The present situation of road installations of Tokyo metropolitan government and new maintenance management.

Tokyo Metropolitan Government
Bureau of Construction
Road and street administration Division
Assistant manager
Sentaro Takagi

SUMMARY

Bureau of Construction manages road installations built in large quantities by Tokyo Olympics holding before and after. As for the these road installations, it was designed economy to the first. Therefore many of institutions do not have enough durability performance, and there is the institution which cannot satisfy the life that I assumed at first. Now Bureau of Construction does not have the source of revenue that these update many road installations which deteriorated. Therefore we investigated a deterioration cause of road installations and did the result with growing life of providing equipment by reference. We decided the deterioration time of an institution by the deterioration cause that we investigated. In late years a countermeasure lengthening economic life is developed a lot, and there are the results. In the same institution, priority sequence decision of measures was possible, but the comparison of a different institution was difficulty. Therefore we tried a priority sequence judgment of an institution by assets evaluation of value of an institution.
I call this calculation method "Tokyo Metropolitan Government road asset management". Terminal decision does new calculation method by trial and error.

1. INTRODUCTION

The road which Bureau of Construction manages, the number of route is 283. Length of road, 2,245km, an area of road are 38,031,015 ㎡. When road compares it with time of the Tokyo Olympics, it is 1.17 times by total extension, and total area is 1.95 times. Same as increasing road, road installations such as a bridge or a tunnel increase. Now, as for the management road installations, there are many institutions built to the high economic growth period which assumes the Tokyo Olympics an opportunity. I planned road as the first aim, and we designed reduction of construction cost (initial cost) in those days. As a result, uneasiness is left in durability performance partly, and there are the road installations that long-term safety and ease of use are anxious about. In road installations, a bridge is important greatly. Now Bureau of Construction manages 1,225 places road

bridge.

