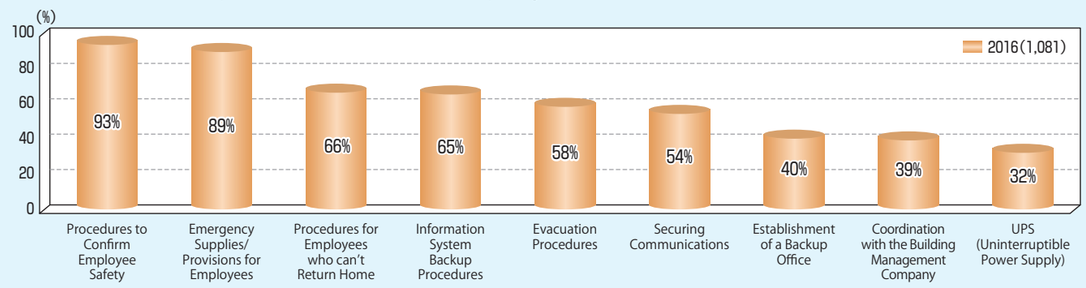


When companies were asked about their business continuity plans, over half of the respondents indicated that they "Have a plan formulated," which rises to 80% with the inclusion of "Intend to formulate a plan." These responses were high in the financial and insurance industry and in foreign-affiliated companies. Those companies which have formulated a business continuity plan, when questioned about the content of their plans, revealed high response rates for items including "Means for verifying safety of employees," "Securing of earthquake readiness supplies," and "Means for handling stranded employees." Five years after the Great East Japan Earthquake, the majority of companies continue to forge ahead with preparation plans. At the same time, the 21% response rate for "Do not intend to formulate" reveals the need to raise awareness concerning the importance of plans and to provide know-how concerning their formulation.

BCP status (2016)



Content of BCP ※ Multiple answers allowed. ※ Total number of responding firms is counted as 100.



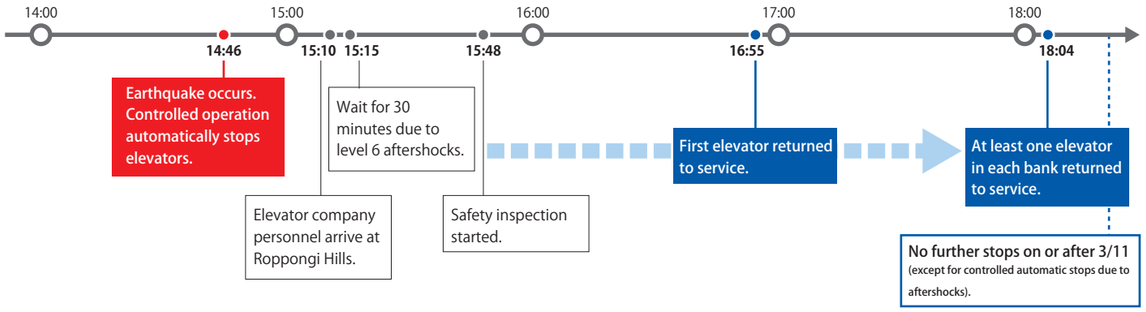
2-8 Earthquake countermeasures for elevators

Mori Building has developed original earthquake-resistance systems for the elevators that are essential for movement in high-rise buildings.

Safe stop followed by rapid restoration of service

So that elevators can be restarted quickly, we have constructed a system of cooperation with the elevator maintenance companies so that a minimum of one elevator in each bank can be returned to service quickly in the event of an emergency. When the Great East Japan Earthquake struck, as soon as the earthquake was detected all elevators were controlled to a safe stop on the nearest floor. No persons were trapped in the elevators, and users were all guided to safety. In Roppongi Hills Mori Tower, the first elevator returned to service two hours after the earthquake, and at least one elevator in each bank was returned to service within 3.5 hours.

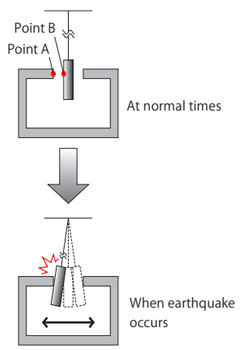
● Flow of elevator return to service at Roppongi Hills Mori Tower following the Great East Japan Earthquake



World's first elevator control for long-period earthquake motion

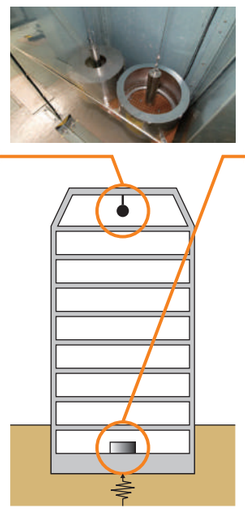
At the time of the Niigata Chuetsu Earthquake in October 2004, emergency stops occurred in elevators in Tokyo super high-rises, located far from the epicenter, due to long-period earthquake motion. Some parts of the elevator shafts were damaged and other problems occurred.
Based on this information, Mori Building studied improvements together with elevator manufacturers, and created the world's first elevator control system for long-period earthquake motion in the Roppongi Hills Mori Tower using a combination of two original long-period earthquake motion detection systems. We also took steps to prevent ropes in the elevator shafts from becoming caught, and strive to ensure that the elevators are able to move safely.
These long-period earthquake motion countermeasures are also being applied at other Mori buildings where there are concerns of the same effects.

Pendulum system

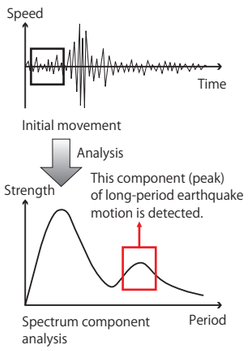


After an earthquake, the pendulum which resonates due to the motion of the building contacts the electrical contacts at Point A and Point B, allowing detection of long-period earthquake motion.

