

Utilities Study

Storm Water Drainage System

This plan includes a utility study from a technical point of view to ensure proper, intended functioning of the park.

The study is only for the area which the JICA Study Team is in charge of. It is necessary to coordinate it with the further studies of utility plans of the other parts of the park.

Storm Water Drainage System

Regarding the storm water drainage pipe network around the park area, which will be constructed along the roads surrounding the park, a pipe network has partially been installed for the former cancelled residential development.

The present storm water catchment-basin is generally classified into three drainage directions. This drainage is made into the downstream 3 canals: "Canal Del Rio Salitre", "Canal del Rio Nuevo" and "Canal del Rio San Francisco."

According to "Zonificacion de Acuerdo A la Precipitacion" of "The Empresa de Acueducto y Alcantarillado, Bogota, D.E.", this area is positioned almost in the Catchment-Basin Zone 3.

Calculation of Rainwater Drainage Volume and Downflow Capacity of Existing Sewer System

• Calculation Basis of Formula of Rainfall Intensity

Talbot's formula of rainfall intensity is calculated for the individual year of probability according to "Curres-Intensidad-Duracion-Frecuencia" of The Empresa de Acueducto Y Alcantarillado, Bogota, D.E.

• Calculation by Talbot's Formula of Rainfall Intensity

In the Catchment-Basin Zone 3, the 15-minute rainfall intensity and 60-minute rainfall intensity are as follows for the individual years of probability.

Table - 41 Rainfall Intensity for the Individual Years of Probability

N (YEAR)	I ¹⁵ (mm/hr)		I ⁶⁰ (mm/hr)	
	q ¹⁵ (l/ha/sec)	I ¹⁵ = 360×q ¹⁵ ×10 ⁻³	q ⁶⁰ (l/ha/sec)	I ⁶⁰ = 360×q ⁶⁰ ×10 ⁻³
3	190	68.4	79	28.4
5	209	75.2	79	31.7
10	243	87.5	103	37.1
20	279	100.4	118	42.5
40	316	113.8	132	47.5
100	329	110.9	160	57.6

• Coefficient of Flow and Rainfall Year of Probability

The standard values of flow coefficient per individual type of work and use are as follows:

Standard Values of Basic Flow Coefficient per Type of Work

Table - 42 Standard Values of Basic Coefficient of Rainwater

Type of Work	Flow Coefficient
Roof	0.85 ~ 0.95
Road	0.80 ~ 0.90
Other non permeable surfaces	0.75 ~ 0.85
Water surface	1.00
Intermediate non occupied area	0.10 ~ 0.30
Park having plenty of lawn and trees	0.05 ~ 0.25
Mountain area having little gradient	0.20 ~ 0.40
Mountain area having large gradient	0.40 ~ 0.60
Commercial area or similar residential area having very little intermediate land within a premise	0.80
Industrial area having some permeable intermediate area such as outdoor work place, etc. and residential area having a certain extent of gardens	0.65
Area where intermediate height housing or many detached houses are located	0.50
High class residential area having many gardens or suburb area with many agricultural lands.	0.35

The average flow coefficients in this park area obtained by the above given standard values are as follows.

Table - 43 Average Rainwater Flow Coefficient in This Park

Type of Work	Area size A (ha)	Coefficient of flow	A×f
Lake	10	1.0	10.0
Non-permeable surfaces such as road, building, plaza, etc.	20	0.8	16.0
Park (green area)	130	0.2	26.0
	ΣA = 160		ΣA×f = 52.0

The average coefficient of flow

$$f_a = \frac{\sum A \times f}{\sum A} = \frac{52.0}{160} = 0.33$$

The average flow coefficient of the area other than lake is:

$$42.0 \div 150 = 0.28$$

From these viewpoints, the coefficient of flow is lower than in the residential area, which was originally scheduled for former residential development. It seems therefore that the volume of drainage is smaller than expected.

It is generally practiced in sewage system planning to use 3 years ~ 7 years as the rainfall year of probability. Although the initial rainfall intensity is large in the park-planned area, the rainfall year of probability "5 years" was adopted from the standpoint of the existence of a lake having the retarding function.

• Classification of Catchment-Basin within the Park and Calculation of Stormwater Flow Rate

The rational formula is used for the calculation of rainwater flow volume.

$$Q = \frac{1}{360} \cdot I \cdot t \cdot A$$

Wherein,

Q: Flow rate (m³/sec.)

I: Coefficient of flow

t: Rainfall intensity (5-years probability)

$$I = \frac{2,500}{t+18} = \frac{2,500}{32+18} = 50 \text{ mm/Hr.}$$

t: Hours of rainfall duration

t = t' + L/V < 32 min.

t': Arrival time at initial stage 7 min.

L: Maximum length of waterway 1.5 km

v: Average flow rate in pipe 1.0m/sec.

A=Area size of catchment basin

Similarly to the present rainwater drainage plan, the catchment basin in the park is classified into three. This water is discharged in the respective downstream channels through the existing drainage pipe network.

The volume of flow from the individual catchment basin in the park can be calculated as follows:

Table - 46 Volume of Rainwater Flow to Existing Each Drainage from the Park

Classification of stream area	Stream area No. in the Park	Area size of stream Area A (ha)	Coefficient of flow I	Volume of drainage (m ³ /sec) $Q = \frac{1}{360} \cdot I \cdot 50 \cdot A$
To Canal del Rio Saftre	[A]	30	0.28	1.2m ³ /sec
	[B]	25	0.28	1.0
To Canal del Rio Nuevo	1/2 of [D] { • Late • Except for late	10/2	1.0	0.7
	[B]	75/2	0.28	1.5
To Canal del Rio San Francisco	[C]	5	0.28	0.2
	1/2 of [D] { • Late • Except for late	15	0.28	0.6
		10/2	1.0	0.7
		75/2	0.28	1.5

Downflow Capacity of Existing Drainage Facilities

The downstream capacity of existing drainage pipe routes, which lead the storm water in the park to the downstream channel, can be estimated as follows according to the section of pipe and gradient thereof by using Manning's formula.

Table - 45 Capacity of Existing Storm Water Drainage

Classification of stream Area	Section and gradient	Capacity of downflow (m ³ /sec)	Flow volume within the park (m ³ /sec)
To Canal del Rio Saftre	2.0-0.3%	83	1.2
To Canal del Rio Nuevo	1.7-0.25% 1.5-0.3%	4.9 39*	3.2 0.2
To Canal de Rio San Francisco	1.75x1.3-0.13%	39*	2.8

* Including rainwater of the area other than the park-planned area

It seems from the viewpoint of the above values that the existing drainage pipe network has the capacity to accommodate the flow volume of rainwater within the park area.

Drainage System

Being collected directly by the open channel which is installed along the park roads, the rainwater is discharged into the existing sewerage pipes located downstream.

The rainwater collected at the center of park is fed to the lake through the drainage ditches that are installed along the park road. Then, it is discharged from the lake into the existing sewerage pipes located downstream.

