CHARACTERISTICS OF LOADING ACTIVITIES IN OFFICE BUILDINGS AND SPACE REQUIREMENTS

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This research describes essential characteristics of operational aspects of loading facilities in Osaka C.B.D. based on field study.
A fundamental knowledge of building characteristics was necessary for preparing loading survey and establishing a guide line for space requirements for office buildings.
Having done the questionnaire and survey in Osaka C.B.D., we studied some characteristics such as existing loading space, parking space, No. of embloyees, type and volume of arrived goods, type of loading problems, frequency of truck arrivals, duration of stay...etc.
In Japan, standards for car loading space for pick-up and delivery vehicles are non-existent, and for this reason it is vitally important to determine a zoning code in order to alleviate the problem of congestion in central business district (C.B.D.) .

1-DATA COLLECTION

In this study, a questionaire and observation survey were made in the C.B.D. of Osaka City. As Osaka has been a traditional commercial center in Japan, there are . *many office and retail buildings in this area.*

A questionnaire was undertaken in July 1981, to determine building and loading characteristics, moreover, to have a knowledge about existing loading problems.

From previous recorded data , it was found that 80% of existing buildings are office & retail type, 17 % are office only, 3 % are retail type. concentrate on office &retail type.
The questionnaire sheets were distributed in 100 buildings the answers received were 89 sheets.
In 1983, a survey was carried out in 13 buildings to get accurate results about the present situation of loading problems at buildings, and to use these data for determining space requirements for buildings, (survey was done from 9.00 - 15.00) .

2- ANALYSIS OF QUESTIONNAIRE DATA

In the following sections, the main results of the questionnaire are described.

a- RATE OF GOODS ARRIVALS ;

Fig.1 shows the rate of goods' arrivals for every category of gross floor area (GFA) . The rate of goods' arrivals for GFA more than 20000 sq.m. has a significant high rate. Considering the total sample, arrivals for 19% of the total sample size was found to be high arrivals rate, 51% of medium rate, and 30 % showed often no arrivals rate.

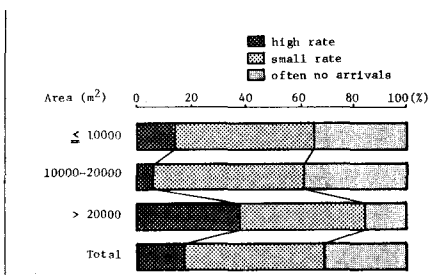

Fig. 1 Area category and rate of goods arrival

b- LOADING SPACE ;

Fig.2 shows the percentage of buildings having loading space for every category of GFA. It noticed that when the gross floor area increases, the ratio of building having loading space is increasing but it does not mean that loading space is enough for doing loading. As shown in the same fig., about 20 % of buildings with gross floor area less or equal 10000 sq.m., have loading space....

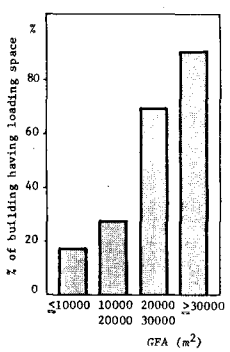

Fig. 2 Gross floor area vs. freq. of buildings having loading space.

c- WHERE LOADING IS BEING DONE ;

Fig.3 shows the place where the trucks do loading activities when arriving at the building. The relation showed that GFA. is proportionaly increased with the percentage of trucks do loading in loading or parking space, and inversily proportion with the percentage of trucks do loading at curb. As average, 54 % of arrivals do loading activities in loading or parking space , 46 % do loading at curb and others.

Refering to the data resulted from the questionnaire, more than 70% of buildings having a gross floor area less or equal 20000 sq.m. which also a high percentage of them has no loading space as shown in figure 2. Comparing these two figures, it seems that loading problems in Osaka city has a significant effect on traffic movements and other road users.

d- LOADING PROBLEMS ;

Fig.4 shows the percentage of buildings for different category of GFA. having loading problems. As shown in the same figure, high percentage of problems are existing in the buildings having gross floor area less or equal 20000 sq.m. where the percentage of this category of GFA.

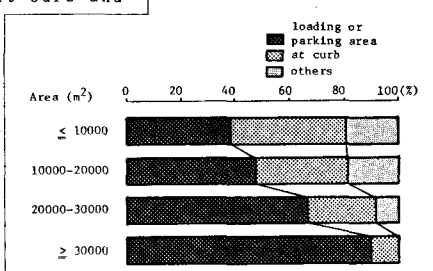

Fig.3 Area category and where loading is being done

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is more than 70 % of the total buildings. Problems due to conflict at entrance and exit represent 48%, and due to unadequacy of loading space represent 32 %.

