PART III:

PRIORITY AREA

(DIN DAENG COMMUNITY AREA: 100HA)

REDEVELOPMENT MASTER PLAN

CHAPTER FIVE:

REVIEW OF EXISTING MASTER PLAN

5.1 BACKGROUND/OVERVIEW

In 1992, NHA and BMA were in accord to improve and renew Din Daeng Community Area lands mainly occupied by these two agencies as a redevelopment "Super Block". During 1996 to 1997, NHA and BMA jointly studied the Super Block concept for the urban renewal of Din Daeng Community Area. The executive officer of BMA (the Deputy Governor) approved the cooperation approach of NHA and BMA, and a Working Committee was established accordingly by both agencies.

In 1999, NHA worked out a preliminary master plan focusing on the renewal of Din Daeng Housing Complex, which is totally used as apartment housing for low to medium income households. In order to realize the master plan, NHA held several meetings with other agencies constituting the Working Committee including OCMLT, SRT, etc. The study called for a minimum budget of 20,000 million baht, and therefore, the participation of private investors was found to be necessary for minimizing public investment. Consequently, a reliable feasibility study by creditable consultants was required to comply with the Royal Act on Private Participation in State Affairs (B.E. 2535).The Act prescribes that if the project owner desires participation of private sector with assets exceeding five billion baht, the owner should hire a consultant to carry out a separate study following the requirements established by NESDB.

After several meetings, the Working Committee decided to entrust a consultant team (Creative Development Co., A-7 Corporation, SJA. 3D Co.) to formulate a master plan to be submitted to the relevant authorities for approval.

At a cabinet meeting held on 7th November 2000, the masterplan was approved with several conditions to be secured. The contents of the decision made at the cabinet meeting are presented in the box below. In essence, the cabinet approved the concept of the project, but requested further study as a condition for approval of implementation. NHA has been making efforts to comply with this requirement by

holding several workshops, consulting the existing residents who would be affected by the project, and requesting technical assistance from the Government of Japan, the result of which being that the JICA Study Team joined the study.

Cabinet Meeting Decision

1. Approval of the Master Plan for Land Development and Urban Renewal in Din Daeng Community as proposed by the Ministry of Interior.

2. Approval of the supporting fund for expenses needed for preparation for not over 793 Million baht within the period of 10 years. The 250 Million baht for initial stage shall be allocated from the budget of the fiscal year 2002 and 2003.

3. MOF, MOSTE, NESDB and the Budget Bureau were assigned to study further details, and find out the appropriate plan that conform with the related laws for investment planning, investment method, and joint-venture with the private sector including the support for construction of residential building, in order to compensate the right of old residents, removal fees during construction period, and environmental impact.

4. Study to improve the National Housing Act so that NHA can be more efficient in developing and managing the large scale communities, including the adjustment of NHA's duty in the operation and management of residential buildings and improving environment of the congested and deteriorated communities of the low-income people. Giving NHA a full authority to operate and manage the cleaning system of each community and assigned the Ministry of Interior and NHA, to proceed the improvement of the National Housing Act as soon as possible.

5. NHA shall determine the criteria and complete the following procedures before initiating the project implementation:

5.1 Prepare a clear plan for removal, construction of building and temporary residence by considering the impact on households, schools and income sources of old residents.
5.2 Study and confirm the number of residents by making the name list and announce at each community for them to check for the correctness.
5.3 Determine the compensation for rental privilege and temporary removal fee for old residents during the project operation with fairness according to economic situation.
5.4 Determine the privilege of old residents to return to the project as first priority with rental fee lower than normal fee that will charge from new resident. The Special rental fee will consider from the average income of old residents.
5.5 Determine the area for pubic center i.e. library, community center, old age health center, nursery, sport and recreation center with appropriate ratio compared with total residents.
5.6 Determine the suitable and appropriate area for community shops in each residential building and specific area by giving the privilege to the residents in making more income with special rental fee and without liquidation.
5.7 Allocate the area in the commercial area with number of building by giving the privilege to the residents with special rental fee and without liquidation.
5.8 Study for possibility of joint venture by private sector for land development for commercial use by giving the opportunity to old residents to purchase the shares of private sector.
5.9 NHA should explain, making the understanding and conduct a-public hearing among the old residents to be used as guideline for operation according to 5.1 - 5.8 and proceed according to the comments from MOSTE, NESDB and Budget Bureau before project implement.

5.2 OUTLINE OF EXISTING MASTER PLAN

5.2.1 Objectives/Target of Planning

The consultant team carried out their study to meet the following requirements set by NHA.

(1) Objectives of the Project

The objectives of the project are:

- To set up a pilot project using the concept of urban renewal in cooperation with local government and other relevant agencies;
- To bring component facilities up to current required standards;
- To build new housing for existing residents with improved infrastructure and environment to provide quality of urban lives;
- To provide new housing to accommodate other residents as a means to alleviate housing shortages within BMA;
- To provide employment opportunities for community residents through reduced commuting time and to ease local traffic problems; and
- To utilize the land development potential at the local level and to develop effective communication networks.

(2) Direction of Development

The development of the Din Daeng Community Area was approached from three levels:

1) the district level (larger area comprising surrounding the super block);
2) the super block level (large block of area comprised of component projects); and,
3) the project level (component projects of the super block).

At the district level, a traffic plan was developed to accommodate new and anticipated increased traffic loads. As Din Daeng district will have a main station in the underground rapid rail mass transit system (the Orange Line), with a park and ride facility for private cars, more traffic is expected. The local road network should be well connected to the city level system with access to the underground station. More parks, open spaces, and green areas are required to enhance the living environment.

At the super block level, the project should be well coordinated with SRT's Makkasan Development Project. These two sites would cover 1,500 rai (240 ha), and successful cooperation between the two projects would enhance the urban renewal concept, and lead to significant improvement of infrastructure and the urban environment.

5.2.2 Spatial Development Plan

(1) Land Use Plan

The land use plan was formulated to achieve the following items.

- Land for mixed use to match the advantageous location;
- Effective network of infrastructure;
- More parks, open spaces and green areas to enhance the community environment;
- Careful approach to minimize impact on the existing residents; and
- Provision of other necessary items to facilitate BMA's new City Hall and other Government works and services.

Figure 5.1 shows the master plan of Din Daeng Community Development.

(2) Zoning Plan

The land use consists of seven spatial zones:

Zone 1	Din Daeng – Makkasan	Zone 2	Din Daeng – Pracha Songkhro
Zone 3	Din Daeng – Mit Mai tri	Zone 4	Din Daeng – Vibhavadi Rangsit
Zone 5	Community Institution	Zone 6	Sports and Recreation Park
Zone 7	BMA Civic Center		

Figure 5-2 shows the zoning plan employed in the master plan and detailed development policy for each zone is presented in Table 5.1.

Figure 5.1: Master Plan of Din Daeng Community Development by NHA

Figure 5.2: Zoning Plan of Din Daeng Community Development by NHA

Table 5.1: Spatial Development Policy by Zone

Zone	Development Policies
Zone 1: South (Din-Daeng - Makkasan)	Is connected with Makkasan marshalling yard of SRT. This zone can be divided into number of minor areas.
Zone 1.1 Site D (Old Din-Daeng) :	Will be developed as compensation housing.
Zone 1.2 Site E (Old Din-Daeng) :	Will be developed for compensation housing project while the remaining will be green area.
Zone 1.3 Site DD3 (Old Din-Daeng3) :	An open area is suggested in front of the building to be developed for parking where roof top will function as green area for existing NHA. hire purchased housing.
Zone 2: East (Din-Daeng Pracha Songkhro)	Comprises 7 minor areas:
Zone 2.1 Site B1 B4 (Old Din Daeng) :	Will be developed for commercial purposes to generate cross subsidy for existing residents. Development elements include good housing for medium income in nice environment with lagoon, fountain at center point and people bazaar for lively activities.
Zone 2.2 Site F:	Will be developed for compensation housing project with some public services.
Zone 2.3 Site DD4: (New Din Daeng 4) :	Will be designed for people walking street alignment and equipped with shopping activities with some elements of Thai architecture.
Zone2.4 Site DD (New Din Daeng) :	A pair of 12 storey buildings will function as connection of zone 2.1 and zone 2.2 through some units of housing.
Zone 2.5 Site G (New Din Daeng) :	Some shop houses are suggested to be converted for connection with pedestrian route system with open space and some shopping activities. Expansion of Pracha-Songkhro Road will be monitored on real situation.
Zone 2.6 Samakee bamrung vittaya school area:	Is suggested to be combined with public service function.
Zone 2.7 Temporary Residence for traveler area:	Should be combined with zone 2.5
Zone 3: North (Din Daeng Mit Mai Tri)	Comprises 6 minor areas:
Zone 3.1 Site H (New Din Daeng) :	Will be designated to compensation housing with more open space and some shopping function and public services.
Zone 3.2 Site DD5 (Hired Purchase) :	Housing will be incorporated in the plan.
Zone 3.3 Petrol station	Suggested to be developed for housing program for BMA officials.
Zone 3.4 Road Construction and Maintenance Center	Suggested to function as zone 3.3 and exchanged with zone 2.2
Zone 3.5 Waste Water Treatment Plant	Should be refurbished for better visual and open space function on roof top.
Zone 3.6 Din Daeng Police Station	Will retain its function with more security checkpoints.