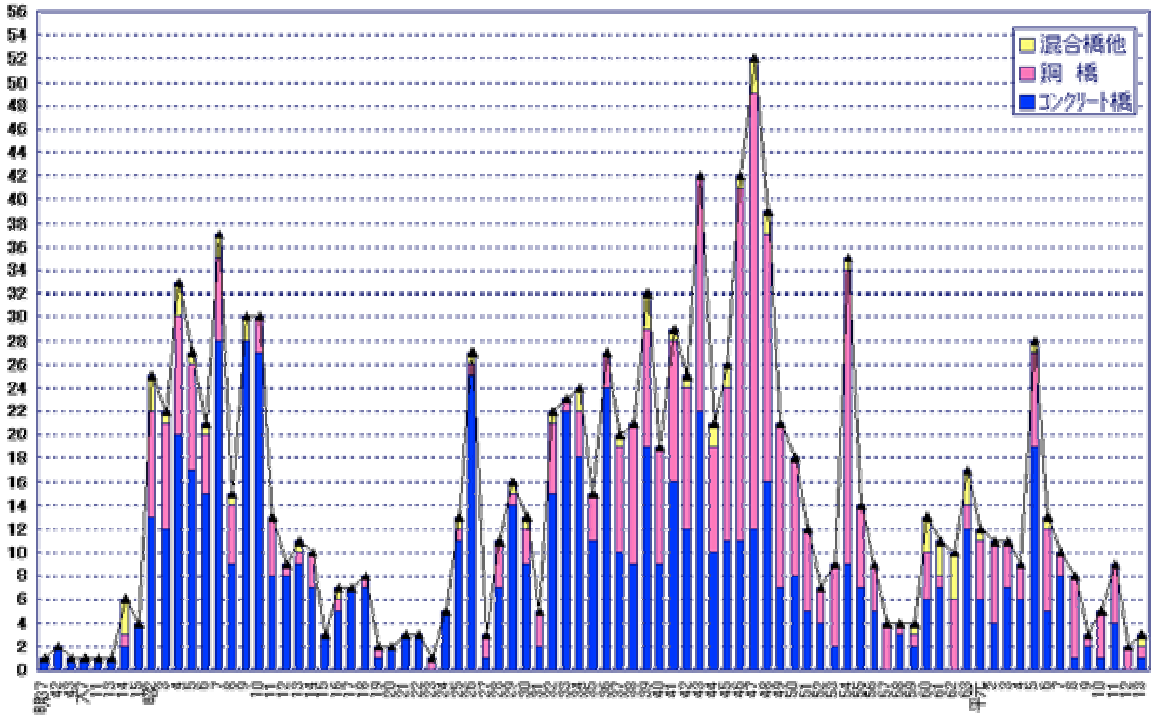


Figure – 1 Number of according to Construction year management bridges

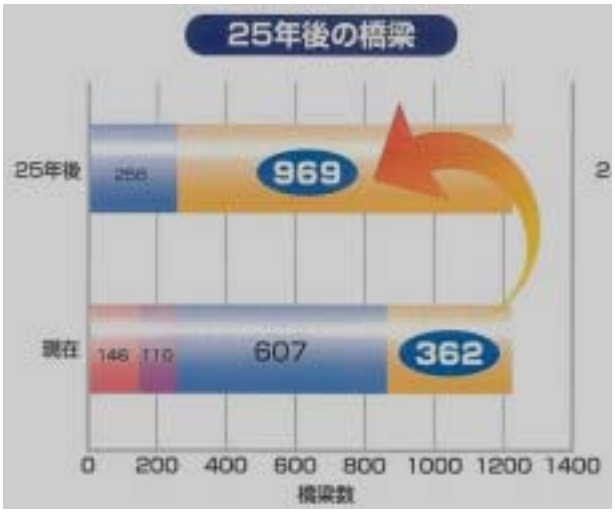


Figure-2 Change of management bridge after 25 years

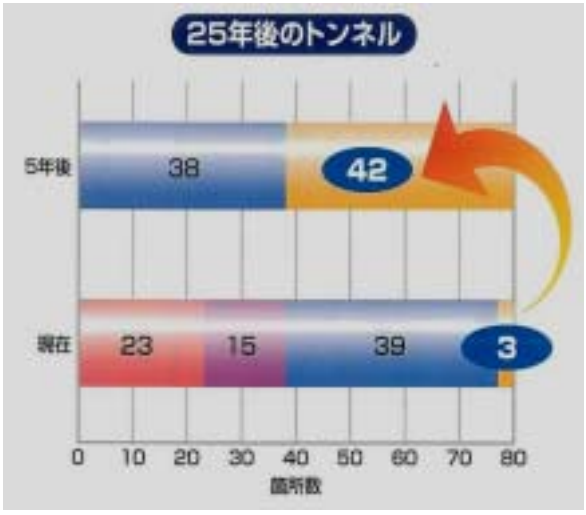


Figure-3 Change of management tunnel after 25 years

Now, as for those bridge, 362 places of the whole pass more than 50 years. However, 25 years later, 969 places become obsolete and become percentage of 79.1%. In addition, Bureau of Construction manages 80 places of tunnels. It is three places, and the superannuation tunnel which it passed through after construction more than 50 years is a

ratio of 3.8%. However, 25 years later, 42 places become obsolete, and the ratio becomes 52.5%.Many road installations managing become obsolete rapidly.
The financial situation of Tokyo metropolitan government turns worse year by year.
According to the financial prospective income and expenditure of Tokyo metropolitan

