



# THE BEST SOLUTIONS FOR ROAD DEVELOPMENT AND MANAGEMENT

## Engineering Consulting Service



Metropolitan Expressway Company Limited



Shutoko Engineering Company Limited



Highway Technology Research Center

# Metropolitan Expressway Group Companies support your road development and management

Metropolitan Expressway Group Companies of Metropolitan Expressway Co., Ltd, Shutoko Engineering Co., Ltd, Highway Technology Research Center and other affiliated companies can provide various road construction technologies and know-how gained through our long-term experience in the high-density Tokyo metropolitan area.

## PLANNING & CONSTRUCTION



- Road construction technologies for various conditions.
- Project evaluation utilizing traffic demand prediction.

## INSPECTION & MAINTENANCE



- Methods of inspection, evaluation, and repair based on our long-term experience in road maintenance.

## OPERATION & TRAFFIC MANAGEMENT

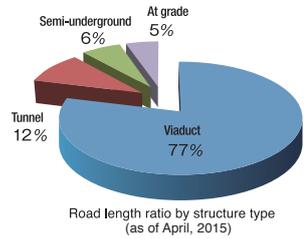


- Appropriate traffic control technologies according to your road network scale.
- ITS and ETC technologies to meet your needs.

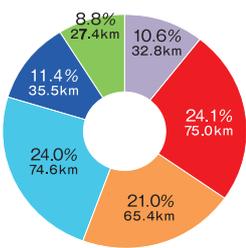
## Our Group Companies' Engineering Consulting Service

# Metropolitan Expressway Group Companies' strengths in road management

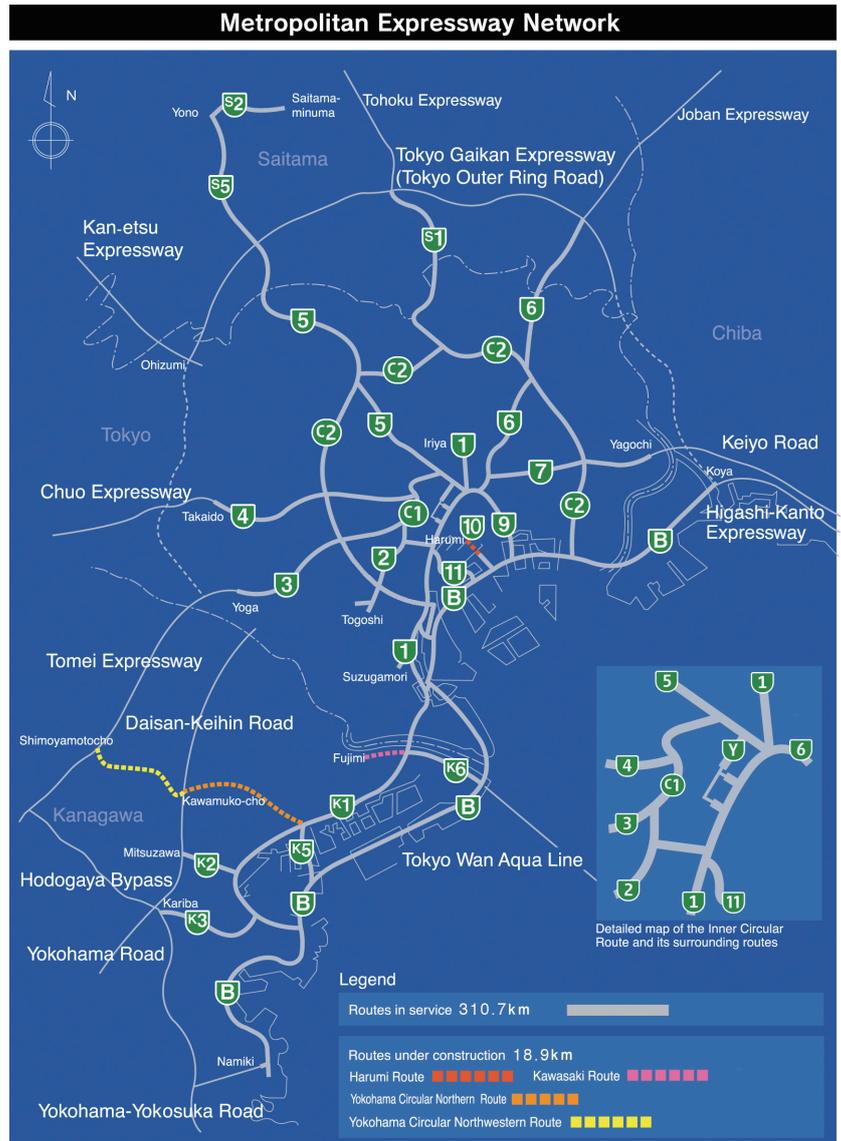
Metropolitan Expressway Group Companies manage the Metropolitan Expressway, which supports the socioeconomic activities in Tokyo metropolitan area. The key features of the expressways are a total length of over 300 km (about half of which are over 30 years old), approximately 90% of the road structures being viaducts and tunnels, and a road usage of approximately one million vehicles per day. Along with these features of expressway, Metropolitan Expressway Group Companies have accumulated expertise for road engineering through planning, construction, maintenance, and management of urban expressways. Utilizing our expertise, Metropolitan Expressway Group Companies aim to contribute to road development all over the world by providing safe and user-friendly roads.