Table 5.1: Spatial Development Policy by Zone (Continued)

Zone	Development Policies
Zone 4: West (Din Daeng Vibhavadi Rangsit)	Comprise 4 minor areas:
Zone 4.1 Site A (Old Din Daeng) :	Will be reserved for greeting land mark with elevated connection with zone 1.2 to the north direction.
Zone 4.2 Site C (Old Din Daeng) :	Are most attractive location for business purpose. The area is suggested for main commercial function such as hotel, convention hall and shopping center. It is expected that income from this area will generate a great amount of cross subsidy for compensation housing investment.
Zone 4.3 Muslim Musyid	Will be retained as religious area with better environment.
Zone 4.4 Department of City Planning and Department of Traffic and Transportation	Is suggested to combine with zone 4.2 or transitional point for park andride facilities for underground station of Orange line of Mass Transit.
Zone 5: Community institutions	Comprise 5 minor areas:
Zone 5.1 Piboolprachasan school	Is suggested to have intensified function to absorb more students. Land along Asok-Din Daeng road is recommended for green space for the approach to Victory Monument.
Zone 5.2 Rajanukul Hospital for the Retarded	Is suggested for rearrangement of building for more effective future functions. Some parts are recommended for commercial development to generate income for new buildings.
Zone 5.3 Research and Analysis Division of BMA	Should be exchanged with other area.
Zone 5.4 Ministry of Labour and Social Welfare	
Zone 5.5 Day Care & YMCA	These functions should be included in housing complex.
Zone 6: Sport and Recreation Park	
Zone 6.1 Site B5 (New Din Daeng)	Nice housing in good environment is planned.
Zone 6.2 Site B6 (New Din Daeng)	Will be designated as multi-purpose function serving as main employment for local residents in Thai culture.
Zone 6.3 Sports Center	It is recommended that sports center is easily accessible by local residents.
Zone 6.4 Sports Hall	Redevelopment of its function should be planned.
Zone 7: BMA Civic Center	Comprise 8 minor areas:
Zone 7.1: New BMA head office	With city Hall Plaza, Citizen's plaza and people walking street.
Zone 7.2: Mechanical Workshop Division	Is recommend for green area with shopping activities underground.
Zone 7.3: Mechanical Division	Same as Zone 7.2.
Zone 7.4: Vichakorn School	This area is planned for amphitheater, public services and people bazaar.
Zone 7.5: Wichutit School	All schools should be relocated in single area.
Zone 7.6: Vocational school	Same as 7.5
Zone 7.7: Waste Water Treatment Plant	Landscaping for this area is recommended.
Zone 7.8: Health service	This area should be combined with NHA area.

(3) Housing Development

The plan proposed high-rise buildings for housing purpose to create more housing units and open space as summarized below.

Table 5.2: Proposed Housing Scheme in NHA

Type	No. of Housing Unit	Remarks
Type A1 (33m^2)	3,019 units	Housing for compensation to existing residents
Type A2 (41.25m^2)	4,193 units	
Sub-total	7,212 units	
Type B (41.25m^2)	6,330 units	Housing for new residents
Total	13,542 units	

At the full development, total floor area for housing would reach 1,434,080m^2, or 574% in the floor area ratio against 24.81 ha (NHA portion). The area would be divided into 1) housing for existing residents (Housing A-1 and A-2) covering 51 rai (8.16 ha), and 2) housing for new dwellers (Housing B) mixed with commercial development covering the remaining 104 rai (16.64 ha).

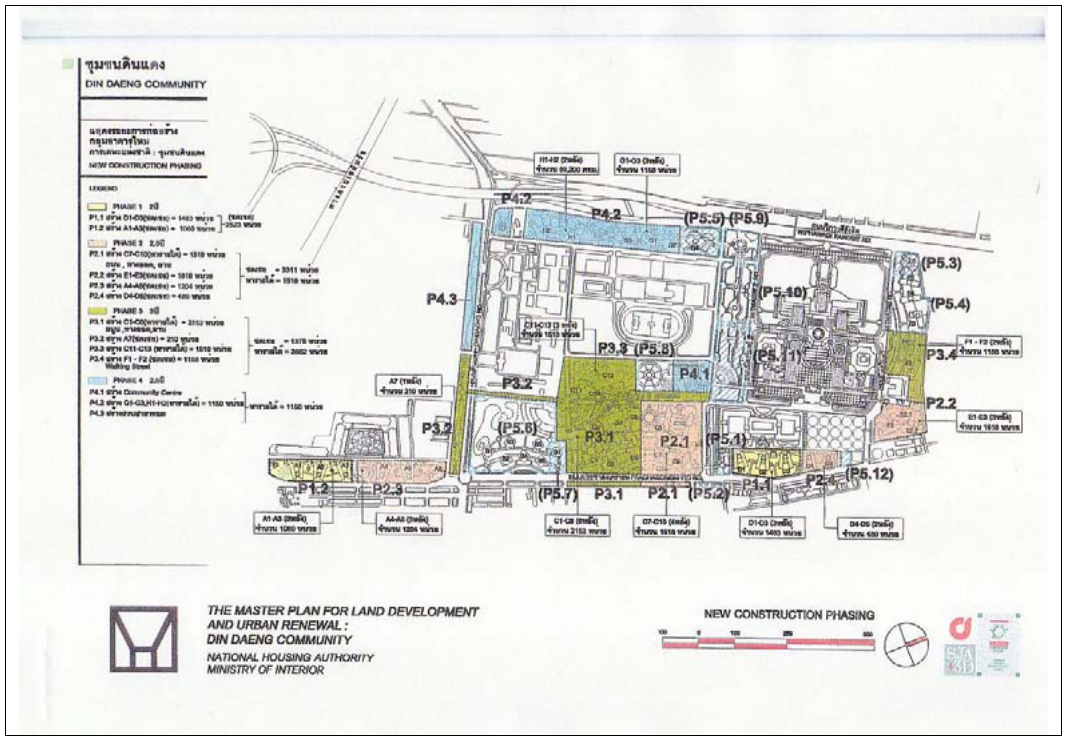
It should be noted that in the master plan, several blocks were excluded from the redevelopment scheme, as the owner/occupiers of shophouses in those blocks would have difficulty accepting to any new proposals and due to the complicated rights held by them. These blocks include Nos. 1,10, 12, 13, and 14.

5.2.3 Construction and Financial Plan

(1) Construction Phasing Plan

The master plan proposed construction phasing plan is as shown in the following figure. The NHA responsibility is to be phased out into four sections and is scheduled to be executed within 10 years.

Figure 5.3: Construction Phasing Plan



(2) Financial Plan

1) Cost Estimate

The expenses for the 10-year NHA development were estimated at 26,433 million baht, with an initial investment of 2,556 million baht needed for the first phase.

Table 5.3: Construction Cost by Phase

(million baht)

Type	Total	Phase 1	Phase 2	Phase 3	Phase 4
Housing A-1 (m^2)	99,627	57,717	41,910	0	0
Housing A-2(m^2)	172,961	31,928	84,191	56,843	0
Housing B(m^2)	261,113	0	62,618	151,058	47,438
Commercial(m^2)	221,072	7,120	45,454	78,854	89,644
Public Service(m^2)	38,213	4,600	9,200	12,700	11,713
Parking(m^2)	215,112	26,044	64,480	80,914	43,675
Circulation(m^2)	425,983	46,216	122,012	159,060	98,695
Total Built-Up Area(m^2)	1,434,080	173,624	429,864	539,428	291,695
Project Cost (mil. baht)	26,433	2,556	7,246	10,357	6,274

2) Financial Plan

NHA has identified the following three alternative financing arrangements:

1) NHA or the government as a sole investor,
2) private sector as a sole investor, or
3) co-investment by NHA and the private sector.

Condition and results of the financial study are as follows:

Table 5.4: Assumptions for Financial Planning

Categories	Criteria
Rent and Leasing of Housing Units	1) Rental payment set at 1,500 baht/month plus 3% inflation for Housing A1 (33m^2) and 2,000 baht/month for Housing A2 (41m^2), both of which are for compensation of existing residents, 2) Rental payment set at 5,000 baht/month plus 3% inflation for Housing B (41m^2), for new residents, 3) Leasing payment for Housing B set at not less than 300,000 baht,
Rent of Commercial Area	Rental payment for commercial floor set at 35 baht/m^2/month,
Compensation for Existing Residents	1) Leasing payment for compensation set at not less than 50,000 baht/m^2/month, 2) Land rent fee for compensation set at not more than 1 baht/wah, 3) Land rent fee for commercial are not more than 200 baht/wah 4) Those who prefer to move out from the area will get new units in other NHA project with cost-reduction scheme. 5) Temporary shelter will be prepared for the first group who has to be relocated. 6) Payment for move will be offered at 5,000 – 10,000 baht./household. 7) Other necessary options will be considered case by cases.
Others	1) Inflation for income 3%/year, for expenditure 4%/year, 2) Subsidy for the study 3%, 3) Interest rate for NHA bond about 7.5% yield 10years, and 4) Interest rate for private bank loan about 8% up.