From the viewpoint that the plaza is designed low so that it may be surrounded by roads and sight-seeing artificial hills, it is not cost-effective due to large volume of soil cover to connect the sewer (for rainwater at the plaza area) directly with the downstream drainage pipes. Therefore, such rainwater is led to the lake, and then discharged into the existing drainage pipes located downstream.

In order to make no change of the existing catchment-basin system, an over flowing weir structure is adopted for the discharge from the lake so that approximately the same volumes of discharge may be accomplished at two points. Thus, the discharge is to the existing downstream drainage pipes.

The open channel system is mainly used for the drainages within the park. Where the pipes cross artificial hills, however, the pipe route is utilized on both the discharge sewer from the lake and the sewerage from the plaza to the lake.

The section of drainage routes will be determined according to Manning's formula.

Fig. - 57 Zoning of Rainwater Catchment Basin



Water Supply

• Hydraulic Pressure and Estimated Supply Capacity of Existing Water-Supply System

According to the data given in "The Empresa de Acueducto y Alcantarillado Bogota D.E.", the hydraulic pressure of existing water-supply pipe-routes is as follows:

Maximum hydraulic pressure 47m (4.7 kg/cm²)
 Average hydraulic pressure 37.8m (3.78 kg/cm²)
 Minimum hydraulic pressure 32m (3.2 kg/cm²)

It seems, however, that these amounts show the hydraulic pressure of main pipe-route at the park plan area. The present supply capacity from the existing water-supply pipe-routes to the park plan area is not clear. Since it seems that it will be possible that the volume of fresh water, almost the same as the volume of waste water (planned), which was originally scheduled for the residential area (located herein), can be supplied to this park plan area, the calculation of capacity can be made as follows according to "Caudal Promedio de Aguas Negras" of The Empresa de Acueducto y Alcantarillado Bogota, D.E.

$1.3 \text{ ltr./sec./ha. (Grupo-B)} \times 160 \text{ ha.} \times 24 \text{ hr.} \times 60 \text{ min.} \times 60 \text{ Sec.} \times 10^{-3} = 18,000 \text{ m}^3/\text{day}$

• Calculation of Water Supply Volume to Park Facilities

The clean water which is required for park facilities can roughly be classified into the following three types.

- 1) Living utility water for individual facilities
- 2) Sprinkling water for around facilities
- 3) Water source of non-utility water facilities such as lake, cascade, etc.

Regarding the fire-protection water, a fire hydrant is not installed from the viewpoint that no possibility of a spreading fire exists due to separate (detached) positioning of individual facilities and that the lake can furnish abundant water.

• Calculation of Living Utility-Water Volume in Individual Facilities

The water-supply volume (per day) can be estimated as approximately 230m³ on the basis of the calculation of the demand of individual facilities.

It is less economic and undesirable to install a water-supply system for use by people who have temporarily gathered, such as for a ceremony, etc. Therefore, the volume of living utility water is calculated herein only for the number of persons who will be present at normal times.

In order to cope with the temporary concentration of people, however, it may be necessary to stop the water supply to the sprinkling facilities and lake and open the emergency branching valves installed in the pipe-routes for such sprinkler and lake.

• Calculation of Sprinkling-water Volume around Individual Facilities

The sprinkling operation based on the clean water will be made only for the plants located around individual facilities. It seems that the maximum volume of sprinkling water (per 1m² of planted area) is approximately 5 mm/m²/day.

• Calculation of Water-Supply Volume for Non-utility Water Facilities Such as Lake, Cascade, etc.

The volume of water supply to the lake is 300 ~ 500 m³/day as described in "Landscaping Study" in this report.

Since a recycling system is to be used for the cascade and stream along the Urban Ribbons, only the replenishment of water to make up for evaporation should be considered in terms of water-supply volume.

It seems that the volume of evaporation is about 3 mm ~ 5 mm/m² per the water area "1m²" although it is variable depending on the climate and season. Thus the calculation can be made as follows according to the area of water surface.

	Area size of water (m ²)	Volume of water supply (m ³ /day)
Cascade	800 m ²	3~4
Route of stream along Urban Ribbons	Width Length AV. 1.5 m×2000 = 3000 m ²	9~15

• Calculation of Water-Supply Volume to Park Facilities

It can be concluded as a result of the study mentioned above that the maximum water-supply volume (per day) required for the park facilities is about 1,300 m³/day.

This necessary water-supply volume is largely exceeded by the estimated supply volume from the existing water-supply pipe system (18,000 m³/day), which is already installed in the park plan area.

Therefore, the existing water-supply pipe system can fully satisfy the demand if a connection can be made with this existing system.

• Water-Supply Network Plan

Even in consideration that the level of prepared ground foundation (of the park-planned area) is higher than that the surrounding roads, where existing water-supply pipes are installed, no booster pump will be required if the minimum hydraulic pressure of existing water-supply pipes can be secured at 3.2 kg/cm².

Unlike working facilities such as hospital, plant, etc., the use of normal level of water is not required in the case of park facilities (due to their nature) even when an interruption stop of water supply occurs because of power failure, etc.

To both main facilities (Colombian History Museum and Religious Museum), however, a water-storage tank (for approx. 1-day's use) and water-supply pump shall be installed from the viewpoint of safety.

• Water-Supply Pipe Network

In the areas other than the plaza, no network connection is required among the dispersed facilities from the viewpoints that individual facilities are dispersed and that the water intake can easily be made respectively by the individual facilities from the existing water-supply pipes located under the surrounding roads.

From the viewpoint that the reduction of hydraulic pressure may occur, if water intake is made at the terminal of auxiliary main routes, at the upstream points in addition to the reduction at such terminal points, both water volume and hydraulic pressure must be secured by making the direct connection with main pipe routes.

It seems from the viewpoint of pipe diameter that the 42" main pipe route running across the park area is installed for supplying water to the population of approx. 100,000.

From the viewpoints that the citizens' life is seriously influenced by an interruption of water supply if such a pipe route is changed, as well as the higher cost, such change is to be avoided unless a new main is required because the old one is no longer usable.

From these standpoints, it is quite important to give no excessive load to the pipes of this main route during the preparation work of the park. In addition, it is desirable in view of maintenance to install the main pipe parallel to park roads.

The volume of use of water at the individual park facilities shall be measured by meters, which will be installed at the respective branching points.

• Plan of Water-supply Pipe Installation and Pipe Diameter

From the viewpoint of maintenance, the water-supply pipe shall be installed under the footpath or park road to the extent that is practical. The soil cover above the route shall, as a rule, be 1.2 m where wheel-load is given and 1.0 m where the route is installed below a footpath or park road.

The diameter of water-supply pipe shall, according to the flow rate, be 8"~6" in the case of an auxiliary main route and 4"~3" in the case of a branched route.

The water-supply pipe must be designed according to the maximum water-supply volume (per hour). In consideration of the nature of park facilities, which are utilized in the daytime only, the living utility water of individual facilities shall have the maximum water-supply volume (per hour) amounting to 3 times the per-day water-supply volume.

In the case, however, of water supply for sprinkler and non-utility facilities, no time variation exists.