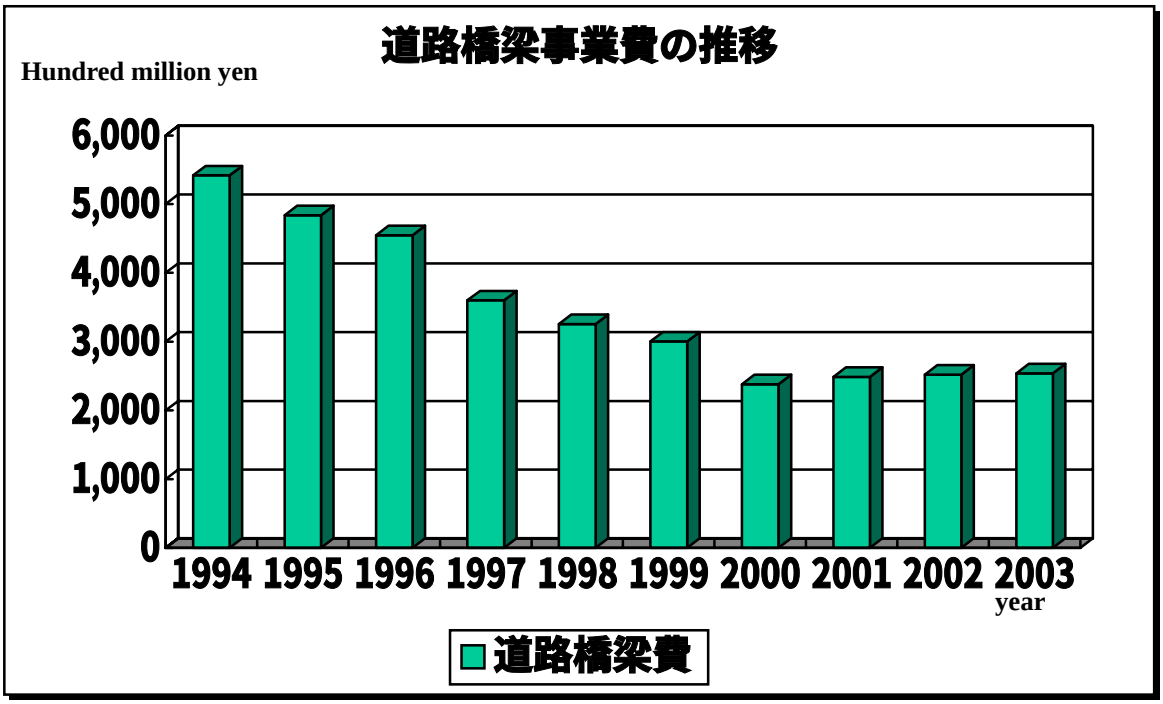


Figure-4 Change of Tokyo metropolitan government road budget

government of 2003, it predicts lack in source of revenue of 2006 with 3,500-3,700 hundred million yen every year from 2004. When this situation continues, a source of revenue to rebuild old road installations becomes insufficient. A budget about maintenance management of road is in inverse proportion with increase of management scale and decreases, and the maintenance management that is need is the present conditions that it is not possible for. The dilapidation advances to road installations unless a necessary budget is worth maintenance management, and road is closed to traffic. In New York City of the 20th century and other many foreign countries, there are many similar examples.

2. REBUILDING AND INCREASE OF DURABILITY OF MANAGEMENT BRIDGE

For example, as for Bridge that the length that Bureau of Construction manages is more than 40 meters, as for the steel bridge older than 50 years old and Prestressed concrete bridge (PC bridge) and Reinforced concrete bridge older than 60 years old, it is it with 45 places. About 2,144 hundred million yen is necessary to rebuild all these. A period of completion is about 20 when it calculates the number of years that is need to rebuild it from total expense used for rebuilding of management bridge till now. It did this steel

product corrosion survey by supersonic wave. The data number which it used for corrosion calculation by this investigation is 1,424 streetlights and 38 road sign column. The corrosion rate of steel product calculated these by the following expressions.

Corrosion rate = (nominal rating stock thickness - measurement minimum stock thickness) / (the investigation date - establishment date)

It shows it about the column progress the number of years and a change of corrosion rate that it investigated this time. When corrosion rate of steel product compares it with galvanizing processing in the case of painting processing, around 10 times are big painting processing. From findings, galvanizing processing is more superior in rust prevention ability than painting processing. In addition, in structure of the foundation outskirts of Streetlight and Road-sign pillar, it compared most concrete and other corrosion rate.

