

Commemorative Symbol Zone

By means of creation of scenery whereby a grand effect of nature is brought into the center of the city, the Commemorative Symbol Zone, the center of the entire park, will be a tangible means whereby the original intention of the Colombian planners, namely to create a memorial park, will be realized. It is centrally located with respect to each special-purpose zone where a variety of recreational activities will take place, and will attract park visitors from all these zones, and provide them with a place for rest and relaxation. For the throngs of people who will gather in the National Ceremonial Plaza, it will serve as a background of sorts and a means of adjusting the real and perceived density of people and prevent injuries such as might be caused by overcrowding. It also will have a perfectly unobtrusive function of providing a place of refuge in the event of a catastrophe which forces large numbers of the population from their homes. By artificially making forests and a lake it will help insure a good environment in the future in keeping with growth of the city of Bogota, and will help maintain ecological balance.

Commemorative Landscape

By artfully incorporating, through the mystically endowed forests, the expansive lawns spreading in all directions of the compass, and the distant boundary lines where water touches the sky, the grandeur and mystique of nature, which surpasses the life cycle of man, park scenery possessing dignity and magnificence befitting a memorial park will be created. These natural elements are of importance for ordinary parks as well, but in the case of the Simon Bolivar Great Memorial Park these elements are scaled up, to approach their limits in terms of function and technology, and further, through their inclusion of long-range vistas which further emphasize grandeur, displace the surrounding urban environment to the extent that visitors in the park are totally caught up in the natural environment it offers.

Sub-Zoning

The following sub-zones are distinguished within the Commemorative Symbol Zone.

- Conservation greenery zone: It is proposed that the recreation within the natural ecological environment be such relatively static types of

recreation as walking in the woods, observation and study of nature, etc., provided, it can also be used as field athletics courses.

- Windbreak greenery zone: The tall trees in this zone for protection against the south-east wind will also provide an appropriate atmosphere for enjoyment of walks.
- Aesthetic greenery zone: Resting, group gatherings and other activities are suitable amidst the sparsely planted tall trees of this zone.
- Lawn zone: This is a place that will allow for comparatively active type recreation activities ranging from light sports to group and family activities.
- Lake zone: Linking the Temple and Urban Complex in a diagonal manner, the lake will serve to increase the apparent scale of park scenery and also will provide a good deal of diversity, through the boating on it, fountains, reflection of buildings so as to make them appear larger, and the rich plant life in and at the edge of the water.
- Entrance zone: The section provided as the park's major entrance and exit, on the east, will be where the park administration office, information center, and similar or related facilities will be located, and will be so arranged as to attract people into the park, and orient them toward their destinations, by affording views of the park's attractions in the distance.

Entrances and Exits

In addition to the main park entrance, in the east there will be the following sub-entrance and exits.

- South gate: Connects the Urban Complex and Symbol Zone by a bridge over Calle 53.
- Southwest gate: Provided for visitors using Urbanizacion de Salitre, and the south side bus stop.
- West gate: Provides access to the Salitre Sports Complex by means of a bridge over Avenida 68. Bus stop to be provided below the bridge. Can be used for getting to the Symbol Zone and Sports Complex.

- North gate: The gate include a plaza which is continuous with the Urban Ribbon, at the intersection of Calle 63 and Avenida 68. Can be used by arrivals using cars on Avenida 68.
- East gate: Approached from Parque el Lago by means of a pedestrian bridge located at the side of the fly-over crossing Calle 63.
- Urban Ribbons: Free access is to be provided from the Urban Ribbons which is planned to follow Calle 63 on the north side of the Symbol Zone but in consideration of park management, a degree of control is necessary, and it is planned that access and egress is primarily to be by means of the plaza.

Circulation and Visual Structure

Movement within the park will primarily be by walking. It is generally the case that the distance a person will walk in a park is 1 – 1.5km but it is also possible to walk much longer distances depending on the scenery, and the facilities which the people want to go to.

The circulation routes within the Symbol Zone is composed of two circuits and the routes from the gates to the lake.

- Lakeside circuit: Walking along this circuit will enable visitors to enjoy scenes of the trees on the far side of the lake, fountains, the Temple, islands, etc., now revealing and now concealing their objective; the distance between the visitors and the lakeside will vary as they progress along the circuit.
- Grand circuit: This route, which circles the artificial hills surrounding the Symbol Zone, in addition for being planned for use by service vehicles between sub-gates, will also be good for jogging and rollerskating.
- Gateways: These routes will be inclined and will extend between the sub-gates and the central lake, passing through the artificial hills. Arrangements will be such that direct view of the contents of the park will be avoided on these routes, and once the hills have been ascended, the surprise with which the grand sights below can be seen will heighten the visitors' sense of arrival in the park.

Fig. 39 Commemorative Symbolic Zone



Colombian History Museum

Objectives

For the education and enlightenment of the general public, easy-to-understand display methods will be used to present the history of Colombia up to and concentrating on the founding of Gran Colombia in the age of Simon Bolivar.

Design Policy

With the walkway between the Colombian History Museum and the Latin American Anthropology Museum as a Liberty Ribbon, it will have along the way outdoor exhibits matching the age given on the mall to enable visitors to have the feeling of

having personally experienced something of ages gone by, and to integrate, spatially and conceptually, the interiors of the museums and outdoor space linking them.

Because this is located on the north-south axis of the National Ceremonial Plaza need is felt for an eye-stopping monument but in order to maintain harmony with the park scenery, an architectural structure should preferably not be openly presented but instead monumentality is to be expressed through Earth Architecture whereby the total structure is integrated with nature.

Spatial Program

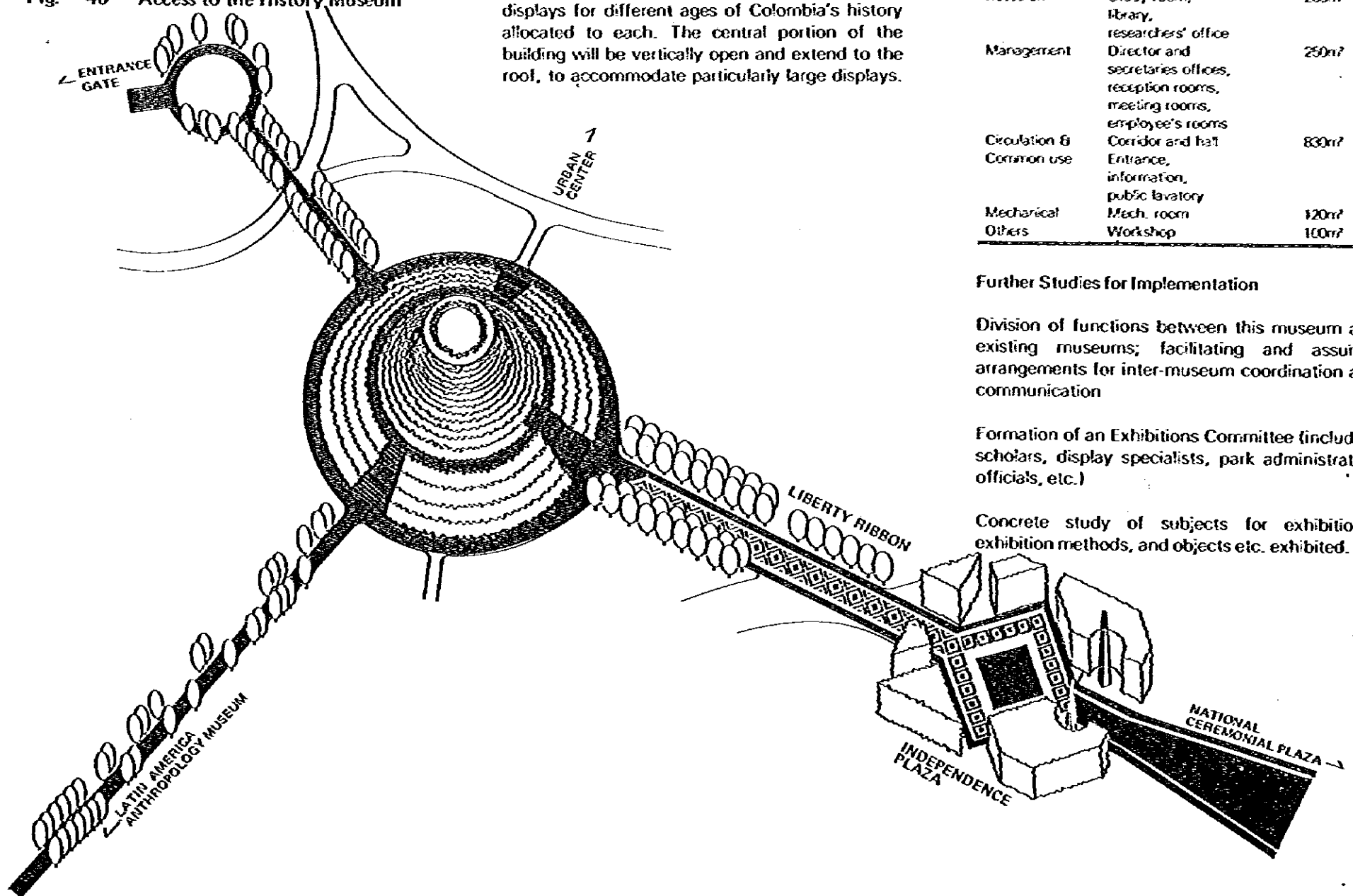
The museum interior is to be of three levels, with displays for different ages of Colombia's history allocated to each. The central portion of the building will be vertically open and extend to the roof, to accommodate particularly large displays.

Because the roof will be the point of highest elevation in the entire park, arrangements should be made so that visitors may go there and use it as an observation terrace.

Table - 21 Room Requirement of History Museum

Function	Room	Space
Site Area		10,000m ²
Building Area		2,000m ²
Lot Occupancy Ratio		20.0%
Building Floor Area		3,000m ²
Exhibition	Permanent ex. rm temporary ex. rm	1000m ²
Store	Safekeping, preparation, packing, storage	500m ²
Research	Study room, library, researchers' office	200m ²
Management	Director and secretaries offices, reception rooms, meeting rooms, employee's rooms	250m ²
Circulation & Common use	Corridor and hall Entrance, information, public lavatory	830m ²
Mechanical	Mech. room	120m ²
Others	Workshop	100m ²

Fig. - 40 Access to the History Museum

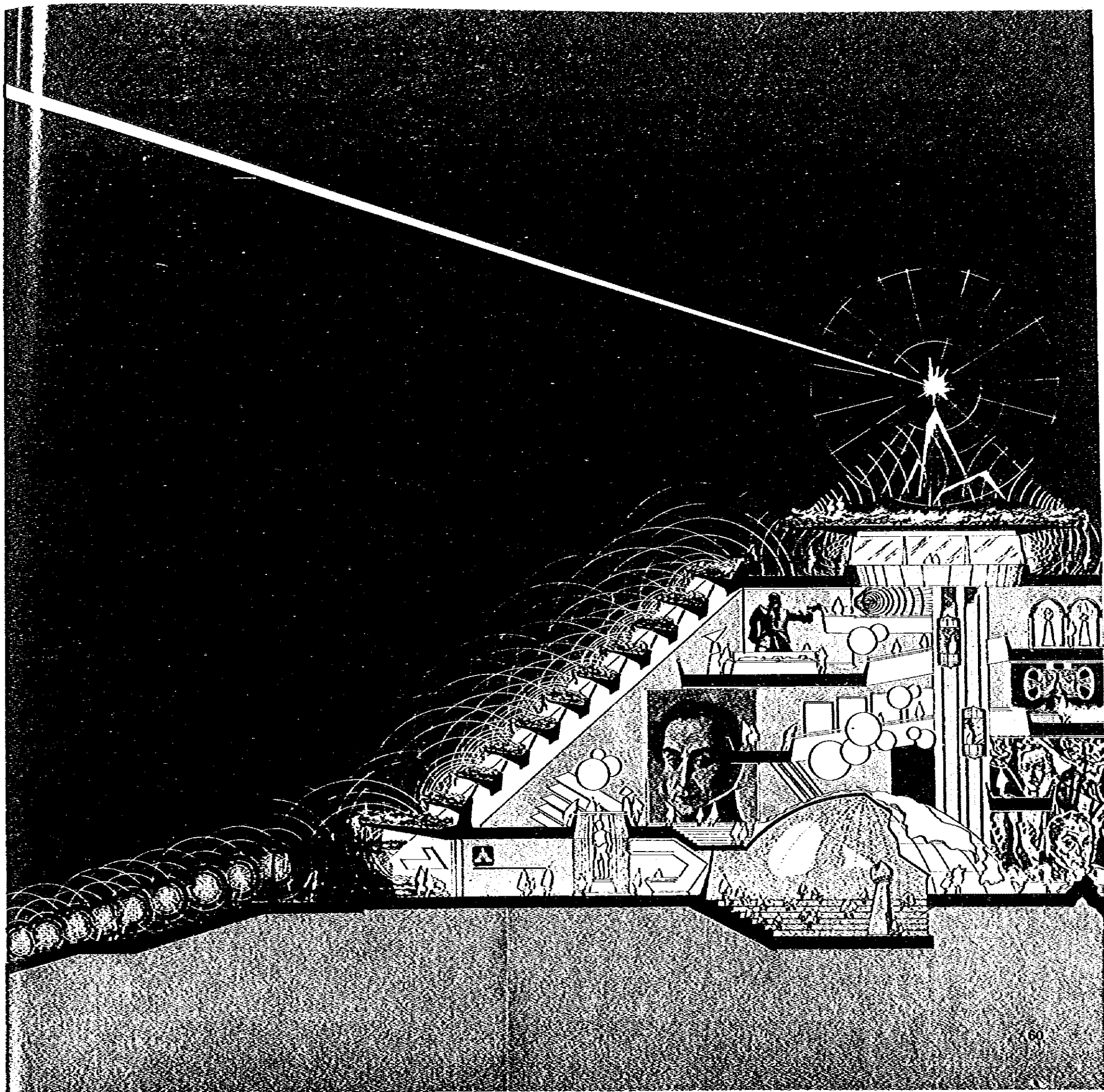


Further Studies for Implementation

Division of functions between this museum and existing museums; facilitating and assuring arrangements for inter-museum coordination and communication

Formation of an Exhibitions Committee (including scholars, display specialists, park administration officials, etc.)

Concrete study of subjects for exhibitions, exhibition methods, and objects etc. exhibited.



Religious Museum

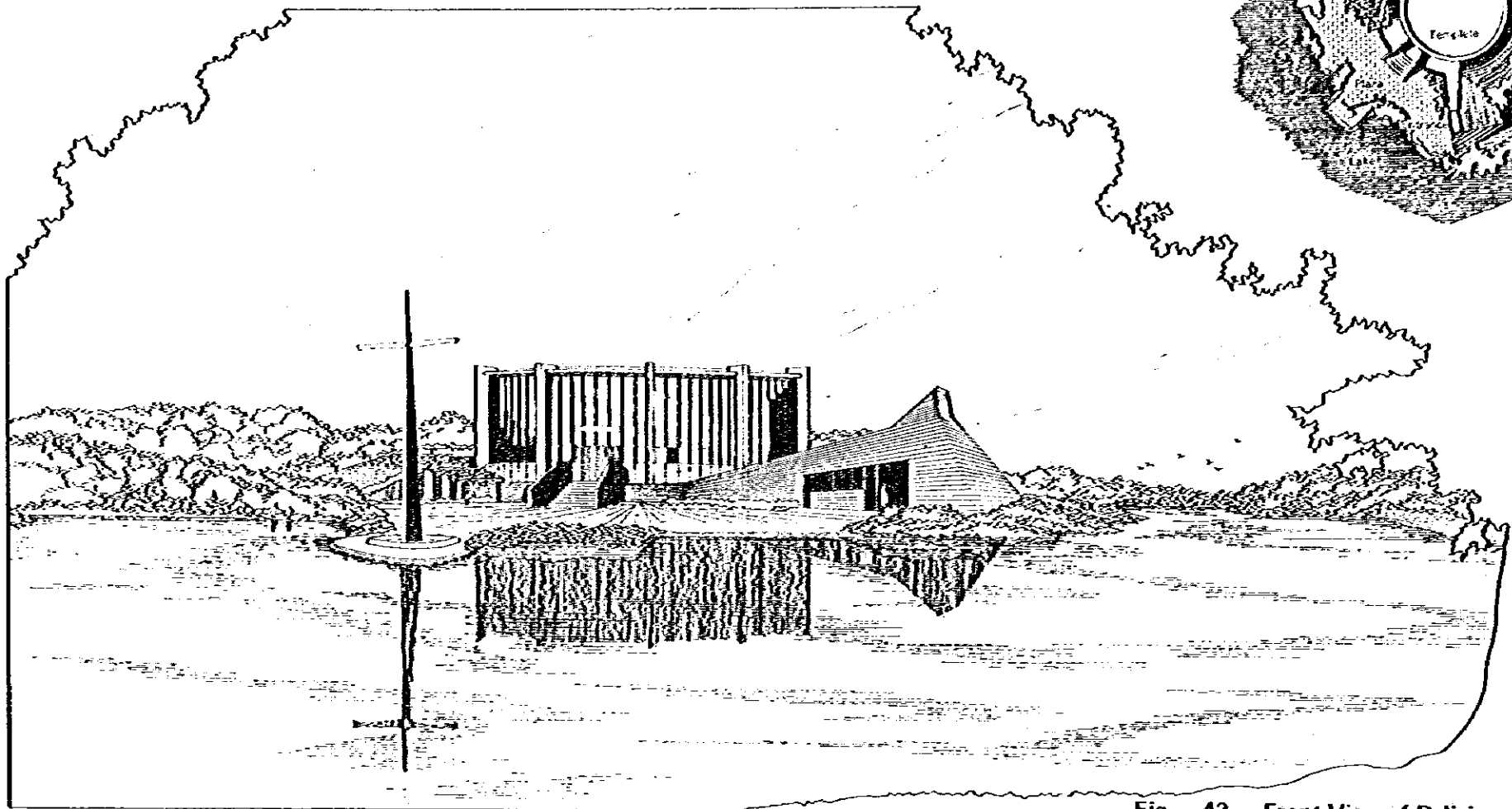


Fig. - 42 Front View of Religious Museum

Objectives

In order to make the Temple which was constructed in connection with the 1969 international Catholic conference and to commemorate the visit the Pope, to be more conveniently and frequently used by the people, on the occasion of construction of the park, a Religious Museum is to be constructed in conjunction with the Temple, so as to harmonize with the rest of the park and add an art museum to the city's cultural assets.

The museum is to display paintings, sculpture, relics, religious articles and the like.

Design Policy

While seeking to harmonize with the Temple which by nature is endowed with symbolic meaning, and with the park landscape, the building is to be designed so that it has prominent form, and combines well with its surroundings.

