
PARKING DESIGN IN THE TROPICS

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The Philippines, like most countries is now fast becoming a metropolis. As the country progresses, more and more structures are being built and more spaces are needed for parking. In the business districts, especially in Metro Manila, one will observe how hard it is to get a parking space. In an ordinary working day, it will take at least 15 minutes before one can get an available parking space.

Although most modern buildings and condominiums in high density areas opt for basement parking or a multi-storey parking structure, open space parking, if the lot allows it, is more economical and at the same time provides the breathing space that is much sought after in the urban areas.

However, designing open space parking imposes a particular set of restrictive conditions. Whereas it can provide useful stretches within the metropolitan structure, the task of accommodating ideal parking spaces is a big challenge to designers and developers alike.

In the past, building officials did not give much emphasis to parking requirements, as there was an abundance of vacant lots, and the number of vehicles did not cause as much traffic as they do

today. Since then this number has been rapidly increasing. According to the Land Transportation Office, as of 1990, the total number of vehicles registered nationwide was already 1.62 million, compared to 1.43 million in 1989. More than one third or 38.8% of this number were registered in Metro Manila¹, which explains why the streets in Metro Manila are more congested than in the provinces. Based on the above figures, the total increase in the number of vehicles for a period of one year is already 16.4%. In 1992, the total number of registered vehicles in the country reached 1.88 million, while 1993 saw an increase of 20%.

With this regular increase of vehicles plying the Philippine streets, it is therefore mandatory for the government to issue guidelines such as those embodied in Rule XIX, Parking and Loading Space Requirements of Section 803 of the National Building Code (PD 1096).

Other parking guidelines have also been published in *A Guide to Site and Environmental Planning* by Harvey M. Rubenstein, and in *Architectural Graphic Standards*, and *Time Savers for Landscape Architecture*. These can provide a useful guide for any designer as exemplified in the following excerpt from Rubenstein :

In some cases, width of usable land determines the type of parking. A greater number of cars can be parked at 90 degrees using the same stall width than at 60 or 45 degrees. On the other hand, 60, 45, and 30 degree parking establishes a one-way traffic system and makes it easy to pull into a space. It is more convenient and less hazardous, however, to back out of a space at 90 degrees because of the larger isle width.²

Although they give guidance, taking into account the standards mentioned in the above references is not a guarantee of good parking design. However, in relation to climatic problems, more responsive design solutions are needed.

The Philippines, as a tropical country, has a very hot and very wet climate. At this time when environmental protection is everybody's concern, a designer must consider the different factors in the design of parking spaces that may affect nature and man as well.

Conventional open space parking is based on what is common in temperate countries, which is usually characterized by unrelieved, hard surfacing. In the tropics, adopting this westernized parking design is unsuitable and impractical as the following problems, as stated by Gordon Paterson in his article "Trees in Urban Areas", arise due to vast expanse of paved spaces:

...dry conditions, lack of air for plants, and the heat that it manates and the intensity of the light which is thrown up from the ground proves to be not only very much a nuisance to man but can also cause leaf scorch and abnormal transpiration in plants.³

A vast expanse of pavement can produce not only blinding glare but also nauseating dizziness when the sun is at its peak. Getting into a car parked under the scorching heat can result in burnt buttocks, and sometimes even an upset stomach or a headache for those who are unfortunate enough. A camera or a cassette tape that has been left inside a car in this condition for a couple of hours will definitely be damaged due to the penetrating heat.

Heat can also cause damage to the car. Fading of paints is the most common example, but too much sun exposure can also damage the car's tint. It has been observed that after a year of constant exposure, air bubbles can form between tint filaments and the glass windows.

Cracked pavements is also another problem. This may be due to improper settling of concrete, but more often pavement cracks are due to the uncontrolled root growth of shade trees. The usual practice is to place a tree wherever there is a space, not taking into consideration the size of the tree as it grows into full maturity. Others may be due to natural phenomena which are beyond our control, like earthquakes or volcanic eruptions. Sometimes it may also be due to poor workmanship, or the designer's negligence in providing suitable expansion joints.