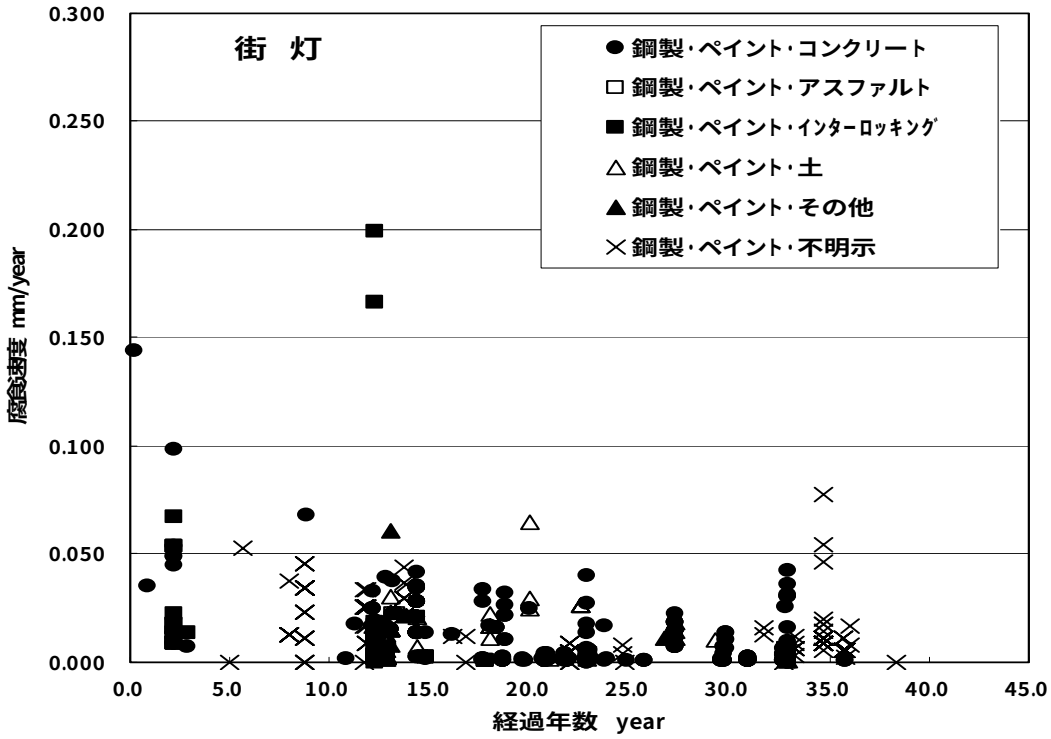


Figure – 5　Corrosion rate of Steel-pipe column (in the case of painting)

Corrosion rate of concrete foundation is 0.05mm / year. Corrosion rate of interlocking block foundation is 0.2mm / year. The corrosion rate when steel product contacted with soil was 0.06mm / year. It writes down a reason of a difference of corrosion rate next.

Because it is superior in watertight ness ability, concrete foundation does not have water retention ability. Soil and an interlocking block base have water retention ability. These water retention ability has a long drying time of rain-water of the steel product outskirts. As for the base of steel product with water retention ability, it is it with big corrosion rate by being the environment that resembled water surface neighborhood. In addition, there is the peculiar example that corrosion rate is big in concrete foundation in this investigation

data, but it is thought with a cause by excretion wastewater of dogs. It explains the effect which investigated corrosion rate according to materials. When aluminum and stainless steel compare it with steel product, corrosion rate is very small with 0.001mm / year. In addition, average corrosion rate of the steel product which it painted is 0.007mm / year. In the case of steel product of galvanizing processing, it is 0.003mm / year and it is 0.001mm / year in the case of aluminum and stainless steel. Corrosion rate of steel materials in Tokyo metropolitan government, it is it with 0.1mm / year when it judges corrosion rate for reference in this findings and return such as "corporate judicial person / steel product club" or "foundation / coast development technology center". This corrosion rate is the set point which thought about security enough. It carries out a periodic inspection of steel product once in 5.