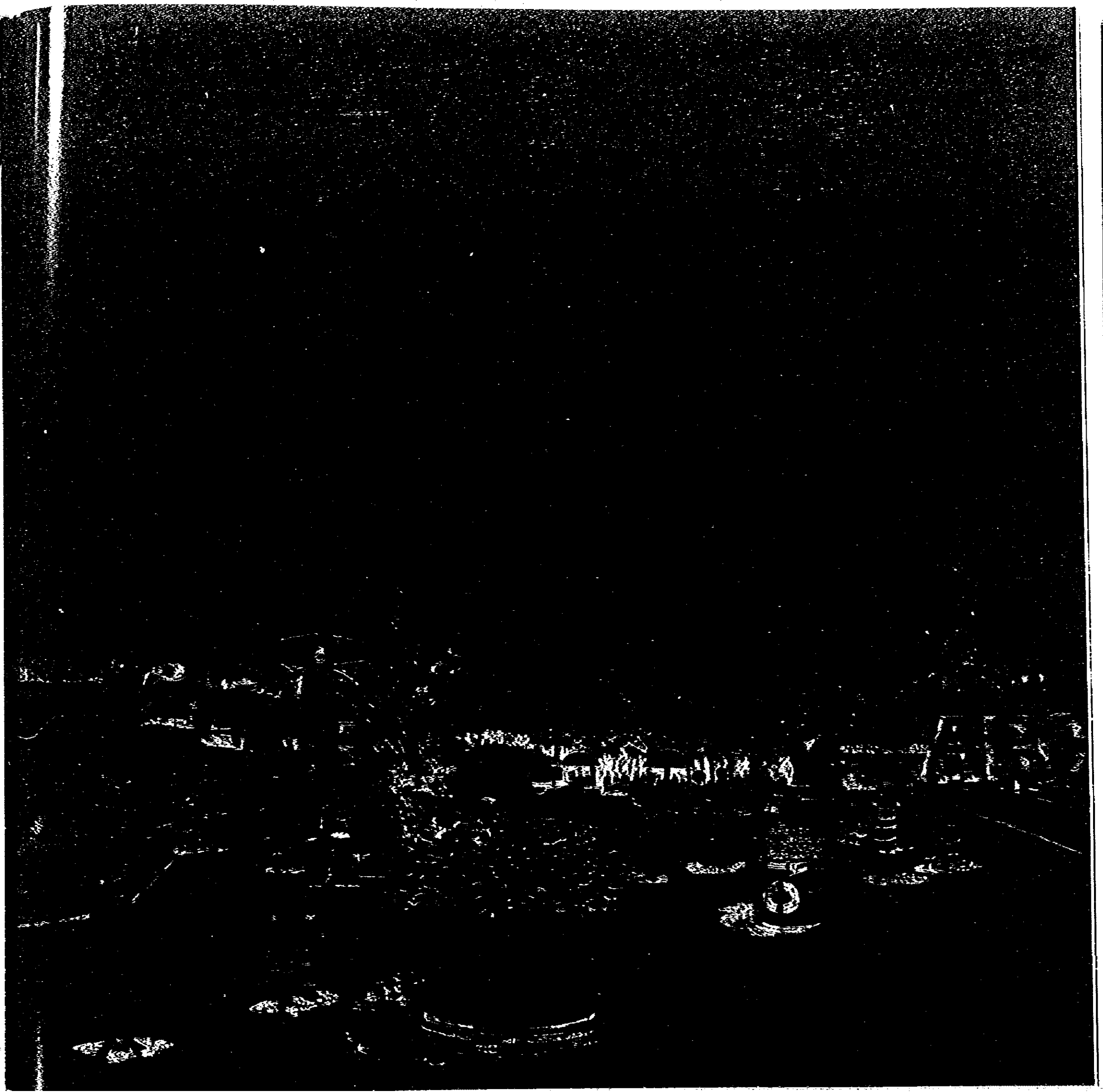
The Religious Museum will be fan-shaped, spreading around the round-form temple, and enclose between them a courtyard garden; planting on the roof will be provided to form one part of the park landscape. Within the museum, control of a combination of natural and artificial lighting will be achieved in order to create a religious atmosphere.

Spatial Program

The museum's display space is to be limited to one level. Paths will enable visitors to circle the temple. Administration offices, storerooms and service facilities will be located in the rear to perfectly separate activities associated with them from the worshippers and visitors.

Table - 22 Room Requirement of Religious Museum

Site Area		10,000m ²
Building Area		1,500m ²
Lot Occupancy Ratio (Including Temple)		15.0%
Building Floor Area		30.0%
		1,500m ²
Function	Room	Space
Exhibition	Galleries	750m ²
	Store	175m ²
Research	Safeguarding, preparation, packing, storage	
	Study room, office	100m ²
Management	Director and secretaries offices, reception rooms, meeting rooms, employee's rooms	100m ²
	Circulation & Common use	250m ²
Mechanical Others	Corridor and hall Entrance information, public lavatory	
	Mech. room Workshop	75m ² 50m ²



Development Framework

10-year Development Plan

It is suggested that the Simon Bolivar Park Development and Improvement Projects extend over a ten-year period from 1981 to 1990, the target year. This period can be divided into three phases: Phase I (1981–1982), Phase II (1983–1986) and Phase III (1987–1990). The following is an outline of the work items for the different development phases.

Phase I (1981–1982)

As multifaced preparatory activities, during this phase there can be establishment of an implementation organization, studies of feasibility of facilities to be introduced, determination of facility content and the facility provision program, completion of detailed design, preparation of a nursery, etc.

While the preparation work is progressing, urgent implementation of work on the National Ceremonial Plaza shall take place for the strategic reason that the ceremony for the 200th anniversary for the birth of Simon Bolivar must be held in 1983 at the plaza.

Phase II (1983–1986)

Since the 200th anniversary of the birth of Simon Bolivar and the Football World Cup are included within this period, it is necessary that there be a program for provision in stages of the corresponding facilities. The development during this phase should concentrate on core facilities that will strongly impress upon the citizens the distinctive features of the Simon Bolivar Great Memorial Park as based on the master plan and service facilities sufficient to accommodate the number of visitors expected in the initial period as well as provision of the main park infrastructure (landscaping, infrastructure, main park roads, etc.). As for the planting, which will provide the major elements of the park scenery, there will have to be some transplanting of mature trees in the central area of the park and at other main scenic points.

Phase III (1987–1990)

In the third phase the park and its environment will be perfected through provision of more park facilities, large-scale greenery formation, expansion of planting for landscaping purposes, provision of small-scale landscaping facilities, park lanes, small plazas, micro land formation, etc. Also during this period a diversified use program is to be implemented on the basis of the know-how accumulated in Phase I and II with respect to operation and management.

Post Phase III (1991–)

After Phase III the content of the park facilities will be reviewed on the basis of new social needs, study will be made of facility demand resulting from extension of the use program, and new park development plans will be drafted and implemented.

Development Area

The figures for areas that will be involved in the development and improvement works to be carried out in the context of the 10 year development plan are as follows.

Table – 23 Development Area List

Zone	Development Area		
	Development Area (ha)	New DevL. (ha)	Improvement (ha)
Grand Mall Zone	43.0	43.0	
Commemorative Symbol Zone	94.2	94.2	
Static Recreation Zone (Parque el Lago)	16.1	3.1	13.0
Cultural Zone (Mi Tierra)	21.6	21.6	
Amusement Zone (Parque el Salitre)	40.1		40.1
Sports Recreation Zone (Urúbad deportiva)	44.4	19.1	25.3
Botanical Garden	16.9		16.9
Urban Complex Zone	24.7	24.7	
Total	301.0	205.7	95.3

* Entrance zone has been included in the Commemorative Symbol Zone and Amusement Zone.

For general index of target, the areal ratio of development for each phase is proposed as follows: Phase I, 10%; Phase II, 60%; Phase III, 100% of Whole Park Area.

Planned number of visitors

The following figures have been set as the target number of visitors to each of development phases on the basis of visitors demand analysis. The total number of visitors in the target year 1990 has been set at 46.6 million and at the peak hour on a peak day in 1990, 14.9 thousands of visitors will use the whole park area. Among those visitors, 23% will be expected to spend time in the Commemorative Symbol Zone and Urban Mall. target number of visitors for the development period has been estimated on the basis of prospective development area ratio to Whole Park Area.

Table – 24 Expected Number of Visitors by Year (Unit: 1000 persons)

Year	Demand of Visitors	Visitors to Commemorative Symbol Zone and Urban Mall	Visitors to the other park areas
1980	32,920.2	—	8,377.0
1981	34,737.9	—	—
1982	35,609.3	8,138.5	27,470.8
1983	37,034.3	—	—
1984	38,329.0	—	—
1985	39,668.7	—	—
1986	41,064.1	9,368.5	31,675.6
1987	42,436.7	—	—
1988	43,883.0	—	—
1989	45,285.4	—	—
1990	46,626.1	10,727.4	35,898.7

The premises for estimation are as follows:

1. Density in the Urban Mall is two times that of the relative zone.
2. Visitors for special events and/or ceremonies are not considered.
3. Operation area will be expanded at the end of each development phase.

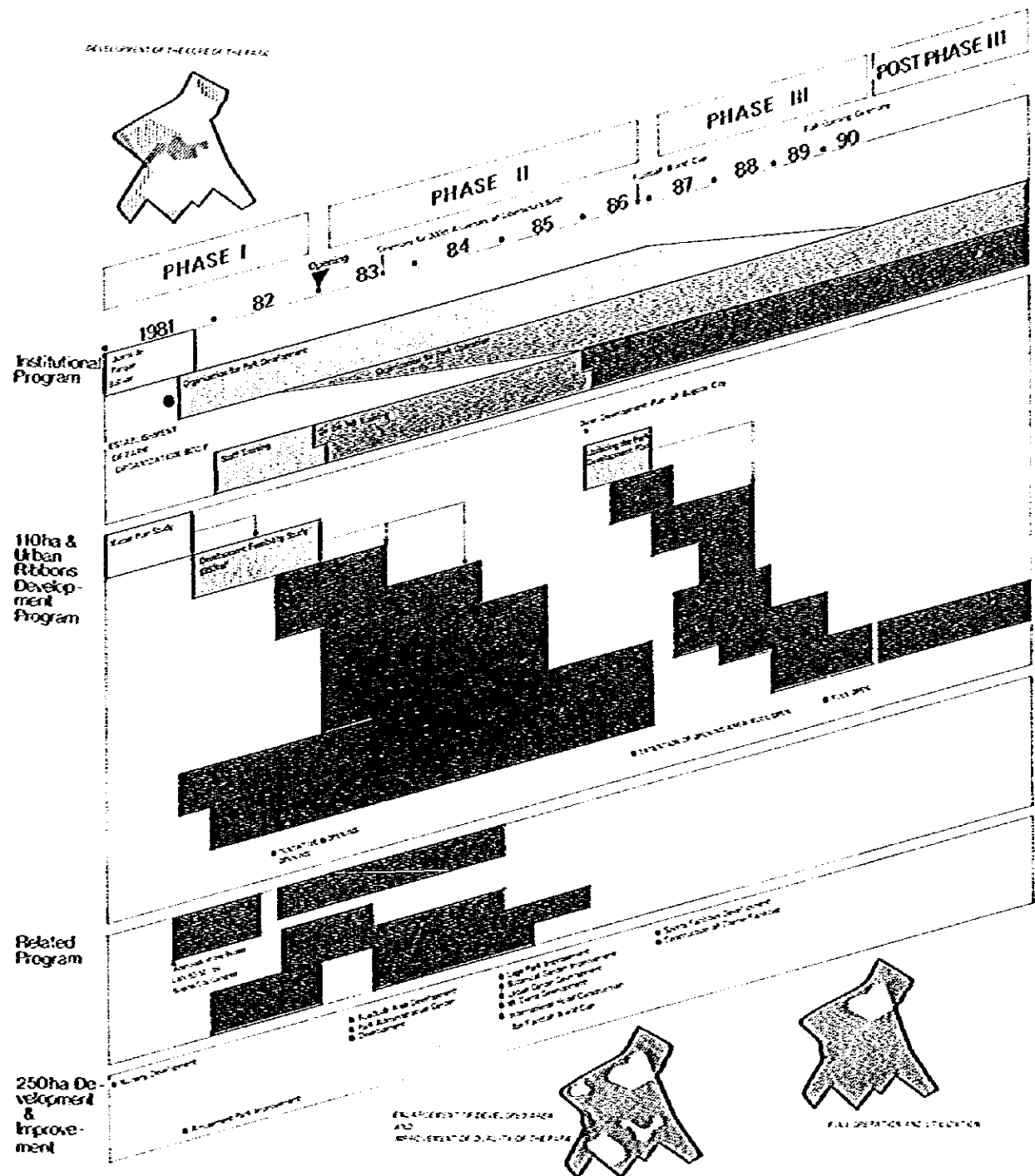
Implementation Program

Policy for Improvement of Existing Parks

Even during the implementation period of the park development, it is necessary that existing parks such as El Lago, El Salitre, Unidad Deportiva and Jardín Botánico shall be opened to public as usual, for supplying valuable recreational spaces in Bogotá. On the basis of the well considered implementation plan, these existing parks and facilities should be improved, extended and/or relocated, and be integrated to Simon Bolivar Park finally, in accordance with the development strategies and improvement plan set forth on this Master Plan. The following is a improvement policy for existing parks and facilities.

- Improvement and completion**
 To be carried out for El Lago and the mechanical attractions' area of El Salitre, for a more clear definition of area and reinforcement of actual uses and character, substantially by means of greenery planting.
- Extension**
 That will affect the sports recreation zone by expanding the Unidad Deportiva El Salitre through the incorporation of 19.08 ha of Distrito's land on two adjoining plots. This area should include the new recreational pool, the hockey rink transferred from El Salitre, sport fields extension (soft-ball, tennis, basket-ball, volley-ball) and the park's own facilities including the administration tower, nursery, workshops, and greenhouses.
- Modification**
 On the part of El Salitre park that is located within the Grand Mall Zone modification is to be made to accommodate more significant facilities related to the core of the park and the ceremonial plaza, like the museums of science and transportation with extensive open space exhibition areas. Provision is made also for the Urban Ribbon. In between those facilities and the recreational area will be located the small Children's Kingdom.

Fig. - 43 Implementation Program

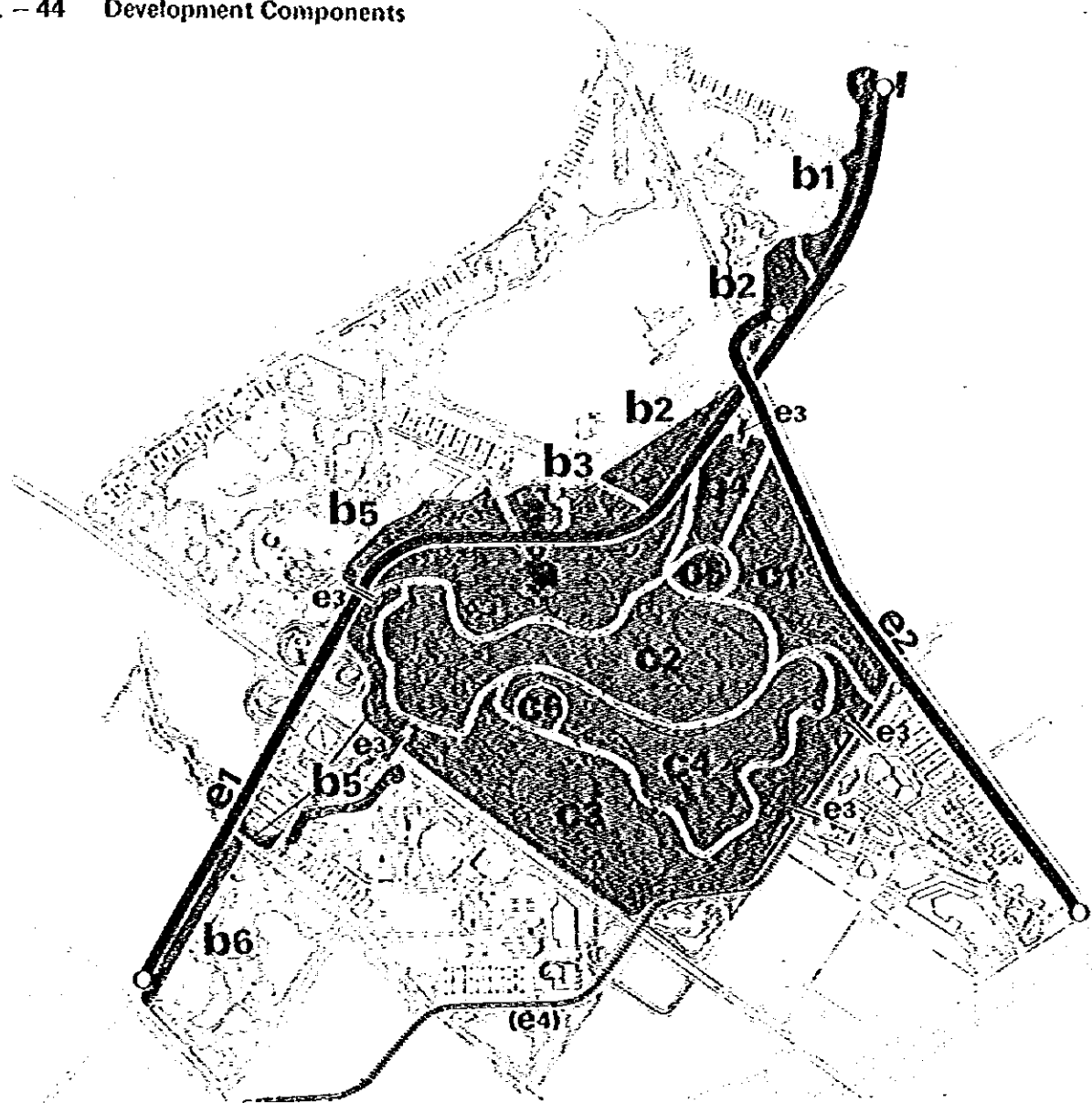


Development Plan

Table - 25 Whole Project Catalog

Development Project	Development Area (ha)	Development Year									Development Cost (Colombian Pesos)			Development Cost by Phase (Colombian Pesos)				
		Phase I 81	82	83	Phase II 84	85	86	87	Phase III 88	89	90	Total	Construction	Engineering	Phase I	Phase II 1	Phase II 2	Phase III
A National Ceremonial Plaza																		
Development	17.0	■	■									315,068,000	268,160,000	46,928,000	315,068,000	—	—	—
B Urban Ribbon Development																		
B-1 Cultural Ribbon	3.5				■	■						73,079,125	62,196,000	10,884,125	—	73,079,125	—	—
B-2 Chronological Ribbon	5.9				■	■						102,026,425	86,831,000	15,195,425	—	102,026,425	—	—
B-3 Actual Ribbon	1.8				■	■						45,098,775	39,233,000	6,865,775	—	45,098,775	—	—
B-4 Liberty Ribbon	2.0				■	■						30,749,750	26,170,000	4,579,750	—	30,749,750	—	—
B-5 Youth Ribbon	11.5				■	■						158,229,025	131,663,000	23,566,025	—	158,229,025	—	—
B-6 Natural Ribbon	1.3				■	■						18,663,700	15,824,000	2,779,700	—	18,663,700	—	—
C Commemorative Symbol Zone																		
Development	91.2											870,436,475	749,797,000	129,639,475	—	371,181,325	349,079,575	150,175,575
C-1 Main Gate Area	13.3					■	■					149,243,800	127,016,000	22,227,800	—	149,243,800	—	—
C-2 Lawn Land	28.1	□	■	■	■	■						129,705,900	110,368,000	19,317,900	—	—	129,705,900	—
C-3 Wood Land	36.1		■	■	■	■						219,373,675	166,701,000	32,672,675	—	—	219,373,675	—
C-4 Lake and Lakeside	13.2	□	□	□	□	□	■	■	■			150,175,575	127,809,000	22,366,575	—	—	—	150,175,575
C-5 Colombian History Museum	2.0				■	■						160,873,960	136,914,000	23,960,960	—	160,873,960	—	—
C-6 Religious Museum	1.5				■	■						61,063,575	51,969,000	9,094,575	—	61,063,575	—	—
D Infrastructure Development																		
Development	(137.2)											261,489,200	222,544,000	38,945,200	76,300,450	100,510,340	84,648,410	—
D-1 Earth Work		■	■	■	■	■	■					32,254,925	27,451,000	4,803,925	9,730,175	3,504,220	18,620,460	—
D-2 Storm Water Drainage Work			■	■	■	■	■					52,861,500	41,980,000	7,871,500	19,521,550	14,020,000	19,309,560	—
D-3 Fresh Water Supply Work			■	■	■	■	■					15,611,060	13,266,000	2,325,060	5,661,750	6,158,175	3,801,125	—
D-4 Sanitary Sewerage Work			■	■	■	■	■					19,249,625	16,375,000	2,875,625	14,000,125	2,491,525	2,745,975	—
D-5 Electrical Work			■	■	■	■	■					108,417,250	92,270,000	16,147,250	11,167,200	66,351,075	30,838,975	—
D-6 Telecommunication Work			■		■	■						33,113,860	28,182,000	4,931,860	15,259,660	7,582,275	9,271,925	—
E Road Improvement and Development																		
Development												1,137,765,425	968,311,000	169,454,425	273,024,175	864,741,250	—	—
E-1 Improvement of Calle 63	11.9	■	■	■								439,211,675	424,861,000	74,350,675	273,024,175	226,187,500	—	—
E-2 Modification of Carrera 60	3.5			■	■	■						476,991,250	406,960,000	71,041,250	—	476,991,250	—	—
E-3 Pedestrian Bridge (5 bridges)					■	■	■					161,562,500	137,500,000	24,062,500	—	161,562,500	—	—
Grand Total	152.6											3,013,625,900	2,564,788,000	448,837,900	664,412,625	1,766,279,715	433,727,585	150,175,575

Fig. - 44 Development Components



DEVELOPMENT COST ESTIMATES

The below table gives rough cost estimates for park development in the area of 137.2ha, with which JICA Study is concerned, in Colombian pesos.

