An aerial photograph of the Tokyo skyline at sunset, showing numerous skyscrapers and buildings under a hazy, orange-tinted sky. The image is used as a background for the title and author information.

Seismic Retrofitting Measures for Sewerage Structures in Tokyo

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Outline

- **Introduction**

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- 2. Seismic Reinforcement Technology
- 3. Countermeasures against Earthquakes for Sewer Pipes

- **Problem definition & Approach**

- 1. Overview of Nagatacho and Kasumigaseki District
- 2. Challenges in Proceeding the Construction

- **Conclusion**



Introduction

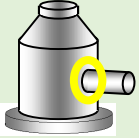

1. The Importance of Earthquake Resistance Measures



The Chuetsu Earthquake
Occurred in 2004 M6.8



The Great East Japan Earthquake
Occurred in 2011 M9.0



The Great Hanshin Earthquake
Occurred in 1995 M7.3

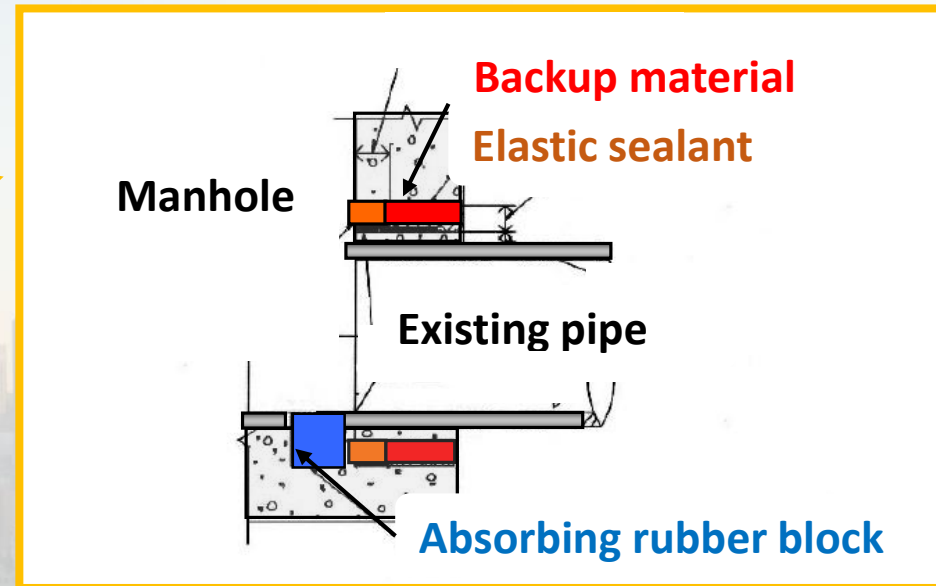
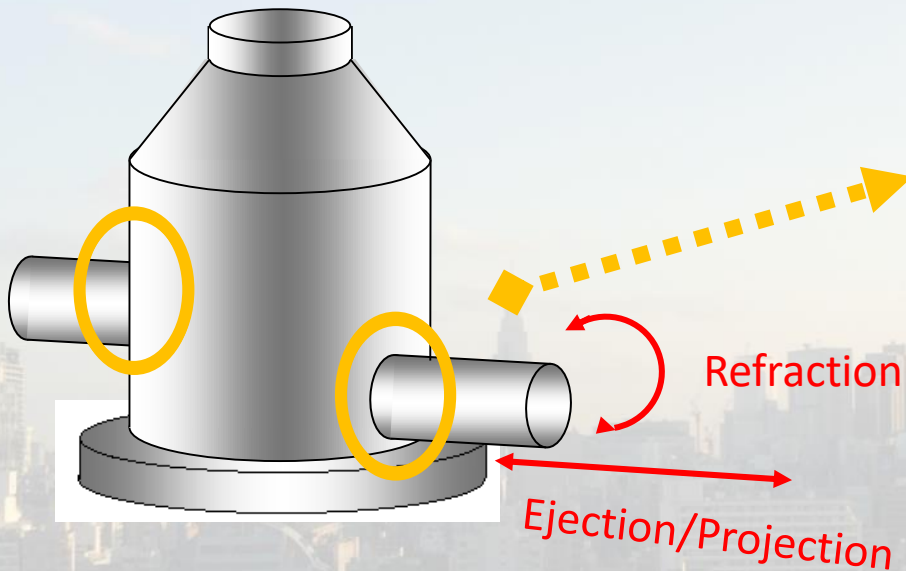
⇒ If happens in Tokyo, Japan suffers enormously.