Therefore, the maximum water-supply volume (per hour) will be as follows for the whole park facilities.

$$230 \times 3 + 480 + 520 \approx 1,700 \text{ m}^3/\text{day}$$

(Living utility water of individual facilities)	+	(Sprinkler)	+	(Non-utility water facilities)	=	1,700 m ³ /day
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For the head loss and calculation of flow rate of water-supply pipes, the Formula of Hazen-Williams will be used.

Sanitary Sewer

The comparison between the waste water volume of the individual drainage system (calculated from the existing data) and the capacity of existing downstream pipe facilities, which was estimated from the section and gradient of stream according to Manning's Formula. It may be defined that the existing drainage pipes can fully satisfy the necessity of drainage in the park.

Through the calculation of waste-water volume, it was presumed that the volume of living utility water supply of the individual facilities is equal with the volume of waste water and that the maximum waste-water volume per hour is 3 times as large the maximum waste-water volume per day.

Plan of Waste-Water Drainage System in Park

--From the viewpoint of maintenance, it is desirable that the sewer pipes be installed below the footpath or promenade as in a large scale as possible.

The minimum soil cover above the sewer pipes shall, as a rule, be 1.20m.

--The minimum diameter of sewer pipe shall be 8".

Lighting and Power Supply

Outdoor Lighting

The illumination should be maintained to the extent that people visiting the park at night will feel safe. As to the lighting method, a mode providing quiet atmosphere, while insuring that objects can be seen clearly, should be adopted. In this planning, outdoor lighting is classified as follows according to the concept suggested previously.

• Plaza Lighting

It is thus planned to erect an about 20 m high pole bearing six HF 1000-W mercury lamps maintaining an illumination of 50 to 100 lux within a range diameter of about 30 m.

• Mall Street Lighting

6-m. poles with decorative lighting fixtures fitted with two HF 250-W mercury lamps will be erected along one side or both sides of mall street providing an illumination of 5 to 7 lux on average. These will be set up extending from the area where the illumination of the Plaza Lighting becomes 7 to 10 lux so that the lighting effect will be harmonious.

• Park Security Lighting

As explained in the "Park Operation Program", the garden is not usually used at nighttime and the lighting for security and maintenance is ample. For this purpose, an average illumination of above 0.5 lux will be maintained by using the 5 to 6 m poles with HF 250-W mercury lamps. Regarding lighting for entertainments, exhibitions, etc., permanent lighting fixtures have been determined to not be necessary, due to consideration to frequency of use and economy. The lighting equipment for the above purposes should be brought in as required. Necessary power sources for such will be installed at strategic terminals.

Temporary Power Source

Temporary power sources for entertainment lighting will be installed as specified below. In expectation of frequent occupation of the Parade Plaza Space, the power distribution panel will be installed there with a power source of 300 KW in total.

For arbitrary locations, a generator is recommended to be employed as necessary.

For lighting small scale exhibitions, power units of about 30 KW will be installed in 10 places.

Power Receiving and Distribution

The comprehensive and nation-wide electric system is planned and operated according to the policy and control of the Secretariat of Electricity. Therefore, the plan for the electric system for the park must be negotiated in advance.

However, in this report, from reasons of economy, we propose that a branch line be connected to the existing distribution cables at each appropriate place, where electricity of high voltage will be received and supplied to each power unit. Transformers will be installed for facilities and areas requiring electricity of capacity above 50 KVA or 100 KVA. To other facilities and localities power shall be supplied after voltage is decreased by means of pad-mount transformer cubicles. Distribution lines within the park will be installed underground so as not to harm the scenic appearance of the park.

Power Demand

According to conditions mentioned above, the power demand forecast has been estimated as 2,500KW.

Telecommunication

The telecommunication network plan will be made according to the conditions below:

- 1) As a rule, telephone lines within the park will be installed underground.
- 2) Two to three telephone boxes will be installed in each plaza according to its requirements.
- 3) In each administration building, more than one telephone for exclusive use and one public telephone will be installed.
- 4) 10 telephone sets will be placed in different spots within the Urban Mall.

Announcement System

The announcement system within the park area shall consist of the following two systems:

- 1) General Announcement System
- 2) System for Acoustic Effects

• General Announcement System

– Speaker

There are two models of speakers concentrating or dispersing sound respectively. For example, the concentrative class of speakers are installed at wide places such as collective farms to convey information. For this purpose, the large trumpet speaker is effective and the cost is low. However, because of the possibility of echo production due to speed of sound travel and the need for fairly large acoustic pressure, a minor nuisance may occur to residents around the area. It is not suited for use in amusements, as the sound quality is not amply modulated. Therefore, to insure a vast range of announcement capacity with melodious resonance, speaker on column type will be installed in different places.

Line Facilities

Messages can be announced by wire or wireless. When the wireless method is utilized, it is obligatory to make previous arrangements with the radio regulatory agency.

When adopting the wiring system method, the cable must be installed underground and the construction cost will be increased.

• System for Acoustic Effect

Construction cost (equipment and installation cost) can be very high, or very low depending on what is desired. Therefore, the kind of system to be used will be determined by directors' way of thinking and budget boundaries. It is further necessary to determine whether the system should be permanently or temporarily installed. With this procedure, a system of a certain level will be selected temporarily and be installed as extra equipment for the park.

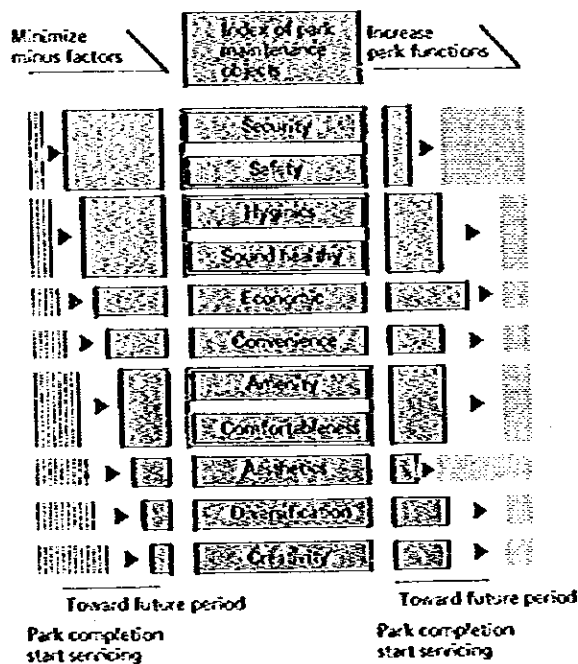
Park Operation Idea

Regular checking and maintenance is required in order for the facilities, equipments, electricity, water supply and drainage systems to function properly. Furthermore, security controls are needed for facility areas as well as whole park area.

Although trees and shrubs are planted in such a way as to suit their individual characters and environmental needs, there tends to be subsequent change in the environment and some undesirable planting practices because of a desire to keep on schedule in spite of unforeseen difficulties and problems.

Thus, contribution to environmental control and coordination regarding the diversified functions of park and park facilities shall be the main objectives of maintenance in this park.