PROJECT COST IN GENERAL

Construction Costs	\$2,564,788,000
Engineering Supervision and Administration Cost	448,837,900
Total	\$3,013,625,900

PROJECT COST BY WORK

National Ceremonial Plaza Dev.	\$ 315,088,000
Urban Ribbon Dev.	428,846,800
Commemorative Symbol Zone Dev.	870,436,475
Infrastructure Dev.	261,489,200
Road Improve. and Dev.	1,137,765,425
Total	\$3,013,625,900

PROJECT COST BY PHASE

Phase I	\$ 664,442,625
Phase II	2,199,007,700
Phase II-1	1,765,279,715
Phase II-2	433,727,985
Phase III	150,175,575
Total	\$3,013,625,900

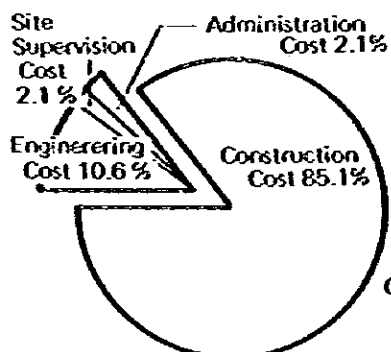
CONDITIONS FOR COST ESTIMATES

The above cost estimates have been made on the basis of the following conditions.

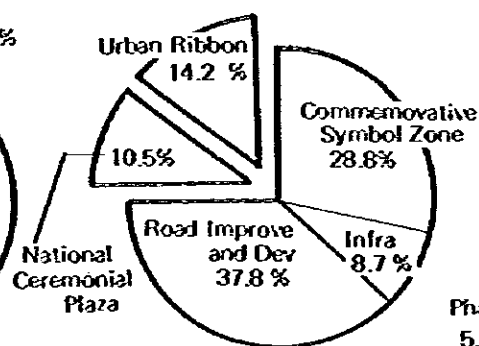
- 1) Date of estimates is July, 1981.
- 2) Estimates have been made on a unit price cost basis.
- 3) Construction cost is including indirect cost of contractor.
- 4) All figures of construction cost include a 5% contingency addition.
- 5) Engineering, supervision and administration costs has been estimated as follows.

-- Engineering Cost	12.5% of construction cost (including technical survey, preliminary and detailed engineering and preparation of contract documents)
-- Site Supervision Cost	2.5% of construction cost
-- Administration Cost	2.5% of construction cost

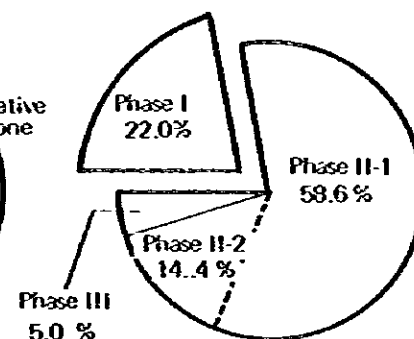
Project Cost by Item



Project Cost by work



Project Cost by Phase



Development Procedure

The implementation of area studies by the JICA study team is divided into three phases according to the 10 year Development Plan.

Phase I is the construction of the area having the National Ceremonial Plaza as its major facility, which must be implemented in a short period of time.

Phase II - The development of both the Urban Mall ranging from Carrera 68 to the railway site along Calle 63 and the area around the entrance of park.

Phase III - Implementation of work on the part of park consisting of lake, woodland, grassland, etc. and on the remaining area.

In the implementation of work for the individual phases, the work items of different nature (in terms of construction component) are conducted in relatively wide areas.

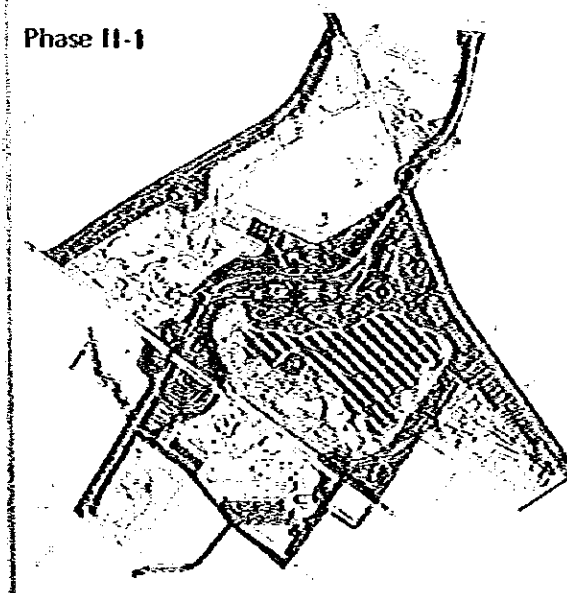
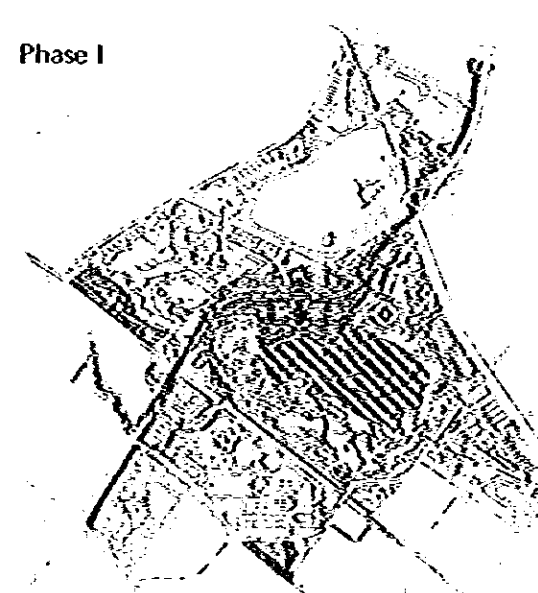
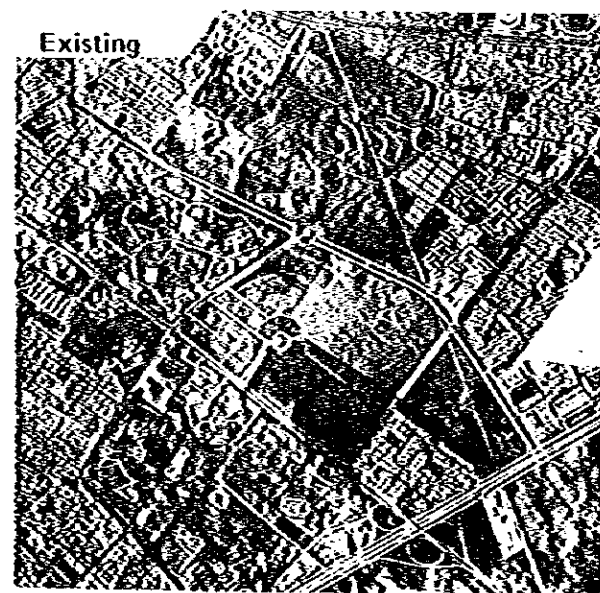
Especially in phase I, when a large scale of earthwork must be carried out a huge volume of earth must be procured mainly from inside of the park for both temporary road construction (which is to enable the continued use of existing Calle 63) and embankment. On the other hand, the auxiliary type projects such as those for the drainage system, utility network, etc. must functionally be distributed in the whole plan of implementation of work.

Therefore in order to control the implementation of the project economically and safely over a long period of time (during Phase I and Phase II) it is very critical to combine different construction components skillfully while utilizing the land effectively. Although various elements are included in the implementation of park construction, the most effective procedures throughout the respective phases can be illustrated in the diagram shown at the right.

Construction Schedule Fig. - 46

Development Phase		Phase I		Phase II		
Construction Item		1981	1982	1983	1984	1985
1	Detailed Design	for Phase I		for Phase II		
2	Road Construction					
	2-1 Temporary Route	█				
	2-2 Demolishment of Existing Road					
	2-3 Construction of New Road		█ Calle 63			
	2-4 Flyover					
3	Earthwork	█	█			
4	Utility					
	4-1 Drainage		█			
	4-2 Water Supply		█			
	4-3 Electricity		█		█	
5	Landscape					
	5-1 Pavement		█			
	5-2 Planting		█			
	5-3 Street Furniture		█			
	5-4 Lake Construction					
6	Architecture					
	6-1 Colombian History Museum					
	6-2 Religious Museum					
	6-3 Service Facility		█			
7	Others					
	7-1 Replacement of Railway					

Development Phasing Plan Fig. - 47



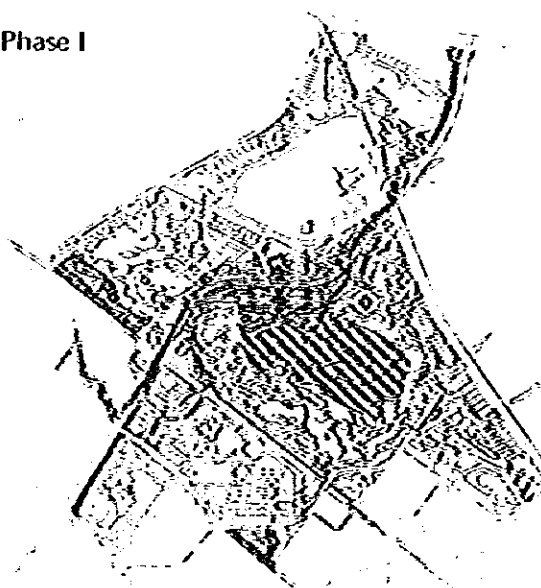
chedule Fig. - 46

Development Phase	Phase I		Phase II				Phase III			
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Year	for Phase I		for Phase II				for Phase III			
Temporary Route	[Bar]		[Bar]				[Bar]			
Demolishment of Existing Road	[Bar]		[Bar]				[Bar]			
Construction of New Road	Calle 63 [Bar]		Carrera 60 [Bar]				[Bar]			
Flyover	[Bar]		[Bar]				[Bar]			
Drainage	[Bar]		[Bar]				[Bar]			
Water Supply	[Bar]		[Bar]				[Bar]			
Electricity	[Bar]		[Bar]				[Bar]			
Pavement	[Bar]		[Bar]				[Bar]			
Planting	National Ceremonial Plaza [Bar]		[Bar]				[Bar]			
Street Furniture	[Bar]		Urban Mall [Bar]				[Bar]			
Lake Construction	[Bar]		[Bar]				[Bar]			
Colombian History Museum	[Bar]		[Bar]				[Bar]			
Religious Museum	[Bar]		[Bar]				[Bar]			
Service Facility	[Bar]		[Bar]				[Bar]			
Replacement of Railway	[Bar]		[Bar]				[Bar]			

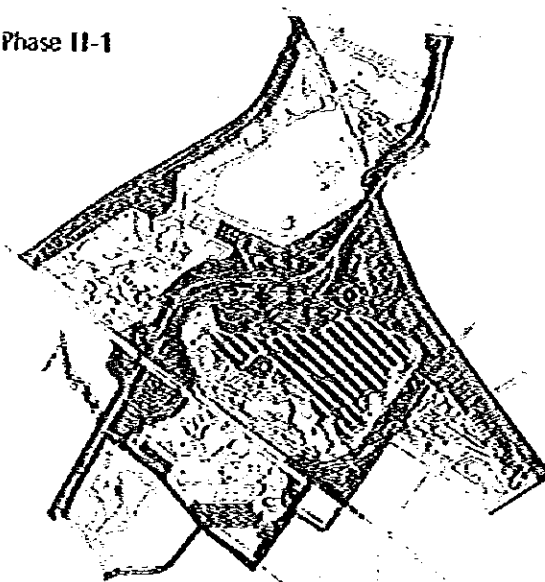
osing Plan Fig. - 47



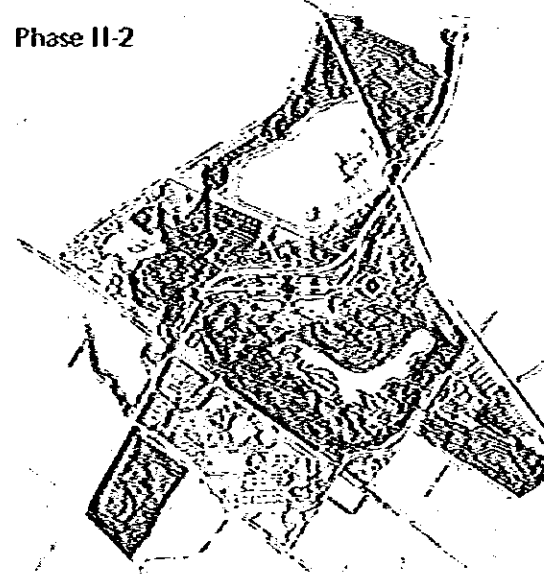
Phase I



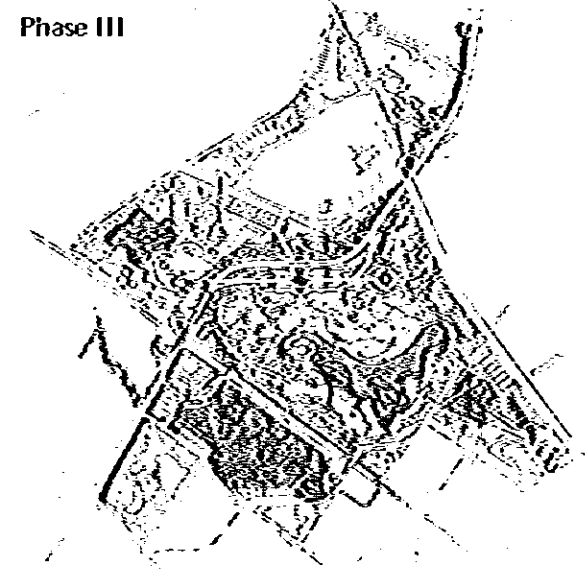
Phase II-1



Phase II-2



Phase III



Park Organization

Park Organization for Development

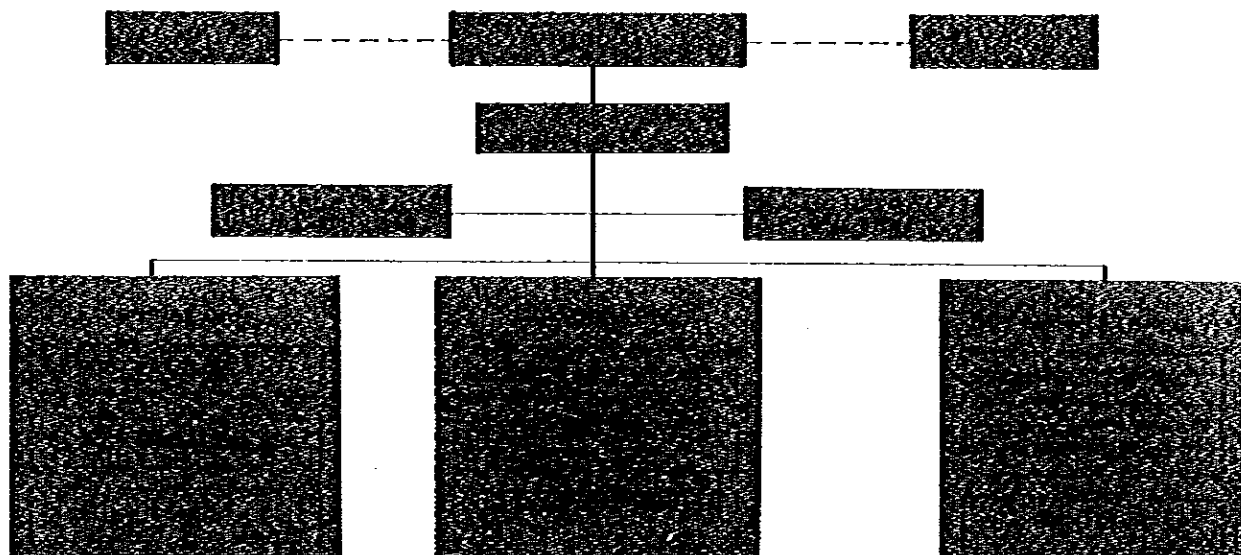
In order to conceive the most effective organization structure for the development of Simon Bolivar Great Memorial Park, various studies and research on the organizations and related functions of the existing recreational institutions have been conducted, and based on the result of these studies and research, planning of the integrated organizational structure has been made.

It is to be noted that because the park shall be a large integrated city park to be completed by improvement of the existing parks (Salitre and Lago) and other recreational and cultural facilities (Jardin Botanico and Sports Complex) and by new development of a 110 hectares lot to be planned for the central core of this park, the lot belonging to Beneficencia to be planned for the commercial urban center, and the area along the northern boundary of the park to be planned for the folk center, together with the modification of the existing roads, there are several different governmental agencies and institutions having specific organizations either currently functioning for operation and maintenance of the existing facilities or forming a group for research and planning of the new development.

Because Simon Bolivar Great Memorial Park shall be developed, improved, modified, and operated and maintained as a integrated, single park with many different zones and facilities, it shall be fundamental and vital that the organization responsible for the development, improvement, modification, operation and maintenance be a single integrated body for functional, economical and effective managerial reasons. Therefore, integration of the existing organizations and establishment of a very strong, powerful and effective organization structure functioning to execute aforesaid purposes on a permanent basis, shall be made immediately with full cooperation and coordination of those agencies and institutions concerned for this park.

The recommendable organization responsible for the aforesaid objectives, in a practical way, in accordance with the process of development phases I to III, shall be a fairly large autonomous body at the final stage when the full-fledged operation of the park starts toward the end of 1980's, expanded from a original organization

Fig. - 48 Park Development Organization



formulated into a single body after integration of the existing different organizations, with a flexible organizational development.

There would be two typical organization structures recommended for this park development, which are described as follows.

Organization at Development Stage:

The function of the organization at this stage shall be research and study, design and evaluation, contract and financial control, construction supervision and security.

Due to the fact that the whole park area is to be developed and improved in close coordination with various governmental agencies it would be suggested to establish a very strong and efficient body which consists of the representatives of the governmental agencies and other institutions closely related to this development project, such as MOPT, Bogota D.E., C.A.R., etc., with a leader who should have strong coordination ability and influence to such agencies and institutions as well as to the subordinate bodies.

The organization structure shall consist of three line-divisions namely financial, planning and implementation and two staff-divisions namely,

general affairs and public relations and promotions headed by the director and his assistant, secretary who shall actually administer the body.

In consideration of the significance and nature of this park development project in line with ways and means of each development phase including the improvement of the existing zone and facilities, it is recommended that this body shall have a permanent office either in Ministry of Public Works and Transport or in the Bogota Special District Office and a branch office at the job site.

The number of staffs to be needed for this body is estimated to range from about 20 persons at the start of the development phase I up to more than 200 persons toward the end of the development phase III in which time most of the zones of whole park area would have commenced operations.

Apart from above, a program for training 30 gardeners/semester is included in the contract between MOPT and Universidad Nacional on the establishment of the nursery.

Park Organization for Operation

The body to administer the park operation and maintenance shall be a sort of autonomous institution responsible not only for the project area of 110 ha. but also for the whole park area. The functions of this organization are: first, to make promotional activities including public relations; second, to execute park operations; third, to be in charge of maintenance of the various park facilities; fourth, to manage the security measures, and fifth, to administer, manage and control the total internal functions of the park. In consideration of the phased construction of the park facilities, the majority of the personnel are to be transferred from the organization at the development stage and the personnel needed for new mission and responsibility are to be newly employed keeping the minimum adequate number of permanent staff at all the time and fully utilizing the temporarily employed laborers when such needs arise.

The organization structure shall consist of four line-divisions comprising an administrative division responsible for general affairs, personnel, financial and communications, operational

divisions formulated by each park zone like the 110 ha. area (central core of Simon Bolivar, having National Ceremonial Plaza, Historical and Religious Museums, lake and ponds and a large greenery areas), Salitre, Lago etc., security division with same zonal sub-divisions and maintenance division with subdivisions formulated by each maintenance function such as maintenance and repair of the building facilities, entertainment facilities, road and so on.