Table 5.5: Results of Financial Study in NHA Sections

(FIRR: %)

	Phase 1-4	Phase 1	Phase 2	Phase 3	Phase 4
Capital Investment	16,226	2,603	5,732	10,594	6,424
Case 1:	9.2	4.5	8.6	9.4	14.0
Case 2:	9.2	4.5	8.6	9.4	14.0
Case 3:					
NHA-Cash	5.4	3.7	4.5	12.8	-
Private - Cash	12.0	-	12.2	10.3	12.5

Based on the results shown above, the master plan recommended that the project should be separated into two parts, i.e., the low cost housing part to be invested by NHA, and the new housing and commercial development to be invested by the private sector.

5.2.4 Community Participation on Existing Master Plan

When NHA selected the Din Daeng Community Project as a pilot project of urban redevelopment, it considered that the understanding and active participation of the residents at the beginning of the projects was essential as the project would affect a large number of residents in various ways. During and after the development of the master plan, NHA conducted three seminars in order to explain the concepts of the project, and to receive comments and opinions from stakeholders.

(1) Workshops during Master Planning

The seminars were held on 8 May 1999, 26 January 2000, and 29 January 2000.

The topic of the first and the third seminar was "Urban Community Redevelopment", targeting different groups: 95 community leaders of Din Daeng 2 attended the first seminar, while 86 leaders of Din Daeng 1 participated in the third seminar. The second was a brainstorming seminar to discuss "Preparation of Projects to Develop Din Daeng Community Area", for which the participants were composed of 200 delegates from relevant local and central government organizations.

The result of the community leader seminars showed that most participants seemed to agree with the project. They pointed out that the buildings were old and might collapse. Building equipment had been in bad condition, and the living environment had become worse.

(2) Workshops after Finalization of Master Plan

NHA held two more seminars attended by community leaders in late February and early March 2001 in Pattaya city. These seminars aimed to give correct information about the project because of confusion and misunderstanding that had spread during the election campaign period.

1) Provision of Up-dated Information

In the seminars, community leaders expressed requests for participation in certain levels at critical points in the project implementation.

The participants requested NHA to provide up-dated information on the project. Some leaders and local politicians suggested that NHA should conduct public

campaigns through various means. The suggestions of these groups on the methods of the public relation campaigns included:

- distributing leaflets to all flat households;
- holding a seminar with more attendants (10% of residents in each flat);
- arranging public meetings for each flat, in which all residents can participate and can directly ask about details of the project from NHA staff; and
- setting up an information center in the project area.

2) Positive Cooperation with Community Leaders

Attending community leaders expressed their willingness to assist NHA to distribute information to the residents. For example, if NHA holds a public meeting, they would participate and help explain and answer questions raised by the residents.

3) Contribution to Planning

They wanted to share and provide ideas to the master plan. To this end, they suggested that NHA set up a committee, sub-committee, or working group in which representatives of the residents would be fully involved.

4) Closer Coordination on Relocation and Compensation Planning

They requested a closer relationship with NHA for making decisions on relocation and compensation policies.

To this end, they suggested that NHA appoint community representatives as members of a relocation committee.

5) Closer Discussion on Setting of New Rent

They requested close discussion for making a decision on the new rental fee. They suggested that NHA should propose several alternatives and let the representatives of the residents consider the alternatives that might be acceptable to residents and feasible for implementing the project.

CHAPTER SIX:

EXISTING CONDITION OF

DIN DAENG COMMUNITY AREA

6.1 SOCIO-ECONOMIC CHARACTERISTICS

(1) General

As accommodating government activities and welfare housing, the Din Daeng Community Area (DC Area) has a large day time and night time population. Based on the social survey results, there are 30,011 residents in DC Area. All of them reside in NHA's Din Daeng Housing Complex.

On the other hand, the daytime population amounted to 32,279 persons, according to the interview survey by NHA. The daytime population includes 25,325 employees and 6,954 students as tabulated in Table 6.1. Regarding employment, BMA has the largest share of 82% among the seven government organizations.

The population density is estimated to be 695.5 persons/ha in the entire area, while it is 927.7 persons/ha if focusing on the housing section.

In addition to residents and employees, the Thai-Japan Youth Center records 1,690,309 visitors, annually.

Table 6.1: Population in DC Area

Categories	Organization	Population	Block No.
1. Residents	NHA Housings*1	30,011 persons	1.2～14
2. Daytime Population			
2.1 Employees (25,325 employees)			
(NHA, 748 employees)	Office	58 employees	1.1
	Shophouses in NHA housing area*2	690 persons	1.10, 13&14
(BMA, 20,656 employees)	City Hall & District Office	14,804 employees	2.1
	Mechanical Workshop Division	370 employees	2.2
	Thai Youth Center	106 employees	2.5
	Sports Complex	108 employees	2.4
	Vichakorn School	154 employees	2.3
	Mechanical Division	1,042 employees	2.6
	Rabies Division	130 employees	2.7
	Park	9 employees	2.8
	Gas Station	743 employees	2.9
	Road Construction and Maintenance Center	1,474 employees	2.10
	Sewage Treatment Plant	112 employees	2.11&12
	Health Source Center	60 employees	2.13
	Witchutit	153 employees	2.15
	Analysis & Research	74 employees	2.16
	Office*3	1,317 employees	4.1
(MOL, 3,013 employees)*4	Office	2,256 employees	3.1, 3 & 4
	Care Center	650 employees	3.2
	Day Care Center	107 employees	3.5
(MOE)	Piboonprachasan School	163 employees	5.1
(MOPH)	Rajanukul Hospital	511 employees	6.1
(OPM)	Police Station	224 employees	7.1
(Other)*5	Mosque	10 employees	8.1
2.2 Students (6,954 students)			
(BMA)	Vichakorn School	1,206 students	2.3
	Vocational Center	1,643 employees	2.14
	Wichutit School	1,659 students	2.15
(MOE)	Piboonprachasan School	2,191 students	5.1
	Samakeebumrungvittaya School	255 students	5.2
Total of Daytime Population		32,279 persons	
3. Visitors (Thai Youth Center)		4,631 persons (daily average)	2.3 & 4

Source: Interview survey by NHA

Note: *1 The number of residents is estimated from the social survey by the Study as presented in 6.1 (2).

*2 The number of employees of shophouses is estimated as 230 shophouses (actual)×3 staffs/shophouse (assumption)

*3 The number of employees at block 4.1 is assumption, based on 5.0 m^2/employee similar to the BMA City Hall at Block 2.1.

*4 The number of employees at each Block of MOL is assumed to distribute 3,013 employees of total by proportion of floor areas at each Block.

*5 The number of employees at mosque is assumption.

(2) NHA Housing Area

As there is no data on population readily available for Din Daeng Housing Complex, several assumptions were made based on the social survey conducted by the Study.

According to the survey results, the average family size was estimated at 3.6 persons with the vacancy rate of 7.5%. the population in entire Din Daeng Housing Complex is estimated at 30,011 residents as tabulated below.

Table 6.2: Estimated Population in NHA Housing Area

Block No.	No. of Units (units)	Population (residents)	Block No.	No. of Units (units)	Population (residents)
1,2	1,776	5,914	1,9	352	1,172
1,3	672	2,238	1,10	664	2,211
1,4	672	2,238	1,11	972	3,237
1,5	640	2,131	1,12	308	1,026
1,6	384	1,279	1,13	952	3,170
1,7	900	2,997	1,14	270	899
1,8	450	1,499	Total	9,012	30,011

Note: Population is estimated by the assumptions: 1) average family member is 3.6 persons and 2) vacancy rate is 7.5%, according to the social survey.

Regarding the age structure, the economically active group (15-59 years old) makes up 72.5% as shown in the following table. The elder group (60 years old or more) is 12.9%, which is higher than that of BMA on the whole (9%). Dividing the age structure into 5-year groups, the 20-24 and 30-34 groups are the largest (both 11.9%).

Table 6.3: Estimated Age Structure in Din Daeng Housing Complex

Age	Estimated Population				
	Male	Female	Total	Ratio	Age Group
0-4	500	700	1,200	4,1%	14,6%
5-9	800	900	1,700	5,8%	(infant group)
10-14	700	700	1,400	4,8%	
15-19	900	600	1,500	5,1%	72.5%
20-24	1,600	1,900	3,500	11,9%	(economically
25-29	1,200	1,400	2,600	8,8%	active group)
30-34	1,700	1,800	3,500	11,9%	
45-39	1,100	1,500	2,600	8,8%	
40-44	1,400	1,400	2,800	9,5%	
45-49	700	1,000	1,700	5,8%	
50-54	700	1,200	1,900	6,5%	
55-59	300	900	1,200	4,1%	
60-64	600	800	1,400	4,8%	12,9%
65-69	400	600	1,000	3,4%	(elderly group)
70～	600	800	1,400	4,8%	
Total	13,200 (44.9%)	16,200 (55.1%)	29,400 (100.0%)	100.0%	100.0%

Note: Component ratio by ages is estimated according to the social survey by the Study.

Apart from the residents, there are 230 shophouses located in Blocks 1.10, 1.13, and 1.14. Assuming the average number of employees at 3 staffs/shophouse, the total number of employees is estimated at 690.

6.2 LAND USE AND TENURE

6.2.1 Land Use

(1) Designated Land Use in the Second Bangkok General Plan

According to the Second Bangkok General Plan, the DC Area is designated to fall into four kinds of land uses as tabulated below. Among them, i) high density residential, and ii) government offices, cover a large area of 796,672m^2 (78.4%), if combined.