Another concern is the suitability of plant materials. Some trees may shed too many leaves that will result in costly maintenance. Some may have low-branching stems that may harm or annoy the parking users, while others may require too much water, and suffer when water supply is low especially during summer.⁴

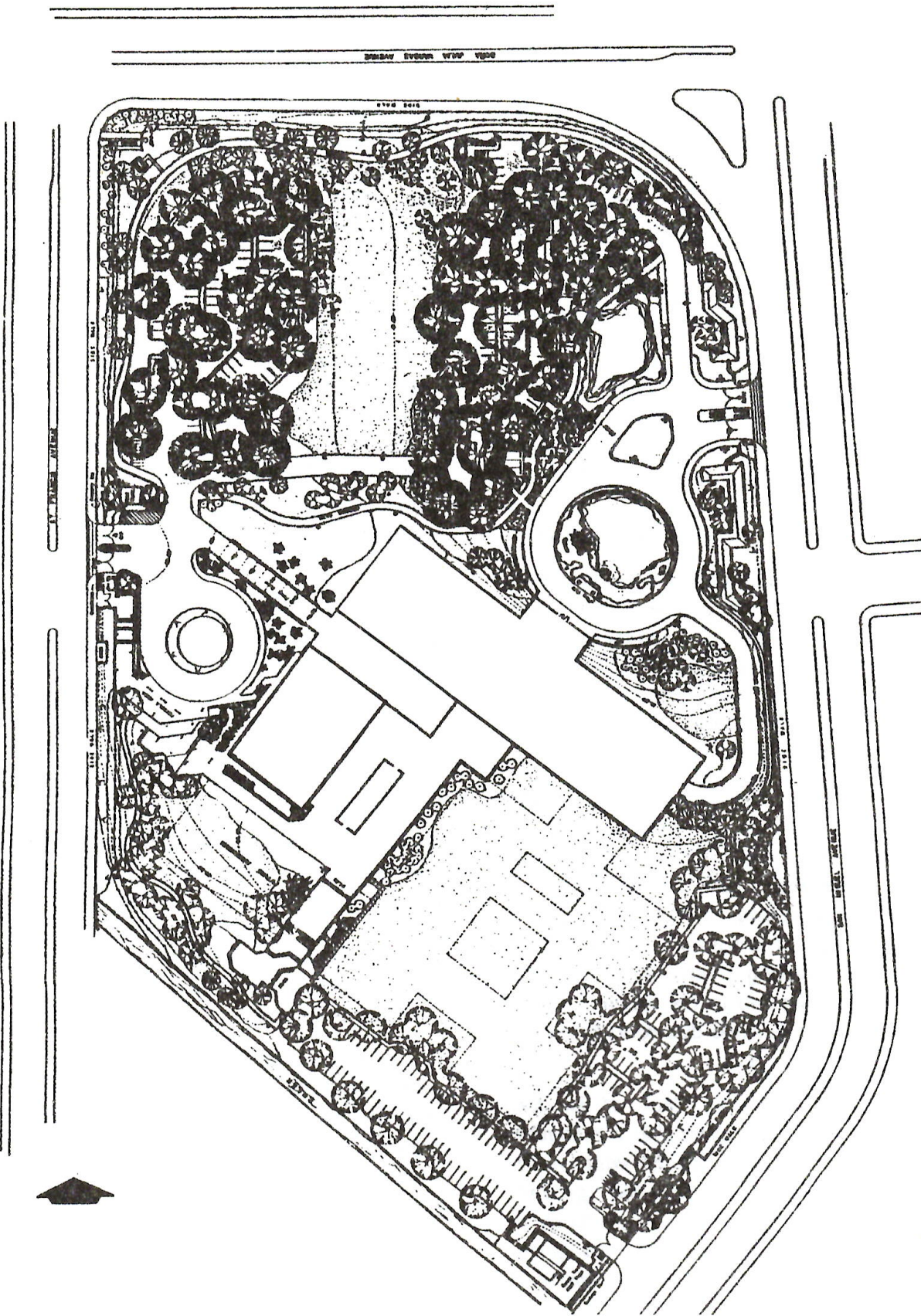


Figure 1. SITE DEVELOPMENT PLAN

All the above problems can somehow be minimized, if not totally eliminated, by careful study and thorough research on proper parking design. In the following case study, the landscape architect has managed to create interesting parking spaces that eliminate most of the problems mentioned above.

THE CASE STUDY

The site is a 7-hectare, relatively flat land located in the heart of Ortigas Center in Mandaluyong City, 2.5 hectares of which is allocated for an 8-storey office building. In this particular project, the landscape architect opted for a natural, tropical design. As one approaches the entrance, one is greeted by a big, round lagoon with a waterfall that serves not only as an aesthetic feature but also as reservoir for watering the plants and as a water source in case of fire. Pathwalks around the area serve both as jogging and security paths. For fences, the designer chose to use organic walls instead of the usual hard concrete. This was achieved by placing four rows of barbed wire and letting a mass of *bougainvilleas* climb and cover them, giving the place the needed security wall and at the same time add to the natural effect that the designer wished to convey.

