

FIREFIGHTING TRAINING TECHNIQUES

To enhance disaster response capabilities by providing instruction in firefighting techniques and know-how



Disaster management challenges among cities

- Enhancing the level of fire rescue skills for responding to earthquakes and other severe disasters
- Developing the capabilities to cope with a range of challenging, complex disasters
- Sharing advanced fire rescue techniques with other cities

Japanese Translation

消防活動の技術やノウハウの提供による災害対応力の向上

災害対応における都市共通の課題

- 震災等大規模災害における消防救助技術等の技能向上
- 複雑・多様化する災害への対応力の強化
- 都市間における先進的な消防活動技術の共有

Figure※

1 低所からの救出法

2 NBC 対応

3 消防車両の整備要領



Instruction in rescue, fire vehicle maintenance, and others

<<Skills instruction process>>

- Accepting trainees from overseas
Instruction in fire rescue techniques (high angle rescue, rope bridge crossing/rappelling, urban rescue, and NBC (nuclear, biological and chemical) disaster management), and others.
- Sending personnel
Instruction in fire rescue techniques, fire truck pump operations, and fire vehicle maintenance, etc.

<<Examples of Skills Instruction>>



Rescuing a victim trapped below ※ 1



NBC disaster management ※ 2



fire vehicle maintenance ※ 3

救助技術・消防車両整備等の技術指導

《技術指導の方法》

■ 海外からの研修生受け入れ

消防救助技術（高所・低所からの救出法、渡過法・降下法、都市型救助法、NBC災害対応）等を指導

■ 海外へ職員派遣

消防救助技術、消防車両のポンプ運用・整備技術等を指導
《指導技術の例》

IMPROVEMENT OF DISTRICTS WITH CLOSE-SET WOODEN HOUSES

Although a major earthquake directly striking the city is feared to be imminent, there are large areas in Tokyo where wooden houses are closely located to each other. Among such areas, those likely to suffer particularly severe damage in the event of an earthquake have been designated “development districts,” and the TMG is promoting improvements in these districts



Policy

Following the Great East Japan Earthquake of March 2011, Tokyo launched the Ten-Year Project to Advance Fire Resistance in Close-Set Wooden Housing Areas in January 2012. Areas that are particularly in need of improvement have been designated “fireproof zones,” and the TMG extends support to special wards that subsidize the replacement of wooden houses by fireproof ones. In addition, the TMG has selected as designated routes for improvement, city-planned roads that will be highly effective in enhancing disaster resistance by blocking the spread of fire, and is proceeding with the development of such routes, while gaining local understanding and cooperation. The TMG also supports the development and expansion of local roads to enhance disaster response.



Examples of initiatives

- 1) Designated routes for improvement (FY2012–)
Conduct surveys on residents/businesses in the area regarding their wishes; establish consultation desks using private sector businesses
- 2) Fireproof zones (FY2013–)
Provide subsidies to wards to cover demolition costs and design costs to rebuild houses
- 3) Local roads to enhance disaster response (FY2016–)
Subsidize wards for the costs of land and construction needed to widen narrow roads



| Designated route for improvement completed

※ 1



| Old wooden buildings replaced by fireproof ones

※ 2



| Local roads to enhance disaster response completed

※ 3

For more information (in Japanese)

<http://www.toshiseibi.metro.tokyo.jp/bosai/sokushin/index.html>

Figure※

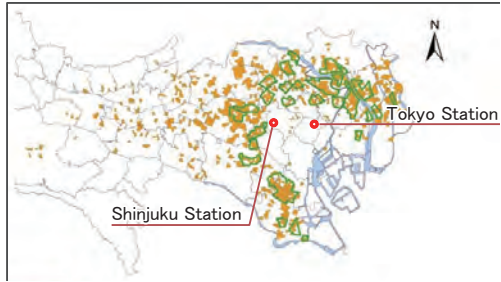
- | | | |
|----------------|----------------|--------------|
| 1 特定整備路線の整備完了 | 4 整備地域 6,900ha | 5 不燃化特区の指定 |
| 2 木造住宅の不燃化完了 | 木造住宅密集地域 | 6 特定整備路線の選定 |
| 3 防災生活道路等の整備完了 | 13,000ha | 7 沿道建物の不燃化完了 |



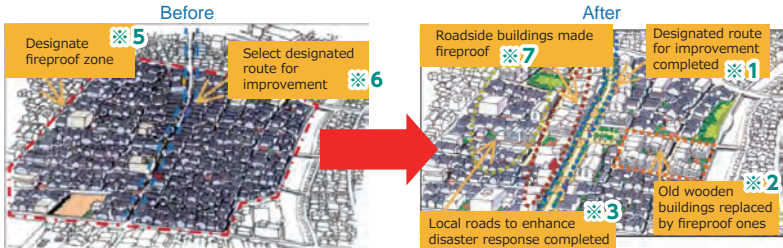
Districts with close-set wooden houses and development districts