Pendulum system



Long-period earthquake motion spectrum method

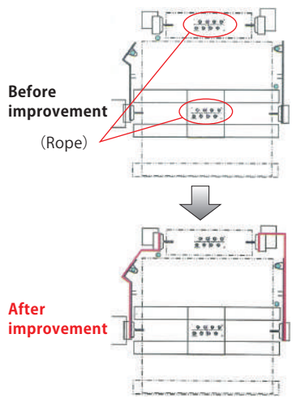


Component analysis is performed of the initial movement immediately following an earthquake in order to detect long-period earthquake motion

● Measures to prevent rope catching

Brackets and other guards are installed on projections inside the elevator shafts where the ropes could become caught.

(Plan view of inside of elevator shaft)



Following the countermeasures, the following long-period earthquake motion was detected and the effects of the countermeasures were verified. In all cases, the elevators were stopped safely after detection (no passengers were trapped inside) and operation was restored automatically.

July 16, 2007 Niigata Prefecture Chuetsu Earthquake
Seismic intensity 7 (M6.8) Minato City: Seismic intensity 2

May 8, 2008 Ibaraki Prefecture Earthquake
Seismic intensity 5- (M6.7) Minato City: Seismic intensity 3

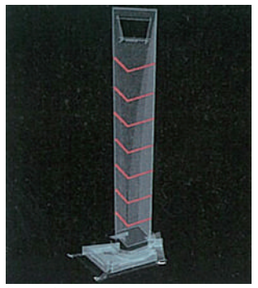
June 14, 2008 Iwate-Miyagi Nairiku Earthquake
Seismic intensity 6+ (M7.2) Minato City: Seismic intensity 2

} 28 elevators detected long-period earthquake movement, stopped safely, and returned to service automatically. No passengers were trapped inside.

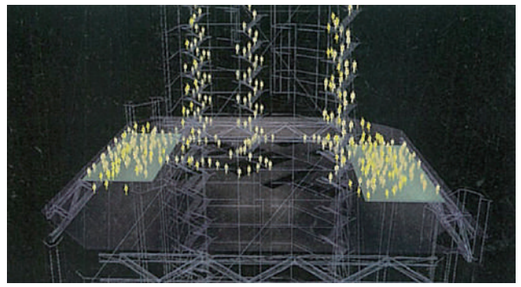
(For reference) Original fire escape measures for super high-ris e buildings

Installation of intermediate refuge floors at the Shanghai World Financial Center super high-rise

Although fire escape stairways are effective means of vertical escape in a super high-rise building, it is difficult even for someone in good shape to descend all at once to the bottom floor, and under Chinese law a "refuge floor" must be installed every 15 floors as an emergency evacuation site where people can stay safely for an extended period of time.
The Shanghai World Financial Center, a 492 m super high-rise with 101 floors, has seven intermediate refuge floors installed – one for every 12 floors, shortening the evacuation distance in case of disaster. At the same time, a pressurizing smoke-control system has also been installed to prevent smoke from entering the refuge floors.
An evacuation plan using the elevators has also been introduced, and evacuation simulation software was used to verify the evacuation instructions. An emergency power supply was also prepared for the elevators that can be used for evacuation, and improvements for evacuation were enacted together with improvements to elevator operation and other software elements.



Seven intermediate refuge floors



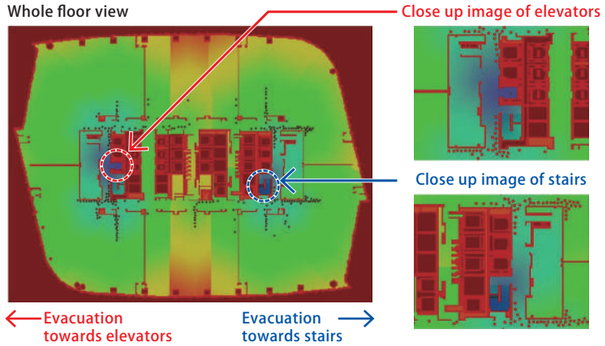
Simulation of evacuee movement by stairs to the refuge floors

Original evacuation simulation system for fire evacuations of super high-rise buildings

*** Acquired patent in 2013**

Mori Building has developed a fire evacuation simulation system for super high-rise buildings in cooperation with Kozo Keikaku Engineering Inc. This system allows more effective studies of evacuation plans in case of fire in a super high-rise building with consideration for the different characteristics of individual evacuees.
The system creates a highly detailed model of individual evacuee behavior and movement characteristics (for example, those who are less able to evacuate such as disabled and elderly people), and sequentially simulates the decision-making and movement of each individual according to circumstances during the evacuation, in order to produce a simulation that is a better match with reality.

● Simulation image of evacuation in Toranomon Hills



Toranomon Hills: First* acquisition of certification for mixed-use super high-rise buildings. Operation of evacuation plans making use of emergency elevators

We have established an evacuation plan at Toranomon Hills, certified by the Tokyo Fire Department, that makes use of emergency elevators to ensure a means for evacuating people with difficulty walking in the event of fire.
With the certification, we are able to have senior citizens, people with disabilities, or other people who have difficulty walking wait temporarily in evacuation areas until the arrival of firefighting teams, then have Security Control Center staff operate emergency elevators to help such people evacuate.

* Based upon the "Evacuation safety measures for persons with difficulties walking, etc. in high-rise buildings, etc. " launched by the Tokyo Fire Department in October 2013. Toranomon Hills was the first mixed-use super high-rise building to acquire certification. Toranomon Hills has also acquired the Fire Safety Building Certificate (February 2016).