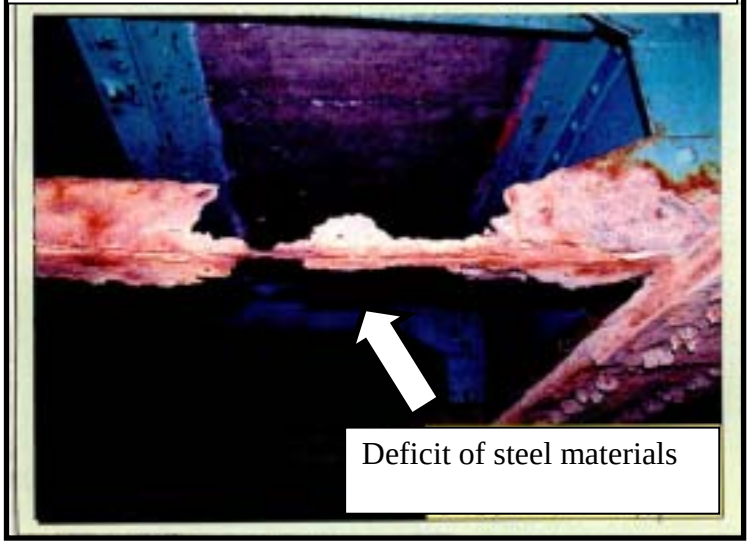
Therefore it set relation of thickness of board of a management standard and thickness of board of a limit.

"Management reference value" = "limit" + "5 *0.1 mm" / age = "limit" +0.5 mm

The deterioration of concrete investigated the situation of concrete structure of Tokyo metropolitan government.

The deterioration of concrete investigated an inner wall of a tunnel built in a beach district.

Figure – 6 Corrosion example of Road bridge



The damage of a concrete inner wall deteriorates by salt of seawater. Reinforcement corrodes by the salt which penetrated and expands. As for the deterioration of reinforced concrete construction, corrosion of reinforcement is the biggest as the damage. It is important that reinforced concrete construction and prestressed concrete structure prevent corrosion of reinforcement. Concrete is alkalinity.

Concrete becomes neutral from alkalinity by outside air. If concrete becomes neutral, internal reinforcement is easy to come to corrode. It investigated deterioration by salt and deterioration by outside air.

Deterioration of steel product has fatigue damage. Fatigue of steel product occurs a lot in weld. We investigate a cause of fatigue of steel product and the measures.

Our investigation is according to structure and is according to materials, and it is environment distinction. We are to elucidate a deterioration cause and deterioration speed of road installations by the next year.

3. NEW MAINTENANCE MANAGEMENT (T.M.G. ROAD ASSET MANAGEMENT)

A decision of the time extending life of road installations is deterioration speed and life.
Next of decision of the measures time is decision of anti-institution measure priority sequence. The decision of priority sequence was done till now by every institution. It judged the priority sequence to be it in deterioration degree or soundness. It was hard to understand the conventional priority sequence decision method in a judgment every institution. New priority sequence decision is the method how assets evaluation of value makes road installations. Assets evaluation of value does an institution, and a private enterprise is decided with improvement contents and order of an institution on grounds in assets value. Bureau of Construction thinks about the method how assets evaluation of value makes road installations same as private enterprise. When lack in source of revenue continues, a budget to rebuild an institution becomes insufficient. Lack of expense to rebuild becomes a big problem in safety and the durability of road installations. Lack in source of revenue takes a traffic function of people. An effective application of a source of revenue is introduction of the road asset management. Bureau of Construction introduces the road asset management early and gets a desirable traffic function. The road asset management switches it to preventive type maintenance management. Introduction of the road asset management is an action of new Tokyo metropolitan government.
The Metropolitan citizens expect it in a policy of new Bureau of Construction.

Key word ; corrosion rate, deterioration, improvement of the durability,
maintenance management of a preventive type, asset management: