

## A STUDY ON RAILWAY TERMINALS TO PROMOTE THE USAGE OF PUBLIC TRANSPORTATION

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abstract: In order to attract more people to public transportation, terminals must be more comfortable and beautiful to satisfy the people not only railway passengers but also the visitors coming to the urban facilities located in adjacent areas. This report suggests that terminals in front of railway stations are required to have the space for traffic, parking, events, facilities for aged and handicapped people, trees and flowers, monuments and evacuation or emergency use. It is also advisable to keep close coordination with urban functions located in adjacent areas.

### 1. INTRODUCTION

As a part of discussions on sustainable community of urban areas, transportation study is one of the biggest topic among many other topics like air pollution, water pollution, preservation of plants and animals, etc. It is obvious that some type of mass transportation system should play important roles in large cities in order to create sustainable community within the area. There are about 300 railway stations in Melbourne Metropolitan Area and 1500 in Tokyo Metropolitan Area. They are contributing as convenient commuter's transportation system and still there are proposals to extend or to strengthen the railway transportation systems.

On the other hand, terminals in front of railway stations are sometimes forgotten from both sides, railway side and highway side, because both sides have been needed to invest more on line haul structures than such attached facilities.

This paper tries to introduce one of the planning methods of attractive terminal courts located in front of railway stations (herein after refer to as "front court"), which are constructed as a part of urban road in Japan, based on the analysis of Japanese railway stations. Then, attractive front courts will be expected to attract more people to public transportation.

### 2. EXPECTED FUNCTIONS OF FRONT COURTS OF RAILWAY STATIONS

The expected functions of front courts of railway stations are not only for transportation purposes but also for public services like a governmental information center and for the improvement of landscape. To add to this, if the adjacent areas of railway stations are developed as a shopping center, a business center or hotels, there will be additional transportation demand other than railway passengers. Sometimes this kind of demand becomes larger than that of railway passengers and requires not only larger capacity as transportation terminals but also additional considerations such as easy and comfortable access to shops and hotels. Therefore, it becomes important to discuss whether or not adjacent area of a front court will be developed as a shopping center, a business center or hotels. Moreover, it was noticed in case of Hyogo Nambu Earthquake in 1995 that many people gathered at front court expecting to get some aids or information from

governments. This means front courts are already one of the public squares where people gather together in case of emergency.

### 3. RECENT TREND OF SELECTED RAILWAY STATIONS

92 railway stations which have data both for 1970 and 1990 were selected. 20 are stations of Shinkansen, 34 are those of ordinary railways located in greater Tokyo and greater Osaka areas and 38 are those of ordinary railways located in the other areas. General description of these three groups are as follows.

#### 3.1 Shinkansen Stations

20 shinkansen stations are located in 20 different cities. The total population of these 20 cities grew from 6.5 million in 1970 to 8.6 million in 1990 and the total number of daily railway passengers of 20 stations also increased from 1.0 million to 1.7 million during the same period. The most drastic changes can be pointed out that the built-up area for commercial use in adjacent area of front courts increased almost 4 times and the area of front courts was increased almost 2 times. This implies that shinkansen stations are to be the gateways to the mother cities and heavy public and private investments have been incurred during this term. Average area of a front court increased from 10,593 m<sup>2</sup> to 19,949 m<sup>2</sup>.

#### 3.2 Stations in Metropolitan Areas

34 selected stations are located within greater Tokyo and Osaka metropolitan areas. The total population of 34 cities which are the home of these stations increased from 8.3 million to 10.6 million and the number of passengers from 1.7 million to 2.7 million. Adjacent built-up area for commercial use increased more than 4 times reflecting the urbanization caused by the commuters to Tokyo and Osaka. Average area of a front court increased from 5,633 m<sup>2</sup> to 9,106 m<sup>2</sup>.

#### 3.3 Other Stations

The other 38 stations consist of 23 stations located in medium or small cities with the population of 100 thousand or less and 15 stations in larger cities. The total population of 38 cities increased from 3.7 million to 4.5 million and passengers decreased from 489 thousand to 460 thousand. Despite of the decrease of the number of railway passengers, the adjacent built-up area of front courts increased about 5.5 times and the average area of a front court increased from 3,940 m<sup>2</sup> to 7,291 m<sup>2</sup>. This implies that the adjacent areas of railway stations have been developed as one of city cores while railway stations have lost the number of passengers.

**Table 1 Change of Stations by 3 Groups from 1970 to 1990**

	Year	Shinkansen (20stations)	Metropolitan (34stations)	Others (38stations)
Population*1 (Thousand)	1970	6460	8340	3730
	1990	8560	10550	4530
Passengers (Thousand/Day)	1970	1000	1710	489
	1990	1700	2720	460
Built-up Area*2 (Thousand m <sup>2</sup> )	1970	266	332	73
	1990	1046	1368	394
Av. Court Area (m <sup>2</sup> )	1970	10597	5633	3940
	1990	19949	9106	7291

\*1 City population by national population census \*2 Total area of adjacent land lot occupied by buildings

#### 4. FACTORS TO DECIDE NECESSARY AREA OF FRONT COURTS OF RAILWAY STATIONS

As shown in previous chapter, especially in the other areas, front courts and its adjacent areas are developed not only for railway passengers but also for the other people. This is also justified by the result of a questionnaire survey to municipalities conducted by the Ministry of Construction in 1993. Questionnaires were responded by 42 stations with 68 front courts, including opposite side courts, and the purpose of development of front courts are shown in Table 2.