The administrative structure at this operation stage shall be very similar to that of development stage, having the chairman and director general of the autonomous body as the top executives with very strong coordinating ability and influence to the various governmental agencies and institutions as well as the management capability needed by this organization.

It is to be noted that at present the steering committee made up of the representatives of the different entities involved is considering the appointment of a director who would manage the whole area and services of the park, with specific sections and areas or zones included which are responsible for performing the various functions

such as security, gardening, utilities workshops, etc.

The number of staffs needed for this organization in 1990 is estimated to be about 500 personnel excluding temporary labourers, and as for 110 ha area, about 80 persons are estimated to be needed with exception of those staffs for National Ceremonial Plaza at special event days. The estimation of the number of personnel at each zone of the park is done based on the areal scale and the density of the projected number of visitors to each zone with co-relation of the basic figures of the Salitre Park administrative body on manpower allocation and job descriptions. The following Table shows the estimated numbers of staffs at each zone in 1990.

With regard to the allocation of personnel in terms of job classification and wage levels at 110 ha area, it is estimated that three (3) persons are needed at administrative level, 5 staffs at middle management level, 24 staffs at field mechanic/engineer/technician level and 48 field labourers are to be needed, and also additional 16 temporary field labourers are to be needed in this area.

Fig. - 49 Park Operation Organization

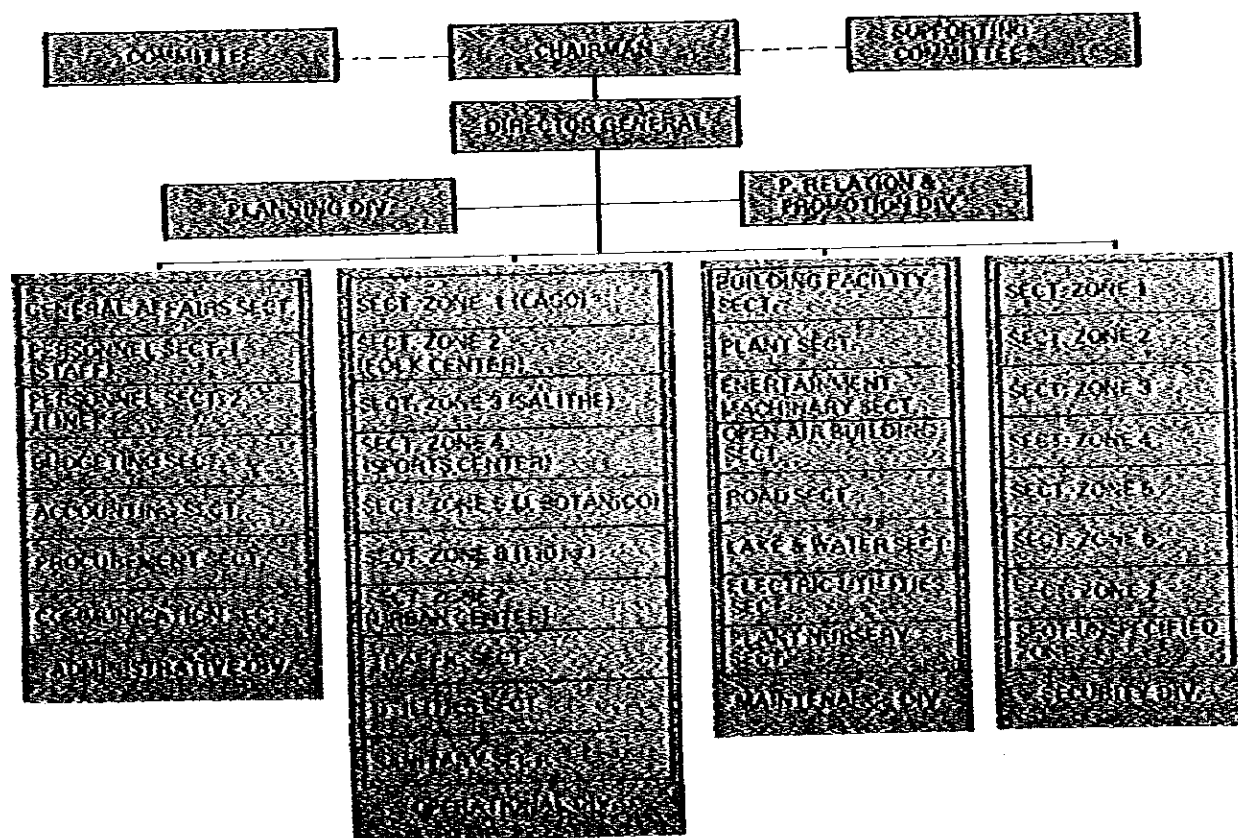


Table - 26 Estimation of Operation and Maintenance Staff

Zone	Area (ha)	No. of visitors per ha/day (person)	No. of Personnel (person)
110 ha	113.0 (206.4)	187 (31.7)	80 (71.3)
Salitre	55.0 (100.6)	533 (100.0)	110 (100.0)
Lago	20.6 (37.5)	187 (31.7)	15 (13.0)
Mt Tierra	21.6 (39.3)	363 (67.4)	30 (26.5)
Sports Center	45.9 (83.5)	533 (100.0)	96 (83.5)
Urban Center	24.7 (44.9)	1,616 (300.0)	150 (134.7)
Jardin Botarico	19.2 (34.9)	37 (6.9)	15 (12.4)
Total	300.0	426	426

* Remarks

1. Source of the basis is "Organization Chart of Salitre Park, 1981" (IPUI)
2. Figures in () are exponents based on Salitre Park as 100.
3. No. of personnel in Jardin Botarico was adjusted by existing conditions.

Operation and Maintenance Plan

The basic plan for the operation and maintenance of the Whole Park Area is worked out based on the field survey of the existing parks and other recreational facilities in the city of Bogota D.E. and by the discussions with the various officials concerned and the Colombian counterpart of the JICA Study Team.

Basic Approach to the Park Operation and Maintenance

It would be necessary to plan such programs so as to effectively promote the free and voluntary activities for recreation and sports for every citizen of Bogota at each social level.

A flexible administrative approach shall be needed so as to hold a variety of cultural, educational and entertainment activities and events so that all the people of each income level in Bogota D.E. can participate in such activities and events to be held in the various zones of the park.

It is necessary for the park to be equipped with ample space, facilities and information systems which immediately and effectively function to cope with an emergency or disaster and will provide the first-aid facilities and countermeasures on such occasions for the city of Bogota D.E., preferably with the same standard as those of other international cities.

The maintenance and preservation of the plants in the park shall be emphasized so as to maintain the large area of green environment represented by the spirit of El Libertador, Simon Bolivar, which shall be the will and pride of the citizens of Bogota D.E. and shall be maintained to high standards of quality for generations to come.

Basic Operational and Maintenance Plan

This park is located in the central part of the city and due to its easy accessibility and the handy availability of various transportation means, it is assumed that this park will be more highly utilized than the other parks in the city, especially on weekends and holidays. Therefore, an adequate operational and maintenance system shall be worked out to cope with quality and quantity of projected demand, including that at the peak time on those holidays and for special events.

It would be a critical issue to establish effective safety measures in the large expanse of the park, especially at night. It would take a considerable time to reach the state that the morals of the citizens are elevated so that the park can be safely utilized even at night. At the present stage, it would be adequate to close the park at night with the exception of some special facility or zone, but further review and planning shall be needed for the final programming after each component facility allocation and detailed designs are determined.

Because the park site is in general flat-land formation, it is indispensable to execute new landscaping and planting. In order to accomplish the scheduled planting a number of years will be needed to have grown and self-sustaining trees. Therefore, for this purpose it is necessary to work out a very precise and detailed planning for development and maintenance of the planted trees at the first stage of the park operations, which eventually will affect the development and maintenance costs greatly.

In order to maintain the environmental quality standard of the park, it would be necessary to work out the very extensive and integrated maintenance and inspection systems to comply with the needs from the various sub-systems such as surface water discharge, sewerage, illumination lightings, water supply and from the various park facilities such as public welfare, rest and leisure, and administration. It would also be needed to establish the systems for garbage collection, cleaning and sweeping, and the first-aid measures.

With regard to the plans for operating hours of the park it would be adequate that most of the zones of this park open at 08:00 hours and close at 18:00 hours on weekdays with the exception of the sport complex and the sport facilities within each zone of the park where the closing would be 21:00 hours. The operating hours on weekends (Saturday and Sunday), special event days and national holidays would be preferably longer by extending the closing hour to 20:00 hours and the same exception shall be applied for sporting facilities.

As to the fees for entrance, utilization of the various facilities in the park and for car parking, it is suggested that there would be no entrance fee to each zone of the park in order to stimulate the use of this park from the areas where the low income groups are dwelling. The entrance fee to the various museums located in the park premise shall range from 5 to 10 pesos for the adults and there would be no fee for infants and children. The charge for the mechanical attractions shall range from 1 to 5 pesos for the children and for infants accompanied by either mother or father no charge is recommended. It is also recommended that there would be no charge for utilization of any of the sporting facilities located within each zone of the park open-air area with exception of those facilities located in the Sporting Complex. The parking fee is recommended to be about 30 pesos because those who come to this park by cars are in the higher income groups.

Security Measures

The existing security measures being taken at the various parks operated in the city of Bogota D.E. mainly comprise protective fences surrounding the park which prevent theft of flowers and other articles belonging to the park after its close, and the patrol of the watchmen within the park on foot or by vehicle, sometimes carrying a transistor transmitter/receiver and occasionally with weapons.

The new security systems and measures conceived for the new park shall be formulated in consideration of the following three components; first, the protective physical facilities like gates, fences and ditches, etc.; second, the manpower allocation and maneuvers of the watchmen and guards and their security activities; and third, the protective communication systems and finally on the landscaping itself, taking into account the following factors.

- 1) Areal factors : Zones
- | |
|--|
| Commemorative zone (110 ha), and other related zones like sports, lake park, urban complex, folk center, etc. (mainly 7 zones) |
|--|

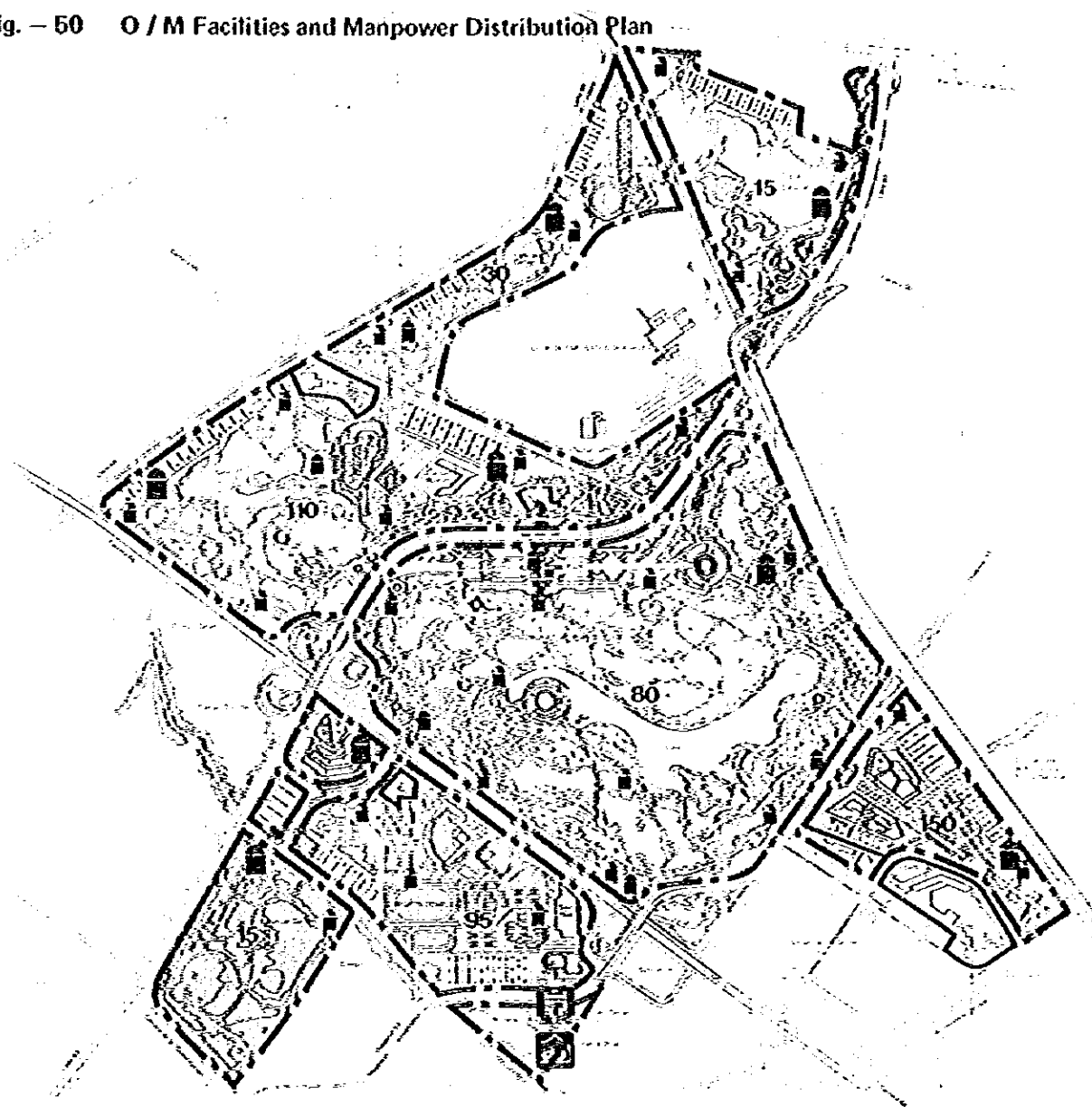
Facilities Buildings, utilities,
forest, plaza, pond &
lake, forest, flower
beds, lawn, etc.

- 2) Time factors : Week days, daytime and night
Weekends, daytime and night
Special days with big events
at daytime and night
- 3) Others : Fire and other natural disasters,
and social and political
disputes and mobs, and riots,
etc.








The security control system for this new park shall have two functional components, that is, one for the safety and comfort of the normal park visitors within the premises of the park and, second, for the emergency aid and medical care in case disasters or riots occur in Bogota D.E., when the park premises is to be used as a safe refuge for the citizens.

Taking all the factors and components into consideration, the detailed plans for the security measures of this park shall be worked out so as to provide the park visitors with enough safety and comfort but not give them too much mental pressures. Pertaining to the emergency aid and medical care, the measures should have to be worked out in close coordination with the police department, medical and welfare department and other related departments concerned of the Bogota Metropolitan Government.

Fig. - 50 O / M Facilities and Manpower Distribution Plan



LEGEND

-  Controlled Access Area
-  Occupied Facility Area
-  Park Administration Center
-  Branch
-  Station
-  Park Maintenance Shop
-  Storage of Maintenance Equipment
- NO.** Number of Persons of O/M



Cost and Revenue of the Park Operation and Maintenance

Comments on Operational Cost and Revenue

Because of the reason that this 110 ha area is featured by vast greenery and lake with national ceremonial plaza, which means there are very few components for the source of revenue in comparison with other zones like Salitre, Sport Complex, Mi Tierra and Urban Center, and consequently, the revenue estimated at 21.98 million pesos covers about 60 percent of the operational cost/expense in this 110 ha area and the deficit of 14.96 million shall be covered by either direct subsidy from the central and the metropolitan governments or by the internal financial and within the autonomous body responsible for the operation and maintenance of the whole park area having operationally profitable zones.

It is to be noted that the following points shall be carefully planned and worked out after this Master Plan.

- 1) Estimation of development cost, operational cost/expense and operational revenue by each development phase and preferably by annual distribution, in close coordination with the detailed planning and designs.
- 2) Planning and implementation of the park development by corresponding development phases so that the operational expense and revenue will approach balancing-off or maximize the revenue.
- 3) In-depth study on financial and economical feasibilities for this zone and other zones.

Table-27 Summary of the Project cost

Unit 1,000 pesos at current price at July, 1981	Amount
1. Development Cost (break down)	3,030,500.9
1) construction cost	2,561,788.
2) indirect cost	413,837.9
3) equipment cost	25,875.
2. Operation/Maintenance Cost	36,938 (100.0%)
1) personnel expense	12,648.
2) general expense	6,324.
3) training expense	632.
4) maintenance material cost	17,334.
3. Operational Revenue	21,978 (59.8%)
1) car parking fee	8,545.
2) boat, inner transport & bicycle fares	8,044
3) kiosk, restaurant royalty	5,389.
4. Balance of Operational Revenue/Cost	(-14,960) (40.5%)

Note: equipment cost, purchase cost of finished projects.
 row boat @25,000x36 = 875,000 pesos
 inner transport @1,200,000x20 = 24,000,000"
 bicycle @10,000x100 = 1,000,000"
 30 bicycles for adult and 70 for child)

General Condition and Scope

The cost/expense and the revenue at the operational stage of 110 ha area, was estimated for the year 1980 at the current price at July 1981 based on the operational policy and strategy set forth at this Master Plan. It is to be noted that this estimation covers only 110 ha area excluding Urban Mall and two museums, historical and religious, which seem to be operated by the separate entities in 1990.

Estimation of Operation/Maintenance Cost.

The annual cost/expense for park operations of 110 has. area in 1980 amounts to 36.938 million pesos at current price at July, 1981 and the details of which is shown as follows.

1) Personnel Expenses

Job classification	No. of Personnel	Proposed Monthly Wage	Amount of Annual Wage
• Permanent Staff			
Executive class (Director and manager)	3	80,000	2,880,000
Upper class (Section chief)	5	30,000	1,800,000
Middle class (Engineer and mechanic)	24	12,000	3,456,000
Lower class (Field labour)	48	6,000	3,456,000
Sub Total	80		11,592,000
• Temporary Staff			
Field Labour	16	5,500	1,056,000
Grand Total	96		12,648,000

* Number of Temporary labours is estimated at 20% of that of permanent staffs.

* Following personnel is excluded in this estimation. Staffs for History Museum and Religious Museum, Personnel's for concessioned outlets (Kiosks and restaurants).

2) General Expense

- 50% of personnel expenses
 $12,648,000 \text{ pesos} \times 0.5 = 6,324,000 \text{ pesos}$

3) Staff Education/ Training Expenses

- 5% of personnel expenses
 $12,648,000 \text{ pesos} \times 0.05 = 632,400 \text{ pesos}$

4) Material Cost

- 1% of park construction cost
 $173,340,000 \text{ pesos} \times 0.01 = 17,334,000$

Construction cost directly related to 110 ha area which is applied in this estimated is calculated by deducting the costs for road construction of calle 63 and carrera 60 from total construction cost.

5) Utility Cost

Utility cost is excluded because utility services to the public facilities are usually exempted from charges in Bogota D.E.

Estimation of Operational Revenue

The annual revenue by park operations of 110 ha area in 1990 amounts to 21.98 million pesos at current price at July, 1981, the details of which is shown on Table

In consideration of the strategy to promote and stimulate park utilization, it would be adequate to apply Plan A on Table-27 which makes the park entrance admission fee to be free, and the admission fees for 2 museums being excluded resulting from the separate and independent operations to be anticipated to them.

With regard to royalty on concession for kiosk and restaurant, key money or bond at the time of contract shall be regarded as one of the sources of fund for development cost.

Table - 28 Park Operation Revenue

Revenue Item	Unit Price (pesos)	Quantity	Annual (pesos)	Plan A	Plan B
1) Park entrance admission fee					
A) Adult individual	3	2,309,400	Free	6,928,200	0
Child and student	Free	5,428,600	Free	0	6,928,200
Sub total				6,928,200	6,928,200
Historical Museum admission fee					
A) Adult	10	46,188	-	-	461,880
Child, student (individual)	5	26,560	-	-	364,500
Group	2	30,792	-	-	1,156,4
Sub total				0	928,384
3) Religious Museum admission fee					
A) Adult	10	62,292	-	-	622,820
Child, student (individual)	5	115,430	-	-	571,360
Group	2	46,188	-	-	92,376
Sub total				0	1,362,546
4) Car parking fee					
passenger car	30	245,306	7,359,180	7,359,180	7,359,180
Bus	100	11,547	1,154,700	1,154,700	1,154,700
Sub total			8,513,880	8,513,880	8,513,880
5) Row boat fare					
	15	30,792	461,880	461,880	461,880
6) Inner transport fare					
A) Adult	5	620,800	3,104,000	3,104,000	3,104,000
Student, child	2	1,676,580	3,353,160	3,353,160	3,353,160
Sub total			6,457,160	6,457,160	6,457,160
7) Bicycle fare					
A) Adult	30	11,547	346,410	346,410	346,410
Student, child	20	26,543	530,860	530,860	530,860
Sub total			877,270	877,270	877,270
8) Paying on concession					
Kiosk	134,715	20	2,694,300	2,694,300	2,694,300
Restaurant	673,575	4	2,694,300	2,694,300	2,694,300
Sub total			5,388,600	5,388,600	5,388,600
Grand Total			21,571,720	31,176,640	31,176,640

* For 5), unit price is estimated by expected annual sale and royalty rate, for kiosk 2,694,300 pesos/5% and for restaurant 9,623,000 pesos/7%.