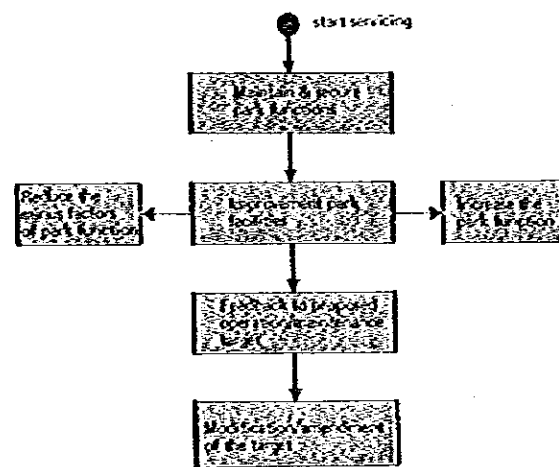
Fig. - 58 Key Factors of Park Maintenance



System and Flow of Park Maintenance

Systemizing the maintenance of the park is the quite complicated, because maintenance objectives of the park is being in the system of natural environmental system. While Man-made landscaped park components shall be classified into two main maintenance aspects: one is minimizing the minus factors of the maintenance of the function of landscaped park components and the other is the increasing the function of these components.

Fig. - 59 Park Maintenance Flow Chart



Maintenance Items and Objectives

The site cleaning and refuse disposal, landscaping and gardening, utility and mechanical care shall be the most important elements of the maintenance of the park which must be carried out according to well defined schedules.

The basic objective of the park maintenance and control is to keep the park facilities, equipment, planted materials and etc. functioning properly, their main functions being enhancement of the efficiency of land use in the park, provision of the amount and quality of public service needed, provision of recreation opportunities, including space and amenities and establishing the greenery.

Maintenance of the Plantings

At the completion of the planting, the trees and shrubs are in immature state of condition, and require much care.

Maintenance should follow planting with such continuity that no period of neglect will endanger the successful growth of the plants. The sequence of operations should reflect not only their urgency, but how they affect succeeding phases.

The amount and type of maintenance will vary with the species, condition of the planting time, size and location, fluctuation of the temperature, precipitation, wind etc. Major items are clean-up, moving, watering, weeding, cultivating, fertilizing, pruning, controlling insect and disease and repair of tools and equipment.

Annual Event List

Operation Idea for Activation of Park Use

In order to achieve a suitably high level of park use, it is desirable that the Operation Division assume the central role in conceiving and planning a program of events and activities, in coordination with Bogota city officials, state officials, and central government officials, which correspond to the themes of the zones, and obtain the cooperation of the related offices and organizations to publicize the program, and implement it.

It is also essential that in each section responsible for management of each zone that a cooperative posture be adopted and communications be maintained with respect to private bodies and government offices which are concerned with cultural affairs, the arts, education, sports and floriculture, and soon, so that they may propose events and activities and that those proposals can be suitable evaluated for adoption. A system must also be adopted so that requests from citizens for use of park facilities can be accepted and processed.

In the programming of such an annual operation plan of events, a workable arrangement whereby there can be discussion, and subsequent cooperation and coordination, by the administrative, maintenance and security divisions. Moreover, a detailed implementation program incorporating seasonal, monthly and weekly schedules should be programmed; a system for providing the public with advance information on the program, and a system for review of events and activities after they have taken place are needed. Arrangements for budgeting and budget control are also essential.

	JAN.	FEB.	MAR.	APR.	MAY.
Plaza de la Comemoración	• New Year's ceremony				
Camino de las Bellas Artes	• Annual photographers, painters, sculptors, publications exhibitors				
Plaza de las Sirenetas					
Camino de las Esculturas					
Plaza de la Danza	• Dance Day				
Plaza de los Aborígenes	• Festival of ceremonies of Familia Orinda				
Sendero de la Cultura Prehispánica					
Plaza de la Hispanidad					
Paseo de la Independencia					
Plaza de la República	• Andes Children's Jubilee				
Plaza de la Comunidad	• Youth Marches				
Plaza de las Industrias	• Emerald Queen contest				
Plaza de la Municipalidad					
Plaza de la Madre y el Niño	• Toy Festival Day				
Camino del Abecedario					
Plaza de la Tecnología	• Junior Contest on Natural Record Day				
Camino de los Atletas					
Plaza de los Deportes	• Bogota Children's Marathon				
Plaza de las Flores	• Ornamental plant sale				
Plaza de los Árboles	• Horticulture exhibition month				
Plaza de los Comercios					
Plaza de los Precusores					
Plaza de los Martires					
Plaza de la Independencia					
Plaza Ceremonial					
Plaza de la Gran Colombia					
Sendero de la Paz					
Plaza de la 6 Repúblicas					
Mi Tierra					
Plaza de los Comercios					
Plaza de los Precusores					
Plaza de los Martires					
Centro de la Comunicación					

Park Producing

Dramatic Park Producing

In order to create a park as a total environment there is need for a comprehensive "producing" whereby harmonized use is made of large "stage" type elements such as land forms, plantings and the like, as well as "sets" and "props" such as outdoor furniture, and "special effects" such as sound and lighting, not to speak of the total graphic design function and effects, expressed in forms such as information display boards and signs.

With regard to Urban Ribbons in particular, it is essential that space from the north and south sides to the Ceremonial Plaza be treated by use of light and sound in a manner similar to composing of music ranging from symphonies to rondos.

Sign Planning

The following is an explanation of basic principles and matters to which attention will have to be given in the graphic design.

What is Graphic Design Standards?

Graphic design standards will help to accentuate the characteristics of the park a great Memorial through graphic design by serving as guidelines for design unity.

They will determine such basic elements as the symbol marks, logotypes, and symbol colors of each park as basic elements and indicate specific sizes and coloring for the design of the park flags, tickets, posters and pamphlets.

They will also determine the type of lettering, pictograms, and coloring of the sign plates and signboards for smooth guidance of the visitors within the parks as a visual communication system.

Signs

The sign planning will aim at the function of visual communication at places of an international and public nature. In a complicated environment the signs will serve as a means of visual communication that will impart the same information to a large number of people at the same time and rapidly and guarantee proper flow of people within the parks. The signs must not only be attractive and functional in their own right but also blend in well with their surroundings, including adjacent buildings.

General Principles for Signs

The following general principles for the signs will ensure that the flow of people within the parks is smooth:

- **Standardization:** Unity of design within each area.
- **Continuity:** Signs indicating direction should be placed wherever needed by visitors, and there should be continuity between them.
- **Simplicity:** The signs should be as simple and readily understandable as possible.
- **Readability:** The size of the signs should be determined by the distance from which they are to be read, and visitors should be able to read the signs without difficulty under all circumstances.

Besides these principles, the psychological elements of attractiveness, reliability, and pleasantness should be added in the actual design of the sign plates.

Types of Signs

Identification signs:

Signs showing names of theme zone-area, theme plaza, facilities, service facilities, etc., including door signs.