Table 6.4: Designated Land Use by the Second Bangkok General Plan

Land Use	Land Area	
	(m^2)	(%)
High density residential zone	345,456	34.0%
Open space, recreation area, and environmental conservation area	158,928	15.6%
Educational institutes	60,400	5.9%
Government offices, infrastructure, and others	451,216	44.4%
Total	1,016,000	100.0%

Source: NHA

(2) Current Land Use

Currently, there are eight kinds of land use dispersed on 100 ha of DC Area. Major land uses are residential (31.5%) and office (24.4%) sharing 55.9% in total. As shown in the following table, the land used for roads is limited to 80,509 m^2 or 7.8%, reflecting unclear hierarchy of the existing road network.

The floor area ratio (FAR) in the whole area is 82.8% in gross and 92.0% in net. Regarding the residential section, the FAR ranges middle to high, as 151.2% in residential areas, and 289.8% in mixed use area of commercial and residential.

Table 6.5: Land Use in DC Area

Use	Land Area		Building Area	Floor Area	Building Coverage Ratio	Floor Area Ratio
	m^2	%	m^2	m^2	%	%
Building Site	929,557	90.4	262,967	823,137	29.4	92.0
Residential	275,483	26.8	96,689	416,449	35.1	151.2
Office	251,058	24.4	54,552	126,906	21.8	50.7
Commercial & Residential	48,015	4.7	19,575	139,164	40.8	289.8
Sport Facilities	131,263	12.8	57,381	66,846	43.7	50.9
Public Service	10,619	1.0	2,838	4,786	26.7	45.1
School	118,722	11.5	20,359	46,347	17.1	39.0
Hospital	52,385	5.1	10,295	21,054	19.7	40.2
Religious Facilities	3,377	0.3	563	870	16.7	25.8
Others	38,635	3.8	715	715	14.7	14.7
Public Space	99,160	9.6	102	102	-	-
Park	18,651	1.8	102	102	-	-
Road	80,509	7.8	-	-	-	-
Total	1,028,717	100.0	263,069	823,239	26.4%	82.8%

Source: JICA Study Team

Note: 1) Building and floor areas of Block 3.4 in "Office" and 2.11, 2.12 and 7.1 in "Other" are not available. Therefore BCR and FAR are estimated excluding land areas of those blocks. Block 3.4 has a land area of 628m2 and 2.11, 2.12, and 7.1 have totally 3,377m2.

2) "Others" includes waste water treatment plant (2.11 & 12), gas station (2.9), and police station (7.1).

Table 6.6 shows details of land use, building area, and building floor area.

Figure 6.1: Existing Land Use in the DC Area

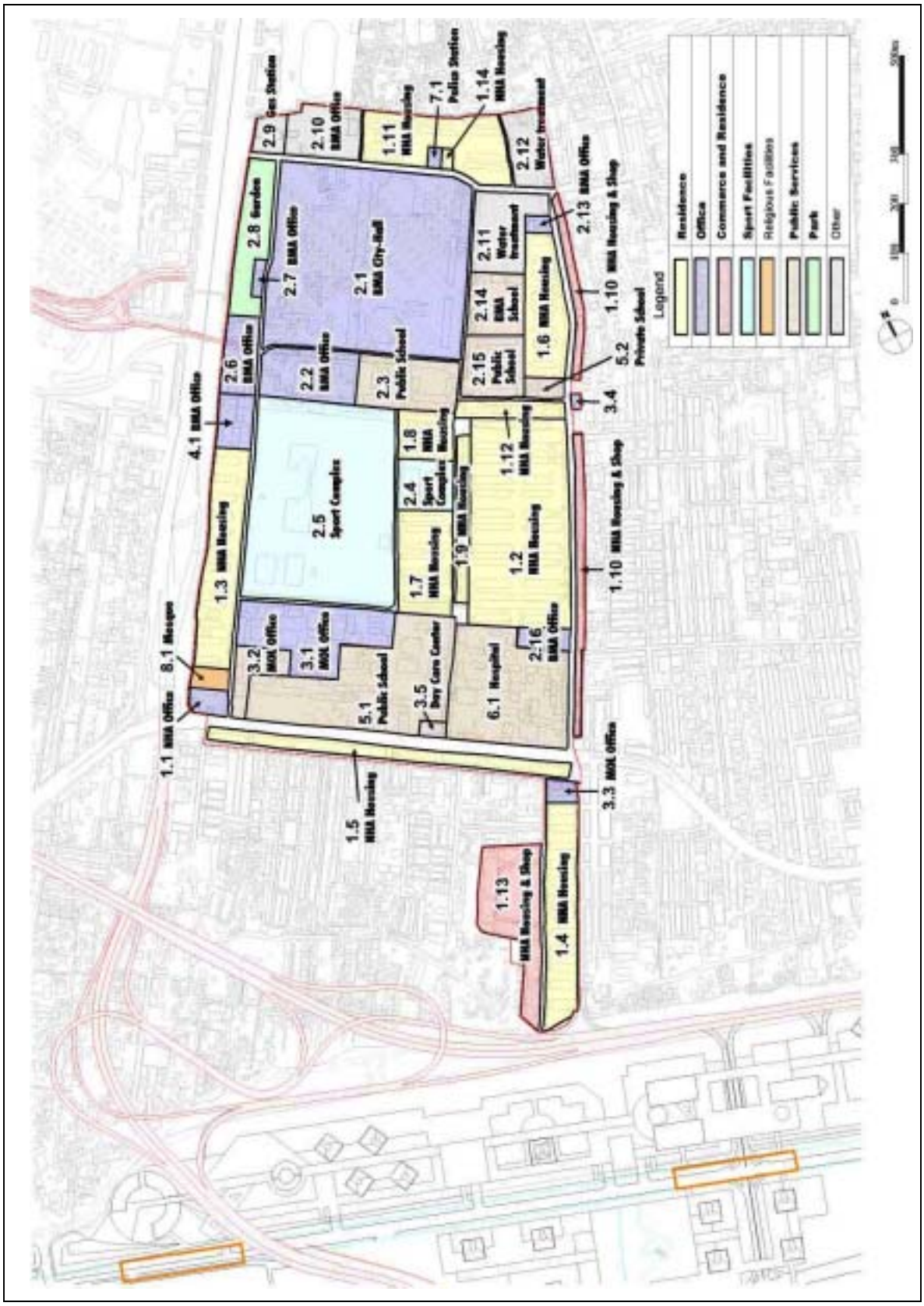


Table 6.6: Land Use, Building Coverage Ratio, and Floor Area Ratio in the DC Area

No.	Land Use	Land Area	Building Area		Floor Area		Remarks
		(m^2)	(m^2)	(%)	(m^2)	(%)	
1.1	Office	3,996	876	22	1,666	42	NHA office/ BMA's Pawnshop/ Branch of the Government Saving Bank
1.2	Residential	86,004	35,291	41	111,354	129	NHA Housings
1.3	Residential	32,597	9,963	31	43,776	134	NHA Housings
1.4	Residential	29,381	9,184	31	43,776	149	NHA Housings
1.5	Residential	20,522	9,022	44	45,000	219	NHA Housings
1.6	Residential	23,365	5,763	25	23,336	100	NHA Housings
1.7	Residential	23,579	9,286	39	45,280	192	NHA Housings
1.8	Residential	11,207	4,478	40	22,640	202	NHA Housings
1.9	Residential	9,427	2,067	22	15,000	159	NHA Housings
1.10	Residential & Commercial	17,395	6,273	36	18,790	108	including shophouse
1.11	Residential	31,446	9,733	31	38,800	123	NHA Housings
1.12	Residential	7,955	1,902	24	27,487	346	NHA Housings
1.13	Residential & Commercial	28,396	11,078	39	89,244	314	including shophouse
1.14	Residential & Commercial	2,224	2,224	100	31,130	1,400	including shophouse
Sub-total		327,494	117,140	36	557,279	170	
2.1	Office	147,674	19,461	13	73,754	50	BMA City Hall and District office
2.2	Office	20,282	14,856	73	15,626	77	Mechanical Workshop Div., BMA
2.3	School	21,541	2,439	11	6,878	32	Vichakorn Elementary School, BMA
2.4	Sport Facilities	11,656	4,168	36	4,168	36	Indoor stadium, BMA
2.5	Sport Facilities	119,607	53,213	44	62,678	52	Thai-Japan Youth Center, BMA
2.6	Office	11,111	3,144	28	6,351	57	Mechanical Div., BMA
2.7	Office	1,697	976	58	1,206	71	Rabies Div., BMA
2.9	Other	4,863	715	15	715	15	Gas Station
2.10	Office	15,537	4,872	31	4,319	28	Construction center, BMA
2.11	Other	19,603	N/A	0	N/A	100	Central WWTP
2.12	Other	12,809	N/A	0	N/A	100	Central WWTP
2.13	Office	1,825	674	37	2,021	111	Health source center, BMA
2.14	School	14,520	1,665	11	5,582	38	Vocational Center, BMA
2.15	School	15,599	5,194	33	13,966	90	Wichutit School, BMA
2.16	Office	4,480	1,354	30	1,757	39	Analysis & Research Center, BMA
Sub-total		422,804	112,731	27	199,123	47	
3.1	Office	33,074	4,595	14	12,187	37	Office, MOL
3.2	Public Service	8,832	2,162	24	4,110	47	Children and elderly care center, MOL
3.3	Office	2,824	730	26	1,460	52	Office, MOL
3.4	Office	628	N/A	0	N/A	0	Office, MOL
3.5	Public Service	1,787	676	38	676	38	Day care center, MOL
Sub-total		47,145	8,163	17	18,433	39	
4.1	Office	7,930	3,014	38	6,559	83	Dept. of City Planning, Dept. of Traffic and Transportation, BMA
Sub-total		7,930	3,014	38	6,559	83	
5.1	School	63,670	10,183	16	18,854	30	Piboonprachasan school, MOE