**Feature1:**  
About 90% of the expressway is viaduct or tunnel structure



**Feature2 :**  
About half the length of the approximately 300 km in-service expressways has been opened for more than 30 years.



Metropolitan expressway opened (Kyobashi - Shibaura)



Near Hamazakibashi Junction (At the time of the Tokyo Olympics)



Rainbow Bridge opened



New traffic control system AISS'09 operated



Ohashi Junction opened



Yamate Tunnel (18.2km) opened

# PLANNING & CONSTRUCTION

Metropolitan Expressway Group Companies provide technical solutions for road development under various conditions in both highly urbanized areas and suburban areas.

## Route planning

We provide engineering advice on efficient and cost-effective route plans, considering the selection of optimal structures and the preservation of roadside environments.

### *Serving you with :*

#### Engineering advice on planning, design and construction of roads in high-density areas.

The Metropolitan Expressway has been planned and constructed in densely populated areas.



Junction constructed above a river (Edobashi Junction)



Multilayered structure (Hakozaki Junction)

#### Engineering advice on planning and constructing road structures considering land constraints for construction and the reduction of the impact on the existing traffic due to construction work.

Many road structures are selected by considering land limitations for construction and the impact on the existing traffic flow.



Compact Junction in a residential area (Ohashi Green Junction)



Long urban tunnel under an existing surface road (Yamate Tunnel)

#### Engineering advice on design and operation of tunnel disaster prevention systems.

The Metropolitan Expressway has various types of road tunnels, including long urban tunnels that reach 20 km in total. We have installed and operated an advanced tunnel disaster prevention system. The system automatically detects tunnel fires and accidents and informs tunnel users of unexpected events inside the tunnel.



Tunnel disaster prevention facilities



CCTV camera



Emergency phone

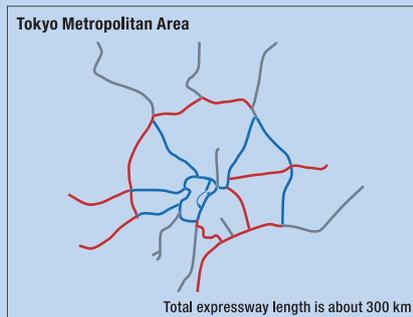


Water spraying device

# Evaluation of road development/improvement

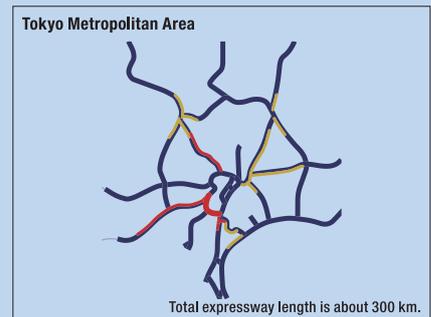
We provide services for the evaluation of your road development/improvement project. Traffic characteristics of overcrowded cities are taken into account when analysis of traffic demand is implemented.

Traffic volume estimation can be offered in consideration of utilization/traffic characteristics of expressways.



