

## TRAFFIC MANAGEMENT MEASURES IN MAKATI CENTRAL BUSINESS DISTRICT (CBD), METRO MANILA

Alexis M. FILLONE  
 Assistant Professor  
 Civil Engineering Department  
 De La Salle University  
 2401 Taft Avenue, Manila  
 1004 Philippines  
 Fax: (632)-524-0563  
 E-mail: alex012167@yahoo.com

Atsushi FUKUDA  
 Associate Professor  
 Department of Transportation Eng. and Socio-Tech.  
 Nihon University  
 7-24-1 Narashinodai, Funabashi City  
 Chiba 274-8501, Japan  
 Tel/Fax: +81-45-933-8074  
 E-mail: fukuda@trpt.cst.nihon-u.ac.jp

**Abstract:** In recent years, several travel demand management (TDM) and traffic system management (TSM) measures have been implemented in the Makati CBD to ease traffic congestion in the area. These include the modification of the loading and unloading scheme for city buses, the putting up of steel railings in the middle of the road to separate public transport (buses, jeepneys) from private cars, and the pedestrianization of the CBD through the construction of elevated and underground pedestrian walks. The focus of this study was to determine the impact of these schemes to commuters/pedestrians, city bus operation, and vehicular traffic in general.

**Key Words:** TDM, TSM, pedestrianization, Emme/2

### 1. INTRODUCTION

The Makati CBD is the primary center of business activity in Metro Manila. Majority of trips in Metro Manila are attracted to the area. Although the Metro Manila Development Administration (MMDA) is the agency involved in traffic management of the metropolis, Makati CBD has its own agency to manage the traffic problems in the area. In addition, the local government of Makati City also provides traffic enforcers to help in traffic management in the area for being under its jurisdiction.

Given the high daytime population density in the area that translates to trip movements, traffic congestion is always a problem most of the day. Hence, several traffic management measures were already implemented in the area ever since, like for example, the one-way road schemes and the traffic signalization. However, in the last decade, there were significant traffic management schemes that have been implemented such as the modification of the loading and unloading scheme for city buses, the putting up of steel railings in the middle of the road to separate public transport (buses, jeepneys) from private cars, and the pedestrianization of the CBD through the construction of elevated and underground pedestrian walks.

The focus of this study is to determine the impact to commuters/pedestrians, city bus operation, and vehicular traffic in general, of these traffic management measures in the Makati CBD. Specifically,

a) for the city bus loading/unloading scheme,

- To compare the old loading and unloading scheme to the new scheme which separate the loading zone to unloading zone of city buses along Ayala Avenue
  - To compare the flow of vehicles and pedestrians in the old loading and unloading scheme from the new scheme implemented
- b) for the steel railing separating the public transport from the private vehicles,
- To compare the lane usage and bus dwell time at the bus stop
- c) for the pedestrianization
- To provide an estimate of the impact on short distance travel in the Ayala CBD.

## 2. TRAFFIC MANAGEMENT MEASURES IN MAKATI CBD

### 2.1 City Bus Loading and Unloading Scheme

This traffic management scheme was implemented in the later part of 1999. Before that time, bus loading and unloading could be done in every block facing Ayala Avenue as shown in Figure 1. Due to problems created by buses near bus stops as they wait for passengers, the loading and unloading schemes were separated and alternated with one block only for loading and the next block for unloading as shown in Figure 2.