Introduction

2. Seismic Reinforcement Technology

1) Trenchless Technology of Seismic Reinforcement Construction (TTSRC)

< Interior of a Manhole >

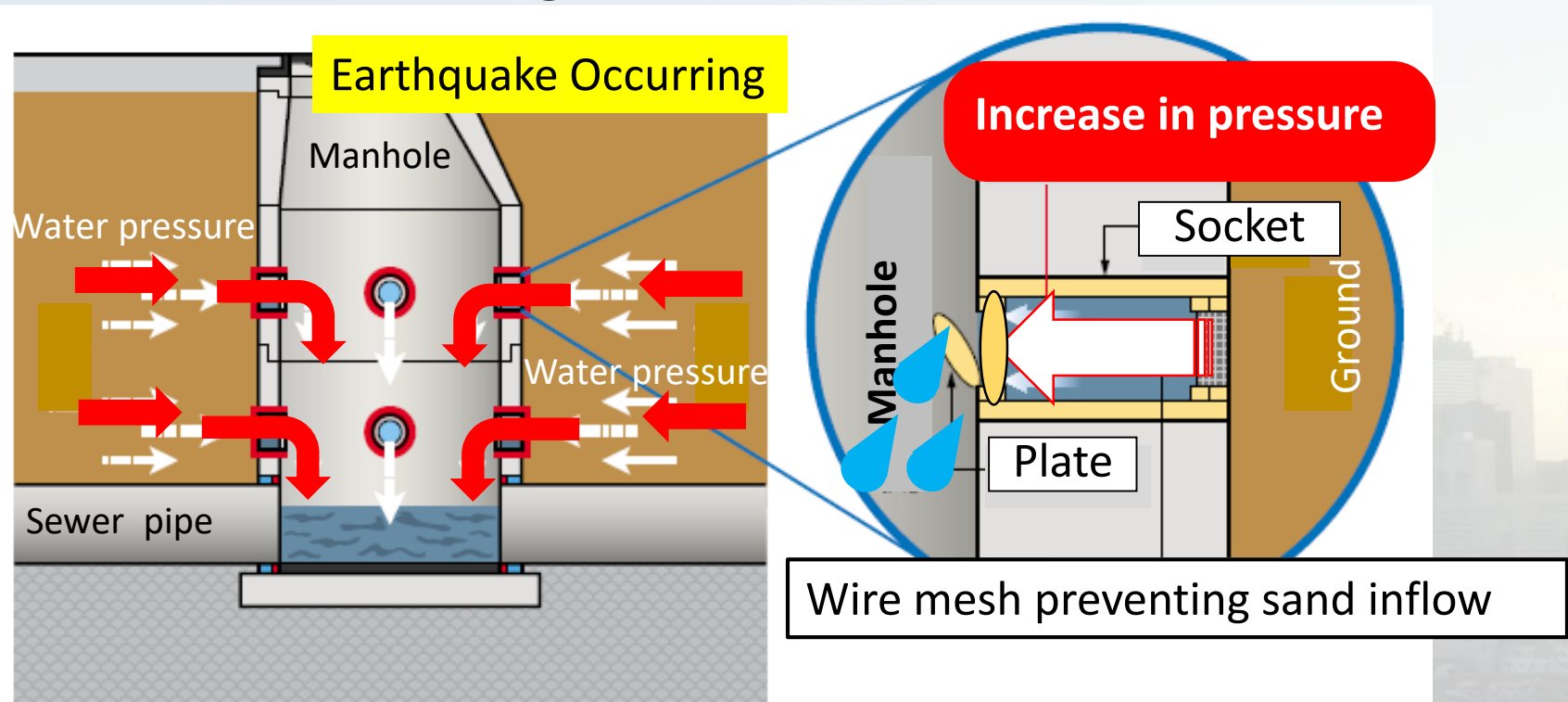


⇒ Secure the flowing function of the sewer.