This, coupled with the lush planting, helps create the differently shaped parking lots that occupy a majority of the place. An innovative parking scheme was introduced by plotting the shade trees with their crowns almost overlapping each other. The result was a huge umbrella of trees forming a nice shade for the vehicles that will park beneath them. The parking spaces were then laid out among the trees giving consideration

to smooth traffic flow (see Fig. 1). An automatic sprinkler system was also incorporated in the design for easy maintenance.⁵

In this plan, the designer is successful in creating ideal parking in terms of eliminating the usual problem of monotony that a vast, conventional parking lot creates. From any point of reference, there is no angle wherein rows of parked cars can be viewed in a single straight file. Even as one approaches, only a hint of the parking area can be glimpsed as one passes the main driveway. Lots of planting hide the parking areas beyond.

Due to its unorthodox shape and ample planting, the problem of extreme heat is almost eliminated. Plants cool the place not only by their shade but also by removing the heat load from the area around and under the tree crowns through the process of transpiration (the process wherein the moisture moves upward to the surface of the leaves and evaporates into the air). Based on an experiment by scientists in the University of Indiana, it was found out that with an air temperature of 84°F, the surface temperature of a concrete street was 108°F, while in areas where shade trees were planted, the surface temperature was only 20°F.

Another factor that contributes to the coolness of the place is the presence of ground-covers and lawns. The natural cover of the land tends to reduce extreme heat, while paved surfaces tend to store more heat and will remain in a higher temperature longer than unpaved surfaces or areas covered with lawn.

This development contributes in This development contributes in minimizing glare, dust, and air pollution in this urbanized city and provides the-

much needed breathing space. Plants, particularly trees, provide comfort to urban dwellers in replacing the oxygen and using carbon dioxide emitted by vehicles, during the process of photosynthesis. In the book *A Guide to Tree Planting* published by the Ministry of National Development of Singapore, it is mentioned that "...each year, an acre (43,560 square feet) of trees can produce enough oxygen to keep 18 persons alive, while even a single row of trees with or without any under layer of shrubs can lessen air pollution significantly." It was observed that a 25% reduction in dust concentration was attained in a street lined with trees. Some trees, notably the evergreens like the *agoho* and *Norfolk Island pine*, are capable of trapping the dust on the surface area of their leaves, which are washed off during the rainy season.

Unlike in conventional parking where every possible space is converted into a parking slot, the above design is very generous in providing spaces for greeneries. Since ample spaces were provided for trees, the problem of cracking and uprooting of pavement is diminished if not totally avoided. However, maintaining this kind of open space parking has its drawbacks. Shedding of leaves by the acacia trees requires constant sweeping of the grounds. Cutting of trees is minimal, but pruning of the lawn is quite time-consuming. Manual watering is at least eliminated due to the presence of a sprinkler system. Maintenance of plants may be costly, but the benefits they provide not to mention the aesthetics, cannot be counted in terms of pesos and cents.

The landscape architect opted for a parking space where curb and gutter

were absent except for some areas where the soil needed to be raised. The idea saves water by enabling some of the surface runoff during rains to flow directly into the planting area. A dwindling water table is one of our ecological problems today, and absorption of rain-water through the soil is a good way to minimize wastage..

The use of asphalt instead of the more commonly used concrete is beneficial, not only in terms of initial cost but also due to some advantages; it is smoother and its softness absorbs some of the noise caused by vehicles. Maintenance wise, it is costly. In the case of this particular establishment, the management spent 4 million pesos for its re-asphalting eight years after its first installation.

As mentioned before, the unusual shape of this parking lot allows for generous use of space. Analyzing how much more cars can be gained by using the conventional parking design, the following results were arrived at:

1. In realigning the parking stalls into a ninety degree standard parking, 147 parking stalls were produced as against the present 102, a gain of 45 slots. See Fig. 2.
2. A loss of 6 or more trees resulted as their location fell on areas to be paved.
3. More areas were unshaded since the trees will only be in rows, resulting into added heat radiation and glare.