No.	Land Use	Land Area	Building Area		Floor Area		Remarks
		(m^2)	(m^2)	(%)	(m^2)	(%)	
5.2	School	3,392	878	26	1,067	31	Samakeebumrungvittaya school, MOE
Sub-total		67,062	11,061	16	19,921	30	
6.1	Hospital	52,385	10,295	20	21,054	40	Rajanukul Hispital
Sub-total		52,385	10,295	20	21,054	40	
7.1	Others	1,360	N/A	0	N/A	100	Police Station
8.1	Religious	3,377	563	17	870	26	Mosque
Total Building Site		929,557	262,967	29	823.137	92	
Park (2.8)		18,651	102	1	102	1	Garden, BMA
Road		80,509	-	-	-	-	
Grand total		1,028,717	263,069	26	823,239	83	

Source: NHA

6.2.2 Land Tenure

The land of the entire DC Area belongs to the government. Upon this condition, most part of the area is used by the government institutions (64.4%). Remaining part, equivalent to 35.6%, is used by non-government organizations, including NHA. It should be noted that the land owned by the government but used by non-government organizations is classified as Ratchaphasadu on which several conditions are imposed for use of the land. BMA, four central governments, and NHA are the main land users as shown in Table 6.7. Among them, BMA shares the largest area (51.5%), followed by NHA (31.8%).

Distribution of the land users is shown in Figure 6-2.

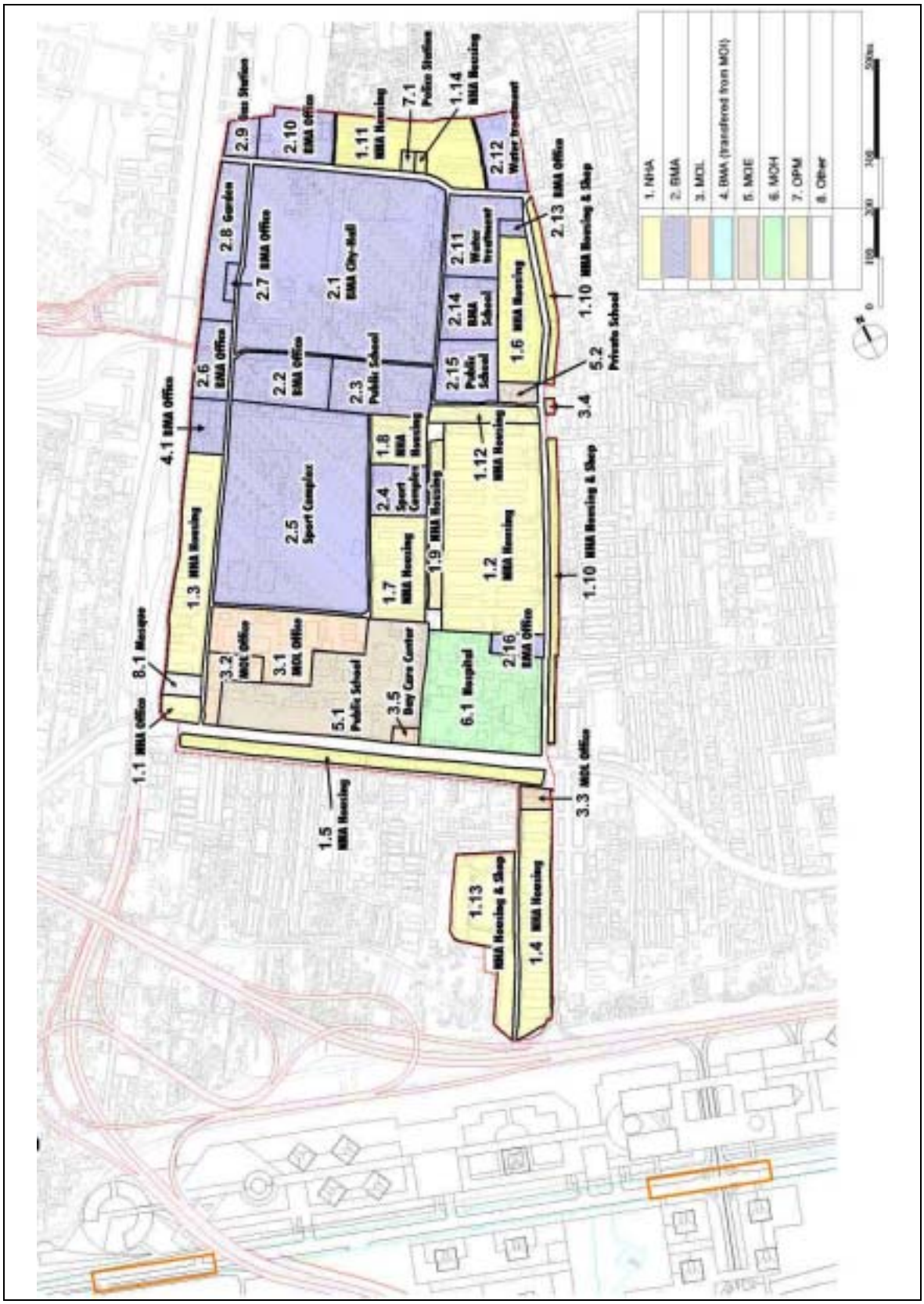
The land used by BMA is located at the southern part of Mit Maitri Road, while those of central governments are located in the northern part of Asok-Din Daeng Road. The NHA lands are widely scattered.

Table 6.7: Land Users in DC Area

User		Land Use	Land Area	
			(m^2)	(%)
Building Site				
	NHA	Residential	275,483	26.8%
		Residential & Commercial	48,015	4.7%
		Office	3,996	0.4%
		Total	327,494	31.8%
	BMA	Office	225,056	21.9%
		Sport Facilities	131,263	12.8%
		School	37,140	3.6%
		WWTP	32,412	3.2%
		Gas Station	4,863	0.5%
		Total	430,734	41.9%
	Ministry of Labor	Office	36,526	3.6%
		Public Service	10,619	1.0%
		Total	47,145	4.6%
	Ministry of Education	School	67,062	6.5%
	Ministry of Public Health	Hospital	52,385	5.1%
	Office of Prime Minister	Police Station	1,360	0.1%
	Others	Mosque	3,377	0.3%
	Total		929,557	90.4%
Public Space				
	BMA	Park	18,651	1.8%
		Road	80,509	7.8%
	Total		99,160	9.6%
Total			1,028,717	100.0%

Source: JICA Study Team

Figure 6.2: Land User Distribution in the DC Area



6.3 BUILDINGS/FACILITIES

6.3.1 NHA Housing Complex

The first housing facility in Din Daeng Housing Complex was built in 1963 and has been expanded until 1999. Currently, the total number of facilities comprises 94 buildings (excluding 5 buildings for offices of the NHA, and the prawn shop of BMA in Block 1.1).

These buildings are mostly old and deteriorated as ninety one buildings (97%) were built more than 20 years ago. Fifty six buildings (60%) are more than 30 years after construction. Focusing on housing units, those old comprise 8,390 (93%) for 20 years and over, and 3,736 (41%) for 30 years and over. As mentioned earlier, buildings in Blocks 1.10, 1.12, 1.13, and 1.14 have 230 shophouses in total.