Introduction

2. Seismic Reinforcement Technology

2) Trenchless Technology of Manhole Floating Prevention (TTMFP)



⇒ Prevent manhole floating, liquefaction

Introduction

3. Countermeasures against Earthquakes for Sewer Pipes in Tokyo

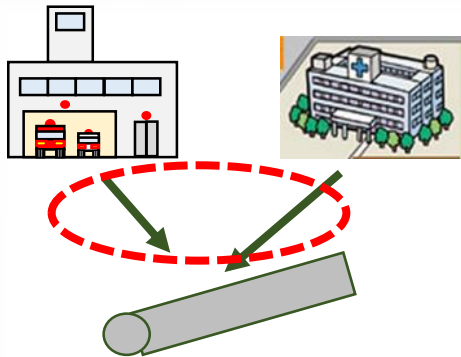
In 23 wards of Tokyo

- 16,000 km sewer pipes
- 480 thousand manholes

⇒ Taking times and expense to apply all seismic reinforcement
⇒ Giving priority

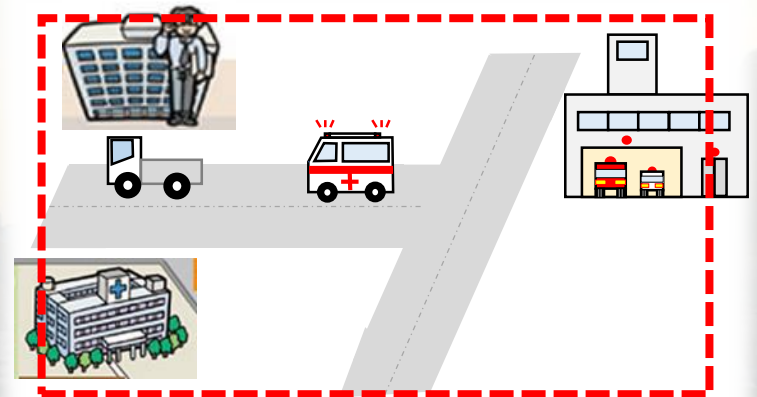
For Examples...

- Disaster recovery bases



Ex) Fire stations, Hospitals
Administrative Buildings

- Emergency transportation roads



Ex) National roads, Prefectural roads

Problem definition & Approach

1. Overview of Nagatacho and Kasumigaseki District (NKD)

The image features a central map of the Nagatacho and Kasumigaseki District (NKD) in Tokyo. The NKD is highlighted in yellow. Surrounding the map are several callout boxes with red borders, each containing a photograph of a specific location. Red lines connect these callouts to their respective locations on the map. The callouts are: Shinjuku Station (top left), Tokyo Station (top right), The Imperial Palace (middle right), Shibuya Station (bottom left), National Diet (bottom center), and Prime Minister's Office (bottom right). The map also shows various train lines and station names in Japanese.

Shinjuku Station

Tokyo Station

The Imperial Palace

Shibuya Station

NKD

National Diet

Prime Minister's Office

Problem definition & Approach

1. Overview of Nagatacho and Kasumigaseki District (NKD)

Construction period:

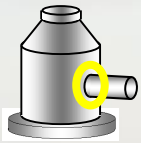
- 220 days
- 7th August 2015
~ 5th July 2016

Target facilities:

- Disaster recovery bases: 17 locations
- Emergency transportation roads: 6km

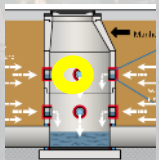
Construction quantity:

- 131 locations:



TTSRC

- 47 locations :