In the above analysis, it can be said that the benefits that people (not only the users of the establishment but also

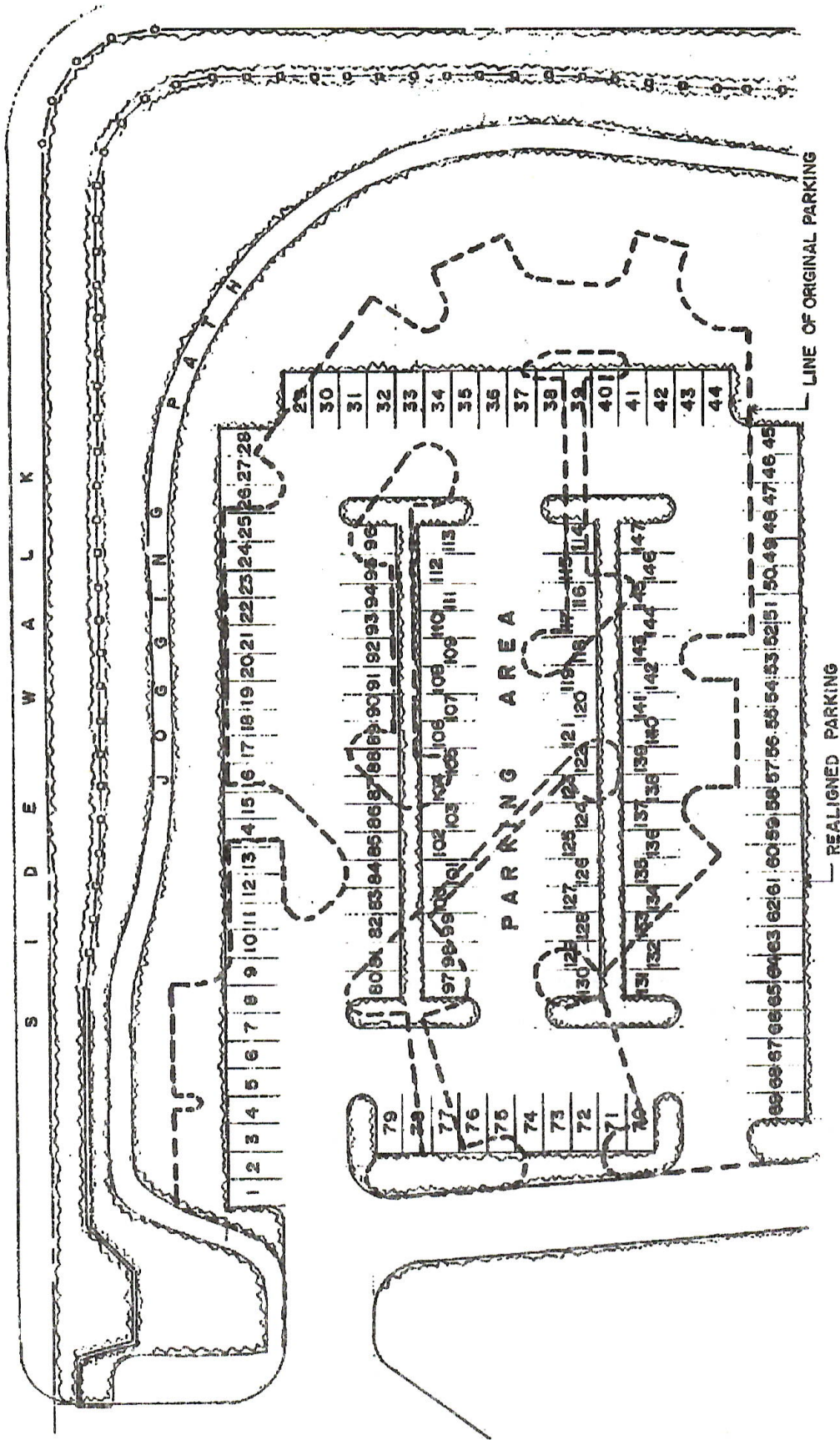


Figure 2. COMPARATIVE LAYOUT OF INNOVATIVE AND CONVENTIONAL DESIGN

of the surrounding areas) get from the development of this parking area far outweigh the disadvantages. In general, the designer is successful in creating a parking space that is suitable for the tropics. Given the full support of the owner, cost of prime space is disregarded, just to produce an area that can be truly different and garden-like in appearance.

However, this is an exception to the rule. This can not be applied to other developments where the prime concern is the cost. Prime lots are developed to their maximum and every available space is utilized for parking, a necessary feature but the least of priorities, expenses and appearance wise. In the following recommendations, the author suggests some solutions based on the above case study to minimize the problems mentioned before and to propose some compromises which may be acceptable to the owners.