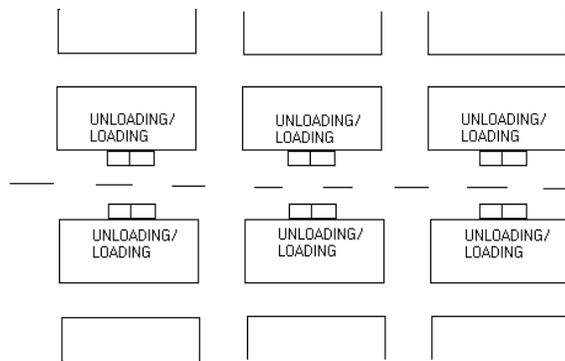


Figure 1. Old loading and unloading scheme for city buses

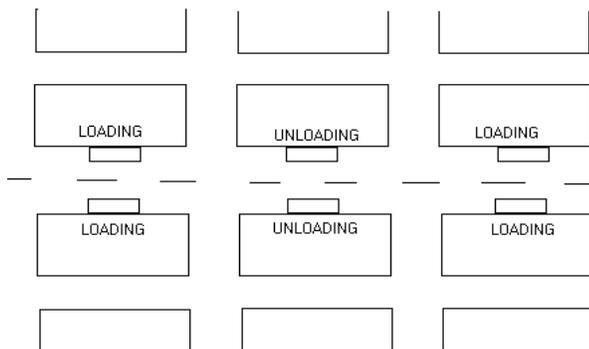


Figure 2. New loading and unloading scheme for city buses

**Impact on Pedestrians.** In order to determine minimum pedestrian paths as they move from bus stops to their final destination in the CBD or vice versa, the Emme/2 transport software was used. Figure 3 below gives the Makati CBD base network where the nodes are the midpoints of a street block's face where pedestrian are assumed to go or are coming from.



Figure 3. The Makati CBD Base Network in Emme/2

When the old loading and unloading scheme was in existence, as shown in the schematic diagram of Figure 1, the minimum path flows from specific locations (centroids of the sides of the street blocks) in the Makati CBD to the bus stops with both loading and unloading of passengers allowed as shown in Figure 4 below. Since in each block along Ayala Avenue both loading and unloading of passengers were allowed, bus commuters from an origin or going to destination points along the blocks in line with the bus stop, could easily access the nearest bus stop.

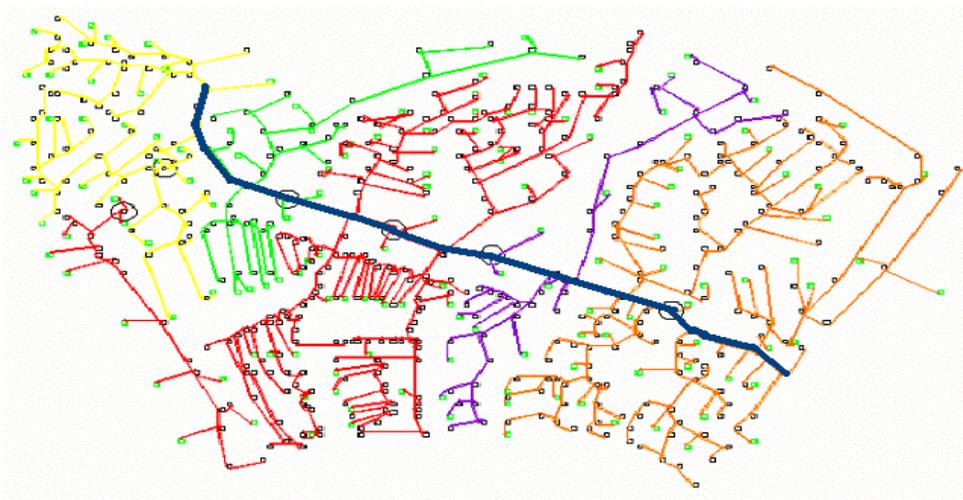


Figure 4. Minimum Path Flows of Pedestrians from Bus Stops going to/fro Specific Locations in the Old Bus Loading and Unloading Scheme

Source: Maldia, et.al. (2003)

However, with the new bus stop scheme, there would be a separate location for loading and unloading of passengers (see schematic diagram in Figure 2), alternating in adjacent blocks along Ayala Avenue. Figure 5 shows the minimum path flows of pedestrian going to bus stops with loading only. While Figure 6 shows the minimum path flows of pedestrians from bus stops with unloading only to their specific destinations in the Makati CBD. Through simple analogy, it can be shown that due to the new arrangement, there would be an increase in the distance to be walked by around one block length for commuters using buses. Depending on one's destination, this increase in distance to be walked would either result during one's disembarkation when going to the office or during embarkation from the office to the bus stop. If one's office is located adjacent to the unloading stop, one has to walk that same distance as before when going to the office. However, when going home, one needs to go to another block to ride the bus located in the loading stop.