All the facilities are built of reinforced concrete structure (RC) and most of them are five stories with some exceptions, including the highest of 14 stories, built during 1997 – 1999. Typical floor plan of the buildings constructed before 1977 is the single corridor type and that of later buildings is twin corridor type. The following table shows an outline of the housing facilities:

Table 6.8: Outline of Existing Housing Facilities in Din Daeng Housing Complex

Built Year	Block	Site Area (m^2)	Building Area (m^2)	Floor Area (m^2)	Operation No.	Use of Building	No of Building	Type of Structure	No. of Stories	Type of Corridor	No. of Units
1963	1.1	(3,996)	(876)	(1,666)	-	(O,PS)	(3)	(RC)	-	-	-
1963	1.5	20,522	9,022	45,000	1	R	8	RC	5	SC	640
1964	1.4	29,381	9,184	43,776		R	12	RC	5	SC	672
1967	1.3	32,597	9,963	43,776		R	12	RC	5	SC	672
1968	1.2	86,004	35,291	111,354	2	R	24	RC	5	SC	1,776
1974	1.6	23,365	5,763	23,336		R	8	RC	5	SC	384
1975	1.10	17,395	6,273	18,790		R & S	10	RC	5	SC	664
1975	1.12	7,955	1,902	27,487	-	R	2	RC	12	SC	308
1977	1.13	28,396	11,078	89,244	3	R & S	4	RC	8	TC	952
1978	1.7	23,579	9,286	45,280	2-3 & 4-2	R	4	RC	5	TC	900
1980	1.8	11,207	4,478	22,640		R	2	RC	5	TC	450
1980	1.11	31,446	9,733	38,800	4-1	R	5	RC	5	TC	972
1984	1.9	9,427	2,067	15,000	4	R	2	RC	5	DC	352
1999	1.14	2,224	2,224	31,130	5	R & S	1	RC	14	DC	270
More than 30 years old		168,504 (52%)	63,460 (55%)	243,906 (44%)	-	-	56 (60%)	-	-	-	3,736 (41%)
More than 20 years old		311,847 (96%)	111,973 (96%)	509,483 (92%)	-	-	91 (97%)	-	-	-	8,390 (93%)
Total		323,498 (100%)	116,264 (100%)	555,613 (100%)	-	-	94 (100%)	-	-	-	9,012 (100%)

Note: 1) Type of Corridor - SC: Single Corridor type, TC: Twin Corridor type, and DC: Double-loaded Corridor type
2) Use of building - O: Office, PS: Pawn shop, R: Residential, and S: Shophouse.
3) Operation Number is designated by NHA for operation and maintenance purpose, according to construction phase and maintenance area.
4) Buildings in Block 1.1 is excluded from the total, as those consist of offices and prawn shops without housing units.

Regarding the housing units, the majority are used as rental flats, excluding Block 1.13 which is hire-purchased. Floor area of these units range from $31m^2$ to $54m^2$ with the average of $40.54m^2$. The floor area per unit is related to the year of construction as follows.

Units before 1975 : floor area - around $40m^2$

Units after 1975 : floor area - around $35m^2$ and more than $50m^2$ (Block 1.13 and 1.14)

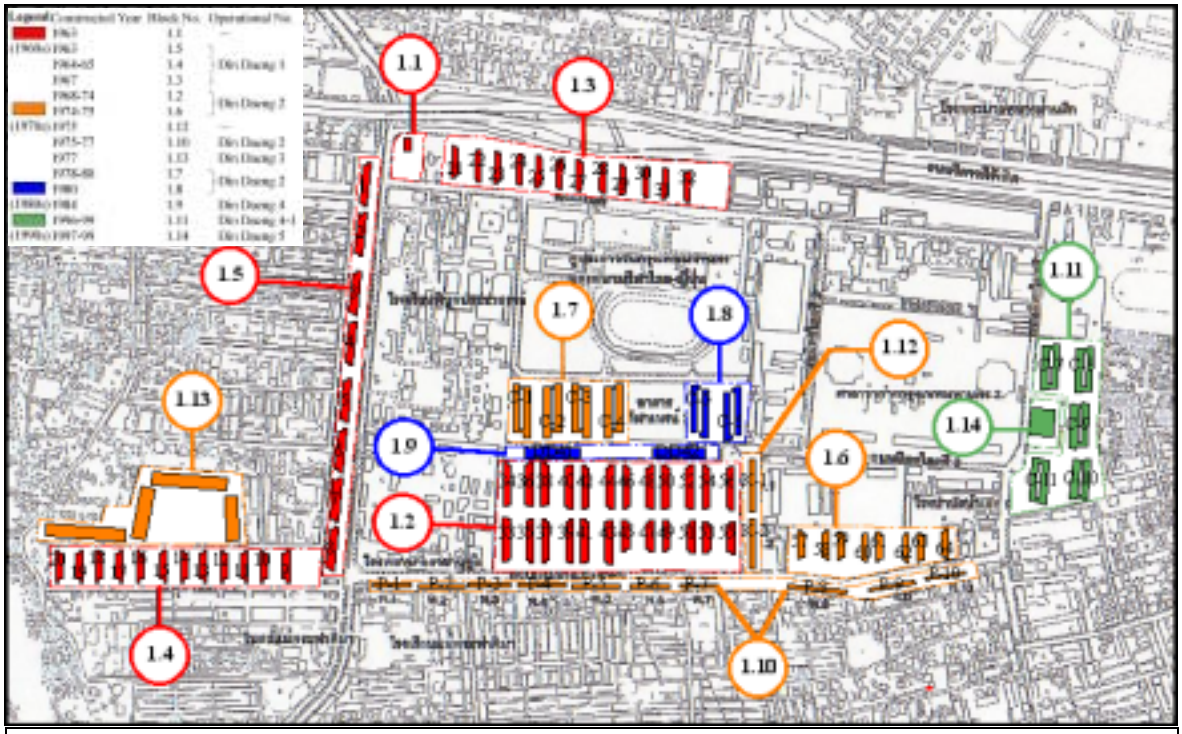
Most of the units are single room type except those having three bedrooms located in Blocks 1.12 and 1.13. A single room type has an open room (or a large balcony), which serves for various purposes including cooking and dinning. Each of these units originally had a toilet and a shower room, but no kitchen. Composition of unit plan types in Din Daeng Housing Complex is summarized in the following figures and tables.

Table 6.9: Outline of Unit Plan in Din Daeng Housing Complex

Built Year	Block	No. of Buildings	Floor Area (m^2)		Unit Plan		No. of Units
			Flat	Balcony	No. of Bedroom	Balcony	
1963	1.5	8	40.6	6.60	0	○	640
1964	1.4	12	40.6	6.60	0	○	672
1967	1.3	12	40.6	6.60	0	○	672
1968	1.2	6	40.6	6.60	0	○	337
		18	40.6	6.60	0	○	1,439
1974	1.6	8	40.6	6.60	0	○	384
1975	1.10	10	34.8	7.15	0	○	664
1975	1.12	2	44.1	0.00	3	×	308
1977	1.13	4	54.0	7.00	3	○	952
1978	1.7	4	36.9	4.50	0	○	900
1980	1.8	2	36.9	4.50	0	○	450
1980	1.11	5	36.9	4.50	0	○	972
1984	1.9	2	31.0	4.50	0	○	352
1999	1.14	1	37.4	8.35	0	○	126
			50.9	8.35	0	○	144
Total	-	94	40.54 (avg.)	5.89 (avg.)	-	-	9,012

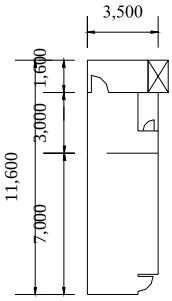
Note: "○" means the unit has balcony and "×" means no balcony.

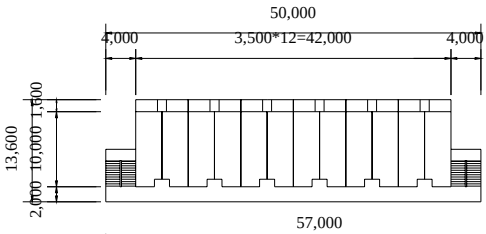
Figure 6.3: Floor Plan and Unit Plan in Din Daeng Housing Complex (1/3)



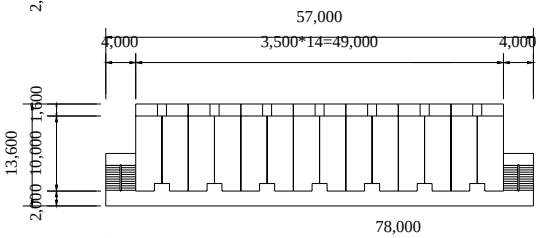
Block No. 1.2 – 1.6

Outline: Side corridor type, 5 stories, 64 buildings, Constructed in 1963 – 1975
40.6 m^2/unit (incl. 6.6 m^2 of balcony and alcove), 4,152 units

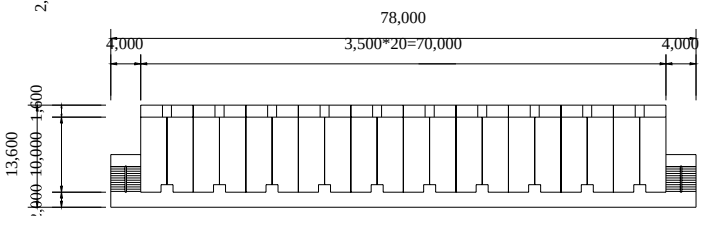




Block No. 1.6: 8 buildings, 384 units (‘74-‘75)



Block No. 1.2: 6 of 24 buildings in 1.2, 337 units (‘68-’74)
(Building No. 45, 47, 49, 51, 53 and 55)
Block No. 1.3: 12 buildings (’67), 672 units
Block No. 1.4: 12 buildings (‘64-’65), 672 units
Total : 30 buildings, 1,681 units