Demand Analysis

Summary

The result of the analysis shows that the number of visitors to the Simon Bolivar Great Memorial Park in 1990 is as follows.

As shown on the table below, the number of visitors to the 110 ha. zone is projected to be about 7.7 million in the year 1990.

The number of visitors on the peak day (Sunday) of the peak month (December) in 1990 is estimated to be 84,700 and subsequently, the estimation of the number of visitors in the 110 ha. zone during the peak hours on the peak day in 1990 will be about 28,200 excluding those visitors to the Mall and National Plaza.

With regard to the number of visitors to the Mall and the National Plaza and those facilities within and connecting to the 110 ha. zone on the special event days, the estimation of the participants or visitors is made based on the capacity of those facilities.

As the inventory of the existing parks in the city of Bogota D.E. and the results of the studies on the

recreational activities indicate, it is conceived that the city of Bogota D.E. has the imperative needs for preservation of the greenery zone as the core of the new park development, having plenty of trees and flowers to compensate for the shortage of such zones, which in terms of international standard shall be about 15 square meters per person.

It is also noted that out-door sports facilities of a fairly good quality and service standards are greatly needed for the normal citizens of Bogota D.E., and especially for the low-middle and low income level classes.

User's Analysis

The total number of visitors to the ten parks in Bogota D.E. in 1980 was estimated based on the statistical data of IDR with estimation of the numbers of visitors to several parks under IDR jurisdiction, which account for 18,565 thousand visitors as per Table 2 with details of each park by month. The seasonal fluctuation of the number of park visitors is calculated on the exponent basis as per the Table which shows that the peak month is December with the exponent of 148 and those months which exceed the exponent 100 are Janu-

ary, 109; July, 109; and August, 110 respectively for the average of 10 parks.

In this study, the weekday fluctuation is estimated using data based on the field survey by the JICA Study Team at seven parks in the city of Bogota D.E., and the result of this fluctuation is shown on the Table 3 with the peak day on Sunday sharing about 39 percent of the whole week visitors, against Monday through Thursday sharing about 10 percent each.

Table 3 also shows the projection of the number of visitors to the existing 10 parks during the period of 1981 up to 1990. The number of visitors to these 10 parks is projected to reach about 26.3 million in 1990.

Then, in consideration of the above analysis of the number of visitors to the existing parks, estimation of the prospective visitors to the Simon Bolivar Whole Park Area is done by the adjusted zoning comprising 110 ha., Salitre, Lago, Jardin Botanico, Sport Complex, Folk Center, and Urban Complex. The projection of the number of visitors to each zone is done in such a way as to put a basis on the scale of area and the nature of each zone, which is shown in Table 4. According to the projection by the JICA Study Team, the total number of visitors to the Simon Bolivar Whole Park Area consisting of about 300 ha. comprising the aforesaid seven zones excluding the road areas, would be 46.626 million in 1990, as shown on the Table 5 the basis of calculation is shown in the Table 6.

The number of visitors to the 110 ha. zone in 1990 is projected to be about 7.7 million on the assumption that none of the Urban Complex facilities are located in this zone.

With regard to the projection of the number of visitors on the peak day (Sunday) of the peak month (December), as shown in Table 7 the number of visitors in 1990 shall be about 84,700.

With the same calculation method, the number of visitors in the 110 ha. zone at the peak hours of the peak day of the peak month in 1990 is projected, and the outcome is about 28,200.

As to the number of visitors to the Main Mall and other facilities within and connecting to the 110 ha. zone on special event days, the estimation of the number of visitors is made based on the capacity of these facilities.

Table - 29 Projection of Number of the Park Visitors

Zone	Area (ha.)	Area share (%)	Nature	No. of visitors in 1990 (million)	No. of visitors, peak day (thousand)	No. of visitors, peak hour (thousand)
110 has	113.0	37.7	Greenery, lake, plaza, cira	7.7	84.7	28.2
Salitre	55.0	18.3	Sport, machines	10.8	119.0	39.7
Lago	20.6	6.9	Lake, greenery	1.4	15.4	5.1
Mi Tierra	21.6	7.2	Handicraft, folklore	2.9	31.4	10.5
Sport Complex	45.9	15.3	Sports	9.0	99.3	33.1
Urban Complex	24.7	8.2	Convention, hotel, etc.	14.6	160.4	32.1
Jardin Botanico	19.2	6.4	Forest, flowers	0.3	2.8	0.9
Total	300.0	100.0		46.6	513.0	149.6

Table - 30 Number of Visitors to Parks in Bogota D.E.

(Unit: 1,000 persons)

Month	Salitre	Nacional	Tunal	Florida	Distrital Del Sur	Kennedy	Timiza	Lago	Gaitan Cortes	Montes	Total	Share	Monthly Fluctuation	Average No. of Visitors
1	650	110	405	60	25	4.5	280	67	25	52	1,678.5	9.04%	108.5	167.90
2	680	90	300	65	16	2.0	150	50	18	45	1,416.0	7.63	91.5	141.00
3	610	95	350	58	14	4.6	130	60	16	42	1,379.6	7.43	89.2	137.96
4	560	105	300	55	13	1.5	130	65	15	51	1,295.5	6.98	83.7	129.55
5	570	105	360	60	12	2.0	140	58	22	48	1,377.0	7.42	89.0	137.70
6	610	98	420	62	16	3.5	135	65	26	47	1,482.5	7.99	95.8	148.25
7	700	135	430	64	20	1.8	200	80	13	38	1,686.8	9.09	109.0	168.68
8	610	130	600	54	12	2.1	170	50	20	51	1,693.1	9.15	109.8	169.91
9	570	140	450	52	14	1.0	150	60	18	54	1,509.0	8.13	97.5	150.9
10	580	115	300	68	8	1.3	140	50	16	48	1,326.3	7.14	85.7	132.63
11	600	135	350	70	18	1.4	130	60	21	41	1,426.4	7.68	92.2	142.64
12	892	167	650	88	22	3.4	290	80	28	68	2,288.4	12.33	147.9	228.84
Total	7,632	1,425	4,915	756	190	29.1	2,045	745	243	585	18,565.1	100.00%		1,856.51
Share	41.1%	7.6	26.5	4.1	1.0	0.2	11.0	4.0	1.3	3.2	100.0%			
Monthly Av.	636.0	118.8	409.6	63.0	15.8	2.4	170.4	62.1	20.3	48.8	1,547.1			
Weekly Av.	146.8	27.4	94.5	14.5	3.7	0.6	39.3	14.3	4.7	11.3	357.1			
Day Av.	20.9	3.9	13.5	2.1	0.5	0.08	5.6	2.04	0.7	1.6	50.9			
Area	55ha	50	93	278	11	17	25	15.5	5	26	575.5ha			
Areal Share	9.6%	8.7	16.2	48.2	1.9	3.0	4.3	2.7	0.9	4.5	100.0%			

SOURCE: IDR Dec. 1980

Table - 31 Projection of Number of Visitors to Existing Park in Bogota by Weekday (1981 - 1990)

Item	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Population	4,297	4,469	4,648	4,834	5,003	5,178	5,360	5,547	5,741	5,911	6,066
Participa- tion rate	4.32	4.32	4.32	4.32	4.32	4.32	4.32	4.32	4.32	4.32	4.32
No. of visitors	18,565	19,306	20,078	20,885	21,656	22,380	23,160	23,972	24,814	25,550	26,307

Table - 32 Fluctuation of Visitor Arrivals on Parque Salitre

	Estimated Visitors to Salitre	Share	Peak Month Dec.	Bottom Month Apr.	
Monday	10.0	6.81	10.07	5.70	14.2
Tuesday	10.0	6.81	10.07	5.70	14.2
Wednesday	10.0	6.81	10.07	5.70	14.2
Thursday	10.0	6.81	10.07	5.70	14.2
Friday	15.0	10.22	15.12	8.55	21.3
Saturday	35.0	23.84	35.26	19.95	49.5
Sunday	56.8	38.70	57.24	32.49	80.4
Weekly Total	146.8	100.00	147.90	83.70	208.0

Table - 33 Projection of Number of Visitors to the Park at Peak Time/day

Zone	Area Area Share	Proposed Density	Estimated No. of visitors per year (Person)	Average No. of Visitors per Month Peak Day	Exponent of Weekly Fluctuation in peak month (Abc.)	Weekly Fluctuation in bottom month (Abc.)	Projection of No. of visitors per year * (thousand persons)														
							Share (thousand)	Abn. - Pr. Abn. Pr. Abn. Pr.	Abn. - Pr. Abn. Pr. Abn. Pr.	No. in year No. on peak day No. on bottom day No. at peak time/day											
										1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1975
110 ha General Use park	1130 Pal (37.7%)	48.1 (19%)	5,435.3 (16.5%)	452.9 134.6 14.9	135 157 26.6 59.8	60 209 33.8	5,435.3 5,650.9 5,879.3 6,111.6 6,270.3 6,549.7 6,779.9 7,015.4 7,261.3 7,476.9 7,668.2 8,224.0 8,362.7	197 207 21.6 22.4 23.2 24.0 24.9 25.7 26.6 27.4 28.2	197 207 21.6 22.4 23.2 24.0 24.9 25.7 26.6 27.4 28.2	197 207 21.6 22.4 23.2 24.0 24.9 25.7 26.6 27.4 28.2	197 207 21.6 22.4 23.2 24.0 24.9 25.7 26.6 27.4 28.2	197 207 21.6 22.4 23.2 24.0 24.9 25.7 26.6 27.4 28.2	197 207 21.6 22.4 23.2 24.0 24.9 25.7 26.6 27.4 28.2	197 207 21.6 22.4 23.2 24.0 24.9 25.7 26.6 27.4 28.2	197 207 21.6 22.4 23.2 24.0 24.9 25.7 26.6 27.4 28.2	197 207 21.6 22.4 23.2 24.0 24.9 25.7 26.6 27.4 28.2					
Seine maize sports	55.8 (18.3)	138.8	7,634.9 (23.2)	600.9 166.8 20.9	118 221 51.8 84.9	84 293 47.5	7,634.9 7,939.6 8,257.6 8,589.0 8,922.3 9,199.2 9,527.5 9,854.7 10,190.4 10,501.4 10,812.3 12,293.5 12,501.3	24.0 24.4 24.7 24.7 24.8 24.8 24.9 25.0 25.1 25.2 25.3 25.4 25.5 25.6 25.7	24.0 24.4 24.7 24.7 24.8 24.8 24.9 25.0 25.1 25.2 25.3 25.4 25.5 25.6 25.7	24.0 24.4 24.7 24.7 24.8 24.8 24.9 25.0 25.1 25.2 25.3 25.4 25.5 25.6 25.7	24.0 24.4 24.7 24.7 24.8 24.8 24.9 25.0 25.1 25.2 25.3 25.4 25.5 25.6 25.7	24.0 24.4 24.7 24.7 24.8 24.8 24.9 25.0 25.1 25.2 25.3 25.4 25.5 25.6 25.7	24.0 24.4 24.7 24.7 24.8 24.8 24.9 25.0 25.1 25.2 25.3 25.4 25.5 25.6 25.7	24.0 24.4 24.7 24.7 24.8 24.8 24.9 25.0 25.1 25.2 25.3 25.4 25.5 25.6 25.7							
Lago General Use	20.6 (6.9)	43.1	900.9 (3.0)	82.6 13.1 2.7	19 29 6.7 10.9	11 16 3.5 6.2	900.9 1,000.6 1,071.8 1,111.7 1,153.7 1,194.1 1,235.9 1,279.2 1,323.9 1,368.4 1,413.4 1,608.7 1,617.4	10.9 11.3 11.8 12.3 12.7 13.1 13.6 14.1 14.5 14.9 15.4 15.9 16.4 16.9	10.9 11.3 11.8 12.3 12.7 13.1 13.6 14.1 14.5 14.9 15.4 15.9 16.4 16.9	10.9 11.3 11.8 12.3 12.7 13.1 13.6 14.1 14.5 14.9 15.4 15.9 16.4 16.9	10.9 11.3 11.8 12.3 12.7 13.1 13.6 14.1 14.5 14.9 15.4 15.9 16.4 16.9	10.9 11.3 11.8 12.3 12.7 13.1 13.6 14.1 14.5 14.9 15.4 15.9 16.4 16.9	10.9 11.3 11.8 12.3 12.7 13.1 13.6 14.1 14.5 14.9 15.4 15.9 16.4 16.9	10.9 11.3 11.8 12.3 12.7 13.1 13.6 14.1 14.5 14.9 15.4 15.9 16.4 16.9							
Fork Centre Estates handover	21.6 (7.2)	93.5	7,619.7 (23.1)	156.3 38.9 5.5	39 5.9 13.7 22.2	22 3.3 7.7 12.6	7,619.7 7,722.2 7,824.7 7,927.1 8,029.6 8,132.1 8,234.6 8,337.1 8,439.6 8,542.1 8,644.6 8,747.1 8,849.6 8,952.1	21.0 21.1 21.2 21.3 21.4 21.5 21.6 21.7 21.8 21.9 22.0 22.1 22.2 22.3 22.4	21.0 21.1 21.2 21.3 21.4 21.5 21.6 21.7 21.8 21.9 22.0 22.1 22.2 22.3 22.4	21.0 21.1 21.2 21.3 21.4 21.5 21.6 21.7 21.8 21.9 22.0 22.1 22.2 22.3 22.4	21.0 21.1 21.2 21.3 21.4 21.5 21.6 21.7 21.8 21.9 22.0 22.1 22.2 22.3 22.4	21.0 21.1 21.2 21.3 21.4 21.5 21.6 21.7 21.8 21.9 22.0 22.1 22.2 22.3 22.4	21.0 21.1 21.2 21.3 21.4 21.5 21.6 21.7 21.8 21.9 22.0 22.1 22.2 22.3 22.4	21.0 21.1 21.2 21.3 21.4 21.5 21.6 21.7 21.8 21.9 22.0 22.1 22.2 22.3 22.4							
Sports Centre sports	45.9 (15.3)	138.8	6,370.9 (19.4)	530.9 122.5 17.5	123 135 43.2 70.1	70 124 39.7	6,370.9 6,625.9 6,881.3 7,137.1 7,392.9 7,648.7 7,904.5 8,160.3 8,416.1 8,671.9 8,927.7 9,183.5 9,439.3 9,695.1	23.4 24.3 25.3 26.3 27.2 28.2 29.1 30.2 31.2 32.1 33.1 34.1 35.1 36.1 37.1	23.4 24.3 25.3 26.3 27.2 28.2 29.1 30.2 31.2 32.1 33.1 34.1 35.1 36.1 37.1	23.4 24.3 25.3 26.3 27.2 28.2 29.1 30.2 31.2 32.1 33.1 34.1 35.1 36.1 37.1	23.4 24.3 25.3 26.3 27.2 28.2 29.1 30.2 31.2 32.1 33.1 34.1 35.1 36.1 37.1	23.4 24.3 25.3 26.3 27.2 28.2 29.1 30.2 31.2 32.1 33.1 34.1 35.1 36.1 37.1	23.4 24.3 25.3 26.3 27.2 28.2 29.1 30.2 31.2 32.1 33.1 34.1 35.1 36.1 37.1								
Urban Centre convention Hotel communication	24.7 (8.2)	418.4	10,265.1 (31.2)	657.1 137.8 28.2	139 219 69.7 113.2	113 159 39.5 64.1	10,265.1 10,666.8 11,068.5 11,470.2 11,871.9 12,273.6 12,675.3 13,077.0 13,478.7 13,880.4 14,282.1 14,683.8 15,085.5 15,487.2	113.2 117.7 122.4 127.1 131.8 136.5 141.2 145.9 150.6 155.3 160.0 164.7 169.4 174.1 178.8	113.2 117.7 122.4 127.1 131.8 136.5 141.2 145.9 150.6 155.3 160.0 164.7 169.4 174.1 178.8	113.2 117.7 122.4 127.1 131.8 136.5 141.2 145.9 150.6 155.3 160.0 164.7 169.4 174.1 178.8	113.2 117.7 122.4 127.1 131.8 136.5 141.2 145.9 150.6 155.3 160.0 164.7 169.4 174.1 178.8	113.2 117.7 122.4 127.1 131.8 136.5 141.2 145.9 150.6 155.3 160.0 164.7 169.4 174.1 178.8	113.2 117.7 122.4 127.1 131.8 136.5 141.2 145.9 150.6 155.3 160.0 164.7 169.4 174.1 178.8								
Botanical Garden Forest Biosci parkway	19.2 (6.4)	9.6	1,243 (3.8)	15.4 3.5 0.5	0.4 0.5 0.7 2.0	0.2 0.3 0.7 1.1	1,243 1,256 1,269 1,282 1,295 1,308 1,321 1,334 1,347 1,360 1,373 1,386 1,399 1,412	12.6 12.7 12.8 12.9 13.0 13.1 13.2 13.3 13.4 13.5 13.6 13.7 13.8 13.9 14.0	12.6 12.7 12.8 12.9 13.0 13.1 13.2 13.3 13.4 13.5 13.6 13.7 13.8 13.9 14.0	12.6 12.7 12.8 12.9 13.0 13.1 13.2 13.3 13.4 13.5 13.6 13.7 13.8 13.9 14.0	12.6 12.7 12.8 12.9 13.0 13.1 13.2 13.3 13.4 13.5 13.6 13.7 13.8 13.9 14.0	12.6 12.7 12.8 12.9 13.0 13.1 13.2 13.3 13.4 13.5 13.6 13.7 13.8 13.9 14.0	12.6 12.7 12.8 12.9 13.0 13.1 13.2 13.3 13.4 13.5 13.6 13.7 13.8 13.9 14.0								
Total	3,000.0 Pa (100%)	32,900.2 (100%)	2,243.4 (63.1)	63.6 95.7 32.2	63.6 223.2 276.1	36.2 64.2 126.3 276.1	32,900.2 34,297.9 35,695.3 37,092.7 38,490.1 39,887.5 41,284.9 42,682.3 44,079.7 45,477.1 46,874.5 48,271.9 49,669.3 51,066.7	136.2 137.6 139.2 140.6 142.0 143.4 144.8 146.2 147.6 149.0 150.4 151.8 153.2 154.6 156.0	136.2 137.6 139.2 140.6 142.0 143.4 144.8 146.2 147.6 149.0 150.4 151.8 153.2 154.6 156.0	136.2 137.6 139.2 140.6 142.0 143.4 144.8 146.2 147.6 149.0 150.4 151.8 153.2 154.6 156.0	136.2 137.6 139.2 140.6 142.0 143.4 144.8 146.2 147.6 149.0 150.4 151.8 153.2 154.6 156.0	136.2 137.6 139.2 140.6 142.0 143.4 144.8 146.2 147.6 149.0 150.4 151.8 153.2 154.6 156.0	136.2 137.6 139.2 140.6 142.0 143.4 144.8 146.2 147.6 149.0 150.4 151.8 153.2 154.6 156.0								
Projection of Bagia D.E.I.							4,297.0	4,479.0	4,661.0	4,843.0	5,025.0	5,207.0	5,389.0	5,571.0	5,753.0	5,935.0	6,117.0	6,299.0	6,481.0		

Park Facilities Study

Activities and Installations

The recreation activities of park visitors are furthered or restricted by the quality and extent of the environment at the places at which such activities take place, the quality of the ground surface at the point where they stand having a particularly great influence. Furthermore, the relative environmental conditions vary according to the use density.