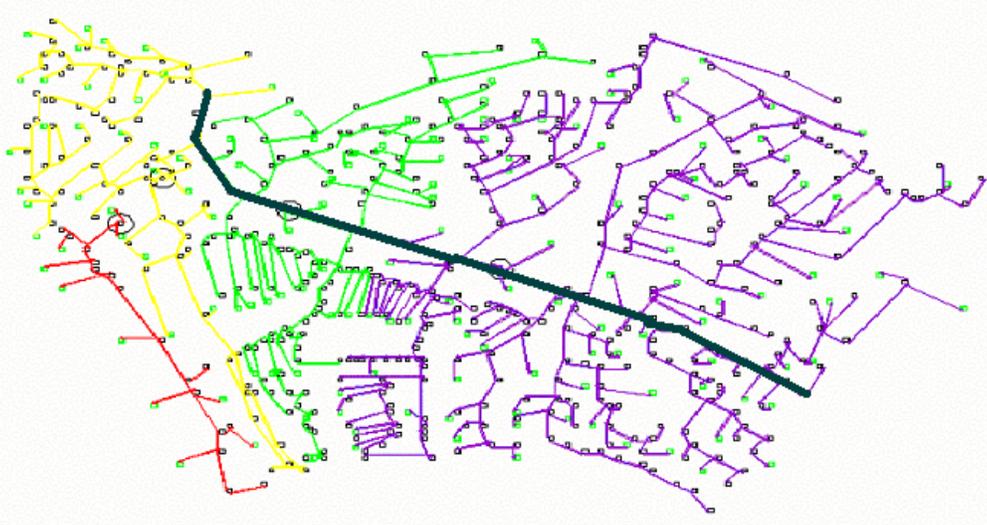


Figure 5. Minimum Path Flows of Pedestrian from Specific Origins to a Bus Stop with Loading Only in the New Bus Loading and Unloading Scheme

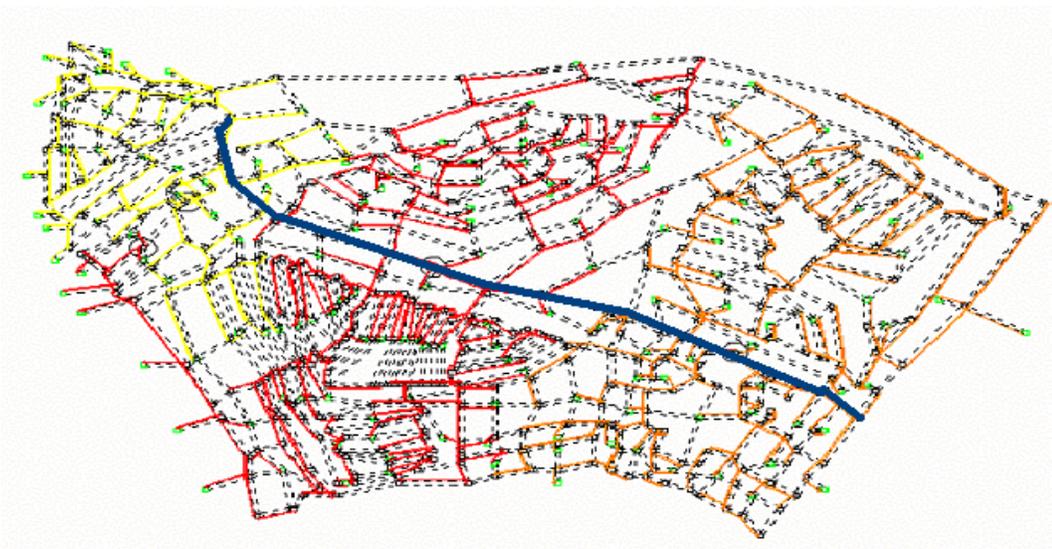


Figure 6. Minimum Path Flows of Pedestrian from Bus Stops with Unloading Only to Specific Destinations in the New Bus Loading and Unloading Scheme

Through detailed calculation with the aid of Emme/2, taking into consideration the average walking speed of pedestrians in the Makati CBD to be 1.263 m/s and the aggregated mean location in CBD, the average increase in pedestrian walking time when going to the loading stop is around 2 minutes and 29 seconds as compared to the old scheme. On the other hand, around 1 minute and 8 seconds average increase in walking time when coming from the unloading stops. The discrepancy in walking times may be attributed to the network configuration of the CBD where more street blocks are located further away from the new bus loading scheme.

**Impact on Buses.** A comparison was made on the impact of the new bus loading and unloading scheme on passenger embarking and disembarking, bus dwell time at stops and on average bus travel speed along the Ayala Avenue section where the scheme was implemented. The results are discussed below.

**Bus Passenger Embarking and Disembarking.** A comparison was made of the number of bus passenger embarking and disembarking before and after the scheme was implemented. As the data would show in Table 1, no discernible difference on the average number of embarking and disembarking passengers between the old and new loading and unloading schemes.