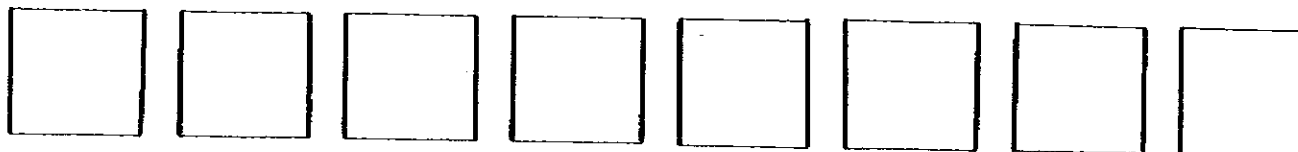
Direction signs:

Signs indicating the direction to facilities and other destinations, including the distance if necessary, and which are to be located along approach roads and at forks and open spaces for convenience of visitors.

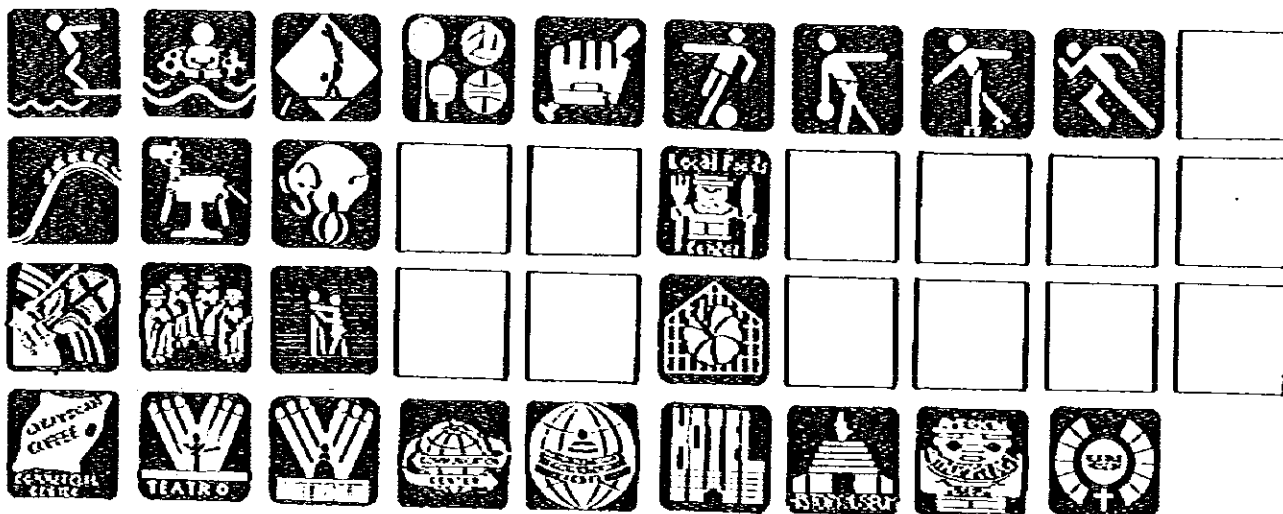
Information signs:

Signs showing the layout of the parks, giving information at the gatherings and entertainment or other events, and indication of prohibition of matters which must be noted.

Theme Zone



Theme Area



Service Facilities



Fig. -60 Ideas of Park Sign

Park Producing by Sound

Ordinarily the element of sound in a park would be comprised of water features such as cascades, fountains and brooks, or the singing of birds. It is particularly through the various sounds of water, in cascades, fountains, etc. whereby aural means will be evoked for forming a continuity pervading the entire park. The singing of birds will be heard in more suitable surroundings of the Bird Sanctuary and elsewhere in the park's forests.

At the same time that such use is made of natural sounds, it will be essential to arrange for musical effects, through the events in the Urban Ribbons and especially the Ceremonial Plaza. In particular, when ceremonies and events for gatherings as large as 50,000 persons are held in the Ceremonial Plaza, it is necessary to have an atmosphere which regulates the flow of the event, and heap up it. A similar requirement exists with regard to the theme plazas of the Urban Ribbons.

Because of the variety of requirements regarding audio equipment, which requirements would depend on such matters as the nature and scale of the events, it would be desirable to use movable equipment rather than equipment fixed in place; thus would also be helpful with regard to maintenance of the equipment.

Park Producing by Illumination

It is particularly important that the Ceremonial Plaza and Urban Ribbons be endowed with the capability of accommodating 24-hour use. As ribbons of light that will stand out from the rest of the park during the evening hours, they are accorded high importance in park planning for the feeling of security they impart, as well as their high drawing capacity as cultural and recreational centers of the city.

At the times of events, it will be indispensable to make use not only of audio effects but also of lighting effects. The use of lighting need not be limited to conventional uses but also could and should include the use of lasers, giant video screens, fireworks displays, etc., and it will be necessary to devise a system which could plan and carry out lighting effects in keeping with the nature and scale of the evening events. It is expected that temporary lighting facilities should be used on an event-by-event basis, in consideration of the tem-

porarily greatly-increased power requirements and the cost of acquiring and maintaining equipment.

In addition, special lighting, whereby attention is also given to color effects, will be needed at cascades, fountains and symbols.

Particular emphasis is to be given to lighting in the Ceremonial Plaza and Urban Ribbons.

Park Producing by Symbols

It is desirable that symbols, in addition to their function of providing the element which creates the commemorative and symbolic nature of the park, have the function of emphasizing the identity of each area of the park and comprise the climax points of vistas created in the park, should at times be outstanding works of art, suitable for aesthetic appreciation.

The monuments located in each plaza and along the Pedestrians of the Urban Ribbons not only are desired to embody the cultural, artistic, historic, educational or other theme of each Ribbon but also they comprise a linked sequence of monuments.

The huge Memorial Walls at the south and north end of the Urban Ribbons, and the Giant Tree, are required to be of such great scale to attain and convey the commemorative and symbolic impression the park is intended to give and they therefore require special lighting at night, and treatment so as to stand out in the proper way when seen from a distance.

Outdoor Furniture

The installation of outdoor furniture to meet four types of functional requirement will be necessary. They may be classified as follows.

- Information function
Information and sign boards about the park, its facilities, events and moving about in it telephone booths, public address systems, clocks
- Service function
Kiosks, drinking fountains, toilets
- Amenity function
Fountains, cascades, ponds, canals, benches, ashtrays, dust boxes, flower boxes, pergolas, illumination, canopies
- Safety function
Bus stops; traffic signs, road crossings (markings); street lights; security lighting

As is stated above, the major components of the park are water features, lighting, symbols, land forms, facilities and planting. In addition to these, various types of furniture, for functions noted above, are also necessary, and they must be planned in accordance with a coherent, unified design policy. It is further necessary that all furniture be harmoniously matched to the immediate environment of use, so as to stand out at the same time as they blend into their surroundings, which is to be attained by control over design and coloring. Thus, design here is required to fulfill a purpose other than that of conventional physical functions.