Legend

- Development district: 6,900ha ※ 4
- Close-set wooden housing area: 13,000ha



Images of a development district before and after improvement



Japanese Translation

首都直下地震の切迫性が懸念される中、東京には、木造住宅密集地域が広範に分布しており、その中でも震災時に特に甚大な被害が想定される整備地域の改善を促進する。

施策

都は、東日本大震災（2011年3月）の発生を踏まえ、「木密地域不燃化10年プロジェクト（2012年1月）」を策定した。特に改善が必要な地区を不燃化特区に指定し、不燃化建替え助成等を行う区へ支援を行っている。また、延焼を遮断するなど防災上効果の高い都市計画道路を特定整備路線に選定し、地元の理解と協力を得ながら道路を整備している。さらに防災生活道路の拡幅整備等も支援している。

取組事例

- (1) 特定整備路線：全軒意向調査の実施・民間事業者を活用した相談窓口の設置
- (2) 不燃化特区：建替えの際の除却費や設計費の区への助成
- (3) 防災生活道路：狭窄な道路を区が整備するために必要な用地費や整備費を助成

木造住宅密集地域と整備地域

整備地域における整備前・整備後のイメージ

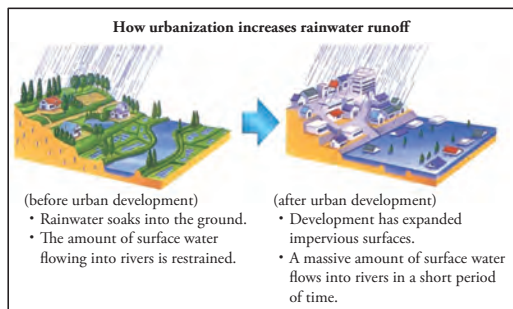
FLOOD CONTROL ON SMALL AND MEDIUM-SIZED RIVERS

To protect the lives and livelihoods of Tokyo citizens from floods resulting from increasingly frequent torrential rains



Flood damage due to typhoons and torrential rains

With the progression of urbanization, Tokyo has been prone to flooding since the high economic growth period.



2005 torrential rain
(Myoshoji River)

Japanese Translation

近年多発する局地的な集中豪雨などによる水害から、都民の命と暮らしを守る。

台風や集中豪雨などによる浸水被害

高度経済成長以降の市街化の進展に伴い、都内では度重なる浸水被害に見舞われてきた。

Figure※

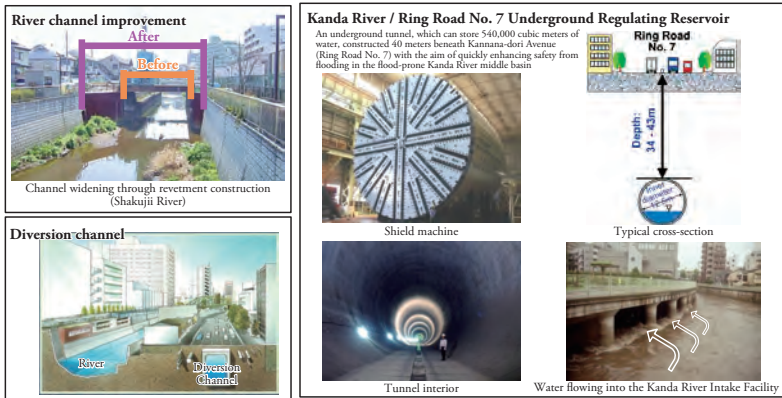
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|---------------------|---------------------|------------------|
| 1 市街化による流出増加のイメージ | 4 護岸整備による河道拡幅(石神井川) | 8 標準断面図 |
| 2 2003年9月集中豪雨(妙正寺川) | 5 分水路の整備 | 9 トンネル内部 |
| 3 河道整備 | 6 調節池の整備 | 10 神田川取水施設への流入状況 |
| | 7 シールドマシン | |



Development of revetments and regulating reservoirs

Improvement of small and medium-sized river

The Bureau of Construction works to quickly enhance safety from flood damage. Along with river channel improvements, including widening and deepening, the Bureau constructs regulating reservoirs to hold flood waters and diversion channels to divert some of the flood water. The locations of these facilities are selected for maximum efficiency.



