

# The Construction of Minatomirai line to Create the New City Space of the Cosmopolitan City "Yokohama"

## 1. Outline

Minatomirai line runs from Yokohama station to old downtown area (Kannai-Isezaki area) via newly developed Minatomirai area. It also contributes to the development of these urban areas with the establishment of new transport infrastructure, especially in the new "Minatomirai21 area". Minatomirai line which is the subway of 4.1 kilometers from Yokohama to Motomachi- Chukagai inaugurated in February, 2004. Minatomirai line forms one part of wide railway network links from Yokohama to Tokyo by the through service with existing line.

Yokohama-city government took the lead in constructing Minatomirai line, and Yokohama Minatomirai Railway Company was established as a third sector (private company established and sponsored by public) in March, 1989. Yokohama Minatomirai Railway Company acquired the railway concession (own and operate) in April, 1990 and the approval of construction in November, 1991. The construction began in November, 1992 by applying the Private Rail Construction Aid Plan of government and completed in February, 2004.

Minatomirai line was transferred from JR TT to Yokohama Minatomirai Railway Company which is the railroad operator.

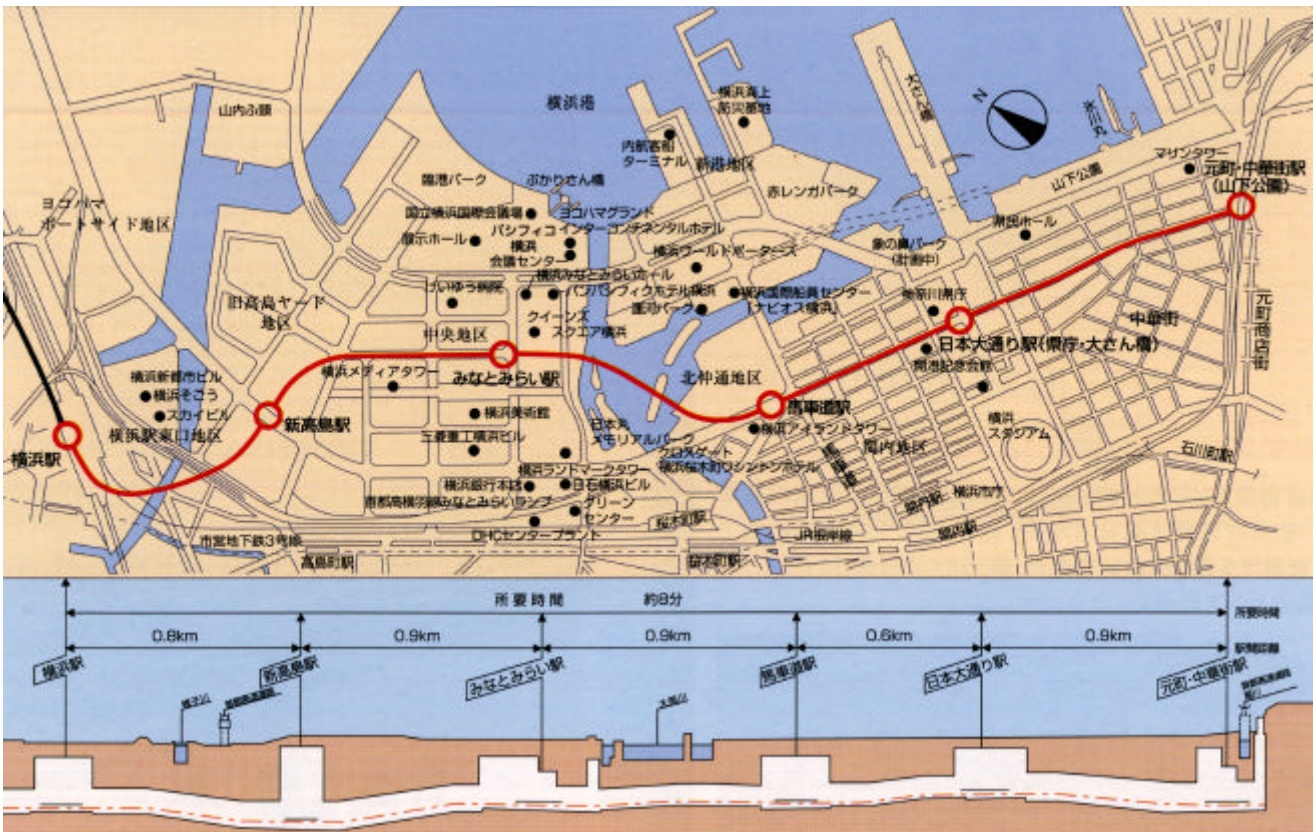


Fig.1: The route map of Minatomirai line

With the Private Rail Construction Aid Plan, JR TT funds and constructs the private urban railways and subways which are urgent projects in large cities such as Tokyo, Osaka and Nagoya by the instruction of Minister of Land, Infrastructure and Transport. After completion, the facilities are transferred to the railway operation companies.

The private railway company pays back the construction cost of transferred facility by equal half-yearly payment with interest in 25 years.