Predictions for traffic volume change associated with a road development/improvement project

- Traffic volume increases
- Traffic volume decreases
- Traffic volume remains unchanged



Predictions for congestion alleviation associated with a road development/improvement project

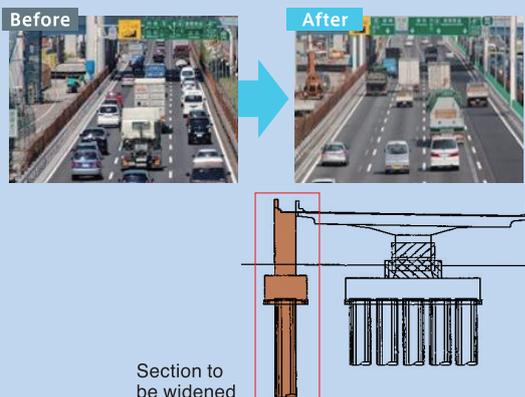
- Travelling speed 20km/h or less
- Travelling speed above 20km/h below 40km/h
- Travelling speed above 40km/h

# Proposal of traffic congestion alleviation measures

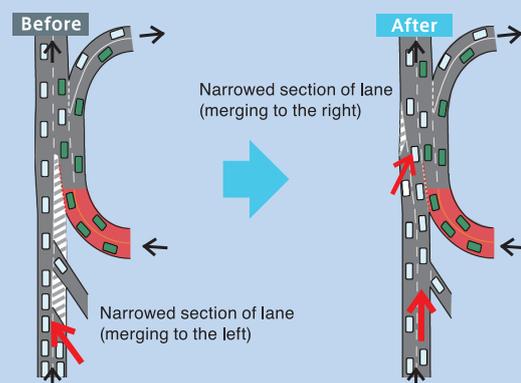
We propose effective strategies to alleviate congestion in areas where congestion is chronic, based on detailed traffic flow analysis. We also plan and design the congestion alleviation works, analyze their effects, and then propose construction work methods that minimize the impact on the existing traffic flow.

We provide engineering advice on planning, designing, and implementing traffic congestion alleviation measures on expressways in service.

Measures for increasing traffic capacity by installing an additional lane



Measures for increasing traffic capacity by improving a merging section



# INSPECTION & MAINTENANCE

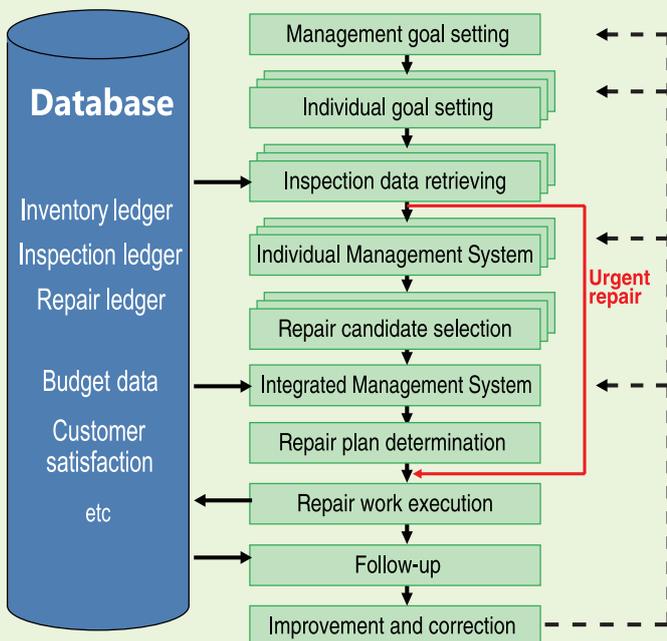
Metropolitan Expressway Group Companies can support your road maintenance work at various stages by using our relevant expertise.

## Maintenance System

We provide engineering advice on road maintenance system, e.g. for inspection, evaluation and repair work, based on our technologies and practical experience of more than 50 years.

### Maintenance Planning

We provide engineering advice to support the development of an optimal maintenance plan, e.g. for inspection work, repair work and asset management, according to the type and scale of road structures.



Flowchart of asset management



### Inspection / Evaluation

Proposal on inspection work and evaluation methods for damage for each type of structures can be provided. This also includes a detailed examination for evaluating the cause of damage and planning for repair or strengthening work.



Inspection work

## OUR ADVANCED INSPECTION TECHNOLOGIES

### Pole-camera and hammer sounding equipment for inspection at high elevated places

Inspections are carried out by pole-camera and hammer sounding equipment in locations where close visual inspection is difficult.



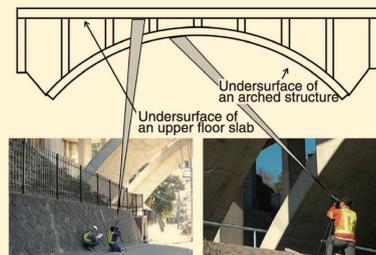
Pole-camera



Hammer sounding equipment

### Inspection and assessment method using digital image processing

The condition of structures is accurately recorded, checked and analyzed using the captured digital images and processing technology.

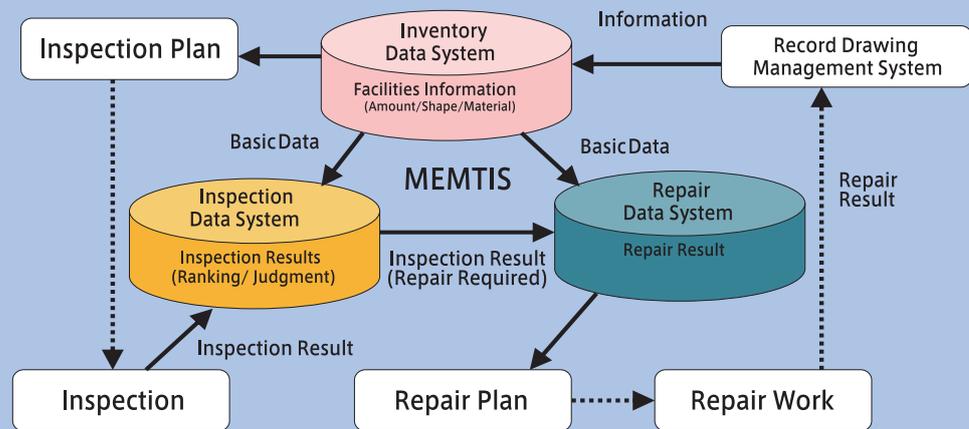


### Semi-automatic ultrasonic for steel plate deck

Through-deck-type fatigue cracks in orthotropic steel decks are detected and the inspection results are recorded by the sliding operation of the SAUT probe.

## Data Recording / Database System

We support the establishment of a database system that manages various types of information related to inventory, inspection and repair work. The database can integrate and efficiently improve maintenance work, and comprehensive information of road assets can be acquired.



**Database of Metropolitan Expressway Group Companies (MEMTIS)**  
MEMTIS: Metropolitan Expressway Maintenance Technical Information System

## Construction Management / Quality Control

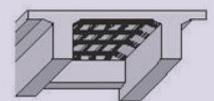
An engineering service for construction management and quality control can be provided in order to ensure high-quality, safe construction work.



Check of re-bar arrangement

## Design and Construction of Repair Work

We provide the most suitable approach for the design and construction of repair or strengthening work according to the type of damage.



Strengthening of concrete slab

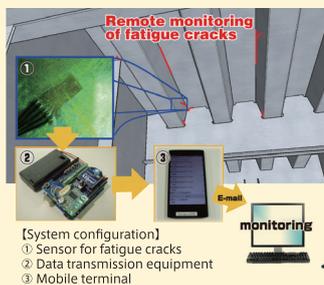
### Sonic testing (SAUT)



Semi-automatic ultrasonic testing (SAUT)

### Remote monitoring technology for fatigue cracks

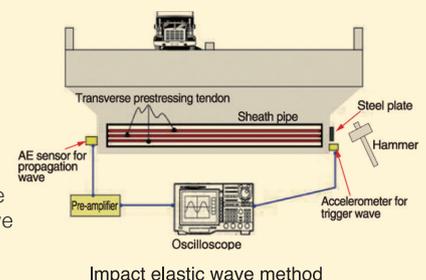
The propagation of fatigue cracks in steel structures can be remotely monitored for a long term by the remote monitoring technology.



Remote monitoring of fatigue cracks

### Inspection of filling condition of grout in transverse prestressing tendons

The filling condition of grout in transverse prestressing tendons of prestressed concrete bridges is evaluated by the impact elastic wave generated by the hammer.



Impact elastic wave method

# OPERATION & TRAFFIC MANAGEMENT

Metropolitan Expressway Group Companies can propose a plan for road service improvement and efficient road management utilizing the latest technologies.