Appendix: PLANT LIST

- TALL TREE
- Conifer
 - Palm
 - Broad Leaf
- MEDIUM TREE
- Normal Tree
 - Flowering Interest
- SMALL TREE
- Normal
 - Flowering Interest
- SHRUB
- Normal
 - Flowering Interest
- VINES & CLIMBERS
- GROUNDCOVER PLANTS
- PLANTS FOR SPECIAL INTEREST
- FLOWERING PLANTS

- Annuals
- Perennials & Biennials
- Bulbs & Bulblike Plants
- Vines

LEGEND

Origin



Native



Exotic

Characteristics



Evergreen



Deciduous



Fast growing



Easy transplanting



Hardy to prune



Drought tolerable



Dense foliage



Ornamental



Seeding propagation



Cutting propagation

Recommendation



Best



Good



Experimental



Flower



Leaf

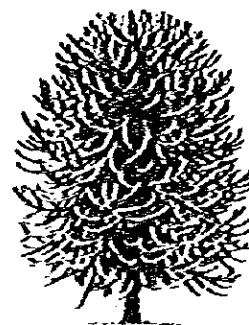


Bird's eatable

TALL TREE

conifer

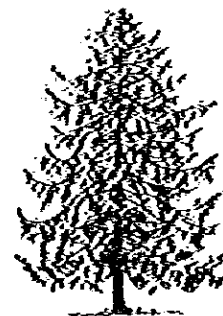
Araucaria araucana
S: Araucaria
E: Monkey puzzle tree
H: 20m



Araucaria excelsa
S: Araucaria
H: 20m



Casuarina equisetifolia
S: Casuarina
E: Horsetail tree
H: 15m



Cedrus deodra
E: Decedar cedar
H: 25m



Cupressus lusitanica
S: Cypress
E: cypress
H: 25m



Cupressus sempervirens
S: Cypress italico
E: Italian Cypress
H: 15-20m



Metasequoia glyptostroboides
E: Dawn redwood
H: 25m



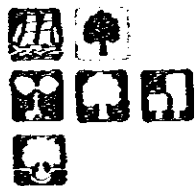
Pinus peata
S: Pino candletero
E: Jelicote pine
H: 18m



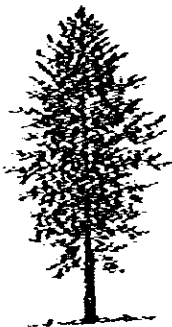
Pinus radiata
E: Monterey pine
H: 20m



Podocarpus macrophyllus
E: Yew pine
H: 15m



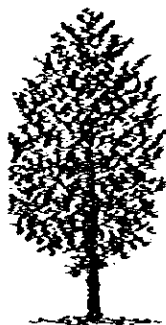
Podocarpus montanus
S: Pino chazúo
H: 15m



Podocarpus de-folius
S: Pino hayuelo
H: 15m



Podocarpus resinosa
S: Pino torceron
H: 20m



Sequoia sempervirens
E: Red wood
H: 20-25m



Taxodium disticum
E: Bald cypress
H: 20m



Palm

Ceroxylon quindiuensis
S: Palma de cera
H: 20m



Phoenix canariensis
S: Palm ferix
E: Canary island date Palm



Washingtonia filifera
E: California fan palm
H: 15-20m



Washingtonia robusta
E: Mexican fan palm
H: 15-20m



Broad Leaf

Acacia decurrens
S: Acacia
E: Green wattle
H: 20m



Acacia melanoxylon
S: Acacia negra
E: Black acacia
H: 20m



Alnus altissima
(*A. glandulosa*)
E: Tree of heaven
H: 20m



Billa columbiana
S: Cariseco
Manzano
H. 15-20m



Cinnamomum camphora
E: Camphor tree
H. 15-20m



Eucalyptus bimiralis
H. 20m



Eucalyptus globulus
E: Blue gum
H. 15-30m



Eucalyptus pulverenta
E: Sh. et mountain gum
H. 15m



Ficus gigantocyce
S: Caucho
H. 15-30m



Ficus retusa nitida
E: Indian laurel fig
H. 20m



Ficus tequendamae
S: Caucho
H. 20m



Fraxinus chinensis
S: Urapan
E: Ash
H. 20m



Ginkgo biloba
E: Maidenhair tree
H. 20m



Liriodendron tulipifera
E: Tulip tree
H. 25m



Platanus occidentalis
E: American cycamore
H. 25m



Populus nigra
E: Lombardy poplar
H. 20m



Sophora japonica
E: Japanese pagoda tree
H. 15m



Tipsoia tipu
E: Tipu tree
H. 20m



Zelkova serrata
E: Sawleaf zelkova
H: 20m



Eugenia jambos
(*Syzygium jambos*)
S: Pomaroso
H: 10m



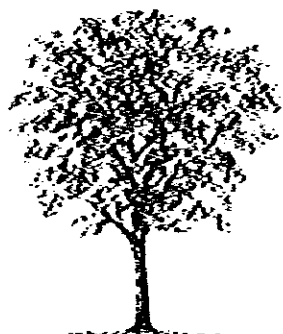
Hicoryna colombiana
S: Motilon
H: 8-10m



MEDIUM TREE

Normal Tree

Cedrela bogotensis
S: Cedro colorado
H: 12m



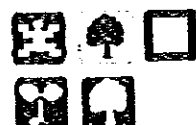
Ficus elastica
S: Caucho
E: Rubber plant
H: 8m