3- ANALYSIS OF SURVEY DATA

a-GENERAL CHARACTERISTICS

The survey data (in 13 buildings) showed that the peak arrivals is always occure from 10a.m.-11a.m. It was found that more than 55% of arrivals occure before noon. It was noticed also, that more than 85% of arrivals were of medium truck type and light vans. Purpose of visit showed that delivery is representing more than 87 % of the total arrivals, these figures are not represented here.

b- LOADING TIME DISTRIBUTION

Observations showed that the average loading time vary from 4.0 to 20.0 min. with total average of 8.0 min. These values was calculated after neglecting vehicles waited more than 40 min. where it does not represent a significant value. Loading time distribution is shown in figure 5.

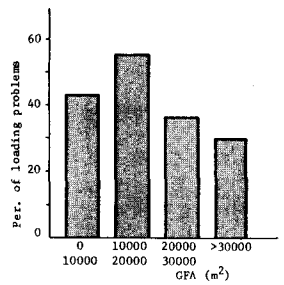

Fig. 4 Area category vs. % of loading problems

4- THEORETICAL DETERMINATION OF LOADING SPACE REQUIREMENTS FOR OFFICE & RETAIL BUILDINGS

The purpose of this part is to calculate theoretically, space requirements to meet the arriving demand for buildings. The result can be considered as standards (付置義務) when calculation of loading space for new buildings is required.

The first step in determing number of required loading space for buildings is to estimate the number of daily truck stops (demand) needed to serve a certain block of area or building. In this study, daily truck stops was related to gross floor area. As shown in figure 6, this relation was examined and could be fitted with a regression line having a high correlation coefficient. Furthermore, the average arrival time was calculated by dividing the total arrivals by 6 hours, and the average loading time was considered as previously explained.

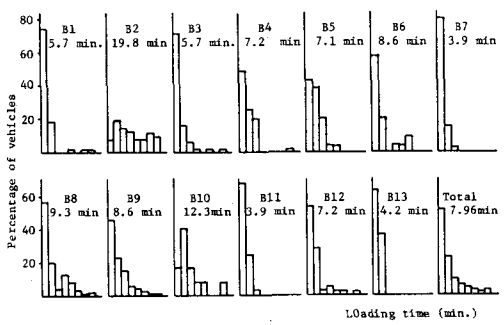

Fig. 5 Loading time distribution

A simulation technique was used for the procedural analysis and performance assessment. The model was designed to examine the efficiency of the loading system in terms of the effect of truck arrivals and service time.

Consider a system consisting of n service station (spaces) operating in parallel, where n is increased from 1 to 15 in order to calculate the required No. of spaces. Arrivals corresponding to the total floor space were determined for different areas, this was calculated from the regression line (fig.4) . After calculating the arrivals over period of 6 hours, the average arrival time was calculated.

The out-put showed that, at max. waited vehecles equal 2,3, 4,5, the corresponding average waiting time will be 0.3, 0.4, 0.6, 2.3 min. respectively. Also, the corresponding percentage of waited vehicles will be 0.07, 0.09, 0.15, 0.30 respectively.

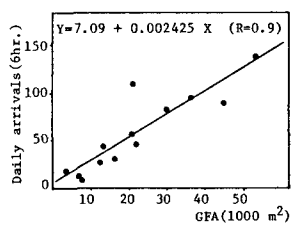

Fig. 6 Gross floor area vs. daily arrivals

RESULTS AND ANALYSIS ;

From the output results, relation between GFA. and max. No. of waited vehicles could be estimated. For convenience, this relationship were drawn in simple way as a relation between GFA. and corresponding loading spaces from which it is possible to determine the requirements for any known area. This relation is shown in Fig. 7.

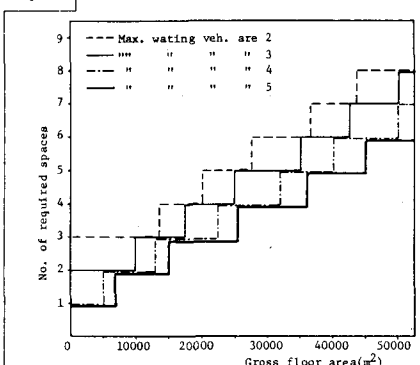

Fig. 7 Space requirements for office & retail buildings in Osaka C.B.D.

GENERAL CONCLUSIONS

- For determining space requirements, one of the 4 curves can be used depending on the conditions surrounding the building, and economical considerations.
- This research suggests a guide line in formulating zoning ordinances which deals with the problem of space requirements for officei & retail buildings.
- The need to encourage planning and constructing of off-str. service area is recommended, but for short term solution of loading problems (specially for existing buildings) , allocation of curb loading space is necessary, at the same time, promoting the co-ordination and co-operation between drivers, shippers, and receiver is strongly recommended.