Table 1: The construction cost and the funds of Minatomirai line

		(US million \$)
Grant aid	Capital	250
	Grant by local government	670
Loan	Loan by private rail construction aid plan	1,170
	Loan by bank	250
Total		2,340

(1\$ ¥110)

## 2. Main Subject

### (1) Creation of New City Space

The basis concept of the station plan of Minatomirai line is 'Accessibility'. Minatomirai line secures not only the transportation but also other various functions with considering urban planning to create the new city space.

Taking advantage of the deep station, the stair well, the arch, and the dome are adopted as an infrastructure with latitude. These create the new and high-grade city space. Furthermore, aiming at the unique aspect, every station takes the city's symbolic attraction and atmosphere into the underground space. By these concepts, we could make these urbane galley stations harmonized with the city atmosphere. In the process of this, we organized the design committee which consists of civil engineers, designers, and

citizens for getting various ideas and images of the area.

#### (a) Minatomirai station (the stair well)

We applied the stair well in Minatomirai station for creating the united space extending from the platform at the 23 m depth to the building at ground level. In Minatomirai station, passengers will not feel any oppression as in the usual underground station. Thus Minatomirai station contributes to create an excellent landscape.



Photo 1: Minatomirai station

#### (b) Bashamichi station (the dome), Motomachi-Chukagai station (the arch)

We designed the dome style structure for Bashamichi station and the arch style for Motomachi-Chukagai station. Those styles create the expressive space with a curved surface and high ceiling.

In Bashamichi station, the diameter of the dome is 25 meters and it becomes a new symbol of the area.



Photo 2: Bashamichi station

In Motomachi-Chukagai station, the arch structure created a large space where it does not seem to be underground. And the concepts of Chukagai (China town) and the settlement era of Yokohama are expressed on the large wall by artists.



Photo 3: Motomachi-Chukagai station

Every station is a symbol as the entrance of each area and has a function of leading the development of the area.

(2)The coordinated equipment with city institution

The coordination with the urban roads and facilities such as underground path reduced the cost and time in the construction of Minatomirai line.

The construction cost of the Shintakashima station was reduced by combining with the underground path. On the other hand, the construction cost of Motomachi-Chukagai station was reduced by sharing the cost with the underground parking which was constructed simultaneously. The other stations, Minatomirai station and Bashamichi station, were also constructed in cooperation with the other underground facilities.

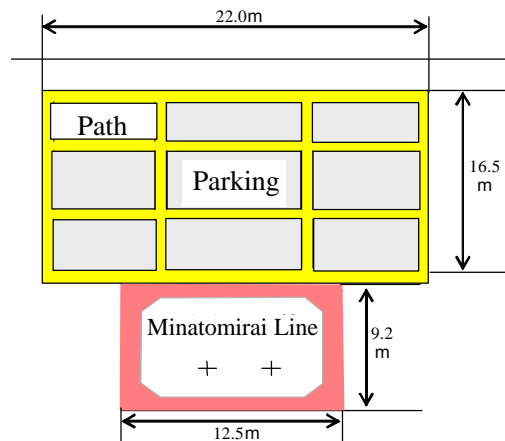


Fig.2: The underground parking

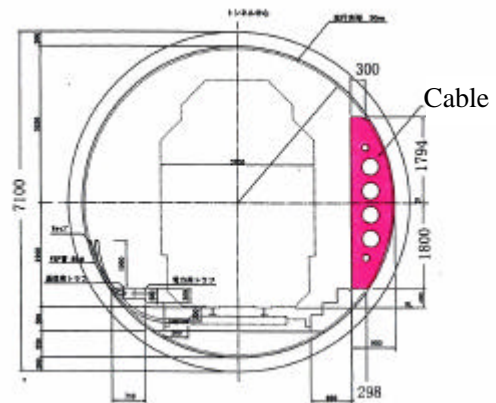


Fig.3: The section of shield

Additionally, the tunnel contains the cable for the public electric power supply. The railroad operator can get the revenue as an occupation fee from the electric power company. Moreover, the power company needs no extra facilities thanks to the rail tunnel and contributes to keep a beautiful landscape without messy aerial cables.

(3)The technical development in the construction of Minatomirai line

We introduce a part of the newly developed technologies for the reduction of the cost, the required time, and the environmental load in the construction.

(a)We developed the machinery caisson right under line operated Yokohama station, and achieved constructing safely and smoothly even in a narrow situation.

(b)We introduced the developing parallel link excavating shield machine for the first time in the interior railway construction. It has smaller radius compared with a conventional machine. Therefore the reduction of the running gear and the alleviation of machine weight were achieved.