Juglans neotropica
S: Nogal
H: 10m



Croton bogotanus
S: Saogregao
H: 12m



Ficus spathulata
S: Caucho
H: 8m



Melaleuca leucadendron
E: Casput
H: 10m



Escallonia tilar
S: Tbar motlon
H: 10-20m



Ficus velutina
S: Caucho
H: 12m



Protea cinnamomeifolia
H: 10m



Quercus humboldti
S: Roble
H. 12m



Quercus phylliracoides
H. 10m



Rapanea guianensis
S: Cucharo
H. 15m



Salix humboldtiana
S: sauce
H. 12m



Flowering Interest

Alata palmifolia
S: Chiribirio
* yellow H. 10m



Acacia baileyana
E: Baileyana
* yellow H. 12m



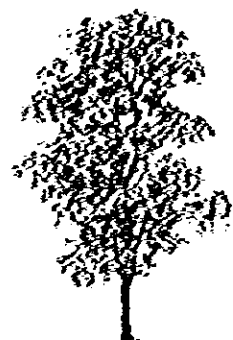
Acacia bracteata
S: Bracteata
H. 8m



Acacia longifolia
S: Acacia
E: Sydney golden wattle
* yellow H. 10m



Eucalyptus ficifolia
S: Eucalyptus pomarrosus
* Red H. 10m



Grevillea robusta
S: Grevillea robusta
E: Silk oak
* yellow H. 15m



Lafoszia punctifolia
* white H. 15m



Magnolia grandiflora
E: Southern magnolia
* white H. 10m



Prunus campanulata
* pink H. 8m



Prunus serotina
S: Cerezo capulí
white H. 10m



Prunus serrulata
P. indica
P. speciosa
P. yedoensis
white pink H. 10m



Myrica pubescens
S: Laurel de cera
H. 5m



Olea europae
E: Olive
H. 8m



Oreopanax bogotense
S: Mano de oso
H. 5m



Osmanthus fortunei
H. 4m



Persea americana
E: Avocado pear
H. 5m



Phyllanthus salicifolius
S: Cedrillo
H. 4m



Pitcosporum undulatum
S: Jazmín
white H. 5m



Prunus laurocerasus
E: Cherry laurel
H. 5m



Sabina chinensis
Juniperus chinensis
H. 8m



Sapium sebiferum
E: Chinese tallow tree
H. 8m



Scheffera bogotensis
S: Mano de oso, yuco
H. 3m



Tamarix parniflora
E: Tamarisk
H. 5m



Ternstroemia japonica
(*T. gymnanthera*)
H. 8m



Viburnum tinoides
S: Carrocho
H. 3m



Xylocarpus spiciferum
S: Cocoto
H. 4m



Bambusa endracea
S: Bambú
E: Bamboo
H. 7m



Flowering Interest

Abutilon insignis
E: Flowering maple
white yellow H. 4m



Abutilon verbasifolia
S: Chirlobito
yellow H. 5m



Carruba japonica
white, pink H. 6m



Cassia sasanqua
pink H. 4m



Cassia velutina
S: Alcaporro
Bright yellow H. 5m



Cercis canadensis
E: Eastern redbud
Purple H. 6m



Cusia cagoyi
S: Gacoy
white H. 4m



Cornus florida
E: Flowering dogwood
white H. 6m



Erythrina crista-galli
E: Cockspur, Coral tree
Red H. 5m



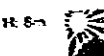
Menisium nobilis
Purple H. 6m



Osmanthus fragrans
E: Sweet olive
yellow H. 6m



Schinus molle
S: Falso pimienta
E: Peper tree
Greenish yellow H. 8m



Schinus terebinthifolius
E: Brazilian pepper tree
yellow to Red H. 6m



Sparmannia africana
S: Yilo
white H. 5-8m



Stewartia pseudocamellia
E: Japanese stewartia
white H. 6m



Tecoma stans
S: Chicla
E: Yellow bells
yellow H. 3m



Tibouchina lepidota
S: Siete cueros
E: Princess Honee
purple H. 6m



Vealea stipularis
S: Rague
pink H. 4m



SHRUB

Normal

Aucuba japonica
E: Japanese aucuba
H. 2m



Baccharis nitida
H. 2m



Buxus sempervirens
E: Box
H. 1.5m



Dodonaea viscosa
E: Hop bush
H. 1.5m



Elaeagnus pungens
E: Silverberry
H. 2m



Escallonia myrtilloides
S: Titar melton
H. 2m



Eucrymus japonica
E: Evergreen euonymus
H. 1.5-3m



Fatsia japonica
(*Ara'ca japonica*)
H. 2m



Ficus carica
S: Brevo, Higuera
E: Fig
H. 3m



Hesperomeles goudotiana
S: Martino
H. 2m



Ilex cornuta
E: Chinese holly
H. 1.5-3m



Ligustrum obtusifolium
E: Privet
H. 2-3m



Mahonia japonica
H. 1.5-3m



Phacelia tenax
S: Lino de N., Zelandia
E: N. Zealand flax
H. 3m
Pittosporum tobira
S: Tobira
E: Tobira
H. 2-3m



Prunus laurocerasus
E: English laurel
H. 1m



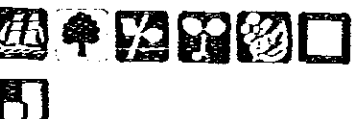
Viburnum japonicum
H. 1-2m



Viburnum suspensum
E: Sandankwa viburnum
H. 2-3m



Viburnum tinus
E: Laurusting
H. 2m



Flowering Interest

Azalea grandiflora
white H. 1.5m



Azalea macrocarpum
E: Flowering maple
red, yellow H. 1.5m



Azalea pictum
E: Flowering maple
red to yellow H. 2.0m



Acalypha godseffiana
red, green leaves H. 2m



Azalea sp.
white, red, pink H. 0.3-1.5m



Barradosia spinosa
S: Espino
pink H. 1-2.0m



Boloperone guttata
E: Stamp plant
white, spotted purple H. 1.0m



Buxopatia glutinosa
S: Charne
red, purple H. 1.5m



Calistemon lanceolatus
S: Calistemo
E: Bottlebrush
red H. 3m



Calluna vulgaris
E: Scotch heather
non-pink H. 0.3-0.5m



Cassia torrensosa
S: Akapano pequinno
yellow H. 2.5m



Cavendishia cordifolia
S: Uva camerocha
pink H. 1.0m



Cestrum elegans
S: Cestrum
purple H. 1m



Cotoneaster dammeri
E: Bearberry cotoneaster
red berry H. 0.3m



Cotoneaster franchetti
red berry H. 1.5m



Cotoneaster horizontalis
E: Rock cotoneaster
red berry H. 0.3m



Oxycaria agatiflora
S: Pajarito
yellow H. 1.5m



Daphne odora
E: Winter daphne
pink H. 1m



Ipocis ingressa
S: Ogarito
red H. 1m



Fejoa sepioides
S: Fejoa
E: Pineapple guava
white H. 3m



For-sythia laevis
yellow H. 2.0m



Fuchsia sp.
red, pink, white
H. 0.3-1.5m



- Gardenia tagua*
S: Tagua
* white H. 2m
- Gardenia jasminoides*
var. *grandiflora*
* white H. 1.2m
- Gardenia jasminoides*
var. *radicans*
* white H. 0.3m
- Grevillea banksii*
S: Grevillea roja
* red H. 2m
- Habe* sp.
* white, pink, blue
H. 0.5 - 1.0m
- Hibiscus syriacus*
E: Rose of Sharon
* white, purple, pink H. 2m
- Hibiscus mutabilis*
E: Confederate rose
* pink H. 1-3m
- Hibiscus rosa-sinensis*
E: Tropical hibiscus
* pink, red H. 3m
- Hydrangea macrophylla*
E: Bigleaf hydrangea
* purple H. 1.5m
- Hypericum daniense*
* yellow H. 0.5m
- Hypericum patulum*
S: Hyperico
* yellow H. 0.5m
- Hypericum thuyoides*
S: Chites
* yellow H. 0.4m
- Impatiens balsamina*
E: Balsam
* white, pink, rose H. 1m
- Jasminum odoratissimum*
* yellow H. 2m
- Jasminum polkesens*
E: Star jasmine
* white H. 2m

- Lantana camara*
* Yellow, Red, Orange
H. 3m
- Lederbergia socuieroides*
S: Mal flores
* Purple H. 2m
- Malvastrum arboreum*
* Red H. 3m
- Philadelphus inodorus*
E: Mock orange
* white H. 2m
- Plangago capensis*
* blue H. 2m
- Poinsettia* sp.
(*Euphorbia pulcherrima*)
E: Spurge shrub
* red H. 2.5m
- Punica granatum*
E: Pomegranate
* red H. 2-3m
- Pyracantha coccinea*
S: Holly
* orange red H. 2-3m
- Raphiolepis indica*
E: India hawthorn
* white H. 0.5m
- Rhododendron* sp.
* white pink
H. 0.3-1.5m
- Rosa rugosa*
E: Roman rose
* white, pink, yellow
H. 1.2m
- Rosa* sp.
E: Rose
* white, pink, red, yellow
H. 1-2m