For automobile traffic	33 %
For pedestrian traffic	17 %
To strengthen urban functions as a center	31 %
To improve urban beauty	19 %

(MOC Japan, 1993)

Taking the fact into consideration that automobile traffic and pedestrian traffic are generated not only by railway passengers but by urban functions in adjacent areas, it can be understood that the purpose of developing front courts is mainly to strengthen urban functions and to improve urban beauty in recent years. This is a drastic change in planning purpose of front courts, if we compare with that of old days when railway stations were located out of towns to avoid troublesome smoke and soot produced by locomotive steam engines. Therefore, the factors to be discussed to estimate the necessary area of front courts should include following other than the traffic originated by railway passengers.

- (1) Traffic demand originated by urban functions in adjacent areas of a front court
- (2) Demand of space not for traffic but for urban beauty, etc.

#### 5. INDICATIVE FACTS OF NEW FACTORS

##### 5-1 Urban Functions in Adjacent Areas of Front Courts

Author conducted the analysis on urban function in adjacent areas of front courts of selected 10 railway stations in 1994 and 95. Those stations are Fukushima station, Nagaoka station and Hamamatsu station as shinkansen stations, Ageo station, Matsudo station and Kusatsu station as metropolitan area stations, and Yamagata station, Toyama station, Kofu station and Saga station as stations in the other areas. The usage of building floor of adjacent areas of front courts is shown in Table 3.

In general observation, the floor for commercial use is predominant except Hamamatsu and Saga where office space was politically invited through public redevelopment projects. Kusatsu is an exception because redevelopment projects are on going and the present residential site will be converted into commercial use in the near future. Kofu is a typical not planned development area and hotels could not be located because of traditional usage of land by small pieces. Yamagata is a base of skiing resort and has more usage for hotels.

Then, it can be said that the floor usage in adjacent areas of front court is possible to estimate by present field survey and by some discussions on peculiar conditions of stations, such as history, location, implementation of redevelopment, etc. Therefore, it is also possible to estimate number of trip generation and concentration of adjacent areas of a front court if we can get the unit data of trip generation and concentration by floor usage through person trip survey or some other field survey. It is necessary to examine

**Table 3 Floor Space Usage of the Buildings in Adjacent Areas**

	Office	Commerce	Hotel	Residence
<b>Shinkansen Stations</b>				
Fukushima	24.5%	64.0%	11.2%	0.3%
Nagaoka	5.5	70.7	23.8	0.0
Hamamatsu	38.8	39.0	22.3	0.0
<b>Stations in Metropolitan Areas</b>				
Ageo	10.2	73.7	8.2	7.9
Matsudo	9.2	90.1	0.0	0.7
Kusatsu	1.4	59.8	0.0	38.7
<b>Stations in the Other Areas</b>				
Yamagata	11.3	51.3	30.3	7.1
Toyama	22.2	56.2	21.6	0.0
Kofu	33.7	59.9	6.4	0.0
Saga	51.5	34.0	14.5	0.0

(Field survey data by H.Konami in 1994)

whether or not those trips really use the front court. Because some of these visitors may use the back side doors of the buildings and have no influence on the front court. This kind of data should be surveyed for each station. According to the data obtained from 6 large commercial buildings in Shibuya area in Tokyo, the proportion of the visitors who use front doors was from 0.75 to 0.83. The result of these computation can be reflected to decide the necessary area of a front court together with the estimated number of railway passengers in the future.

### 5-2 Factors Other Than Traffic Demand

New factors other than traffic demand to be taken into consideration are listed below.

- (1) Space for events
- (2) Space of the facilities for aged and handicapped people
- (3) Space of trees and flowers
- (4) Space of monuments
- (5) Space of evacuation and emergency use

Space for events and space of evacuation and emergency use may be overlapped with pedestrian way or parking space if facility planning has been made with such consideration as overlapping usage. The total space for these new factors and pedestrian space is normally half of a front court according to the observation of existing ones. And it is pointed out from the experience of Kobe earthquake that the minimum area required for evacuation use must be more than 4000 m<sup>2</sup> and that if it is used also as a temporary bus terminal which alternate the damaged railway, some additional area is required.

The space for these purposes have been put aside in traditional way of planning because both sides, road authority and railway company, did not like to invest for those additional facilities. But nowadays, nobody doubts that these additional facilities are the source of sustainable public transportation systems.

### 5-3 Coordination with Adjacent Area

The expected functions of front courts are full of variety as mentioned in Chapter 2, and some of those are difficult to prepare in public space. Then, it is important to lead the functions in adjacent areas to satisfy the need of visitors. For example, civic service, bank, post office, clinic, nursery, information center, restaurant, meeting room, library,

etc. are all required but may be difficult to prepare the space for them within the front court. These functions are desirable to be prepared in buildings located in adjacent areas.

## 6. CONCLUSION

It was found through the study on the change of front court during the past 20 years since 1970 that the adjacent areas of front courts of railway stations are developed not only for railway passengers but also for other visitors in adjacent areas. This change also requires to improve the way of planning of front courts. Traditional way of planning was to decide the necessary area based on the number of estimated future railway passengers. But nowadays, it is required to sum up the necessary areas not only for railway passengers traffic but also for the visitors to urban functions near by and also for such new demand as urban beauty, social welfare, emergency use, cultural development, etc.

The traffic demand originated by urban functions in adjacent areas can be estimated by careful analysis on the history, location, implementation of redevelopment, etc. of each railway station.

By doing the design of front courts as mentioned above, front courts become more attractive than before and give incentives to the people to choose railway rather than automobile when they are in the mind of wondering in modal choice of transportation.

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