## Traffic Operation System

From a stand-alone system to an advanced traffic control system, which make full use of the latest ITS (Intelligent Transport Systems), we advise on planning, installation, improvement and operation of the system to meet the road administrator's needs.

### Traffic control system

Improvements will be realized in customer service and the efficiency of traffic management by collecting, processing, and providing traffic information.

#### Traffic data collection



Emergency phone



CCTV camera



Vehicle detector



Patrol car

#### Traffic data processing



Traffic control room



Central processing unit

#### Traffic information provision



Variable message signboard



Graphic information board



Web site

### Automatic detection system for unexpected events

This system can automatically detect unexpected events, including low-speed vehicles, stopped vehicles and reverse running vehicles, by processing images from CCTV cameras, and inform traffic controllers of such events.



Example of image processing (stopped vehicle)

### Automatic axle-load weighing system

This system is installed at the toll gate to check overloaded vehicles, which can cause damage to road structures.



Axle-load measuring device



Camera

### Motorcycle patrol group / message signboard vehicle

A motorcycle patrol group can reach a site quickly even in congestion. Vehicles with a message signboard can warn following vehicles of any danger.



Patrol Motorcycle



Message signboard vehicle

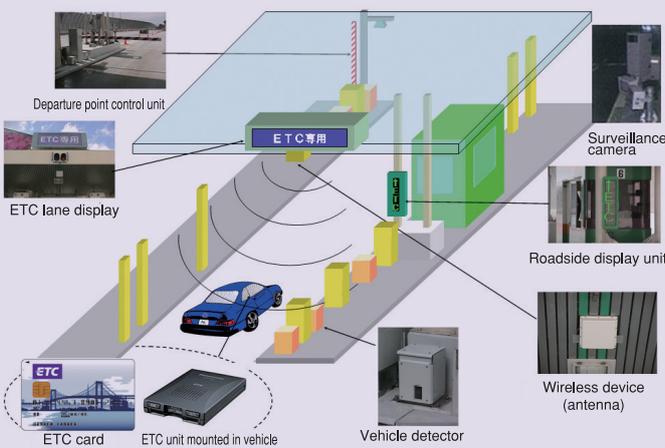
# Electronic Toll Collection System (ETC)

We can support the introduction of ETC, and also propose improvements in the ETC radio communication environment of the road in service by utilizing our extensive experience in the operation of precision ETC systems, which handle approximately 900,000 ETC vehicles per day (ETC usage ratio: 90%).

## ETC installation

We can support the installation of ETC, including proposals on the construction of ETC and Free Flow ETC systems.

We can support detailed design, construction management and quality control of the ETC system.



ETC at entrance



ETC at exit

2002.May.23(Thu)16:00



ETC usage ratio = 1%

2008.Jan.24(Thu)16:00



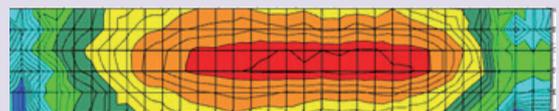
ETC usage ratio = 80%

Congestion Reduction at Toll Gates

## ETC reliability improvement

Proposals can be offered to decrease radio communication errors. (measurement of electromagnetic intensity, measures against electromagnetic wave leakage, etc.)

Proposals can be offered to secure toll collection in terms of both the system and the operation.



Measurement of electromagnetic field intensity



Measurement of electromagnetic field intensity



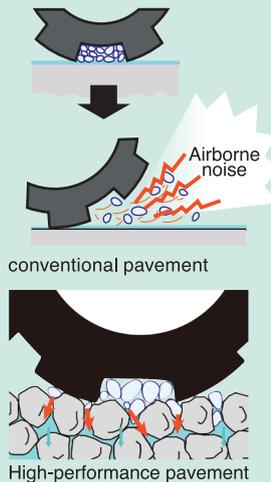
Tentative installation of electromagnetic wave absorbers

# ENVIRONMENT & TRAFFIC SAFETY

Metropolitan Expressway Group Companies provide technologies to promote safe driving and measures for preserving roadside environments.

## High-performance pavement (Porous asphalt pavement)

This high-performance pavement has more pores than conventional pavements. It reduces air pumping noise because the air between the road surface and tires can escape into pores on the surface. In addition, rainwater quickly penetrates into the pavement. Therefore, running safety is improved owing to greater visibility of lane markings on rainy days.