Table 1. No. of Embarking and Disembarking Passengers along Ayala CBD

	Old Loading/Unloading Scheme		New Loading/Unloading Scheme	
	Embarking	Disembarking	Embarking	Disembarking
Morning Peak				
Northbound	6.89	35.78	5.00	31.10
Southbound	4.83	34.67	7.00	36.07
Afternoon Peak				
Northbound	41.71	13.47	37.56	5.33
Southbound	29.10	15.10	20.25	16.25

**Bus Dwell Time.** From initial data gathered and through observations in the field, overall bus dwell time along the Ayala Avenue did not differ much. However, buses tend to stay longer in the loading stops than in the unloading stops. After passengers disembark on the unloading stops buses would move immediately. However on loading stops, buses tend to wait longer for passengers. Traffic enforcers are necessary here to prohibit buses from waiting since they would usually form a long queue thereby affecting adjacent intersections.

**Average Bus Travel Speed.** From onboard bus survey conducted along the Ayala Avenue before and after the implementation of the scheme data showed that the bus average travel speed improved with the implementation of the new bus loading and unloading scheme. However, the samples, since are quite few, may not be statistically significant. The data are shown in Table 2.

Table 2. City Bus Average Travel Speed Along Makati CBD

Direction	No. of Samples	Average Travel Speed (kph)
Before		
North Bound	8	7.7
South Bound	11	9.23
After		
North Bound	10	11.57
South Bound	10	10.73

**Impact on Private Vehicles.** The average travel speed of private cars along the segment with the new scheme for the north bound (going to EDSA) was found to be 17.92 kph while in the south bound (going to Gil Puyat Ave.) was found to be 16.35 kph. From MMUTIS data (1996), these speeds were found to be 9.00 kph and 8.40 kph, respectively. Please see Table 3. If we are to take the data as it is, there is around a 100% improvement in average travel speeds for both directions. However, this effect may not be necessarily attributed mostly to the effect of the new scheme. Other factors such as increase pedestrianization thereby reduction in the number of vehicular traffic as well as the separation of the private cars from the city buses using the steel railings.

Table 3. Passenger Car Average Travel Speed Along Makati CBD

Direction	No. of Samples	Average Travel Speed (kph)
Before		
North Bound	-	9.00*
South Bound	-	8.40*
After		
North Bound	10	17.92
South Bound	10	16.35

\* MMUTIS Data, 1996

## 2.2 Effect of Steel Railing Separation of City Buses from Private Cars

Steel rails were put up to separate city buses from private cars using the Ayala Avenue. The steel rails were put up in the middle of the four lane road in both directions, except for one section in the south bound direction along the Makati Ave. to Paseo Roxas Ave. segment of Ayala Avenue.

Figure 6 shows a typical traffic flow between one side with steel rails separating the city buses and jeepneys from the passenger cars and the other without the steel rail separation. It can be seen that in the upper flow (going left) buses tend to occupy up to three lanes while in the lower flow (going right), buses are confined to the two outermost lanes with the steel rails separating them from other vehicular flows. It should also be noted that jeepneys, though few in numbers should also use the lanes for buses.

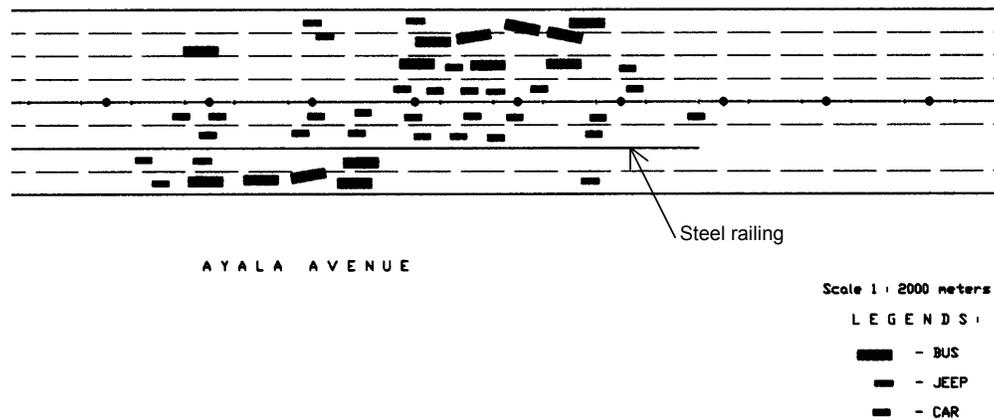


Figure 6. A typical vehicular flow along the segment with and without the steel railing