Knowing fully well the importance of plants as mentioned before, tree allocations should be provided in every parking design. Space for planting can be squeezed in between wheelstops and left out spaces (see Fig. 3). Ground covers, which can lessen heat radiation and help reduce the effect of the blazing sun

should be utilized in between these spaces. To minimize water consumption, drought resistant plants like *agave*, *maguey*, and *bougainvillea* can be used. Plant species that can tolerate and absorb air pollutants must be specified.

A study conducted by the National Environmental Protection Council, "The Uptake of Pollutants by Philippine Plants" found that there are indigenous plant materials that are resistant to and can help absorb air pollutants like sulfur dioxide and nitrogen dioxide, which are usually emitted by factories and internal combustion engines of motor vehicles.

The following plants have been recommended by NEPC to help reduce nitrogen dioxide: *ipil-ipil*, *yellow bell*, *chichirica*, *san francisco*, *mollucan sau*, *lumbang*, *african tulip*, *bandera espanola*, *yemane* and *pandan*.

For the containment of sulfur dioxide, NEPC has recommended the planting of *ipil-ipil*, *picara*, *mollucan sau*, *yemane*, *pandan*, *chichirica*, *caballero*, *african tulip*, *zigzag plant* and *mayana*.⁶

Botanists at the University of the Philippines, in their study, "Tree Planting Program for Metro Manila," suggested the following trees to help reduce air pollution: *Balitbitan* (*Cynometra rami-*

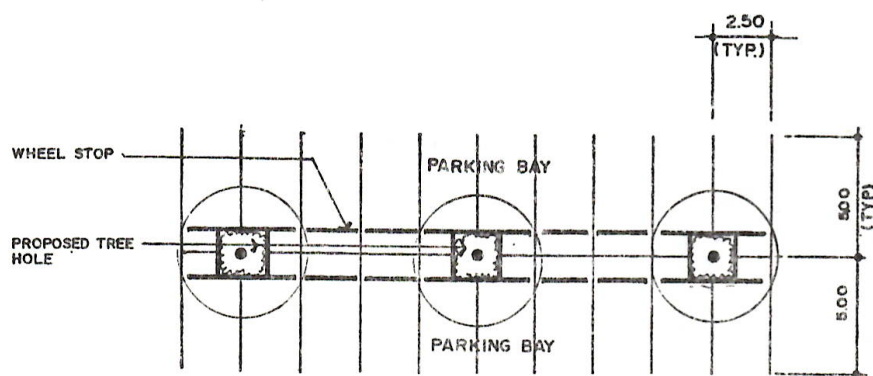


Figure 3. PROPOSED PLANTING BETWEEN WHEEL STOPS

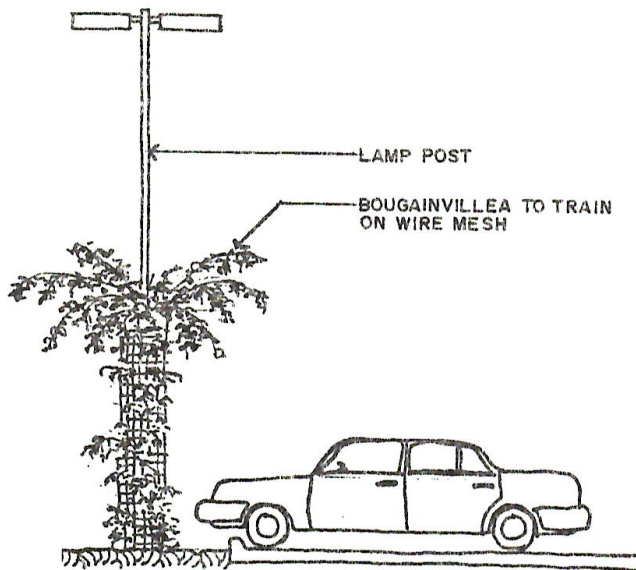


Figure 4. PLANTING AROUND LAMP POSTS

flora), *Bitao* (*Chlorophyllum mophyllum*), *Palawan Cherry* (*Cassia nodosa*), *Golden shower* (*Cassia fistula*), *Fire tree* (*Delonix regia*), *Agoho* (*Casuarina equisetifolia*), *Bagras* (*Eucalyptus deglupta*), *African tulip* (*Spathodea campanulata*), *Indian rubber* (*Ficus elastica*), *Salisi* (*Ficus benjamina*), *Botong* (*Barringtonia asiatica*), *Bottlebrush* (*Callistemon citrinus*), *Coconut* (*Cocos nucifera*), *Anahaw* (*Livistonia rotundifolia* var. *luzoniensis*), *MacArthur Palm* (*Ptychosperma macarthurii*), and *Manila Palm* (*Veitchia merrillii*).