For more information

http://www.kensetsu.metro.tokyo.jp/jigyo/river/chusho_seibi/index.html
 (in Japanese)

護岸や調節池等の整備

中小河川の整備

- ・河道整備（河道拡幅，河床掘削）とともに，洪水の一部を貯留する調節池や洪水を別のルートに分けて流す分水路を効果的に配置し，水害に対する安全性の早期向上に取り組む。

■本技術の詳細は

http://www.kensetsu.metro.tokyo.jp/jigyo/river/chusho_seibi/index.html

ROBUST WATER SYSTEM

To minimize damage to water facilities in the event of an earthquake, and secure water supply to all possible extent



Challenges in securing water supply in the event of an earthquake

In the wake of the Great East Japan Earthquake in 2011, water supply was suspended at about 2.57 million households. On top of the lack of domestic water, the unavailability of water at evacuation centers and other crucial facilities highlighted how important it is to secure water supply in the event of an earthquake.



<An uncoupled joint that was not seismically designed (Niigata Prefecture)>
(Source: Ministry of Health, Labour and Welfare) ※ 1



<A water tower that tilted from an aftershock of the Great East Japan Earthquake (Iwate Prefecture)>
(Sources: Ministry of Health, Labour and Welfare / Japan Water Works Association) ※ 2

Japanese Translation

震災による水道施設の被害を最小限にとどめ、給水を可能な限り確保

震災時の給水確保に向けた課題

平成23年の東日本大震災では、約257万戸にも及ぶ断水が発生し、生活用水はもとより避難所等の重要施設でも水が使えないなど、震災時における給水確保の重要性が浮き彫り

Figure※

- | | |
|--|--------------------|
| 1 非耐震継手管の離脱 (新潟県)
(出展元: 厚生労働省) | 3 水道管路を耐震継手管に取替 |
| 2 東日本大震災の余震による配水塔の倒壊 (岩手県)
出展元: 厚生労働省・公益社団法人 日本水道協会 | 4 抜出防止機能を備えた継手 |
| | 5 水道施設 (配水池) の耐震化例 |
| | 6 耐震補強前 |
| | 7 耐震補強後 (耐震壁設置) |

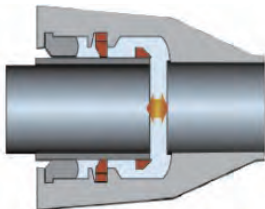


Advancing earthquake resilience of the water supply system overall

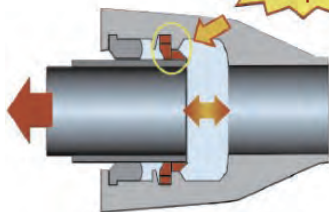
- Minimizing damage in the event of an earthquake and ensuring water supply to all possible extent
- Enhancing earthquake resistance effectively, including setting priorities and implementing seismic retrofitting starting from key facilities

<Replacement to an earthquake-resistant joint pipe>

※ 3



Catches and does not uncouple



Joint with interlocking function ※ 4

<Example of seismic reinforcement of distribution reservoir>

※ 5



Before seismic reinforcement ※ 6



After seismic reinforcement (installation of quake resistant walls) ※ 7

水道システム全体の耐震化を推進

- ・震災時における被害を最小限にとどめ、給水を可能な限り確保
- ・優先度の高い施設から耐震補強を行うなど、効果的な耐震化を実施

MEASURES TO SUPPRESS THE SURFACING OF MANHOLES DUE TO LIQUEFACTION

Mitigating manhole uplift to ensure transportation functions



Issues of manhole floatation due to liquefaction occurring during earthquakes

Liquefaction from a strong earthquake could result in buoyant forces lifting the manholes. There are concerns that this would have large impacts on sewer functions and passage of emergency vehicles.



Niigata Prefecture Chuetsu Earthquake Oct. 23, 2004 (Tokamachi, Niigata Prefecture) ※ 1