**Bus Dwell Time at Bus Stop.** A comparison was made regarding the bus dwell times at bus stops with and without steel railing separation along the Paseo Roxas Avenue to Makati Avenue segment of Ayala Avenue. As shown in Figure 7 buses loading passengers on the segment with railing separation stayed longer than those without railings. The provision of railings seemed to provide buses some form of exclusivity to the two inner roads although traffic enforcers prohibit buses to stay too long. Fifty bus samples were obtained for both directions of flow during the morning (9:00-11:00 AM) and afternoon (3:00-5:00 PM) periods.

It should be taken note that this bus dwell time only concerned about one segment of Ayala Avenue while the previous bus dwell time under the bus loading and unloading scheme concerned the bus dwell time for the whole stretch of Ayala Avenue.

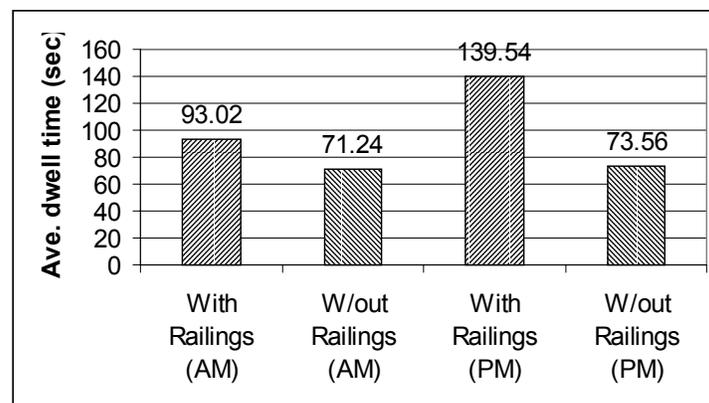


Figure 7. Average bus dwell time on road segment with and without steel railings along Ayala Avenue

**Vehicle Running Positions.** The notation in Figure 8 of vehicle position (bus or private car) regarding lane usage of segment with and without steel railings was used. The steel railing is located at 2.5 from curve in the Northbound direction. It can be seen in Figure 9 that more than 70 % of city buses used the inner most lane (1.0) when there is a steel railing while only around 32 % of buses used this inner most lane when there is no steel railing. Private cars used lanes located at 3.0 and 4.0 more at 41.1% and 39.4%, respectively when there is a steel railing as compared to 28.7% and 35.3% respectively when no steel railing is present.