Mori Building's main earthquake countermeasure initiatives

Our company has enacted a variety of measures as part of our mission to create safe, secure, disaster resistant cities, including physical measures for buildings and organizational measures involving operations. We further strengthened these measures following The Great Hanshin-Awaji Earthquake of 1995, and have worked toward further improvement of our disaster readiness capabilities while continually undertaking revisions under changes in social conditions and technological innovations and through varied training.

＜January 17, 1995: The Great Hanshin-Awaji Earthquake＞

1995 Began active adoption of seismic mitigation and seismic isolation systems
Research and development based on seismograph data in major buildings
Aug. Launched disaster response organization and formulated earthquake emergency response plans
Launched disaster readiness office
・Constructed earthquake disaster system involving all Mori Building employees, including preparation of supplies by employees. Distributed emergency supplies and foods to major buildings.
1996 Jan. Began Mori Building Comprehensive Earthquake Training for all Mori Building employees
2003 Apr. Opened Roppongi Hills "place of refuge"
・Prepared 10,000-meal food stockpile (about 200,000 meals for Mori Building overall) for residents and visitors (stranded persons)
・Installation of or own city (medium-pressure) gas-burning energy plant, etc.
2004 Jan. Began Roppongi Hills Earthquake Training for office workers residents, etc.
2005 Jun. Began placement of AEDs (automated external defibrillators) in key facilities
Oct. Full-scale operation of long-period earthquake vibration detection system in Roppongi Hills Mori Tower
2008 Apr. Full-scale operation of our original Disaster Portal Site information collection system
2010 Apr. Coordinated suspension of elevator operation and start of in-building broadcasts, making use of the emergency earthquake warning system
2010 Dec. Completed earthquake resistance renovations for all operating buildings constructed prior to enactment of new earthquake resistance standards (1981)

＜March 11, 2011: The Great East Japan Earthquake＞

2012 Feb. Held first earthquake workshop for residents at Roppongi Hills
Mar. Concluded cooperative agreement with Minato City, Tokyo on sheltering stranded people during disasters (Roppongi Hills)
Construction of original disaster information provision system making use of area-restricted broadcasts
Jul. Construction of backup Disaster Response Headquarters in ARK Hills
Concluded a cooperative agreement with Minato City, Tokyo on sheltering stranded people during disasters (ARK Hills Sengokuyama Mori Tower).
Aug. Adopted city (medium-pressure) gas-based emergency power generation system for business continuity at ARK Hills Sengokuyama Mori Tower
Held first training for sheltering stranded persons as part of Mori Building Comprehensive Earthquake Training
Published "Mori Building Comprehensive Earthquake Protection" as a way to let society benefit from our know-how on the creation of safe, secure cities
Adoption of bicycles for disaster readiness
Sep. Held "Social Disaster Readiness Training" together with Yahoo! Japan, Twitter Japan, and J-WAVE
2013 Mar. Released Great East Japan Earthquake seismograph data and analysis results from Mori Building properties academic bodies
Aug. Began operation of e-Daps post-earthquake building damage estimation system at Roppongi Hills
2014 Mar. Construction of original wireless system making use of general commercial wireless as a new means of communication in a disaster
Apr. Conclusion of memorandum of understanding with NHK concerning emergency and disaster broadcast earthquake announcements in Mori Building-managed properties
Aug. Held the first "Survive the Night" nighttime post-disaster living experience event at Roppongi Hills as an awareness-raising activity for residents
Began distributing original "Emergency Kit" disaster readiness supply kits to residents
Oct. Held first "Overnight Stay in Mori Building" awareness-raising activity in ARK Hills for tenant companies
2015 Oct. Participated in conference to create measures for handling people congregating around Roppongi Station
2016 Jul. Concluded a Residents' Communication Agreement with Minato City, Tokyo (Mori Building).
2017 May Concluded a cooperative agreement with Shibuya City, Tokyo on sheltering stranded people during disasters (Omotesando Hills).

Overview of Disaster Readiness Plan (Preface)

At Mori Building, we consider it our social responsibility to carry out urban planning which can serve as centers of disaster readiness for the surrounding areas, based on the concept of "turning cities from places to flee into places of refuge". We have carried out a broad range of programs aimed at building safe, secure, and disaster-resistant cities, not only from the hardware side of the buildings, but on the human and organization side as well.

Disaster readiness and other crisis management plans now occupy an extremely important place in evaluations of corporate value. We hope that all employees will maintain a high awareness of disaster readiness on a daily basis, and will prepare for the worst eventualities in a way that will ensure the best response.

The term "Business Continuity Plan" (BCP) is one that is often heard these days, and it is now essential to construct systems which focus on restoring building function rapidly following a disaster, and which support the continued business and lives of building tenants and residents.

This overview of the disaster readiness plan will serve as the basis for disaster readiness at our company. We hope that through further study and training in the future, it will contribute to even safer and more secure urban planning in the future.

