No.38 - Environmental Concerns Relating to the Ohashi Junction Loop Structure Project

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Contents

- Ohashi JCT - Challenges to construct an expressway junction connecting tunnels and viaduct in the densely inhabited district (DID) in Tokyo
- How the Ohashi area has been developed and redeveloped
- Approaches to environmental concerns
- Cutting-edge tunneling technologies help reduce environmental burdens
Shutoko (Metropolitan Expressway) Network

Central Circular Route (Yamate Tunnel)

Ohashi Junction

Tokyo Bay
Location of Ohashi Junction

OPENED in March 2010 (4.3km)

OPENED in 2007 (6.7km)

Route C2: Central Circular Shinjuku Route
(Yamate Tunnel: 10km)
Configuration of Ohashi JCT: 2 Turns of Double-storied Spiral Loop

Viaduct Structure (Expwy. Route 3)

Shield Tunnel (Route C2: Yamate Tunnel)

Cross Section (A-A)

Rooftop Park

27m

60-70m
Ohashi JCT: Multi-storied RC structure
Ohashi Jct.- Compact Junction, Minimal Influence on Neighborhoods

Comparison: A Freeway Junction in Los Angeles, USA

Size of Ohashi JCT

200m
(40,000m²)

1000m
History of Ohashi Area
(From 1940’s to 1970’s)

Suburbanization after the 1923 Great Kanto Earthquake

- Streetcar (Tama-Den) on National Route 246
- No Expressway

Motorization after the 1964 Tokyo Olympics

- Streetcar (Tama-Den) was replaced by Subway underneath Route 246
- Expwy. Route 3 opened over Route 246
Ohashi Area before Redevelopment

Small houses, stores and narrow alleys

Densely populated community (No park nor open space)
Ohashi Redevelopment Project
- Land Use Plan -

- Redevelopment Area: 38,000m²

- Residential bldg. #1-2
  - Opened in 2009
  - Open FY 2012
  - JCT Opened in March 2010
  - Rooftop Park
  - Residential bldg. #1-2
  - 27F (100m²)
  - 700 households

- Residential bldg. #1-1
  - Rooftop Park
  - Residential bldg. #1-1
  - 42F (160m²)
  - 700 households

[ 900 households, 2000 residents ]

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Redevelopment Stakeholders

- Shutoko (Metropolitan Expressway Co., Ltd.)
  Expressway structures (Ohashi Jct.)
  Greenery on jct. wall and ventilating station

- Tokyo Metropolitan Government
  2 Residential buildings and surrounding open space

- Meguro City Government
  Jct. rooftop municipal park, open space, and surrounding streets

- Local Community and residents
  Community redevelopment, design, environment

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3-Dimensional Zoning System

- Junction rooftop for municipal park
- Ground Surface for redevelopment building
- Expressway ramps in the aerial space
- Underground for Expressway tunnels
- Land of a building under redevelopment
  - Duplicate usage area
  - Building under redevelopment
  - Ramps
  - Expwy. Tunnel
  - Range for roads
  - Range, possible for duplicate usage

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Ohashi Redevelopment Area (Under Construction)

Ventilating Station

Space for Residential bldg. #1-1

Residential bldg. #1-2

Open Space

Rooftop Park

Redevelopment Area

December 4th, 2009

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Ohashi Area when Completed

More Residential Capacity

Residential bldg. #1-1

Residential bldg. #1-2

Access Bridge to Rooftop Park (5F)

Access Bridge to Rooftop Park (9F)

For Central Tokyo

To Tomei Expwy. for Western Japan

Rooftop Park

Ohashi JCT

Redevelopment Area

More Open Space, Wider Avenues, More Trees
Ohashi “Green” Junction
Environment-Friendly Approaches

Residential bldg. #1-1

Residential bldg. #1-2

Roof Garden for Conservation of Biodiversity

Rooftop Park with Various Trees (7000m$^2$)

Greenery on Junction Wall and Roadside Plants

Compact Development by Effective Land Use

CO$_2$ reduction: 40ton/year
JCT Rooftop Park
JCT Rooftop Park
Ohashi Ventilating Station

Cleared Air

Exhaust Emission

Ventilation Fan

Removes over 90% of NO₂, over 80% of Suspended Particulate Matter (SPM)
Ohashi TBM Rotation Shaft

Shaft for tunnel boring machine (TBM) for “3-dimensional U-turn”
3-Dimensional Rotation of TBM

1. Lower tunnel entrance

2. Rotating TBM

3. Jacking down

4. Rotating TBM

5. www.irf2010.com
Connecting tunnels by removing shield tunnel segments

Connection with shield tunnels already in use

Connecting two sets of shield tunnels by removing segments

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Conclusion

Engineering challenge: the construction of tunnel-to-viaduct expressway junction in a congested urban neighborhood;

- Created compact without sacrificing drivers’ safety
- Environmentally friendly design with greenery
- Introducing 3D zoning system, redeveloped to accommodate former residents and created new open space with gardens
- Reduced air pollution and noise by covering JCT
- Ventilation system for emission control inside junction loop

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Greenery Design

Cross Section

Tree-Planted Sidewalk

Well-designed wall

Rooftop park

Open Space with Trees

Grow slowly

Self-climbing Vine (Ficus pumila)

Greenery on JCT Wall

Meguro River

Greenery on JCT Wall

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Roof Garden on Ventilating Station

Roof Garden for Conservation of Biodiversity
Enlarging Shield Tunnel by Removing Tunnel Segments

Remove shield segment

Pipe roof method for connecting two shield tunnel
直接的な環境配慮として

• 構造的にループを覆蓋して換気所設置 → 大気汚染（NOx, SPM）対策及び騒音対策

• 3つの緑（JCT屋上公園、換気所屋上の生物多様性空間、壁面緑化）→CO2削減（40t/年）

間接的な環境配慮

• 土地の有効活用（立体道路制度適用） → JCTのコンパクト化

• 生活環境配慮

• 住民が地元で生活再建出来るよう再開発ビルと道路の一体整備