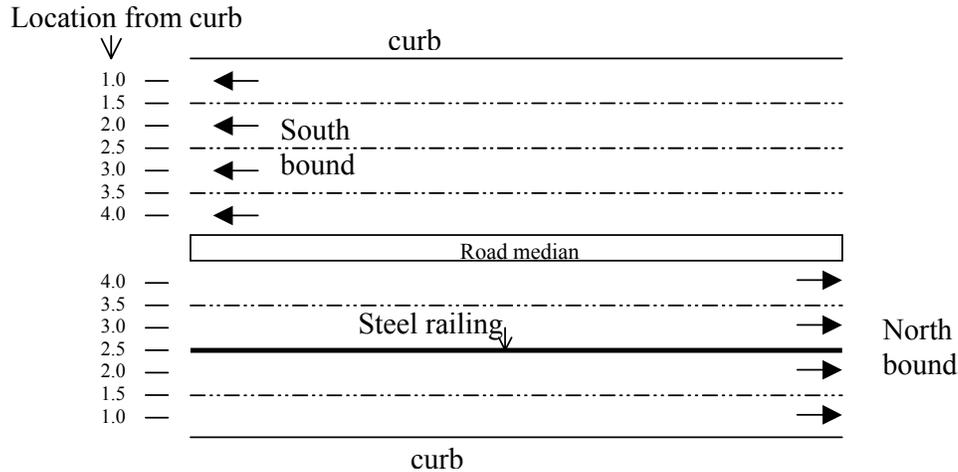


Figure 8. Notation of Vehicle Running Position on the Road Segment

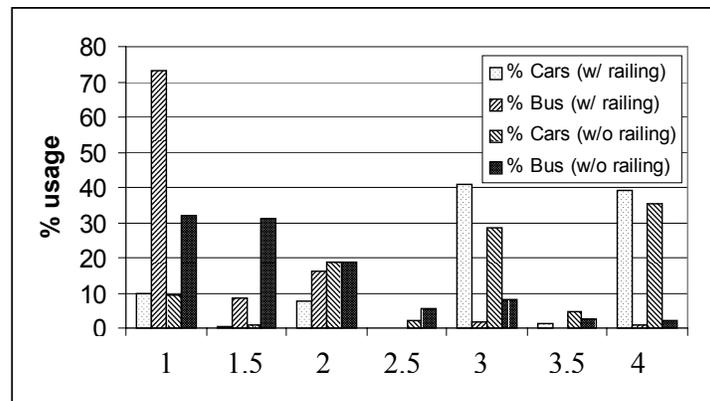


Figure 9. Vehicle running position along segment with and without steel railings  
Source: De la Pena, et. al. (2003)

### 2.3 Pedestrianization of Makati CBD

Makati Commercial Estate Association (MACEA) Pedestrianization Project is a system of pedestrian access, which includes underpass road crossings where major pedestrian flow occur such as the Ayala Avenue Intersection with Paseo de Roxas Avenue and Herrera St. and elevated (See Figure 10) and on-grade covered walkways along main thoroughfares of Legaspi and Salcedo Villages. The latest addition is the underpass road crossing Ayala Avenue at the Salcedo St. intersection

The project is designed to encourage motorists especially for short trips to walk. The ultimate goal of the scheme is to ease the flow of vehicular traffic in the CBD and thus reduce air pollution.



Figure 10. Pedestrian Elevated Walkway in the Makati CBD

Table 4 below shows the typical peak hour volume of pedestrians on particular locations in the Makati CBD and the corresponding average travel speeds. The mean pedestrian speed in the Makati CBD was found to be 1.263 m/s. Generally, males walk faster than females by around 0.159 m/s.

Table 4. Typical Pedestrian Volume on Selected Sites in Makati CBD

Location	Pedestrian Facility Description	Vol. (1 hr)	Speed (m/s)
V.A. Rufino St. (front of Feliza Bldg.)	Covered Sidewalk	392	1.27
Ayala Ave.-V.A. Rufino St.	Ped. Underpass	1346	1.30
Ayala Ave. – Paseo de Roxas Ave.	Ped. Underpass	1873	1.33
De la Rosa St. (front of Filipino Merchants Bldg.)	Covered Sidewalk	170	1.51
De la Rosa St. – PLDT MGO/R. Cojuangco Bldg.	Elevated Walkway	1232	1.25
De la Rosa St. – Carpark 2	Elevated Walkway	424	1.05
Ayala Ave. - Legaspi St.	Ped. Underpass	984	1.19
De la Rosa St. – Carpark 1	Elevated Walkway	357	1.29
Paseo de Roxas Ave. – Sedenos St.	Ped. Underpass	1589	1.26
De la Rosa St. – V.A. Rufino St.	Elevated Walkway	725	1.19

Without a thorough and statistically significant survey of changes in commuter behavior and travel characteristics especially for trips within the CBD, it is quite difficult to assess the impact of the pedestrian walkways. This would be an interesting area for further research.

### 3. FINDINGS/CONCLUSION

The traffic management schemes in Makati CBD were discussed and their impact on pedestrians/commuters, on public transport and private vehicles in general were determined.

The effect of the new bus loading and unloading scheme on bus commuters is that on the average pedestrian walking times when going to the loading stop increased by around 2 minutes and 29 seconds as compared to the old scheme. On the other hand, around 1 minute and 8 seconds average increase in walking time when coming from the bus unloading stops. However the new scheme has no significant difference in passenger embarking and disembarking as well as overall bus dwell time along Ayala Avenue as compared to the old scheme. Although, the data showed that buses tend to stay longer at loading stops than at unloading stops.

For the separation of the city buses from other vehicular traffic, buses tend to stay longer on those with railing separation (due to the fact that it was a loading stop) than those without railings. Majority of buses (70%) used the outermost lane with railings compared to only 10% of the other side without railings. Also more than 80% of buses used the dedicated lanes, thus making the scheme effective in confining the buses to the two outermost lanes near the curb.

### 4. RECOMMENDATIONS

This is a continuing study, the impact of the traffic management measures in the Makati CBD is still being researched and studied in detail.

### ACKNOWLEDGEMENT

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