Basic Disaster Readiness Policy

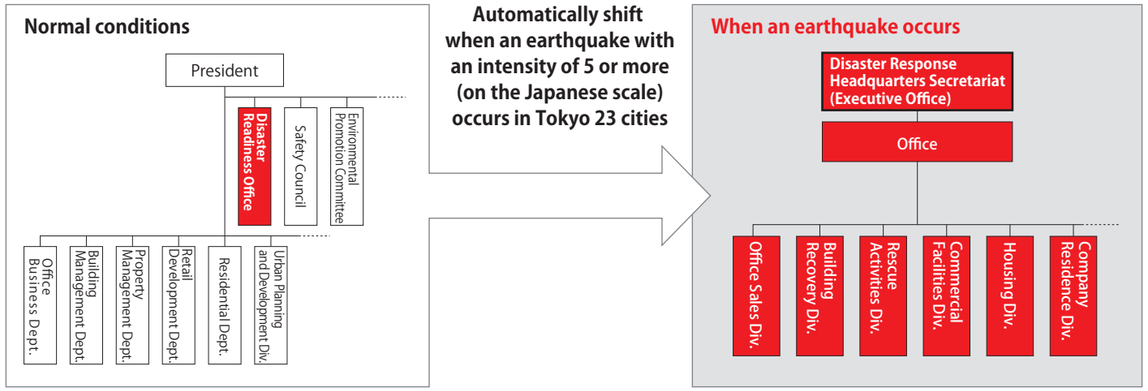
1. Top priority shall be given to ensuring the lives and safety of tenants, residents, and visitors who use the buildings and facilities that are owned or managed and operated by our company, as well as the people in nearby areas and our company's employees.
2. Respond quickly in the event of an earthquake in order to minimize damage.
3. Maintain the functions that support continued business operations of tenants and continued everyday lives of residents.
4. Cooperate with the local, Tokyo, and Minato City police and fire departments, and other related government organizations, in order to contribute to society.

(This overview and basic policy are distributed to all Mori Building employees.)

3-1 Disaster readiness organization system that can provide a rapid initial response even at night and on holidays

Mori Building is committed to helping local residents maintain their daily lives and businesses continue operating to the extent possible after a disaster occurs. All 1,400 employees in the company are well prepared to swiftly implement, whenever necessary, our disaster-response system for promptly engaging in recovery activities.
Non-working hours, including nighttime and holidays, account for about three-quarters of the total hours in a year. If a disaster strikes during off-hours, the prompt implementation of emergency efforts is crucial. Mori Building, at its own initiative, has established a range of emergency-response measures, including providing several housing units for disaster readiness for staff within a 2.5-km radius of our business facilities. In addition, specialized training is organized on a regular basis for these employees. We also have adopted a disaster readiness night watch system.

● Shift to disaster response organization



Disaster readiness night watch system

All managers take turns staying overnight at Roppongi Hills to support our disaster response organization as well as ensure our preparedness for first-response measures such as information gathering and prompt decision-making.

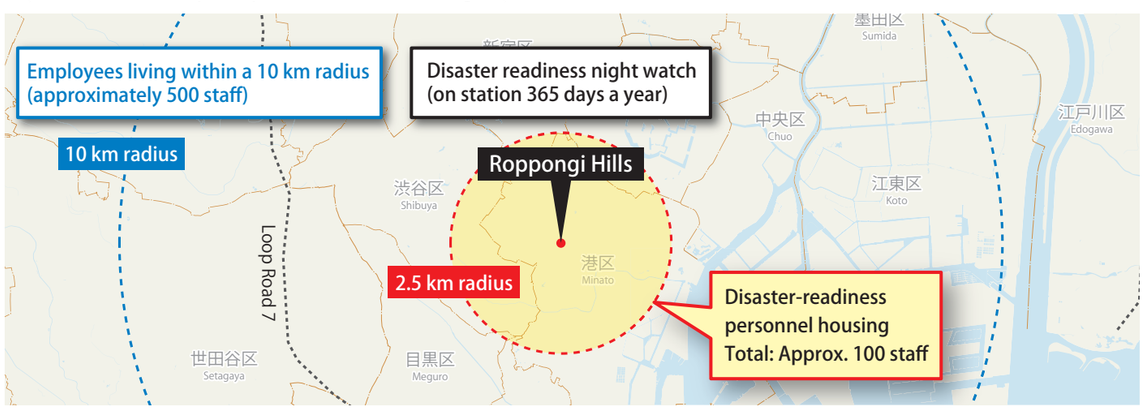
Staff housing units for disaster readiness

Mori Building provides disaster-response employees with company-owned accommodations within a 2.5-km radius of Roppongi Hills to enable them to respond quickly in the event of an emergency. About 100 employees who live in the area have been appointed as disaster-response personnel charged with providing first-response assistance if an emergency occurs.

Accommodation for Building Management Department personnel

Seven members of the Building Management Department reside in a house near Roppongi Hills. These employees remain on standby to respond to emergency situations and set up our disaster response organization together with emergency night-duty personnel.

● System of disaster response personnel in case of emergency



3-2 Continual training of disaster-readiness personnel

In addition to the general disaster-readiness training that is conducted throughout the company twice each year, disaster-response personnel also participate eight times a year in the monthly disaster-readiness training, and are working continuously to maintain their skills. One unique characteristic of our company is that all employees are required to obtain first aid skills certification.

● Schedule of earthquake preparedness training

	Target	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Mori Building comprehensive earthquake preparedness training	All company employees	○								○			
Roppongi Hills earthquake prevention training	Roppongi Hills Neighborhood Association and tenant			○									
Disaster Prevention Day training Company	Members (Employees) of administrative (management) departments	○	○	○	○	○	○	○	○	○	○	○	○
Residence Div. Training	Disaster prevention company residence residents		○		○		○		○		○		○
Personnel safety verification training	All company employees	○				○				○			
On-foot training	All company employees								○	○	○		
First-aid training	All company employees (attended once every three years)	○	○								○	○	○


Mori Building disaster preparedness drill


First aid drill


Disaster-readiness personnel training


Mori Building disaster preparedness drill (Headquarters)

Commute-by-walking drill

Each year, we organize a commute-by-walking drill for all employees to prepare them for the possibility of public transportation being disrupted. If a disaster strikes, employees may be required to report to work and assist in emergency-response efforts, or to leave work and help look for family members not accounted for. The drill is designed to help employees remain calm and safe in emergencies and choose appropriate walking routes and/or emergency shelters.