## Noise barrier, viaduct undersurface acoustic board

Noise from expressways can be suppressed by installing the noise barrier which has higher sound insulation performance along with undersurface acoustic board for viaducts.



The noise barrier



Viaduct undersurface acoustic board

## Ventilation system

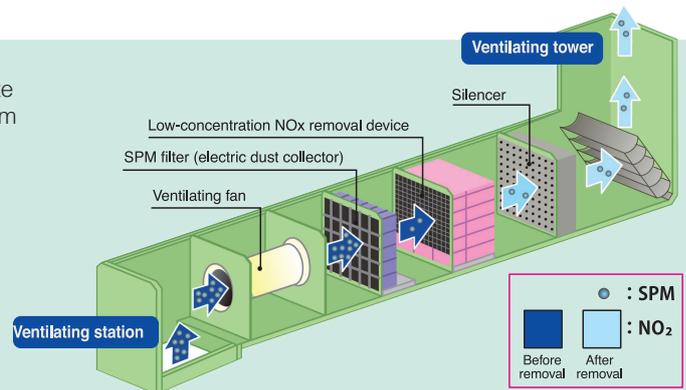
We propose an advanced NO<sub>2</sub> and SPM (suspended particulate matter) removal system in tunnel ventilation facilities. This system removes most of the NO<sub>2</sub> gas and SPM emitted by vehicles.



NO<sub>2</sub> Removal System



Electrostatic Precipitator



## Road traffic safety facilities

We propose measures for enhancing traffic safety by installing curve warning reflectors and colored pavements for the place with many accidents. Know-how to help drivers spontaneously achieve safer drive, which has been acquired from traffic safety campaigns, can also be provided.

### Road traffic safety facilities



Curve warning reflector



Congestion tail information board

### Traffic safety campaign

TOKYO SMART DRIVER (project) is an approach launched by users of the Metropolitan Expressway targeting a reduction of traffic accidents through mutual consideration while driving.



Campaign logo mark

# OTHER ACTIVITIES

Metropolitan Expressway Group Companies are ready to accept technical visits of road-related parties from various countries, to provide training opportunities, and to dispatch specialists.

## Technical visit / Training program

We accept technical visits from road organizations and road administrators of foreign countries to our expressways that are in service or under construction. Training programs on our technologies are also provided.

### Major subjects of the training / technical visit

- Route planning
- Construction technology for bridges / tunnels
- Inspection of structures
- Maintenance and management techniques
- Traffic control system
- ETC system
- Traffic safety measures



Training program



Technical visit



Technical visit

### Inspection training at a training facility

The training facility for structural damage inspection skills has been established for developing inspection skills. The trainees can obtain technical knowledge which is essential for damage detection and evaluation.



## Specialists dispatch / Seminars

We can support road development in foreign countries in various ways through dispatching specialists and holding seminars on road infrastructure.



Seminar in Indonesia



Seminar in Thailand



Inspection demonstration during a seminar



## **Engineering service with collective strengths of Metropolitan Expressway Group Companies**

### **Metropolitan Expressway Co., Ltd.**

- Road development planning, route planning and design ● Inspection planning ● Repair and strengthening work planning
- Research and study of traffic control (ITS)

### **Shutoko Engineering Co., Ltd.**

- Inspections (periodic, daily, emergency)/Evaluation ● Expressway soundness evaluation
- Maintenance priority evaluation ● Deterioration prediction ● Design of seismic repair and strengthening work
- Development of inspection technology ● Impact examination of the proximity construction

### **Highway Technology Research Center**

- Establishment/operation management of asset management system ● Inspections (detailed/general)
- Soundness/deterioration evaluation ● Design ● R&D of advanced technology
- Promotional activities for new technology information (holding of lectures / training sessions)

**Shutoko Maintenance West Tokyo Co.,Ltd.  
Shutoko Maintenance East Tokyo Co., Ltd.  
Shutoko Maintenance Kanagawa Co., Ltd.**

**Shutoko Electrical Maintenance Co., Ltd.  
Shutoko ETC Maintenance Co., Ltd.  
Shutoko Machinery Maintenance Co., Ltd.**

- Planning and implementation of repair work of road structures
- Inspection and repair work of road facilities

#### Contacts



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