Great East Japan Earthquake March 11, 2011 (Urayasu, Chiba Prefecture) ※ 2

Manhole uplift due to liquefaction ※ 3

Japanese Translation

マンホールの浮上を抑制し、交通機能などを確保

震災時の液状化現象によるマンホール浮上の課題

強い地震により液状化が発生すると、大きな浮力を受け、人孔が浮上する場合があります。これにより下水を流す機能や緊急車両の通行に大きな影響を与える懸念がある

Figure※

- 1 新潟県中越地震
- 2 東日本大震災

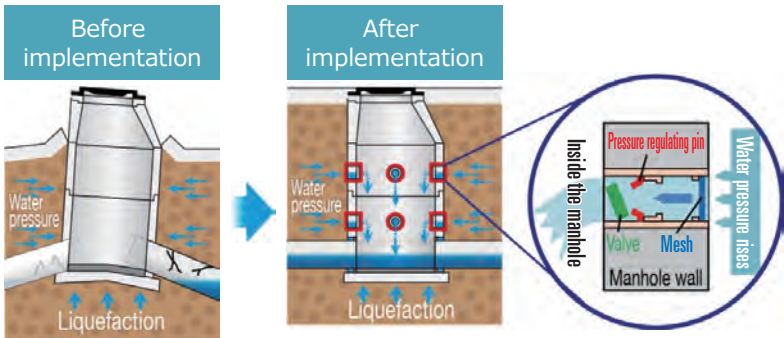
- 3 液状化による人孔の浮上状況



Development and implementation of a simple and inexpensive method to inhibit floating

(Features)

- This technology installs pressure control devices in the wall of the manhole, which suppress the uplift by releasing the excess pressure generated from liquefaction into the manhole when an earthquake occurs.
- Installed in approx. 23,000 manholes in Japan.
- Proved its function during the Great East Japan Earthquake in 2011.



簡単で安いフロートレス工法を開発し、実用化へ

(特長)

- マンホール側面部に圧力調整装置を設置し、液状化現象による過剰な水圧をマンホール内に逃がして浮上を抑制する技術
- 国内では、約23,000ヵ所設置
- 東日本大震災で機能実証

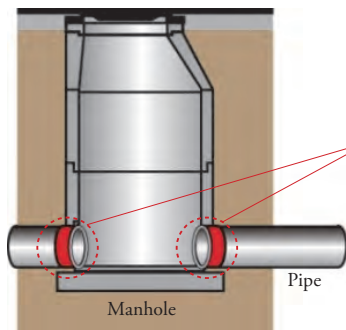
ENHANCING EARTHQUAKE RESISTANCE BY A NON-EXCAVATION METHOD

Seismic retrofitting of sewer pipe-manhole joints



Issues of intensive damage to sewer pipe-manhole joints in the event of an earthquake

- Impacts will be felt on sanitation, the environment, and other living conditions when toilets become unusable due to damage to sewer facilities.
- Seismic retrofitting of sewer networks should be advanced in order to ensure toilet functions in evacuation centers and transportation functions of disaster response routes.



Great Hanshin-Awaji Earthquake ※ 1
Jan. 17, 1995 (Kobe, Hyogo Prefecture)

Japanese Translation

下水道管とマンホールの接続部の耐震化

地震で被害が集中する下水道管とマンホールの接続部の課題

- ・ 下水道施設が被災しトイレが使用不可となると、衛生面・環境面など生活に影響が及ぶ
- ・ 下水道施設の震災対策を進め、避難所などのトイレ機能や緊急輸送道路などの交通機能の確保が必要

Figure※

- | | | |
|-----------------|--------------------------------------|-------------------------|
| 1 阪神・淡路大震災 | 4 地震により被害を受けやすい下水道管とマンホールの接続部を可とう化する | 5 地震の揺れを吸収するゴムブロックなどを設置 |
| 2 地震による下水道管の突出し | | |
| 3 マンホールの破損 | | |



Development and practical application of a simple and inexpensive method to enhance the earthquake resistance of manholes without excavation

(Features)

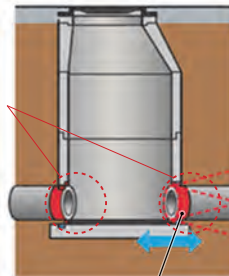
- Can be conducted from the manhole without excavation
- Inexpensive compared to excavation
- Implemented in 3600 sections of sewer pipes connected to evacuation centers, terminal stations, and other locations

Non-excavation method to enhance earthquake resistance of existing manholes

This method improves the flexibility of the existing sewer pipe-manhole joint without excavation. It prevents damage due to bending and protrusion, and ensures sewage drainage functions.



Implemented from FY 2000.



Installation of rubber blocks, etc., which absorb the shocks of an earthquake.

※ 4
Making the sewer pipe-manhole joint, which is easily damaged by earthquakes, more flexible.

※ 5

簡単で安い非開削既設人孔耐震化工法を開発し、実用化へ

(特徴)

- ・非開削でマンホール内から施工可
- ・非開削より施工費が安価
- ・避難所、ターミナル駅など排水を受入れる下水道管3600ヵ所で耐震化実施

この工法は、道路を掘削することなく、既設の下水道管とマンホールの接続部を柔軟な構造に改良するもので、地震時の屈曲・突出しによる破損を防ぎ下水の流下機能を確保