"Mori Building Emergency Route Map for Time of Disaster"

First real estate developer awarded for first-aid provision

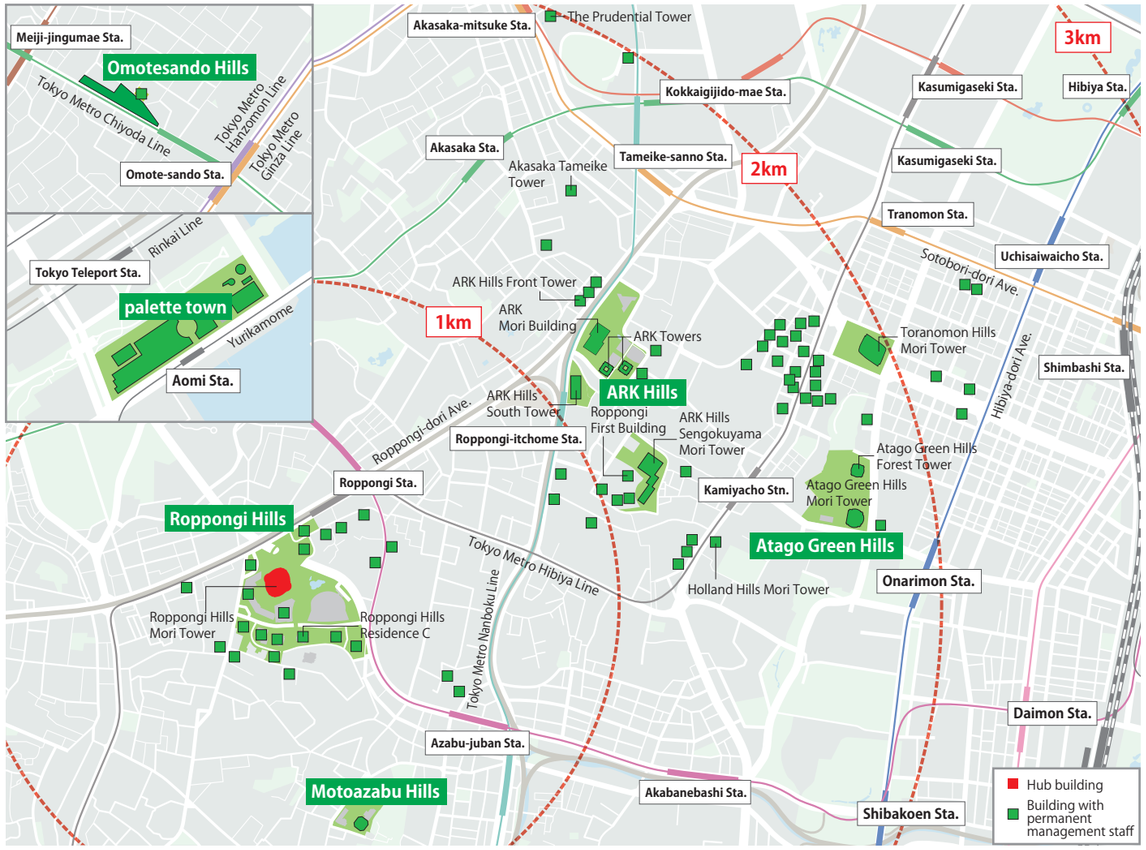
In September 2016, Mori Building won an award presented by the chief of the Tokyo Fire Department for distinguished first-aid provision in a local area. Mori Building was the first property developer to win this award, which recognizes the company's relentless efforts to ensure its first-response capabilities. Businesses and organizations that actively implement first-response initiatives in their local communities are nominated by 81 fire stations in Tokyo, and winners are chosen for implementing the most effective initiatives and serving as role models. Winning this award is a testament to our commitment to developing "cities to escape to" in both tangible and intangible forms, as well as our innovation, continuity, training and development programs, and contributions to our local communities.

〈Rationale for award:〉

- Mori Building has participated in a life-saving training course for the past 16 years, with 95% of its employees having completed basic life-saving training.
- Mori Building independently conducts first-aid training and has 72 employees trained as first responders and also qualified as life-saving trainers.
- Mori Building has 66 AEDs installed in its properties, available whenever needed.
- Mori Building utilizes its own equipment for disaster drills that it jointly organizes with nearby residents' associations, and the company promotes first-aid skills in its local communities.
- Mori Building has entered into agreements with local authorities to support people stranded in emergencies.

3-3 Area management–based disaster prevention network with Roppongi Hills as the hub

Many of our properties are located within walking distance of Roppongi Hills, which possesses strong continuity support capabilities. Therefore, Roppongi Hills has been positioned as the disaster prevention core hub, and we support the daily life and business continuity of our customers during emergencies through a network that consists of hubs such as ARK Hills and Toranomon Hills and buildings with permanent management staff.



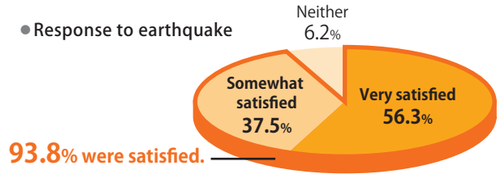
※Reference: 2017 Mori Building Handy Map

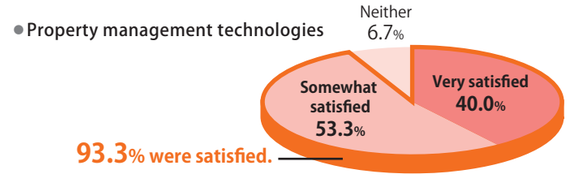
Disaster-readiness center functions staffed by disaster management professionals

A disaster-readiness center has been established to serve as the center of activities at each building in the above network in case of disaster. This center is staffed full-time, and works daily to construct a comprehensive disaster-readiness system in cooperation with the employees of specialist management, facility, and security companies, so that the members can function as disaster management professionals at times of emergency.