- Basic conditions controlling walking are pavement quality and form, level change, stairs and slopes.
- Facilities for satisfaction of the physiological conditions of park visitors are of greatest importance in the park, particularly seating and rest facilities, which are particularly necessary where there is a concentration of people.
- For the convenience of park visitors, shade, litter bins, information guides, etc. must be provided, it being particularly important that users be able to easily determine the direction in which they should proceed. Furthermore, facilities for maintenance of the environment are of convenience to park visitors at places where there is concentration and slowing down of movement of people.
- In an aesthetic sense, such facilities as walls, alcoves, niches, flower beds, etc. are important for a beautiful environment as elements that attract visitors.
- There must also be detailed provision for control of visitor activities and for the sake of ensuring visitor safety, including fences, rails, level changes, bollard lighting, etc.

Study Regarding Quantity of Service Facilities

Park Utilization Population

Generally, it is necessary to set the scale and capacity of service facilities at those needed for peak days of the year and peak hours in order to ensure the pleasantness of use of the park by the visitors.

If this is done, however, on normal days the use of most facilities is way below capacity. Some facili-

ties can be supplemented by temporary or substitute facilities, and therefore from the standpoint of efficiency of use of service facilities, it is not necessary that the permanent facilities have capacities geared to peak days of the year.

In the case of the city of Bogota, only December is a peak month of park use, the number of park visitors being about the same for each of the other eleven months of the year. The ratio of this December peak to the number of users in an average month is about 1.5 : 1.

This being the case, the service facility capacity should be set at the level of the second-use peak (75% of the level of the peak day of the year), with temporary facilities being used to cope with the peak days and peak hours.

In 1990 the number of visitors on the peak day of the year will be 84,700 persons

And the number of persons in the park at the same time during peak hours on such a peak day (total number of users \times turnover rate) will be: $84,700 \times 1/3 = 28,233$ persons

The capacity of the permanent service facilities will therefore be $28,233 \times 0.75 = 21,174$ persons \approx 21,200 persons.

Setting of Service Facility Capacities

The necessary service facility capacities are anticipated as follows on the basis of the rate of use and unit size. Since the criteria for these calculations are based on Japanese case studies as slightly modified for conditions in Bogota as determined in the first field survey. Further study will have to be given to such criteria for better reflection of actual conditions.

Table - 34 Area Requirement of Service Facilities

Type of service facility	Calculation formula	Necessary area
Rest place	$21,200 \text{ persons} \times 0.1 \times 1.5 \text{ m}^2/\text{person}$	3,180 m ²
Public lavatory	$\text{Log } Y = 0.872 \text{ Log } 21,200 - 1.615^{**}$ $Y \times 1/2 = 71 \text{ Stalls} \times 3.3 \text{ m}^2/\text{Stall}$	234 m ²
Restaurant	$21,200 \text{ persons} \times 0.05 \times 1/2 \times 1.0 \text{ m}^2/\text{person}$	529 m ²
Total		3,943 m²

Note:

1. The proposed formula has been used for calculation of public lavatory capacity on the basis of Japanese architectural safety ordinances, the necessary number having, however, been set as one-half considering difference in living habits.

Table - 35 Number of Service Facilities

The necessary number of service facilities is as follows as based on the average area of each facility.

Type of service facility	Unit area for each facility	Number of facilities of each type
Rest place	10 m ²	320
Public lavatory	25 m ² (3 stalls for men and 4 stalls for women)	10
Restaurant	250 m ² (200 seats)	2

Traffic Study

Traffic Characteristics of Roads Around the Park

The traffic characteristics of roads around the park area can roughly be recognized from the result of traffic research, which was conducted by Universidad Nacional de Colombia in December 1980.

On the basis of both reports of this traffic research and the result of the site survey (implemented by the JICA Study Team), the problems at the present stage are herein rearranged, and such problems are further studied from the viewpoint of "Park Use Plan", which has the target year of 1990 corresponding to the project's target year.

Problems of Present Traffic Conditions

From the viewpoints that appropriate capacity is exceeded on almost all main roads around the park area and that traffic flows intersect, a very high level of congestion appears at the peak time-zone on weekdays. (Refer to the tables, which show the relationships between peak traffic volume on weekday and weekend and permissible traffic volume.

The traffic source consists of the residential area and Unidad Deportiva Del Salitre in the case of areas surrounding the park area. So, almost all of the traffic, which uses the main roads, is through traffic.

When estimating the development of cities in future, it seems quite probable from the viewpoint of present traffic status that the traffic will be paralyzed completely in 11 years if the growth rate of traffic volume is 3% p.a. If the growth rate is 5% p.a., paralysis will occur in 7 years.

Even from the standpoint of growth of population and public traffic (Conditions in 1990 would be about 1.6 times as bad as in 1980 if no changes take place or are made.), the above forecast implies that countermeasures must be made for improvement of traffic.

Table -- 36 Traffic Volume and Capacity of the Surrounding Roads in the Weekend

Intersection	Survey Spot		Way	Lane	Peak hour	Day	Volume	Capacity	Volume/Capacity
	No.	Direction							
Carrera 68 - Calle 63	1071	N	2	4	13:30 - 14:30	Saturday	1409	2600	0.54
	1071	S	2	4	12:30 - 13:30	Saturday	1670	2600	0.64
		E	1	3	13:30 - 14:30	Saturday	1372	1800	0.76
		W	1	2	13:30 - 14:30	Saturday	1082	1200	0.90
Carrera 68 - Calle 53	1081	N	2	4	13:30 - 14:30	Saturday	1228	2600	0.47
		S	2	4	12:30 - 13:30	Saturday	1731	2600	0.67
		E	1	3	12:30 - 13:30	Saturday	697	1800	0.39
Carrera 60 - Calle 53	1041	N	1	3	12:30 - 13:30	Saturday	801	1800	0.45
		2S	1	3	14:00 - 15:00	Saturday	456	1800	0.26
		E	2	2	12:15 - 13:15	Saturday	572	1800	0.32
		W	1	3	12:15 - 13:15	Saturday	572	1800	0.32
Carrera 60 - Calle 63	1031	N	1	3	14:00 - 15:00	Saturday	449	1800	0.25
		S	1	3	12:45 - 13:45	Saturday	633	1800	0.35
		E	1	3	12:45 - 13:45	Saturday	1645	1800	0.91
		W	1	3	13:45 - 14:45	Saturday	1253	1800	0.70
		N	1	3	12:45 - 13:45	Saturday	966	1800	0.53
		S'	1	3	12:30 - 13:30	Saturday	601	1800	0.45
		E'	1	3	17:30 - 18:30	Saturday	966	1800	0.53
		W'	1	3	13:30 - 14:30	Saturday	1372	1800	0.76
Carrera 50 - Calle 63	1011	S	1	3	12:30 - 14:30	Saturday	880	1800	0.49
		E	1	3	17:15 - 18:15	Sunday	1033	1800	0.57
		W	1	3	13:45 - 14:45	Saturday	1066	1800	0.59
		S'	1	3	13:45 - 14:45	Saturday	553	1800	0.31
		E'	1	3	17:00 - 18:00	Sunday	926	1800	0.51
		W'	1	3	12:00 - 13:00	Sunday	968	1800	0.55

Table -- 37 Traffic Volume and Capacity of the Surrounding Roads in the Weekday

Intersection	Direction	Way	Lane	Peak hour	Day	Volume	Capacity	Volume/Capacity
Carrera 68 - Calle 63	N	2	4	7:45 - 8:45	Thursday	2344	2600	0.90
	S	2	4	18:00 - 19:00	Thursday	1811	2600	0.71
	E	1	3	13:30 - 14:30	Saturday	1372	1800	0.76
	W	1	2	7:30 - 8:30	Thursday	1200	1200	1.00
Carrera 68 - Diagonal 53	N	2	4	7:45 - 8:45	Thursday	1908	2600	0.77
	S	2	4	18:00 - 19:00	Thursday	2071	2600	0.80
	E	1	3	18:00 - 19:00	Thursday	704	1800	0.39
Carrera 60 - Calle 53	N	1	3	13:45 - 14:45	Thursday	1561	1800	0.87
	S	1	3	18:00 - 19:00	Thursday	808	1800	0.50
	E	1	2	12:25 - 13:25	Saturday	806	1200	0.67
	W	1	3	7:30 - 8:30	Thursday	1001	1800	0.56
Carrera 60 - Calle 63	N(in)	1	3	13:00 - 14:00	Thursday	963	1800	0.51
	S(in)	1	3	18:00 - 19:00	Thursday	1174	1800	0.66
	E(in)	1	3	18:00 - 19:00	Thursday	1711	1800	0.96
	W(in)	1	3	7:30 - 8:30	Thursday	1573	1800	0.87
	N(out)	1	3	18:00 - 19:00	Thursday	1360	1800	0.76
	S(out)	1	3	13:45 - 14:45	Thursday	1561	1800	0.87
	E(out)	1	3	8:00 - 9:00	Thursday	1334	1800	0.74
	W(out)	1	3	13:30 - 14:30	Saturday	1372	1800	0.76
Carrera 50 - Calle 63	S(in)	1	3	17:30 - 18:30	Thursday	1255	1800	0.70
	E(in)	1	3	13:00 - 14:00	Thursday	1068	1800	0.60
	W(in)	1	3	7:30 - 8:30	Thursday	1417	1800	0.79
	S(out)	1	3	12:45 - 13:45	Thursday	875	1800	0.49
	E(out)	1	3	8:00 - 9:00	Thursday	1803	1800	1.00
	W(out)	1	3	13:15 - 14:15	Thursday	1500	1800	0.83

Table - 38 Existing Road Classification

Section of Road	No. of Way	No. of Lane	Direction of Operation
A	2	3	2
B	2	2	2
C	2	3	2
D	2	3	2
E	2	3	2
F	2	3	2
G	4	2	2
H	1	2	2
I	2	2	2

Fig. - 51 Typical Road Cross Section

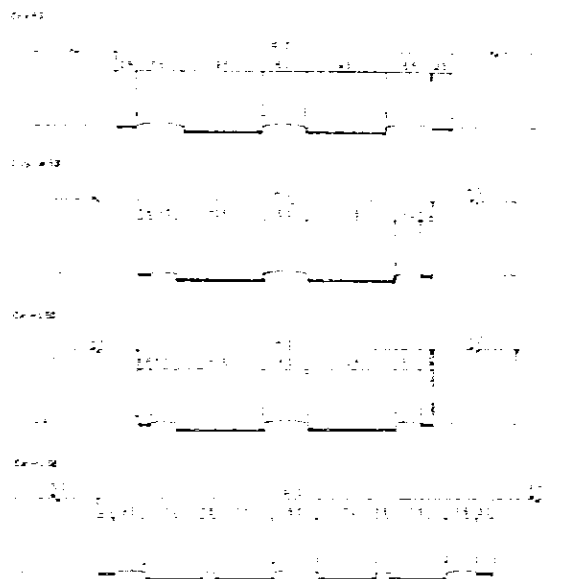
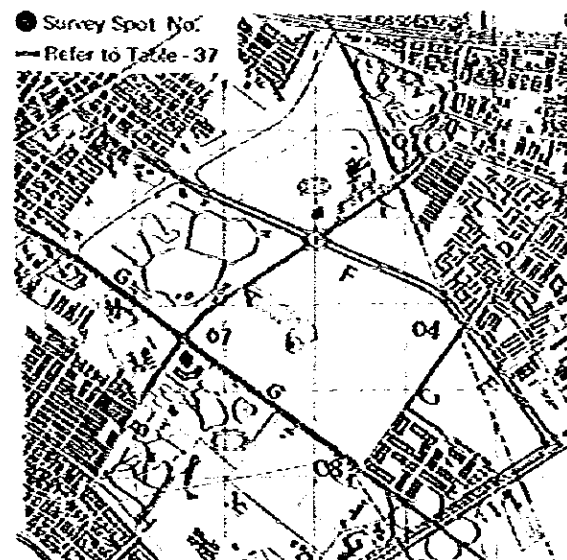


Fig. - 52 Existing Road Network



Control Plan for Traffic in the Vicinity of the Park

General

As shown by the traffic analysis conducted by the University of Colombia, the construction of roads as planned at present, will prove unsuitable for traffic capacity at peak hours in accordance with projected demands by 1990. Especially, for intersections of main roads joining Calle 63, Carrera 68 and Avenida Ciudad de Quito, the grade separation method is unquestionably suitable.

In planning traffic control, taking usage of the park into consideration, the problem occurs during peak hours when the flow of traffic is halted by vehicle and pedestrian congestion. There are three times in weekday rush-hour periods of commercial and private vehicles, i.e. school-commuters' bound cars flooding the roads in the morning (7:30 to 9:00), in the afternoon (12:00 to 15:00) and in the evening (17:00 to 19:00). In addition, there are two peak periods on Saturdays in the morning and in the afternoon. As for the visiting number en route to the park, it is tends to reach the maximum between 10:00 AM and 3:00 PM. Consequently, in formulating the traffic control plan, each overlapping period of park visits and rush-hours must be taken into consideration, i.e. peak hours in the afternoon and in the evening after 5:00 PM during the week and in the afternoon or Saturdays. As it is estimated that over 85% of park visitors will rely on buses as the means of transportation, the quantity of large sized buses should be taken into consideration in planning.

Traffic Burden Forecast

As to expectations for traffic volume in the vicinity of the park and the countermeasures to cope with it, an investigation will be conducted concerning overlap periods of peak hours on weekdays and weekends mentioned above. The forecast for use frequency of the park and the measurement of the traffic volume on future road networks will be made on the basis of investigation and analysis.

Therefore, as to the definite traffic control plan, the detailed countermeasures should be established at the time when investigation into the entire transportation system of Bogota City and future trends related to recreation, and forecasts the number of visitors to the park (the Whole Area: 350 ha), have been completed. The

measures will be worked out on the basis of information and data gained up to now, especially by the JICA study team as to the following:

: Smooth traffic of park visitors and vehicles at main crossings and safety.

: Preserving the beauty of the environment.

Features of the Planning

The fundamental conditions in the inquiry into the planning and the features of the planning are as follows:

- There must be compatibility in terms of land-use planning with the land-use pattern in the vicinity for a sense of unity.
- There must be an appropriate approach arrangement that avoids concentration at a single place of incoming and outgoing traffic, with particular attention being given to the individual functions of the different roads in the vicinity.
- Avoidance of hinderance of park functions through segmentation of the park by such roads, ensuring that overall harmony and continuous linkage of the various park functions can be maintained.
- The design conditions of the roads are to conform to those of present city planning streets. Accordingly, the width of the roads is to be the same as those of the present ones. As for design speed, 100 km/h should be appropriate for the Autopista El Dorado (V-O), and the range of 40-60 km/h should be suitable for the other roads around it, the specific speed for each depending on its particular functions.

On the basis of such basic conditions, the separately attached network plan is recommended for the future transportation network of the city of Bogota. (It is necessary, however, that this traffic plan be fully coordinated with the results of future traffic volume surveys and comprehensive urban development plans.)

The following are the main points to be noted with respect to this plan.

Partial Closing of Carrera 60

Carrera 60, which lies between Autopista El Dorado and Calle 63, appears to have a Low traffic volume occurrence judging from the surrounding land use and is not an important route in terms of city planning. Furthermore, most of it runs through the area scheduled for the park.

Accordingly, in the park plan consideration should be given to closing of it between Diagonal 53 and Calle 63 for the purpose mainly of prevention of division of park function, incorporating the right of way of the road along that stretch into the park land-use pattern.

Future study will have to be given, however, with respect to the problem of transfer and maintenance of such facilities as storm water drainage pipes and sewage drainage pipes laid within the right of way of this Carrera 60, the water supply main (42") presenting a particular problem.

Modification of Calle 63

Calle 63 runs almost parallel to Autopista El Dorado right through the center of the park site and is classified as a service road for medium- and short-distance trips as well as being considered as a main route in terms of the street network structure. However, considering the fact that from the point of view of the park area it shares the road function of through traffic, there are difficult elements with respect to incorporation of it into the park plan.

Nevertheless, from the standpoint of its significance to the park plan, it is necessary to deal with it in an integrated manner with the park in view of its role as a symbolic and commemorative urban mall within the city as a whole.

The following will therefore be necessary for the sake of fulfilling the functions and purposes of Calle 63 in terms of the street network while at the same time having it serve as an urban mall.

- It is necessary to separately classify the kind of traffic that it should carry and the kind that it should not carry and to find a way for as smooth handling as possible of through traffic, which rules out direct access to the park by way of this road.
- It is necessary, as far as possible, to avoid

diversion of direct traffic between the Chapinero district and the airport, which is expected to increase in the future, onto Calle 63, instead diverting it onto Autopista El Dorado as near the center of the city as possible. A possible way of accomplishing this is by building a bypass road along the railway running east and west along south side of the park site between Calle 63 and Autopista El Dorado so as to lighten the burden of through traffic to the northwest area, at the same time using such a bypass road as the main approach road to the 110 ha area of the park, this proposal also being valid in terms of ensuring the function of Carrera 60.

- It will be necessary to have grade separation at the intersection between Avenida Ciudad de Quito in order to be able to properly handle the large volume of through traffic of both, the diamond interchange type of grade separation being most appropriate.

As for the overpass, considering the pedestrian traffic and the facility layout in the vicinity of the intersection, the flyover type for both Carrera 68 and Avenida Ciudad de Quito would appear to be recommendable.

- Besides Calle 63's function as an urban mall leading into the park, it will also be possible to form other multipurpose space in connection with it unrelated to park or road functions by providing a grand plaza for national ceremonies consisting of a diversity of small plazas for casual use by its citizens.

The skeletal road alignment for this mall between El Lago and Carrera 68 can be a large, continuous S-shaped curve, with complete separation of traffic lanes and the pedestrian lane, the whole thing looking like an enormous tied ribbon. This is not consistent, however, with the present plan and profile alignment.

- In the section where the grand plaza is located, mainly as a profile consideration there should to a certain extent be clear separation of the functions of the amusement park and the 110 ha park area, with use of the slope of the road for the effect of perpendicular variation of the grand plaza.

For greater ease of motion of pedestrians and in view of the need to keep the amount of earthwork to a minimum considering the ground and drainage conditions, a pedestrian crossing has been provided under the road (architectural limit

minimum height of 2.5m). The planned height of the pedestrian road and that of the grand plaza have been set 1m lower than the present ground level as the limit height in terms of drainage planning.

Carrera 68

Since this is an important loop road, it is not appropriate in terms of road function for direct access to the park, such access being only from major intersections, i.e. those of Calle 64, Calle 63 and Diagonal 53

Calle 64

This road is to function as a service road for direct access to the park, receiving traffic from the Main loop roads Avenida Ciudad de Quito and Carrera 68. As for road specifications, the cross section should allow for separation of through traffic and service traffic.

Intersection Design

Various designs are conceived as means to satisfy these functional requirement but as a result of studies, as is shown by the plan, it is intended to handle the main traffic flow by means of a direct ramp approach. It is believed that this use is suitable from the viewpoints of traffic flow, boundary conditions with Urbanizacion La Esmeralda and the land use of the park.

- Calle 63/Carrera 68

Calle 63 and Carrera 68 are two of Bogota's arterial roads. As both carry through traffic, it is expected that a split-level crossing will be constructed. The city's master plan calls for full access for both of these roads, in principle, and an interchange of relatively high standards is intended. For purpose of park planning, the full access called for by the city's master plan is accepted and a cloverleaf interchange which would permit full access is planned.

The reason for this type of intersection to be used is that as a result of facilities of the Unidad Deportiva El Salitre becoming the control point, in order to obtain space for the roadway and facilities, the route of Calle 63 has to be moved to the opposite side, and the overall form therefore becomes linear.

- Calle 63/Avenida 60 (Bypass road)

The access road located at the 110 ha area's Entrance Zone has both the character of a bypass of Calle 63 and of the Main approach road leading into the 110 ha area.

Therefore the traffic flow which is to be given priority is that between the center of the city, via Calle 63, and the airport, and it is necessary to make arrangement to insure that it has a bypass function in connection with community to and from school and work, and an approach function when used by visitors going to the park.

Various designs are conceived as means to satisfy these functional requirement but as a result of studies, as is shown by the plan, it is intended to handle the main traffic flow by means of a direct ramp approach. It is believed that this use is suitable from the viewpoints of traffic flow, boundary conditions with Urbanizacion La Esmeralda and the land use of the park.