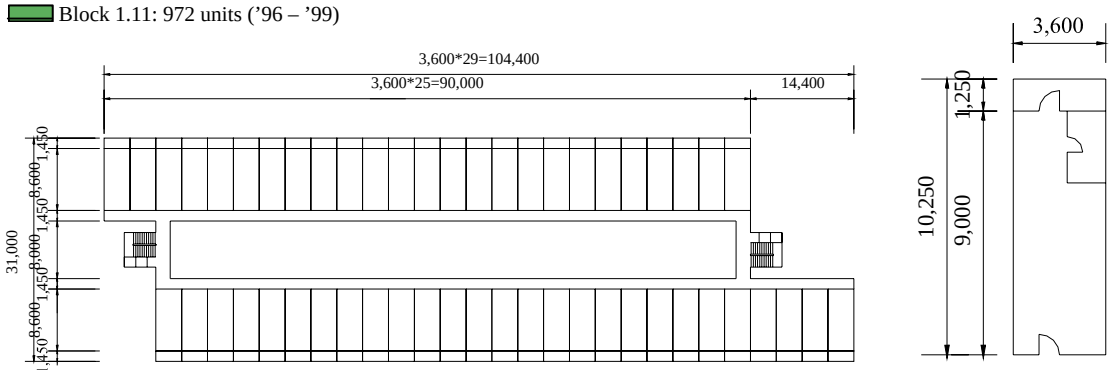


Block No. 1.2: 18 of 24 buildings in 1.2 (‘68-’74), 1,439 units
Block No. 1.5: 8 buildings (’63), 640 units
Total : 26 buildings, 2,079 units

Figure 6.3: Floor Plan and Unit Plan in Din Daeng Housing Complex (2/3)

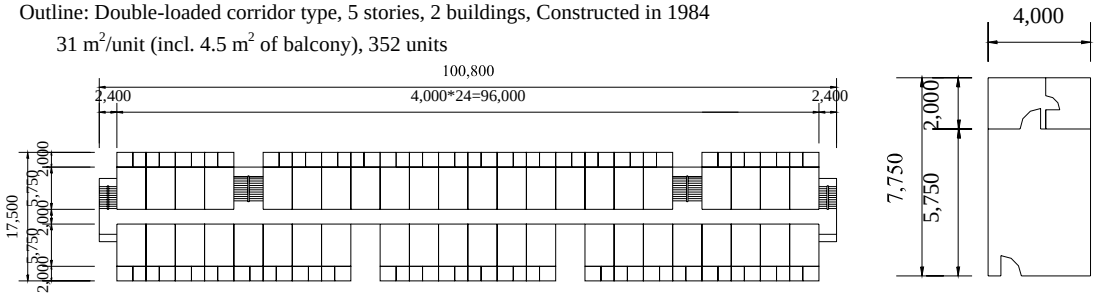
Block No. 1.7, 1.8 and 1.11

Outline: Twin corridor type, 5 stories, 11 buildings, Constructed in 1978 – 1999
36.9 m^2/unit (incl. 4.5m^2 of balcony), 2,322units
Block 1.7: 900 units (‘78 – ‘80) Block 1.8: 450 units (‘80),
Block 1.11: 972 units (’96 – ’99)



Block No. 1.9

Outline: Double-loaded corridor type, 5 stories, 2 buildings, Constructed in 1984
31 m^2/unit (incl. 4.5 m^2 of balcony), 352 units



Block No. 1.10

Outline: Side corridor type, 5 stories, 10 buildings, Constructed in 1975 - 1977
34.8 m^2/unit (incl. 7.15m^2 of balcony), 664 units

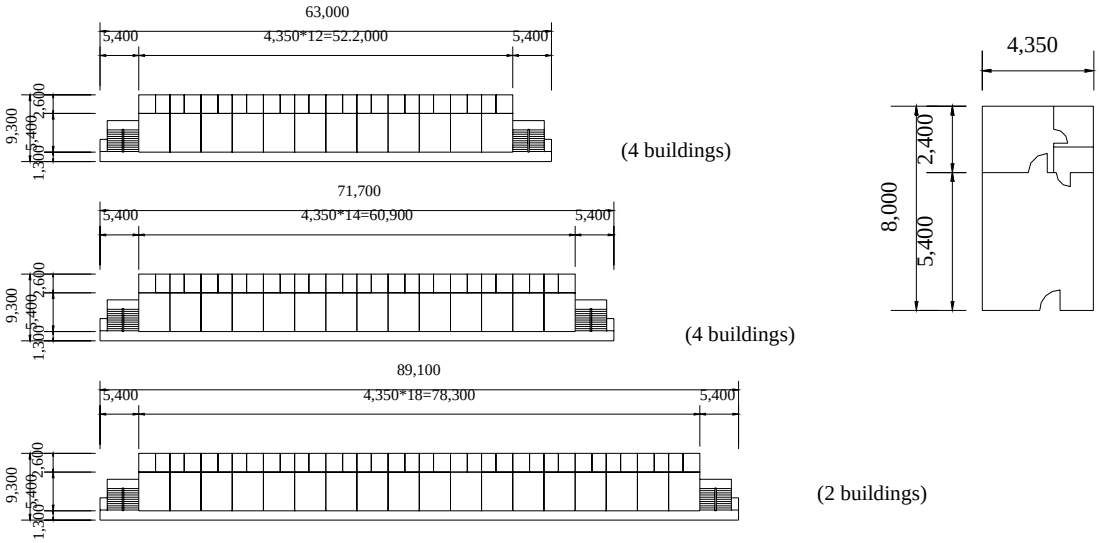
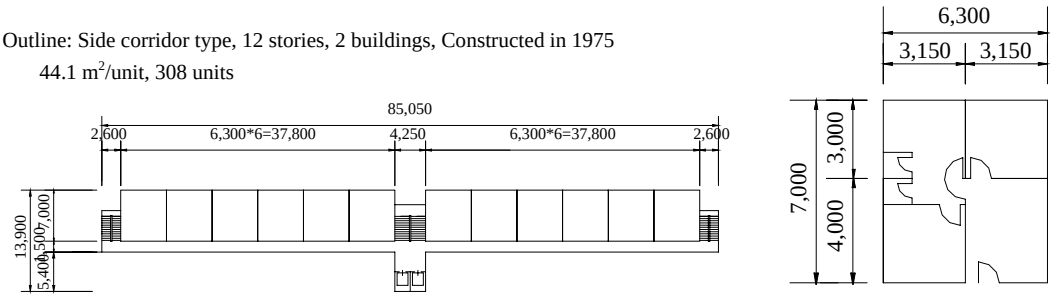


Figure 6.3: Floor Plan and Unit Plan in Din Daeng Housing Complex (3/3)

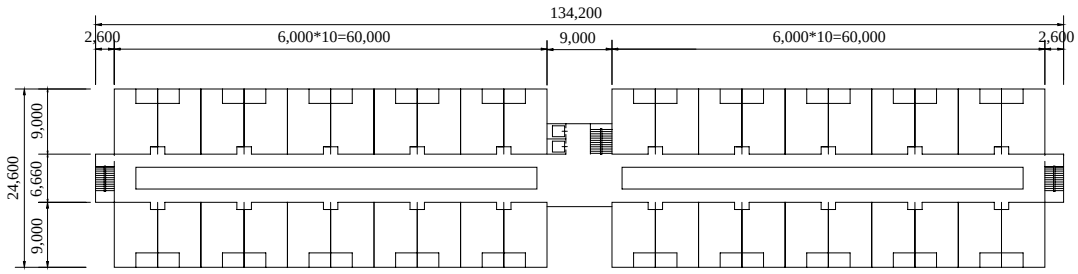
Block No. 1.12

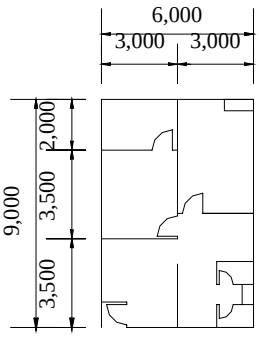
Outline: Side corridor type, 12 stories, 2 buildings, Constructed in 1975
44.1 m^2/unit, 308 units



Block No. 1.13

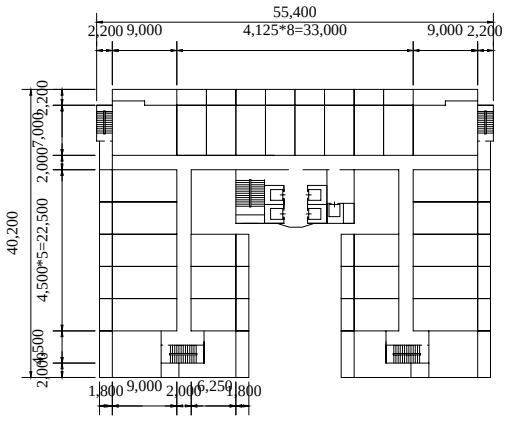
Outline: Twin corridor type, 8 stories, 4 buildings, Constructed in 1977
54 m^2/unit (incl. 7 m^2 of alcove and balcony), 952 units

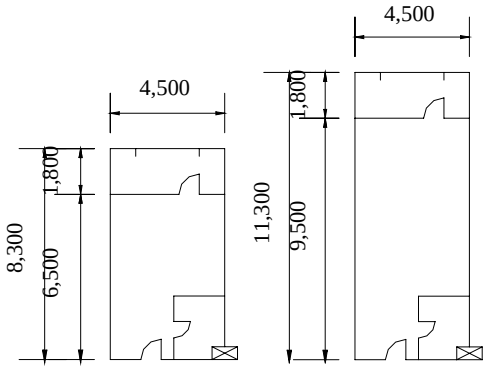




Block No. 1.14

Outline: Double-loaded corridor type, 14 stories, 1 building, Constructed in 1977 – 1999
①37.35 m^2/unit (incl. 8.35m^2 of balcony), 126 units
②50.85 m^2/units (incl. 8.35 m^2 of balcony), 144 units





Plan-① Plan-②

6.3.2 Government Office Buildings

There are 72 government office buildings situated in 11 blocks in DC area with a total floor area amounting to 192,758m^2 as tabulated in Table 6.10. The land area amounts to 247,062m^2 in total.