3-4 Customer satisfaction with the Mori Building management system

The results from a survey of customer satisfaction following the Great East Japan Earthquake related to the buildings managed by Mori Building showed that the accumulation of efforts made on a daily basis was proving effective and that our response on the day of the earthquake was highly rated.





Other comments received from business tenants and residents of our office buildings at the time of the earthquake

- **Business tenant (official, foreign-owned finance company)**

  "Although all of the Mori Building staff were themselves in trying circumstances, they all showed the top level of professionalism and made every effort for the safety of our employees and the continuity of our business. The Mori Building staff are on the top global level, and we are grateful to them."

- **Business tenant (General Affairs Division Manager, foreign-owned finance company)**

  "Although Roppongi Hills was not subject to power restrictions, by increasing the excess power (from the power generation system) during times of limited power, Through Mori Building, we were able to supply power to TEPCO, and were able to take active steps for contributing to society."

- **Owner of a property managed by Mori Building**

  "Among the several properties which I own, the contact I received from Mori Building was especially fast and accurate, and this was very reassuring. I hope they will continue to provide the same level of service."

- **Resident**

  "Although some lights were out and the numbers of elevators in service reduced during the period of power conservation after the earthquake, I was not inconvenienced. Longer waits for the elevator meant more chances to talk with the other residents, and actually helped improve our communication."

Mori Building's highly-regarded firefighting team

In order to smoothly carry out initial response and emergency measures in a disaster and to ensure the safety of users of our facilities, we are forming in-house firefighting organizations in each of our facilities, in accordance with the Fire Service Law.
When fires, earthquakes, or other disasters occur, in-house fire-fighting teams are expected to perform initial reporting, contact, and firefighting, provide prompt evacuation guidance, and so on, to quickly minimize damage. Our company performs regular education and training centered on front-line staff such as the Security Control Center and residence front desks, while also coordinating with staff from security and facilities partner companies. We also participate actively in the in-house firefighting activity examination committees held by local fire stations, and work to enhance our skills. Every year several of our in-house firefighting teams in each jurisdiction take part in these examinations, with each achieving an excellent track record.

Our initiatives involving safety and security have earned high regard, including letters of appreciation and commendations from the Tokyo Fire Department, for making major contributions to communities.

3-5 Disaster supplies and wells for use in disasters

The largest scale stock of private emergency disaster supplies

Following the Great Hanshin Awaji Earthquake, we started to establish emergency store depots (warehouses) and storing goods in the case of earthquakes. At the current time, we have food stores equivalent to about 270,000 meals (of which about 100,000 are at Roppongi Hills), one of the largest amounts in the private sector. We also stock various types of items required during disasters, such as blankets, medical supplies, mechanical equipment, and simple (portable) toilets, at each facility.
These preparations include a total of about 100,000 meals for area visitors (stranded people), consisting of 9 meals per person (3 meals per day for 3 days) and ensuring daily nutrition of about 1,600 to 1,700 Kcal per person.
We revise the content of the stockpiles as necessary, for example purchasing aluminum blankets (cold-resistant, heat-retaining sheets) after the Great East Japan Earthquake. Recently, we have been working to prepare special stockpiles for small children, senior citizens, and persons with food allergies.

Distribution of disaster supplies after the Great East Japan Earthquake

Roppongi Hills emergency supply warehouse

【Primary supplies】
◇Food:
*270,000 meals, for about 100,000 persons
Water, canned foods, crackers, instant rice, retort pouch meals, food bars, other
◇Stored items:
Blankets, aluminum blankets, pharmaceuticals, air mattresses, portable toilets, sanitary napkins, diapers, dust masks, AEDs, stretchers, generators, hydraulic jacks, shovels, pickaxes, tarps, plywood, megaphones, plastic tanks, flashlights, radios, other

【Intended recipients】
Residential tenants, residents, area visitors (stranded persons), local neighborhood associations, Mori Building employees, partner companies, etc.

"Emergency Kit" to aid residents' peace of mind

We provide residents with our own original Emergency Kits, These contain select supplies needed for living securely at home for about a week following a disaster that has a major impact on daily living. Each kit includes an instruction manual in English and Japanese for easy use by foreigners as well. We also hold workshops offering hands-on experience using the kits, and work to increase residents' disaster readiness awareness and their self-help and at-home refuge capabilities. We also assist with purchases of additional items for the kits, enabling customization to every family's needs.

LED light, lantern, portable toilet (30 bags), shampoo towels (30 sheets), body towels (24 sheets), water tank (10ℓ), bandages, gloves, duct tape, waterproof bag, carrying cart

Bicycles for emergencies (Survival City Bikes)

Immediately after the Great East Japan Earthquake, many roads in the Tokyo metropolitan area where overwhelmed with people and cars, making them virtually impassable. Bicycles were widely used as a highly effective means of transportation in the aftermath of the disaster, so Mori Building has prepared mountain bikes modified for emergency use. These bicycles will help expedite first-response efforts, including patrolling properties and surrounding areas and gathering vital information from ward offices.

Key Features of Emergency-use Bicycles

(1)Large (29-inch) wheels
Larger wheels increase the ability to ride over uneven surfaces and maintain stabilizing contact with road surfaces.
(2) Easy tire repairs
Mountain bike tires are highly resistant to punctures, but if one occurs the inner tube can be changed in about 5 minutes.
(3) High mobility
The bikes are equipped with disc brakes for superior braking and 30-speed gears for negotiating hills and rainy conditions. Weighing just about 14 kg, they are also light enough to be carried over obstacles when necessary.

Model name: Trek X-caliber

Voluntary construction of disaster wells

We have voluntarily constructed disaster wells in a total of 17 locations at the major facilities which our company manages. At time of disaster, these can be used to supply water for domestic use to the facilities where they are installed and the surrounding communities.