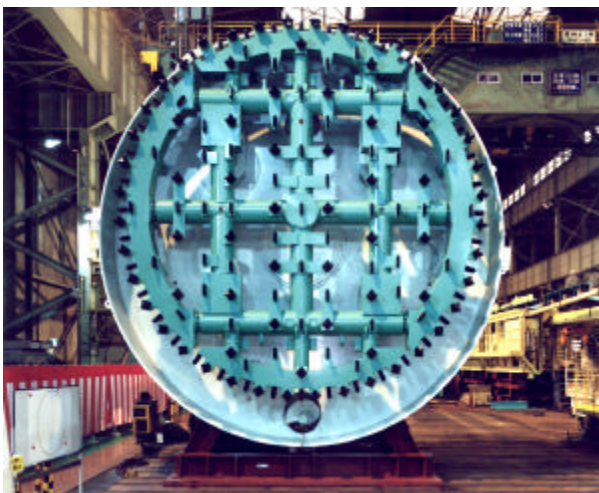


Photo 4: The shield machine

(c)The method of using wooden raft floated on the infused water as a scaffold was applied to the open cut tunnel of Shintakashima station because keeping the enough space was necessary for moving a shield machine to length. The sufficient safety and the shortening in the time necessary for the construction could be secured by the method.

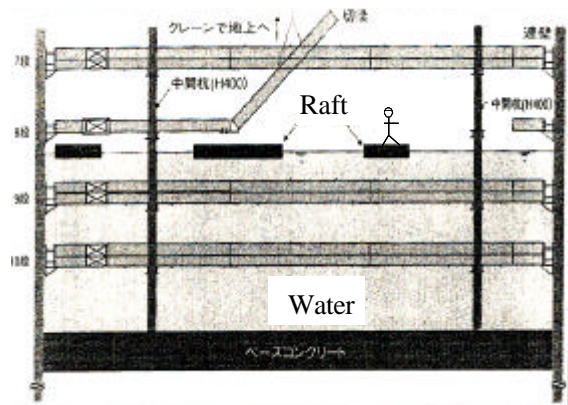


Fig.4: The scaffold of infused water

(d)The non-bolt type segment was introduced as the segment of shield machine, so the simplification and speed up of assembling work was available.

(e)The floating slab was used as the environment measure to reduce the vibration and the noise at the time of train running in Minatomirai station, a part of which was unit structure with music hall. So the vibration could be reduced by 10 several decibels.



Photo 5: The floating slab

Furthermore, the environment measure and the reduction of the construction cost were achieved by recycling the construction waste sludge as the liquefied soil to use backfilling.

### 3. The construction effects of Minatomirai line

The demand of Minatomirai line amounts to 123,000 people per day, which is near to forecasting result. It proves the success of the Minatomirai line project.

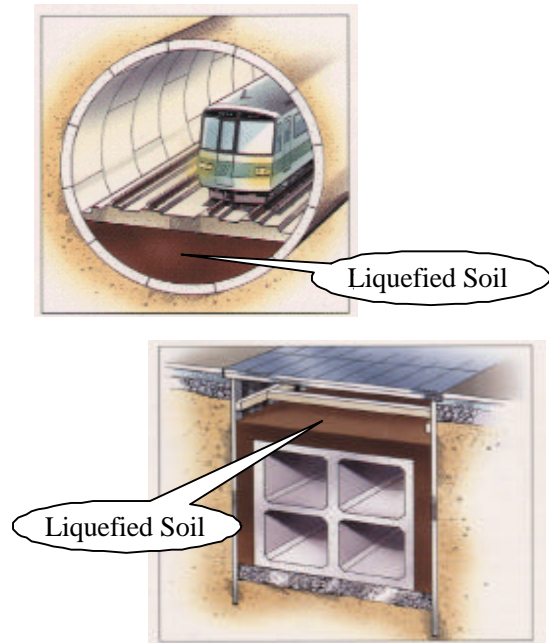


Fig.5: The liquefied soil

The major factor in this result is collecting visitors from all over the metropolitan area by virtue of business effort, which is tie-up with line side shopping district and sightseeing institution, and it is also the result that each station of Minatomirai line was taken up by mass media.

According to the survey of Yokohama-city government, number of pedestrians is increasing to 1.4 or 2.7 times in the Motomachi area and the Chukagai area. In the questionnaire survey, 1/3 of persons who visited Yokohama answered that they stimulated by the opening of Minatomirai line.

Some newspapers inform the increase of the proceeds of the commerce institution.

The enterprise lure has advanced since the opening of Minatomirai line.

Especially, the head office move of NISSAN MOTOR CO., LTD., the scale of which is about 2,000 people, will bring a large effect such as an increase of tax revenue and employment.

#### **4. Summary**

(1)The creation of new city space

The construction of Minatomirai line is based on the structure with sufficient space. Each station has a large space which unifies with the ground by applying the arch, dome or stair well, and these high grade and unique stations also create the new city space in the cosmopolitan city Yokohama.

(2)The contribution of the area development

Minatomirai line improved the status of the Yokohama metropolitan subcenter. Each unique station became sightseeing sights and obtained high evaluation from mass media and citizen. As the result of this, increase of the line side visitor, proceeds increase of the commerce institution, advance of the enterprise, vitalization of central area of Yokohama, Contribution to sightseeing and so on, Minatomirai line contributes to the development of cosmopolitan city Yokohama largely.

The construction of Minatomirai line, which contributed to development of local community, is said as the project of leadership, and it should be evaluated highly as the case that showed the new direction of attractive infrastructure upgrading.

(3)Contribution to the development of civil engineering technology

Various newly developed technologies in the construction of Minatomirai line, would contribute to the construction technology such as the future underground structure.

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