- Solanum lycioides*
S: Gurrubo
* Purple H. 2m
- Spartium junceum*
* yellow H. 3m
- Spiraea cantoniensis*
* white H. 1.5m
- Spiraea thurbergii*
* white H. 1.5m
- Streptosolen jamesonii*
E: Marmalade bush
* orange, yellow H. 1m
- Sumbucus nigra*
* white H. 3m
- Tibouchina mollis*
S: Mayo
* purple H. 1.5m
- Tibouchina semidecandra*
S: Siete cueros brazil
* purple H. 2-3m
- Viburnum plicatum*
* white H. 3m
- Weigela hortensis*
* red, pink H. 2m

VINE AND CLIMBER

- Bignonia* sp.
E: Trumpet vine
* yellow, orange red
- Ficus pumila*
E: Creeping fig
* Dark green
- Hedera*
E: Algerian ivy
* shiny green

Hedera helix
E: English ivy
Dark green



Lonicera japonica
E: Japanese honeysuckle
white H. 0.3 - 0.6m



Lonicera serpyllifera
Trumpet honeysuckle
orange yellow



Passiflora edulis
E: Passion fruit
white, purple



Tecora capensis
(*Tecora capensis*)
E: Cape honeysuckle
orange red



Trachelospermum jasminoides
(*Trachelospermum jasminoides*)
E: Star jasmine
white



Hedera helix
E: English ivy
dark green H. 0.3 - 0.5m



Hypericum calycinum
E: Aaron's beard
yellow H. 0.3m



Juniperus horizontalis
E: Prostrata juniper
Dark green H. 0.3 - 0.6m



Lonicera japonica
E: Japanese honeysuckle
white



Lonicera nitida
E: Box honeysuckle
Creamy white H. 0.3 - 0.6m



Pachysandra terminalis
E: Japanese spurge
Dark green H. 0.3m



Pennisetum clandestinum
S: Kikuyo
E: Kikuyo grass
green H. 0.1 - 0.3m



Sedum crassifolia
E: Stone crop
red H. 0.3 - 0.5m



Vinca major
E: Periwinkle
lavender blue H. 0.6m



Vinca minor
E: Dwarf periwinkle
lavender blue H. 0.3m



Nymphaea alba
S: Lotus
E: Water lily
H. 0.3 - 0.5m
Yucca elephantipes
S: Bayoneta
E: Giant yucca
H. 5m



GRANDCOVER PLANTS

Achtotis stoechadifolia
E: African daisy H. 0.5m
white, violet, purple



Cotoneaster dammeri
(*C. humifusus*)
E: Barberry cotoneaster
white, red H. 0.2m



Gardenia jasminoides
Var. *Radicata*
white H. 0.3m



Hedera canariensis
E: Algerian ivy
Shiny green H. 0.3m



PLANTS FOR SPECIAL INTEREST

Agave americana
E: Century plant
yellowish green H. 1.5m



Arundo donax
E: Giant reed
H. 1.5m



Cordyline terminalis
S: Palma roja
red, yellow H. 1.5 - 2m



Cyathea caracasana
S: Palma boba
E: Tree fern
H. 3 - 4m



Cyperus papyrus
S: Papiro
E: Papyrus
H. 2m



Dicranella selowiana
S: Palma Boba
E: Tree fern
H. 3 - 4m



FLOWERING PLANT

Annuals

Ageratum houstonianum
Annarathus
Antirrhinum majus
Browallia americana
Calendula officinalis
Calistephus chinensis
Celosia
Centaurea cyanus
Clarkia
Convolvulus tricolor
Coreopsis tinctoria
Cosmos
Delphinium ajacis
Dianthus barbatus
Dianthus chinensis
Dimorphotheca
Eschscholzia californica
Calliandra pulchella
Gypsophila elegans
Helianthus annuus
Helichrysum bracteatum
Iberis
Impatiens holsti
Ipomoea
Lathyrus odoratus
Limonium
Linaria maroccana
Linum grandiflorum
Lobelia erinus
Lobularia maritima
Lupinus nanus
Matthiola incana
Marrubium tigrinus
Myosotis sylvatica
Nemesia strumosa
Nicotiana
Papaver rhoeas

Papaver nudicaule
Petunia hybrida
Phlox drummondii
Portulaca
Primula malacoides
Quamoclit pennata
Salvia splendens
Scabiosa atropurpurea
Tagetes
Thunbergia alata
Torenia fourieri
Tropaeolum majus
Verbena hybrida
Viola cornuta
Viola tricolor hortensis
Zinnia

Perennials & Biennials

Achillea
Aethionema
Alyssum saxatile
Anemone hupehensis japonica
Anthemis tinctoria
Aquilegia
Arabis
Arctotis
Aster
Astrife
Aubrieta deltoidea
Bergenia crassifolia
Bellis perennis
Bilbergia
Bulbineella robusta
Calceolaria integrifolia
Campanula
Catheranthus roseus
Ceratostigma plumbaginoides
Chrysanthemum frutescens
Chrysanthemum maximum
Chrysanthemum monifolium
convallaria majalis
Coreopsis grandiflora
Cynoglossum amabile
Delphinium
Dianthus
Dicentra spectabilis
Digitaria purpurea
Echinops exaltatus
Francoa ramosa
Calliandra grandiflora
Gazania
gerbera jamesonii
Helianthemum autumnale
Helopsis scabra
Heliopsis arborescens

Helleborus
Heuchera sanguinea
Hosta
Hummelmannia fumariifolia
Iberis sempervirens
Kriphofia uvaria
Lampranthus
Limonium
Lobelia cardinalis
Muhlenbergia jalapa
Paeonia, herbaceous
Papaver orientale
Pelargonium domesticum
Pelargonium hortorum
Penstemon glaxinioides
Phlox paniculata
Phlox subulata
Platycodon grandiflorum
Primula malacoides
Primula polyantha
Rehmannia angulata
Romneya coulteri
Rudbeckia hirta
Saxifraga
Sedum spectabile
Senecio creentis
Stokesia laevis
Streptia reginae
Tibonia rotundifolia
Tulbaghia fragrans
Viola cornuta
Viola odorata

Bulbs & Bulblike Plants

Vines

Agapanthus
Amaryllis belladonna
Anemone coronaria
Begonia
Calochortus
Canna
Clivia miniata
Colchicum autumnale
Crocus
Cyclamen persicum
Dahlia
Eranthis hyemalis
erythronium
Freesia
Fritillaria
Gladolus
Hemerocallis
Hippeastrum
Hyacinthus orientalis
Iris
Iris kaempferi
Iris unguicularis
Lilium
Lycoris
Moraea
Muscari
Narcissus
Nymphaea
Ranunculus asiaticus
Schizostylis coccinea
Scilla hispanica
Sparaxis tricolor
Tigrida pavonia
Tulpa
Watsonia
Zantedeschia
Zephyranthes

Antigonon leptopus
Bean
Bougainvillea
Calonyction aculeatum
Cobaea scandens
Dolichos lablab
Dolichos lignosus
Phaedranthus buccinatorius
Trachelospermum jasminoides
Wisteria