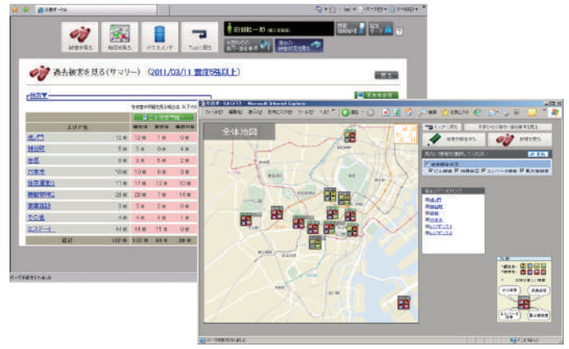
【Facilities where located】
Roppongi Hills (2 locations), Toranomon Hills, Omotesando Hills, ARK Hills, ARK Hills South Tower, ARK Hills Forest Tower, ARK Hills Sengokuyama Mori Tower, ARK Forest Terrace, Holland Hills, Atago Green Hills, Motoazabu Hills, Hirakawacho Mori Tower, Akasaka Tameike Tower, Koraku Mori Building, Toranomon 37 Mori Building, Roppongi Residences (company housing)

Disaster well (Roppongi Hills)

Water release training

3-6 Independently-developed information gathering system "Disaster Portal Site"

In the case of disasters, such as earthquakes, flooding, and violent winds, it is necessary to not only have developed equipment and materials–related measures, such as those concerning building safety performance and physical stores, but also to accurately gather information and tie this to appropriate recovery activities in order to ensure the safety of visitors, tenants, employees, and other parties. We have introduced and operate the Disaster Portal Site, an independently developed (in-house) information gathering system to quickly ascertain the state of damage caused to facilities by various events ranging from earthquakes to floods, strong winds, and acts of terrorism and to quickly launch business recovery measures. The system makes it possible to ascertain and grasp information on various issues, including the state of damage (damage to the various buildings, fires, power outages, elevator problems, etc.) and the safety of front-line administrative staff at a single glance and in real time during an emergency.



3-7 Reinforcing soft measures —New measures following the Great East Japan Earthquake (3)

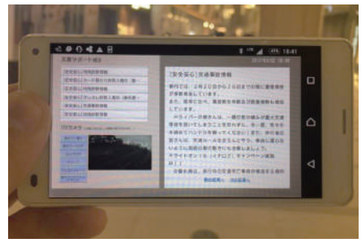
Emergency information service systems for visitors and residents

Based on lessons learned from the Great East Japan Earthquake, we have developed unique emergency information service systems for various target groups and have made them available at Roppongi Hills since 2011. These area-specific systems provide information in a timely and effective manner to occupants of our residential properties as well as visitors and people stranded at the properties. The information is specifically prepared for these designated areas, so it is very useful when a disaster strikes. Mori Building entered into a Residents' Communication Agreement with Minato City, Tokyo, in July 2016, ensuring our access to earthquake, heavy rain, and other disaster information provided by Minato City via mobile devices and computers as well as monitors provided in our buildings and TVs in residential properties. The service is being extended sequentially to Roppongi Hills office blocks and Toranomon Hills.

【Area broadcasting systems】

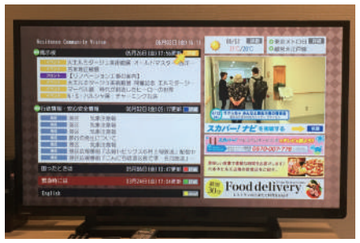
Target:
Visitors and people stranded at our properties
Method:
Temporarily operated monitors
Content:
Information from local governments, e.g. Minato City, and information regarding crime prevention (police department), traffic, Mori Building properties, etc.

【Support Web for Stranded People】



Target:
Visitors and people stranded at our properties
Method:
Smartphones, computers, etc.
Content:
Information from local governments, e.g. Minato City, and information regarding crime prevention (police department), traffic, Mori Building properties, including ITV feeds from cameras, etc.

【Residence community vision】

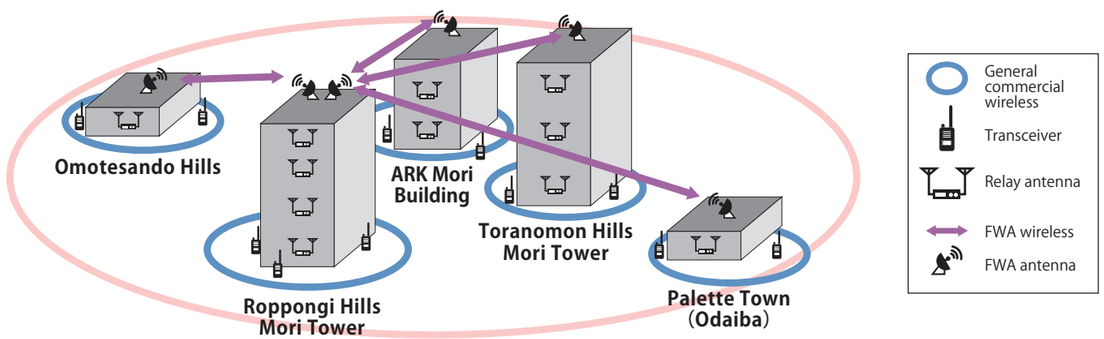


Target:
Residents
Method:
TVs in residential units
Content:
Concierge information (notices to occupants), information from local governments, e.g. Minato City, and information regarding crime prevention (police department), traffic, weather, and Mori Building properties, including emergency news

Multi-layering of communication methods in a disaster: Construction of an original wireless system making use of general commercial wireless

We have acquired a general commercial wireless* license from the Kanto Bureau of Telecommunications, Ministry of Internal Affairs and Communications, and have constructed an original digital wireless system. Since 2014, we have been rolling out a system for large-scale facilities that we envision as sheltering people stranded by disasters. General commercial wireless is effective as a means of communication that is resistant to congestion, even under increased communications load following a large-scale disaster. We use the system as a means of information transmission, both within facilities and connecting the Disaster Response Headquarters (Roppongi Hills) with individual facilities. In addition, by connecting through FWA (Fixed Wireless Access), we are able to communicate at once with all personnel who have transceivers.