Fig. - 53 Proposed Intersection Design

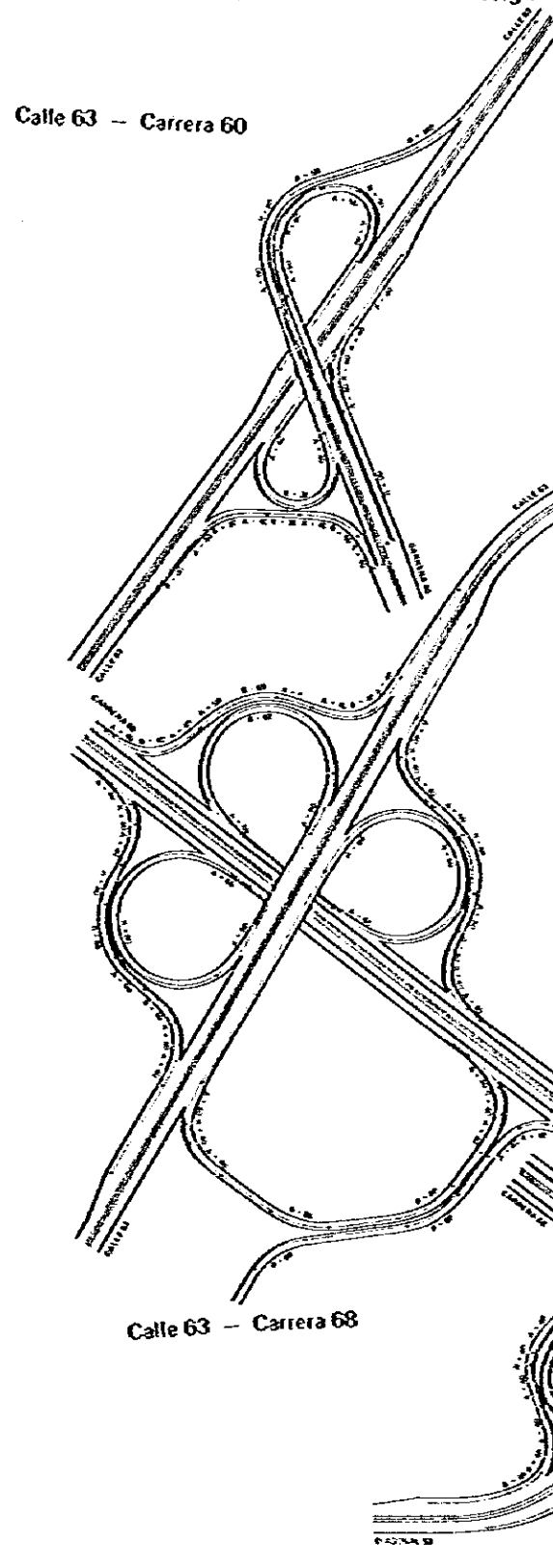
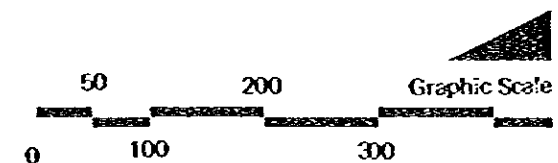
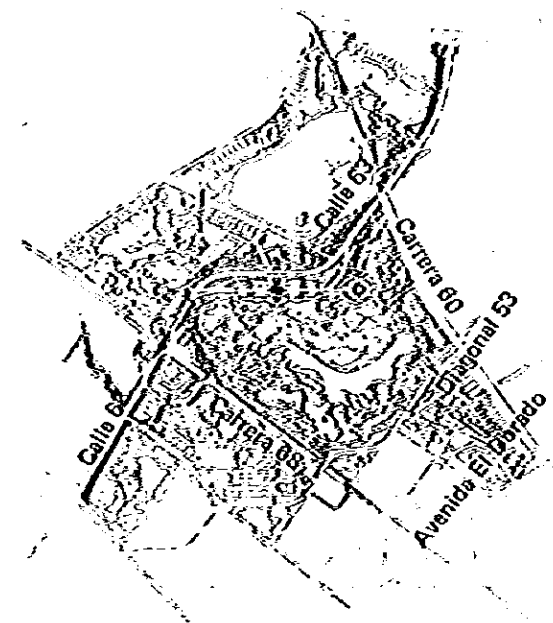


Fig. - 54 Road Network Plan



Diagonal 53 - Carrera 68

Calle 63 - Carrera 68

• Diagonal 53/Carrera 68

The present plan for Diagonal 53 is for it to originate in central Bogota, fly over Avenida Ciudad de Puito, and pass Urbanizacion Salitre to Carrera 68.

As indicated in the city's master plan, Diagonal 53 is modified so as to fly over Carrera 68 and to extend in a northwest direction. The park plan recognizes this aspect of the master plan and in keeping with the relationship with the park, the existing road structure is to be retained to the maximum extent possible and the road centerline alignment is planned as indicated in the road network plan.

In connection with the matter of access to the park, there is not to be direct access from this road. The intersection with Carrera 68, in view of the substation, is planned as a half-cloverleaf type.

• Diagonal 53/Carrera 68

The present plan for Diagonal 53 is for it to originate in central Bogota, fly over Avenida Ciudad de Puito, and pass Urbanizacion Salitre to Carrera 68.

As indicated in the city's master plan, Diagonal 53 is modified so as to fly over Carrera 68 and to extend in a northwest direction. The park plan recognizes this aspect of the master plan and in keeping with the relationship with the park, the existing road structure is to be retained to the maximum extent possible and the road centerline alignment is planned as indicated in the road network plan.

In connection with the matter of access to the park, there is not to be direct access from this road. The intersection with Carrera 68, in view of the substation, is planned as a half-cloverleaf type.

Landscape Study

Earth Work

Site grading

The grading scheme is developed as a whole, structure elevations being adjusted and readjusted until a balance of all potential site requirements is achieved.

For visualizing the site undulation as a fundamental landscape element, site grading shall be considered to be coordinated with the surface water drainage system.

The following basic policy is proposed for earthwork in the 110ha area considering the various problems with respect to the present conditions.

- Collection of the surface water is to be in the direction of the lake. Which is located near the center of the park. And drainage from the lake is led in the direction of the city main storm water drainage.
- The overall volume of earthwork will be quite substantial on account of the basic conditions of the scenic structure of the park. This will determine the proposed ground formation height on the basis of the planned surface area of the lake and the drainage gradient, the central part of the park being set lower than the existing ground level. This is for the purpose of achieving a balance of cut and fill. However, since a considerable volume of borrow will be required as a whole, ways will have to be studied for creation of mounds with high scenic effect with a minimum of embankment work.
- In order to prevent the use of soil with a high clay content, which is not suitable for planting, surface soil removed in connection with earthwork, must be retained for re-use at the time of final embankment formation.
- Borrowed earth can be sandy or have a certain amount of gravel mixed in it, but it should have good water retention and a considerable quantity of organic matter in it, particularly when it is used as the surface layer.
- There should be a policy of avoiding environmental disruption through the taking of large amounts of borrowed earth from single places, the matter of how much can be taken

depending, of course, on the particular conditions.

- Due to the limitation of the gradient on site drainage, water levels of the lake shall be determined as the lowest formation height. Grading and earthwork will be based on this determination of the water level at the lake. The approximate earthwork volume will be assumed as follows in this study stage.

Cut approximate	494,400 m ³
Fill approximate	595,000 m ³
Borrowed earth volume	150,000 m ³

* Soil shrinkage ratio 0.9

- Average gradient of grass land area is proposed to be approximately less than 1%, Surroundings of the national ceremonial plaza and woodland area are be proposed to be 5% to a maximum of 30%.

The deepest cut will be approximately 3.5m below existing ground level at the Lake area, and highest embankment will be approximately 7.5m above the existing ground level at the woodland hill.

Technical Consideration of the Soil; Coping with Poor Ground in the Park Area

It has been geologically confirmed in past surveys that the whole park area has a poor deep ground structure.

It is assumed that the ground structure under the surface is the same for all of the borings, and the features of the various strata are as follows.

- The topsoil (capa vegetal, i.e. humus soil or vegetable topsoil) extends on the average to about 60cm below the surface of the ground.
- Below that, there is an extremely soft clay stratum of medium consistency with an average compressive strength of $q_u=0.5\text{kg/cm}^2$ and a thickness of between 1.2m and 2.5m, with considerable variation.
- Below this clay stratum and at least to the depth bored (10-15m from the surface) there is a brownish-gray soft mud (limo gris-carmelito brando) stratum with an average compressive strength of $q_u=0.3\text{kg/cm}^2$, high compressibility and a liquid limit of between 100% and 200%.

- The ground water table is relatively high (with seasonal variation, averaging 1.5-2.0m).

Consideration of the Poor Ground

As described above, the soil in question is cohesive solid with a high clay content and a high silt (or organic matter) content and high percentage of moisture content. In terms of soil mechanics, it is very soft, with a unconfined compressive strength of less than $q_u=0.5\text{kg/cm}^2$.

This being the case, in the planning of embankment works or structural foundations on such soft ground it is necessary to take such a soil structure into consideration.

The items that have to be considered in this respect are the stability and settlement of the embankment itself, the effect of mud wave action on important facilities, private homes or roads contiguous to the planned embankment and selection of the type of structural foundation.

Structure of Foundations of Building Facilities

The conditions for selection of the type of general buildings and the type of foundations for them suitable for construction on ground having the soil characteristics described above are as follows.

- Considering the compressive strength of the soil, the maximum load strength on the foundation should be about 0.5kg/cm^2 . Accordingly, it is desirable that the foundation be set at about 1.5m below the surface, where the bearing capacity is $0.4-0.6\text{kg/cm}^2$.
- With such a foundation structure, a square individual footing foundation or a rectangular mat foundation would be adequate in the case of a comparatively small building (one of up to about three stories).
- For a building of more than three stories, however, the foundation should allow for some settlement as well as even distribution of load (this is in order to prevent damage to the building due to differential settlement).

Furthermore, since it is important that the load stress on the foundation be under 0.5kg/cm^2 , the general solution that has been adopted in the city

of Bogota on the basis of considerable experience and research is that of a floating structure for the foundation (creation of a hollow part as a semi-basement).

The advantages of such a foundation structure are that it is not necessary to excavate more than 1.5m from the surface of the ground to the bottom of the foundation and the fact that a spread foundation can be adopted within the soil compressive strength tolerance. While there are, of course, many possible types of floating structure, the geometric center of gravity and the center of gravity of the load from above should coincide, and there should be an integral structure so as to avoid differential settlement.

It is important that there be sufficient leeway at each of the boundaries and junctions in order to cope with difference in amount of settlement between the building proper and the surrounding ground and facilities that can be expected.

Settlement and Fracture of Embankments

As embankments rise, the ground beneath them settles, and there is lateral displacement and upheaval of the ground on the sides of the ground on the sides of the embankments. There is pronounced increase in the amount of settlement and the amount and range of upheaval as the height of embankment increases, and when the embankment increases, and when the embankment load reaches the ultimate bearing capacity of the ground, the embankment suffers fracture along the slide surface.

Let us now estimate the limit embankment height and total amount of settlement that can be expected in the case of the park site considering the given ground conditions.

Critical Embankment Height

The value of critical embankment height can be obtained from the relationship between the average unconfined compressibility of the soft stratum and the ultimate bearing capacity of the ground, this relationship being Height is the weight per unit of volume of the embankment (t/m^3), the value for common soil of $1.8 t/m^3$ being used here.

When the ground is considered to be a uniform clay, so that critical embankment height will be approximately 7m accordingly.

Let us consider the conditions that have to be taken into account in selecting construction methods to deal with clay ground as well as reviewing some of the construction methods that are generally applied.

All types of construction methods can be applied to cope with clayey ground, except for soil compaction, but in the case of some clay cohesive soil, there is an extreme decline in bearing capacity if the sensitivity ratio is high and irregular. In order to deal with ground having such soil quantities it is necessary to adopt a construction method that entails as little disturbance of the ground as possible.

In the areas in question it would appear that it would not be necessary for any special methods to be applied in general land formation (embankment) as long as the limit embankment height is not exceeded. If however, the embankment does exceed that limit or the construction work involves rapid soil compaction, special care and countermeasures will have to be taken.

In the case of road construction, particular care will have to be taken with respect to embankment since it is extremely important from the standpoint of safety that the surface of the pavement be flat. Accordingly, everything possible must be done to deal with settlement.

In the case of high embankment, such problems can arise as instability of the embankment and mud wave action or substantial settlement during the construction or settlement deep within the clayey stratum. In the case of low embankment there are fewer such problems, but, still, partial fracture can occur quite easily, leading to the occurrence of unevenness on the road surface and fracture of the pavement.

Measures to assure stability of civil structures

As may be understood from existing boring logs from the Club de Empleados Oficiales site, as well as logs of new borings done in connection with this project (Soils Progress Report, Parque Simon Bolivar Report No. 1777/81), the major characteristics of the soil at the site are that almost all of the soil below the surface layer (humus-containing surface soil) has a compressive strength of about $q_u = 5_t/m^2$ and at the depths reached by the

boring (30-50m) no bearing layer was encountered and all of the soil to those depths was soft.

This situation requires that caution be exercised in the design and construction of structure and facilities for the park, such as earthwork, roads and buildings, so that their load does not cause sinking or sliding.

It is therefore necessary to undertake structural studies of each of these facilities and the like on the basis of a study of the existing circumstances of building and road structures in the vicinity of the park area, as well as of the settlement due to consolidation and other characteristics of the soil.

• Earth planning within the park

Because embankment or fill operations as part of the earthwork for the park will be made to finished grades of no more than 10m above the original grade, and because the earth thus formed will have gently sloping sides, it is believed that there would be no special problems other than the possibility of settlement due to consolidation and therefore planning may proceed without inclusion of stabilization measures.

It is judged from the bearing capacity of the soil that the maximum embankment height is 7m and in consideration of the intention not to exceed the embankment height of 10m it is further judged that providing that build-up of the load through embankment work is properly phased so that earth is added at a suitably-timed rate, and a suitable period for settling is provided, the overall stability of embankments can assured.

The speed with which earth can be placed in the case of this project, in view of experience elsewhere, is about 5-10 cm/day. It is thought that the earth permitted to settle for a period of up to 6 months.

Further, it is anticipated that about 250,000 m^3 of earth will have to be obtained from off the site, due to the nature of the site topography and scale of cut and burrow. This earth preferably should be sandy (mountain origin) but if this is not possible then ordinary earth may be used although it is desirable for it to be mixed with an equal volume of cut from the site.

Regarding drainage, which is one of the factors influencing stability, because a lake is to be at a central location in the park and surface and underground drainage will be provided, no problem is expected.

- Road embankment planning

Road embankment work is to be performed separately from other park embankment work, to insure road safety by preventing subsequent problems of uneven settlement and improper slopes. Further, it will be necessary to give consideration to public service facilities to be provided within the road area, such as drainage pipes, water pipes, telephone lines, etc.

Various methods of stabilization may be used, such as the sand mast method and laying material method. Selection of methods used is to be done on the basis of such factor as the available construction time in view of schedule for road use, and the relative costs.

At this point it is judged that as long as the soil characteristics and design are such that the embankment height is not to exceed 7m, there would not be any fracture of the existing foundation and if the slopes are within approximately 1:4 the slopes would be stable and therefore no stabilization measures would be required. If possible, however, the rate of work should be 5 cm/day, and 10cm/day at most.

Regarding settlement due to consolidation, it is believed that extra banking should be employed, and that sub-surface placement of structure and paving work should be done after residual settlement has reached 10cm.

It will not be particularly necessary to provide sand at the interface of the existing foundation and the road proper about 1.0m of good-permeability form the viewpoint of facilitating settlement due to consolidation, and further stabilizing the roads themselves.

Drainage of the roads may accomplished by provision of side ditches at the toes of road embankment slopes, from which water may be made to flow into underground drains.

- Foundation of road structures

Regarding selection of foundation types for road structures, for box culverts and other structures having low loads such as about $5t/m^2$, direct foundations should be adequate, and for structures having loads greater than that replacement of earth by sand or use of friction piles should be planned.

For bridges and other heavy structures, the use of friction piles as presently used by Bogota officials (municipal standards) should be adequate.

- Foundation of general buildings

Regarding foundation types for general buildings, because the existing compressive strength is about $5t/m^2$, types which do not have more than a $5t/m^2$ upper load should be selected. It is through that friction piles will be suitable when loads will exceed that.



Water Surface

Lake Design Study

The lake plan for the park site will have a surface area of approximately 98,000 m^2 and water depth of up, to, 3m for a very large water storage capacity. The foundation of the lake bottom shall be set 0.5m to 3.5m lower than the present ground level so that there will be a comparatively large bearing capacity.

Generally speaking, water supply mains, ground

water, rivers, etc. are possible sources of water for lakes of this kind, but in the case of this park, the supply of water from water mains would appear to be most appropriate from the standpoint of maintaining water quality and securing a stable supply (Since, however, the large quantity of water that will be required could present a problem, it will also be necessary to study the matter of possible future use of ground water for this purpose).

In considering the source of the water, full consideration should be given to such matters as the water supply situation in the context of the surrounding land use, the cost of water supplied by water mains, the cost of electricity, etc.

Another possibility is use of rainwater as a source of water for the lake, but on account of such problems as irregularity of amount of rainfall from month to month, increase of turbidity during surface flow, destruction of bank protection works, the large number of inflow points, etc., this cannot be actively considered as a main source. From the standpoint of water conditions and drainage, however, it can be considered as a supplementary source of water for the lake, it being preferable, however, that the amount of supplementation not be taken into account in the calculation.

Water supply outlets should be provided at several points for even supply.

The bottom of the lake should not have very abrupt change so as not to obstruct upstream to downstream flow. One of the most important design conditions for the lake is prevention of leakage. In the way of watertightness construction methods for prevention of leakage, there are four mainly methods.

(1) Clay Facing Method

(2) Waterproof Film Laying Method

(3) Concrete Method

(4) Shot Concrete Method

In the case of the present park, adoption of the waterproof film laying method would appear to be most recommendable. The features of this method are good watertightness, ease of implementation over wide areas, economy, comparatively good durability and the ability to shape the lake fairly freely.

Lake and its Control Function

• Control Function and Capacity of Control

A "control pond" is basically constructed in order to prevent any false influence to the downstream river or drainage facilities when the volume of drainage is increased due to development.

From the viewpoint that the volume of drainage is rather decreased after the development of these park facilities, the original function of the control pond is not required. In order, however, to prevent any possibility of temporary inundation of the planned area even at the stage of rainfall more than the designed probability of years for drainage network, a control function is imposed on the lake.

The capacity of control, which can cope with the rainfall of 40-years' probability, can be calculated as follows:

$$V = (r_{40} - \frac{r_c}{2}) \cdot 60 \cdot t_c \cdot f \cdot A \cdot \frac{1}{360}$$

wherein,

V: Capacity of control (m³)

r₄₀: Rainfall intensity of 40-years' probability

$$r_{40} = \frac{3,600}{t_c + 17}$$

r_c: Rainfall intensity which conforms with the permissible volume of flow

Rainfall intensity of 5-years' probability = 50 mm/hr.

t_c: Optional rainfall durability (min.)

f: Flow coefficient

• Lake f, 1.0

• Area other than lake f₂ = 0.28

A: Area size of catchment-basin

• Lake A₁ = 10 ha.

• Area other than lake A² = 75 ha.

Therefore,

$$V = \left(\frac{3,600}{t_c + 17} - 25 \right) \cdot 60 \cdot t_c \cdot (1.0 \times 10 + 0.28 \times 75) \times \frac{1}{360} = \left(\frac{3,600}{t_c + 17} - 25 \right) \cdot t_c \cdot 5,167$$

The maximum capacity of control is about 8,000 m³. The rise of water level is approx. 8 cm (8,000 m³ ÷ 10 ha.).

From the viewpoint that this lake is of the "dig-in structure", any accident such as destruction of bank, etc. will not occur even if there is a rainfall larger than 40-years' probability. Only temporary inundation of the park may happen, and it may be affirmed that the lake itself is fully safe.

• Preservation of Water Quality of Lake and Water Source

From the standpoint of standard of water quality applicable to the usual lakes and ponds, the limit of environmental preservation, to which discomfort is not produced in the daily life (including the walks along the shore), is BOD 8 p.p.m. Bio-chemical oxygen demand).