TTMFP



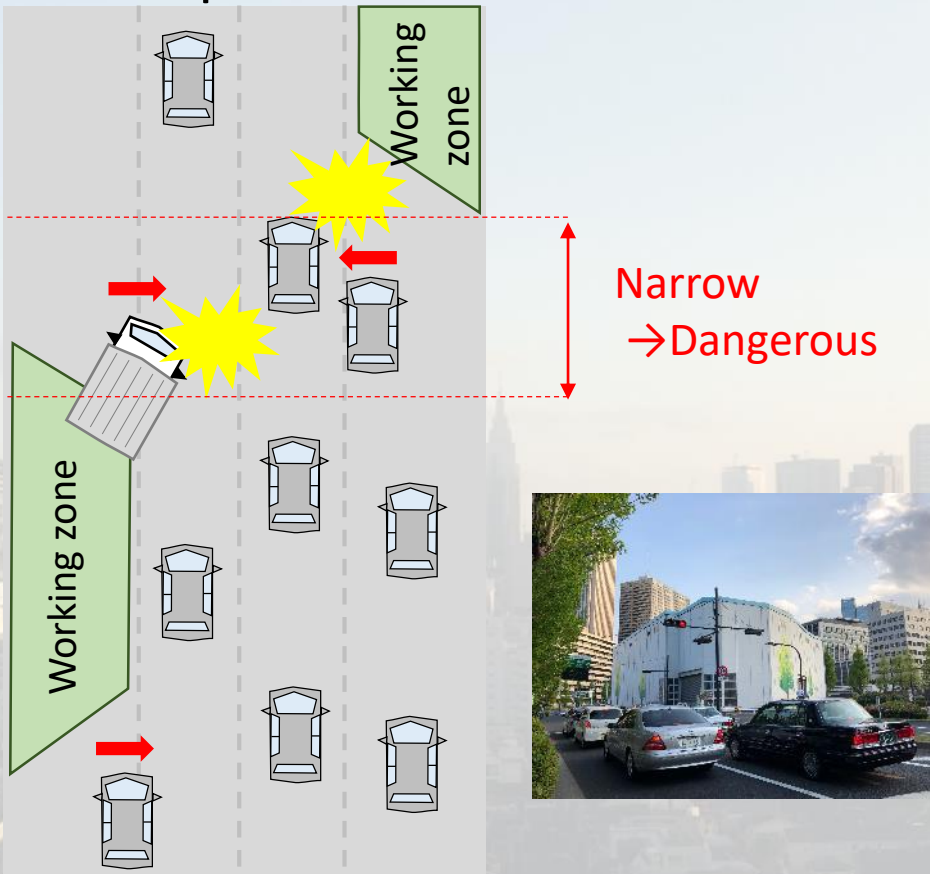
The Construction Map

Problem definition & Approach

2. Challenges in Proceeding the Construction

Problem:

- Overlap with other construction works



2018/5/17

- Large traffic volume



In front of Tokyo police office

Challenge:

Prevention

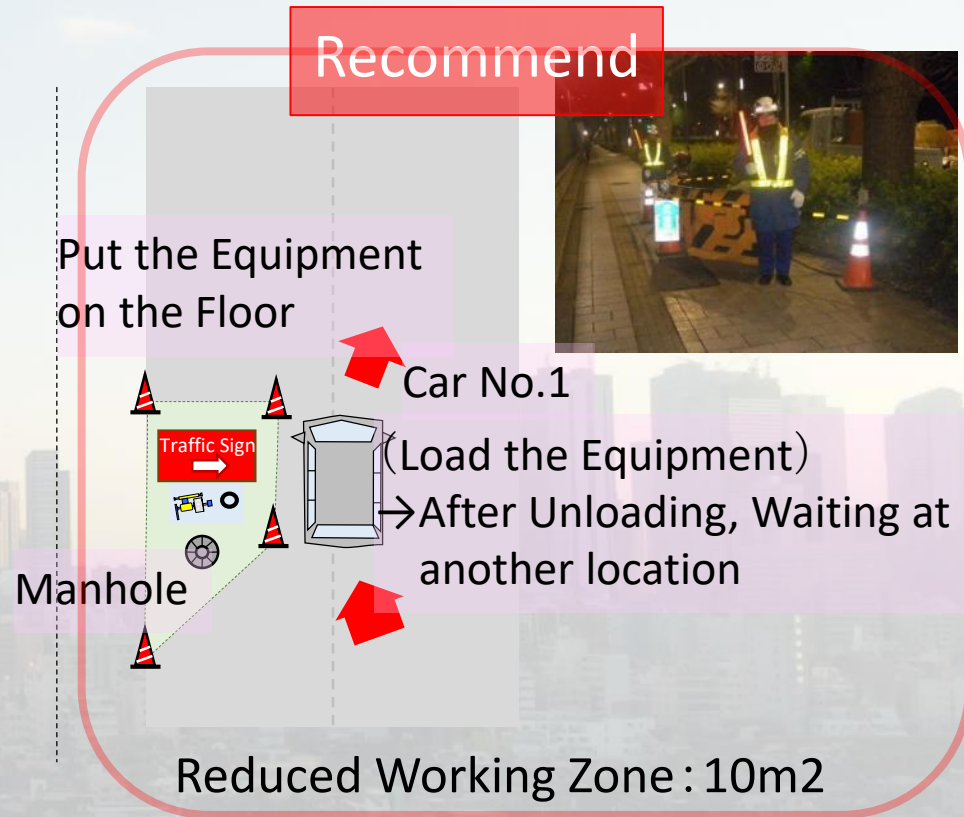
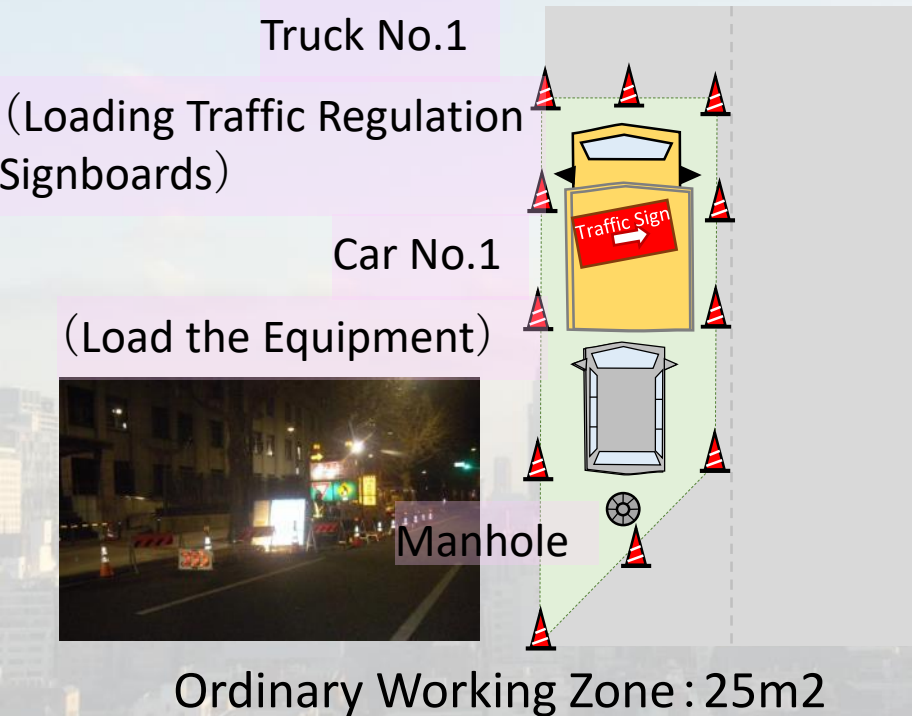
- Traffic jams
- Traffic accidents

Problem definition & Approach

2. Challenges in Proceeding the Construction

Challenge:

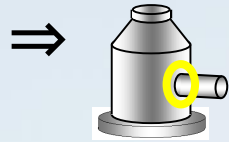
- Working at night with less traffic volume
- Reducing the working zone



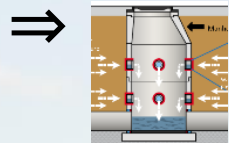
⇒ Reducing the influence on road traffic & Carrying out competing constructions

Conclusion

- Promoting countermeasures for sewer pipes against earthquakes

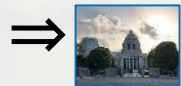


The trenchless technology of seismic reinforcement construction (TTSRC)



The trenchless technology of manhole floating prevention (TTMFP)

- Gave priority for these measures



Disaster recovery bases



Emergency transportation roads

- In spite of the heavy traffic in Tokyo, two technologies with no excavation and reducing working area promote countermeasures.