* Unlike simple wireless in which limited frequencies are shared, general commercial wireless is able to make exclusive use of multiple digital frequencies allotted over a limited area, eliminating worries over congestion even under increased communications load following a large-scale disaster.



Emergency kits in elevators

To help people trapped in elevators during an earthquake or power outage, we provide emergency kits* in cabinets inside the elevators on properties owned and/or managed by Mori Building. Some 650 elevators (including passenger, emergency, and service elevators) in our office, commercial, and residential properties have been provisioned.

Emergency kit:
- Portable toilet
- Wet wipes
- 5 bottles of water
- LED flashlight
- Thermal blanket, etc.

Image of contents in emergency kit


In residence elevator


In office elevator

Creation of a system for sheltering stranded people at large-scale facilities

Our company is readying a system for sheltering as many as 10,000 stranded people* at our large-scale facilities. In addition, at Roppongi Hills (March 2012) and Toranomon Hills (June 2014), we concluded a cooperative agreement with Minato City, Tokyo on sheltering stranded people during disasters, as we work under public-private partnerships to create safe, secure, disaster resistant cities that will also serve as centers for disaster readiness in their surrounding regions.

* 5,000 people at Roppongi Hills, 3,600 people at Toranomon Hills, and additional people at ARK Hills Sengokuyama Mori Tower, Omotesando Hills, etc.

Excerpt/summary of the agreement

1) Provision for temporary evacuation sites for stranded people
2) Provision for food supplies, drinking water, etc. for stranded people
3) Provision for tools to guide stranded people to evacuate
4) Provision for guidance and related personnel to assist people stranded at train stations, etc.


3-8 Improving overall area disaster readiness capabilities through collaboration with government organizations, residents, neighborhoods, and other parties

Since the Great East Japan Earthquake, the limitations of public assistance in times of large-scale, wide-ranging disasters have become apparent, reaffirming the importance of self-reliance and cooperative assistance.
In addition to strengthening collaboration with government bodies, our company holds training and workshops for area residents, office workers, and store staff, and creates opportunities for community bonding to foster self-reliance and cooperative assistance. We are also working to strengthen collaboration with concerned parties in our neighborhoods to improve overall area disaster readiness capabilities.

Roppongi Hills Neighborhood Association – Increasing awareness of disaster readiness in the local community

Roppongi Hills is home to a deeply rooted neighborhood association that comprises a diverse range of parties including office operators, shop staff, and others in addition to approximately 800 households. This association has as its primary goals "safety and security, disaster-readiness, and crime prevention", and has carried out a broad range of disaster-readiness activities in the local community.
The Great East Japan Earthquake further strengthened the community bonds and heightened awareness of the needs for self-reliance and cooperation. In February 2012, upon request from the residents of Roppongi Hills Residence, Mori Building together with Minato City and the Azabu Fire Department conducted a disaster-readiness exercise. A total of 100 people, including foreign residents, participated in the exercise, which raised disaster-readiness awareness and was also an opportunity to reinforce community bonds.


Disaster-readiness exercise


Earthquake exercise conducted each year jointly by the neighborhood association and Mori Building

Furthermore, through the Roppongi Hills Neighborhood Association, we conduct earthquake preparedness training in collaboration with Mori Building; hold events, including the Roppongi Clean-up, which involves picking up trash in the Roppongi area, and seasonal events such as a New Year's event, spring festival, and Obon festival, as contributions to the local community, and strive to develop and foster the local community.


Roppongi Clean-up

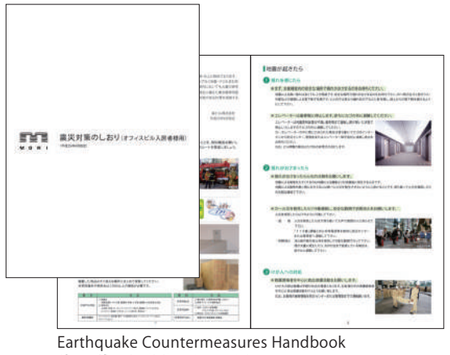

Bon dance festival

Awareness-raising activities for office workers and store staff

Among our activities to raise awareness, we create and distribute a "Earthquake Countermeasures Handbook" collecting information on the preparations for emergencies that we request office and retail store tenant companies to undertake.

Content of the "Earthquake Countermeasures Handbook"
- Restrictions on all staff returning home at once
- Enforcement of firefighting plans
- Implementation of safety verification for employees and their families
- Ensuring safety in offices and shops
- Preparation of emergency supplies

Requiring employees to shelter in offices is a likely measure for dealing with persons unable to return home. Accordingly, in 2014 we implemented the "Overnight Stay in Mori Building" project in ARK Hills. Through the experience of overnight stays in their buildings, companies were able to check the practicality of their manuals in terms of actions, supplies, and so on, and improve their self-reliance and cooperative assistance skills through presentations by experts.



Earthquake Countermeasures Handbook (for office building tenants)

Participation in the conference to create measures for handling people congregating around Roppongi Station

During disasters, a large number of people congregate around Roppongi Station, including those stranded and unable to return home. Given the risk of impeded rescue activities, earthquakes, crowd accidents, and other secondary disasters, we participate as a member, along with Minato City, firefighters, police, railway companies and other local companies, in a conference to create measures for handling people congregating around Roppongi Station, and otherwise cooperate in improving disaster readiness in the area.