Since most of the time, space provided for tree planting is really very tight, root guards can be introduced. This root control barrier can help direct roots to go down, preventing it from spreading sideward which is the most common cause of pavement cracks.

Another solution which can help soften an otherwise harsh parking landscape is the use of interlocking blocks. By using it in a car stall instead of the usual plain concrete or asphalt, interesting patterns can be created and parking monotony lessened. In addition

to this, these blocks permit surface water to seep through the ground and to the water table.

Use of grass pavers or turf paving blocks is another suggested solution, which, like the blocks, not only reduces glare and heat but also permits water infiltration. Turf paving blocks are either made of concrete or hard plastic with regularly spaced holes for the grass to grow out of. These blocks were found to be interesting and environmental friendly such that the Singapore Parks and Recreation Department even makes their use mandatory.

Lampposts, which are a must in vast parking lots, can be treated in such a way that they can also add shade and aesthetic at the same time. Trailing and drought-resistant plants like *bougainvillea* and *chinese hat plants* can be trailed at a certain height around the lampposts so that they will not block the lamps' illumination (see Fig. 4). This is commonly used in some streets in Metro Manila and Singapore.

Given all the above suggestions, the government for its part should issue mandatory directives requiring developers to provide spaces for greeneries in their parking. The law, which requires only a certain number of parking stalls in relation to a given area, should be revised. Developers should not be allowed to develop certain business establishments with only the minimum provisions for amenities like parking and open spaces. The Philippines should follow the example of Singapore, which requires the mandatory provision of open space and a certain number of trees in proportion to the size of their property.

Air pollution is everybody's concern, and the government must be strict in

enforcing laws that may affect or reduce this problem. Developers must not only think of maximum profitability; they must be required to contribute to the ecological enhancement of their vicinity in terms of providing a much-needed breathing space that will help abate air pollution around their properties.

Suggested Provisions to be Included in the Building Code:

(as applied to parking areas)

Planting:

1. All parking spaces with a minimum area of 20 square meters should at least be provided with one tree. For larger areas, big shade trees should be provided at every four (4) parking bays.
2. Grass paving blocks should be used for every other bay, to insure water infiltration through the soil and to reduce glare and heat.
3. Tree holes should be provided with aeration slabs to insure proper growth.

Paving:

Permeable paving materials like permeable asphalt or interlocking blocks must be used in places where turf paving blocks are not used, to allow surface water to penetrate the ground.

Drainage:

A rainwater cistern must be provided for areas accommodating 100 cars or more. The drainage system must be designed such that excess surface water runoff will go directly to this cistern for water storage. This can be used for plant irrigation.

CONCLUSION

Parking design is a very neglected subject. Designers and developers often take for granted the area allotted for car parks. The low priority given to it is reflected dimly in the poor standards of most parking developments.

In a hot humid place like the tropics, parking under the sun's blazing heat is a cause for despair. What is needed is a deeper understanding of the conditions in the tropics, and an innovative mind to be able to create parking spaces that are both harmonious with nature and satisfactory to human comfort levels.

Use of some modern materials can greatly enhance conventionally designed open space parking. Profit-oriented developers can adopt some if not all of what is recommended to improve the sad state of parking areas in the tropics and at the same time contribute to the ecological enhancement of the environment.

ENDNOTES

¹ "LTO Notes Vehicle Growth, Revenue Increase in 1990," Manila Bulletin, 15 February 1991, p.HC-8 col. 1.

² Harvey Rubenstein, A Guide to Site and Environmental Planning, 3rd ed. (Singapore: John Wiley & Sons, ---), 77.

³ Brian Clouston, ed., Landscape Design with Plants (London: Van Nostrand Reinhold Co., 1977), 33.

⁴ *Ibid*, p. 25.

⁵ Ildelfonso P. Santos, "Landscaping in the Tropics: The Philippine Experience," speech

delivered in IFLA seminar, Nairobi, Africa, 1994.

6 Geronimo V. Manahan, "Ecology, Man and the Environment," paper, University of the Philippines College of Architecture.

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