This lake has two water sources: rainwater and fresh water. Due to these being separate systems, no living waste water can be mixed in the rainwater. Therefore, it seems that the BOD value of rainwater is lower than 3 p.p.m. when it flows into the lake.

The lakes and ponds in the surrounding areas are poor-nutrition lakes, where plants such as duckweeds, etc. are not found in large quantities. Therefore, it seems that this lake can be a poor-nutrition lake in which the quality of water is fully preserved. A poor-nutrition lake tends to become a rich-nutrition one gradually if the water's stay time is long.

If rainwater run-off is discharged for the purpose of water purification, it may be defined that the water is replaced every 2 rainy seasons, as a result of calculation of rainwater volume which flows into the lake for the individual month. Therefore, it seems that no rapid deterioration of the quality of water will occur.

Thus, the normal water stream will have the nature of replenishing water against the natural evaporation. The volume of evaporation is expected to be about 3 mm ~ 4 mm/m² against water area size "1 m²" although this volume is variable depending on the climate and season.

Therefore, the volume of water supply required for this lake amounts to 300 m³/day ~ 500 m³/day.

• Calculation of Rainwater Flowing into the Lake per Individual Month

$$Q = r_m \times f \times A \times 10$$

Wherein,

Q: Volume of rainwater flowing into the lake per individual month

r_m: Volume of rainfall per individual month

f: Discharge coefficient

Lake f₁ = 1.0

Area other than lake f₂ = 0.28

A: Area size of catchment-basin

Lake A₁ = 10 ha.

Area other than lake A₂ = 75 ha.

$$*Q = r_m \times (1.0 \times 10 + 0.28 \times 75) \times 10 = r_m \times 310$$

Table - 39 Volume of Rainwater Flowing into the Lake

Month	Volume of rainfall per individual month (mm)	Volume of rainwater flowing into the lake per individual month Q (m ³)
Jan.	45	14,000
Feb.	55	17,100
Mar.	60	18,600
Apr.	105	32,600
May.	100	31,000
Jun.	60	18,600
Jul.	40	12,400
Aug.	40	12,400
Sep.	50	15,500
Oct.	110	34,100
Nov.	105	32,600
Dec.	75	23,300

Remarks

• Capacity of lake
10 ha. × 1.2 m (depth)
= 120,000 m³

• Volume of rainwater flowing into the lake
Jan. ~ Jun.
132,000 m³

• Volume of rainwater flowing into the lake
Jul. ~ Dec.
130,000 m³

Planting

Approach to Purposes of Planting in Urban Parks

Plantings have various meanings in an urban park, and make various contributions to the life of the citizens.

- From the viewpoint of greenification, the planting will work as a base for introducing a large scale and various species. Through the greenification, the "Green" of a city can be enhanced from the viewpoints of both quality and quantity.
- From the standpoint of preservation of the environment, the natural environment can be distributed, through plantings, in the central area of city in a large scale. It will result in the establishment of a desirable ecosystem with "fauna" and "flora" in a natural environment.
- In regard to the landscape, landscaping consisting of trees, shrubs, etc. is the most "natural" and, furthermore, can be realized in a three dimensional and colorful manner.
- From the viewpoint of the place of recreation activities, the plantings can furnish, to the urban residents, a convenient place where they can enjoy nature fully. The natural environment which is formed by the plantings activates the recreation activities or sports in various ways.
- In addition, the plantings can exhibit various roles and functions through the "planting distribution" and the pattern, figure and shape of plants.

Environment for Plant Growth and Plantings

It is very important for the practice of planting to understand the plant-growing environment fully. It must be a target of planting that a large scale of park functions in an organic manner for a long period of time in future. In this plant-growing environment, there can be considered various factors such as "biological component", "climatic component", "land and soil component", "artificial component", etc. It is essential to study and practice the countermeasures fully according to these respective components.

Allocational Planting Purpose of Allocational Planting

The term "allocational planting" means to

determine the layout among various trees, shrubs and ground-cover plants. The allocational planting is variable according to the purpose of planting and area to be planted. It is important, however, to accomplish the purpose of planting while making effective use of the basic topography, which is modified by the ground modelling. It is also critical that the whole plantings are integrated as a park itself and exhibit an organic effect therein.

Procedures of Allocational Planting

In consideration of living and formal characteristics of planting materials, etc. the layout in vertical constitution and horizontal constitution is determined. For this purpose, it is important to understand the growth and form characteristics among various plant species in consideration of the mixture of species, sizes, quantities, etc. required in the planting plan. And, at the final stage, it is required to handle the layout of plants reasonably and aesthetically.

• Planting Density

The density of planting is variable according to the purpose and function of allocational planting. The density of planting in the whole greenification area becomes the criteria for the quality and extent of greening.

• Vertical Configuration

Being the configuration among shrubs and groundcover plants in the vertical direction, this vertical configuration determines various elements such as "degree of shelter and closeness", "security of visibility through trees and/or shrubs", "spread of open space in tree-planted area", "existence/non-existence of space, etc.

• Configuration According to Plant Size at the Planting Stage

This is the configuration among adult trees, young trees, etc. This configuration should be determined in consideration of volume of "green" at the end of the work and also from the viewpoint of outlook of greenification including the passage of long period of time such as "after 10 years", "after 20 years", "after 50 years", etc. In addition, factors of wider range such as "succession of plant ecology", "follower trees in view of preservation of green" etc. must also be considered in the determination of this configuration.

• Group Plantings and Unit Number

In the case of a single tree, of its value as a symbol can be comparatively large. In traditional allocational planting, the group plantings consisting of "2 trees", "3 trees", "5 trees" or "7 trees" easily has the character of arranged planting. If the number of trees exceed such a level, the trees show the feature of grove, or wood.

• Ratio Between Trees, Shrubs, and Lawn Area

While the forest (grove) constitutes a vertical spread, the lawn and/or ground-cover plants create a horizontal spread. A space configuration is determined by the spread in vertical and horizontal directions, layout thereof, rate of shelter, etc.

• Proportion among Evergreen Species, Deciduous Species and Conifers

Determining the character of space configuration in the planting zone, this proportion among "evergreen species", "deciduous species" and "conifers" constitute a scene of contrast, continuity, degree of shelter, harmony, etc.

Guideline on Design of Allocational Planting

Being of a large scale, this park has various elements of landscape. For proper allocational planting, the following points are proposed as the design guideline.

- **Unity:** To have a unification of quality as a whole despite of the possession of variety.
- **Simplicity:** Being such that individual factors can easily be recognized without confusion.
- **Repetition:** To have repetitive expressions of shape, texture and color, etc. This repetition is required especially at those areas which are key points for the whole.
- **Graduation:** To have gradual increase or reduction of the shape, color, etc. By this graduation, a dynamicism can be expressed. In the actual application, the combination of graduation and repetition is required.
- **Rhythm:** To have a repetition in a single phase, of "repetition" and/or "graduation" being followed by a certain variation of shape, line and color. By this rhythm, a contrasting factor such

as accent, high-low tone, strength/weakness, slowness/rapidity, etc. can be produced.

- **Symmetry:** To have a symmetrical layout of shape, color, plane expanse, etc. being centered on an axis. This symmetry can express impressiveness, stability or representative space.
- **Balance:** To have a conflict between two different directions centered at a point. It is very important to give the same impression between these two conflicting factors in terms of quantity and quality.
- **Contrast:** To have an opposition from the viewpoint of characteristics such as color, shape, etc. This contrast can produce a kind of variety and beauty.
- **Harmony:** To produce a familiar unity on an overall basis by making small variations of the characteristics such as color, shape, and figure.
- **Proportion:** To have mathematical relationships, which create a beautiful scene against the "whole" by the large/small degree on volume or area size or long/short degree on a line.

Planting Density and Quantity of Plants

The number of trees to be planted per unit of area will depend on the planting zone and on the species planted in it. In terms of vertical composition, there can be different combinations of tall, small trees and shrubs, and viewed from above, the crowns will overlap at maturity.

The highest planting densities will occur where conservation greenery is newly provided. Particularly where a natural forest type of effect is to be created, the trees and other plants will have a multistrata composition.

In the detailed planning the planting density of such conservation will decline in the order of that which has elements of a primeval forest, that characterized as a mixed forest and that representing a single-tree type forest. Comparatively high planting density will also be required for windbreak greenery, edge greenery and screening greenery. Although the overall density of facility greenery will be somewhat lower, there is normally some high density planting of small trees and shrubs.

The planting of roadside greenery and aesthetic greenery, on the other hand, is characterized by low density, with priority being given basically to tall trees. In mall greenery, high trees are planted comparatively densely, but there is some high density planting of medium and low trees, which has a considerable influence on the overall planting scenery. In the case of turf greenery, there will be coverage by lawn grass, but since green shade trees will be planted along park roads

and at other strategic points of the park, the density of the turf greenery will be extremely low. Nursery greenery will be of comparatively high density, but, of course, it will not be permanent.

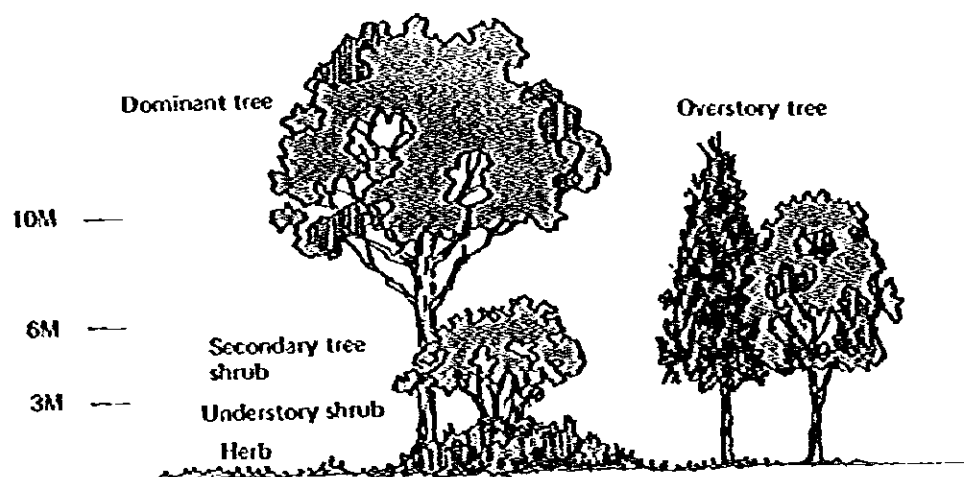
The number of trees to be planted in each planting zone of the park 3110 ha² will be roughly as indicated as follows.

Table - 40 Planned Planting List

	Tall Tree	Small Tree	Shrub	Small Shrub	Ground Cover
1.	400	500	1,330	9,975	30,000
2.	93	160	325	2,430	500
3.	175	290	580	4,350	—
4.	20	30	60	450	500
5.	56	91	186	1,338	—
6.	327	545	1,090	8,170	—
7.	41	65	—	920	—
8.	817	1,165	2,364	6,954	—
9.	780	1,550	2,060	1,300	23,280
10.	4,080	4,700	6,280	15,700	180,500
11.	200	200	150	1,700	17,000
12.	45	90	360	1,350	6,000
13.	55	90	180	1,350	7,500
Totals	7,091	9,476	15,095	51,687	474,800

1: National Ceremonial Plaza. 2: Cultural Ribbon. 3: Chronological Ribbon. 4: Actual Ribbon. 5: Liberty Ribbon. 6: Youth Ribbon. 7: Natural Ribbon. 8: Main Gate Area. 9: Lawn Land. 10: Wood Land. 11: Lake and Lakeside. 12: Colombian History Museum. 13: Religion Museum.

Fig. - 55 Multilayered Planting for Vertical Configuration



Nursery

One of the most important park implementation factors is the planting of trees, shrubs and ground covers which precisely represent park environment.

Simón Bolívar Great Memorial Park contains the park project area of 110 ha. for new planting and other park area of 250 ha for improvement of greenification, so that the Whole Park Area is approximately 350 ha.

If the park project area is to be greenified, it will need approximately 80,000 to 100,000 trees, shrubs and other plants.

In consideration of present supply capacity at nurseries in Bogotá area, total demand for the park planting would exceed existing capacity of young tree supply. For this reason a new nursery for the park must be established at an early period.

Following are important considerations for nursery establishment, operations, maintenance and other related subjects

Planned production to meet exact demands according to park implementation needs

a) Quality of produced young trees and shrubs in regard to their size, growing condition, etc.

b) Delivery target for producing numbers of young trees; tree planting periods in the implementation schedule.

c) Selection of species including with native, exotic and hybrid ones.

d) Quality control of production for diverse species, size, numbers and delivery periods in accordance with detailed operation management schedule.

fig. -- 1

Introduction of new technology for nurseries

a) Containerized planting for safety care and convenient transport

b) Systemerized irrigation for continuous supply of adequate amounts of water to diverse planting group of species, such as sprinkler system, drip irrigation system and mist spray system.

c) Mechanized transportation system within the nursery for systematic transport and distribution of trees with ease and safety.

d) New transplanting methods to meet sizes, characteristics and other conditions of each group of species. Transplanting operational techniques for well grown young trees are needed such as preparation for transplating, cutting roots, making root ball, trimming-thinout etc.

Increase of nursery productivity

a) Incentive production system for supplying enough quantities of young trees according to the schedule, with specified species, equal sizes, and right quantities.

b) Introduction of adequate machinery for planting, transplanting, removing, transporting, digging, lifting and so on. New horticultural tools and nursery equipment also need to be introduced.

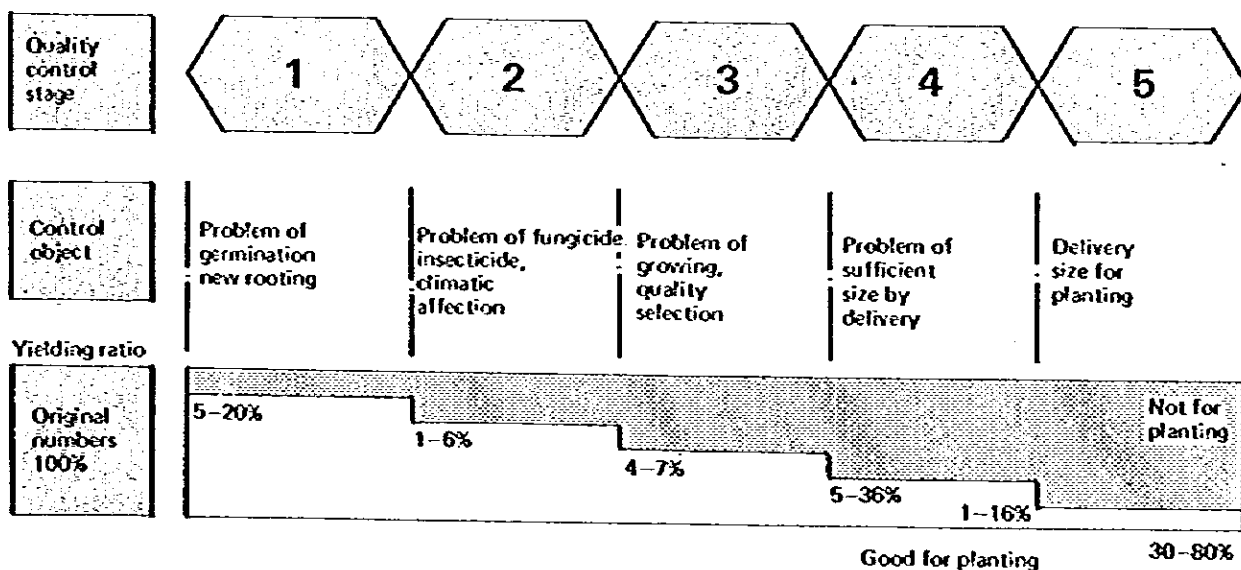
Horticultural training and education

A program for training skilled gardeners and planting specialists through advanced technical training and education is a necessary part of nursery management.

The program will contribute to the establishment of new systems of trees and plant maintenance and also to planting implementation in Colombia.



Fig. -- 56 Quality Control Flow Chart for Plants Production



Planting Manual

Planting seasons

Off-season planting should be avoided unless prompt replacement is considered important enough to offset the handicaps. Unusual care is required to move plants during seasons ordinarily regarded as unfavorable. In the case, plants are set out during the dry season, they will survive only after heavy cutting back, and will remain in a depleted condition, producing little or no leaf effect until the following natural wet and moderate growing season. Thus, frequently little is gained, and expense is increased by the necessity of using more careful methods and by the lengthening of the period of artificial watering.

Methods of handling

- The method of handling dramatically influences the amount of time required for plants to become established. Other factors being equal, plants taken from containers in which they have been growing start new growth most rapidly.
- Plants moved with solid, natural, expertly tied balls of earth enclosing most of their roots show only slightly less speed of recovery, and plants moved with roots bare of earth recover more slowly than those handled by either of the other two methods.
- Rapidity of establishment and probability of success in transplanting of balled or bare rooted plants are much increased if the roots are pruned as far in advance of moving as necessary to induce a compact root growth. In cases of transplanting from the wild, root pruning will make the difference between success and failure.
- Plants with shallow root systems may be root-pruned with a sharp spade, however deeply rooted plants require trenching. Root pruned plants should be plainly tagged or otherwise marked so that they may be identified at moving time.
- For the handling during transportation and on arrival, not only is it important to keep the roots from drying out, but also to keep the tops from being subjected to excessive evaporation while the plants are out of the ground.
- Broad-leaved evergreens in excellent condition can be ruined by exposing to the sun and whipped by the wind at high speed. Plants should be grouped together and covered, so that transpired moisture may remain in the vicinity. The covering should protect the plants from the sun and wind. When the plants arrive, they should be immediately tended by placing in a cool, shady place and by sprinkling unless they can be planted promptly.

Drainage

- Most plants will die if the soil about them remains saturated for any considerable length of time. For this reason, adequate drainage must be provided if plants not capable of enduring such conditions are to be used.
- It is desirable to dig at least a few plants pits before the plants arrive, and check the drainage condition.
- Consideration of using raised beds for the larger and deeper-rooted plants shall be also made.
- Drainage may be accomplished by open ditches, if it is necessary.

Planting operations

- Best weather for planting is an overcast day two or three days after a rain. The soil will be moist but not muddy, and the plants will be spared the withering effects of the hot sun. Failing the ideal circumstances, adjustments will need to be made.
- Planting pits and holes. At any rate, pits should be dug at the proper locations. If it is not too wet or poor, it may be treated with humus and other additives and used to backfill the plant. The poorer the soil, the larger the hole should be.

Setting the plants:

- The plant may now be removed and placed carefully in the pit. In the case of roots with burlap, no attempt is made to remove the burlap, it will soon rot and disappear into the soil.
- With the plant in the pit and level checked so that the level of the plant "crown" and the adjacent ground level are identical, the plant may be rotated until it best side faces the direction most often seen, small amounts of backfill being used and tamped to insure verticality and the backfilling may begin until the top is reached. Then the pit should finished with generous basin of earth and watered in thoroughly.
- Tie the trunk loosely to the stake in order to hold the plant in place temporarily until the permanent guard is installed if necessary.

Pruning

- Unless already accomplished, pruning should be done at this stage. If the material is container grown, there may be little need to prune, or to shape the plant in general.
- However if the material is deciduous or semi-deciduous, especially if there is poor root condition, some considerable pruning may be indicated in order to balance the top with the curtailed root system.

Mulching

- Over the surface of the basin should go a mulch to conserve moisture and reduce evaporation. Almost anything that is moisture retentive, inexpensive, and available.

Wrapping

- A sizeable tree with smooth bark, lacking much shade on the trunk from side branches or other sources, may suffer from sun scald unless wrapped.
- Wrapping would also be required for a young tree transplanted from the wild if the wild environment were shady and new location hot and sunny. Prior to wrapping, a judgment should be made as to whether the bark is too tight or not.

Guarding

- Trees are vulnerable to a number of circumstances caused by nature and by man: windstorms, bark injury by lawn mowing machines, vandalism etc. A measure of protection from all these may be afforded by a permanent guard.

Planting ground covers

- The area between trees is to be planted in ground cover, the surface soil should be treated adequately. The amending material may be spread uniformly over the surface of the ground and cultivated if possible.
- The ground cover plants will probably be delivered in flats, or in small pots and be planted.

Watering-in

- The final step in any planting is watering-in. Whether sod, shrub, or tree, this should not be delayed.