The largest government office in the area is the branch city hall of BMA, which has a total floor area of 28,213m^2. There is a de-facto development project to construct a new city hall of BMA with a total floor area of approximately 500,000m^2, as one of the major components of Din Daeng Community Redevelopment. The Ministry of Labor (MOL) has 16 office buildings with a total floor area of 36,526m^2.

As a whole of the offices, the building coverage ratio (BCR) and floor area ratio (FAR) are 21.8% and 78.2%. There is no block with the FAR above 100%.

Table 6.10: Government Offices in the DC Area

Building Use		Land Area	Building Area		Floor Area		No. of Buildings
		m^2	m^2	%	m^2	%	(buildings)
BMA							
2.1	BMA City Hall and District office	147,674	19,461	13	128,213	87	17
2.2	Mechanical Workshop Div., BMA	20,282	14,856	73	5,426	27	16
2.6	Mechanical Div., BMA	11,111	3,144	28	7,967	72	7
2.7	Rabies Div., BMA	1,697	976	57	721	43	3
2.9	Gas station	4,863	715	15	715	15	6
2.10	Construction center, BMA	15,537	4,872	31	4,319	28	1
	Health Source Center	1,825	674	37	1,151	63	1
2.16	Analysis & research center, BMA	4,480	1,354	30	1,757	39	1
4.1	Dept. of City Planning, and Dept. of Traffic and Transportation, BMA	7,930	3,014	38	6,559	83	4
MOL							
3.1	Office	33,074	4,595	14	12,187	37	12
3.3	Office	2,824	730	26	1,460	52	2
3.4	Office	628	-	-	-	-	2
Total		247,062	53,676	22	192,758	78	72

Source: NHA
Note: BCR and FAR in total excludes offices in Block 3.4.

6.3.3 Public Facilities

Public facilities located in DC Area include educational, recreational, health, and religious facilities as tabulated in Table 6.11.

Table 6.11: Public Facilities in the DC Area

Building Use		Land Area (m2)	Building Area		Floor Area	
			(m2)	(%)	(m2)	(%)
Educational						
2.3	Vichakorn Elementary School, BMA	21,541	2,439	11%	6,878	32%
2.15	Wichutit School, BMA	15,599	5,194	33%	13,966	90%
2.14	Vocational Center, BMA	14,520	1,665	11%	5,582	38%
5.1	Piboonprachasan school, MOE	63,670	10,183	16%	18,854	30%
5.2	Samakeebumrungvittaya school, MOE	3,392	878	26%	1,067	31%
Recreational						
2.4	Indoor stadium, BMA	11,656	4,168	36%	4,168	36%
2.5	Thai-Japan Youth Center, BMA	119,607	53,213	44%	62,678	52%
2.8	Garden, BMA	18,651	102	1%	102	1%
Health and Public Service						
3.2	Children and elderly care center, MOL	8,832	2,162	24%	4,110	47%
3.5	Day care center, MOL	1,787	676	38%	676	38%
6.1	Rajanukul Hospital	52,385	10,295	20%	21,054	40%
Religious						
8.1	Mosque	3,377	563	17%	870	26%

Source: NHA

As for educational facilities, there are four schools accommodating pupils for compulsory educational demand consisting of two public schools (Vichakorn public school, and Wichutit). As a whole, the capacity of schools under BMA is sufficient as these two public schools can accommodate a total of 3,010 pupils, only 2,865 pupils have been enrolled as of July 2001. In addition to these schools, there is one public school (Piboonprachasan) for disabled pupils under BMA which has a capacity of 2,730 pupil for 2,191 enrolled pupils.

On the other hand, Piboonprachasan private school insufficiently accommodates 240 pupils, as the number of enrolled pupils is 255.

Table 6.12: Capacity of School in the DC Area

School		Kindergarten	Elementary	Secondary		Total
				Lower	Upper	
Vichakorn Public School (BMA)	Capacity (pupils)	250	1,040	0	0	1,290
	No. of pupils	324	882	0	0	1,206
	No. of Classroom	10	26	0	0	36
	No. of Staffs	-	-	-	-	65
Wichutit Public School (BMA)	Capacity (pupils)	200	1,200	320	0	1,720
	No. of pupils	242	1,120	297	0	1,659
	No. of Classroom	8	30	8	0	46
	No. of Staffs	-	-	-	-	94
Piboonprachasan Public School for Disabled Pupils (MOE)	Capacity (pupils)	250	1,400	720	360	2,730
	No. of pupils	288	1,123	636	144	2,191
	No. of Classroom	10	35	18	9	72
	No. of Staffs	-	-	-	-	152
Samakeebumrungvittaya Private School (Situated on the MOL land)	Capacity (pupils)	0	240	0	0	240
	No. of pupils	0	255	0	0	255
	No. of Classroom	0	6	0	0	6
	No. of Staffs	-	-	-	-	13
Total	Capacity (pupils)	700	3,880	1,040	360	5,980
	No. of pupils	854	3.380	933	144	5.311
	No. of Classroom	28	97	26	9	160
	No. of Staffs	-	-	-	-	324

Source: NHA
Note: Capacity of kindergarten classrooms: 25 pupils/classroom
Capacity of elementary classrooms: 40 pupils/classroom
Capacity of secondary classrooms: 40 pupils/classroom

The Thai-Japan Youth Center consists of an outdoor stadium, indoor stadium, swimming pool, meeting room, and outdoor stage. The total capacity of those facilities is for 16,914 visitors. According to the recent record, the annual number of visitors is 1,690,309 persons, which can be converted to 4,631 visitors per day as described earlier.

Table 6.13: Capacity of Thai-Japan Youth Center

Number of Visitors		Annual Number	Daily Average	Note
	Visitors for sport	1,073,306 visitors	2,941 visitors/day	Record in 1999
	Visitors for others	262,282 visitors	719 visitors/day	Record in 1999
	Audience	354,721 visitors	972 visitors/day	Record in 2000
	Total	1,690,309 visitors	4,631 visitors/day	
Capacity of Facility		Capacity(person)	Note	
	Stadium (Outdoor)	6.400 visitors	1) Daily Water Demand: 350 m3/day 2) Wastewater is treated by septic tank of Thai and aeration type. 3) Max Storm Discharge: 11,000 m3/day (rainy season) 4) Capacity of electricity transformer: 1,600kVA, receiving from 12 kV power line of MEA. 5) No. of telephone: External - 5 lines, Internal - 40 lines.	
	Stadium (Indoor)	9.000 visitors		
	Swimming pool	800 visitors		
	Meeting room	214 visitors		
	Outdoor stage	500 visitors		
	Total	16,914 visitors		

Source: Thai-Japan Youth Center

6.3.4 Infrastructure

(1) Transport System

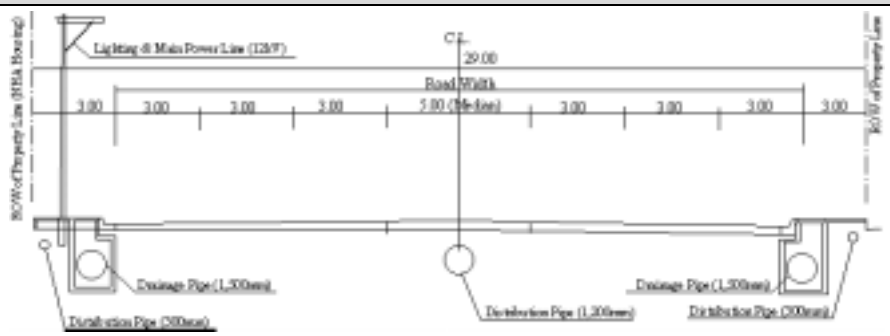
The main roads in the DC area, such as Pracha Songkhro Road, and Mit Maitri Road, connect to Asok-Din Daeng Road, and Vibhavadi Rangsit Road. These main roads have two lanes and pedestrian ways.

Regarding the pedestrian movement, the foot bridge at the intersection of Asok-Din Daeng Road and Pracha Songkhro Road, connects the northern and southern parts of Asok-Din Daeng Road. Cross sections of these main roads are shown in Figure 6.4.

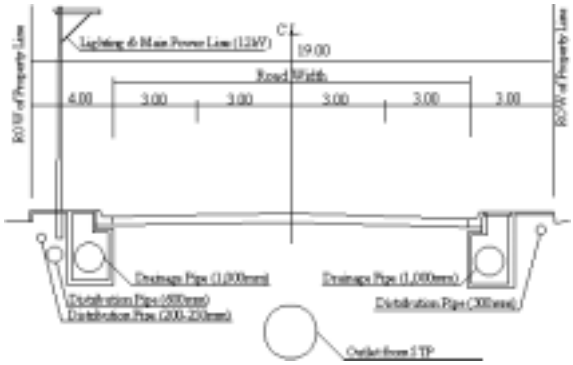
There are several other roads situated within the DC Area serving as collector and access roads. These roads have one lane in each direction, and sometimes are over-crowded by passing through traffic.

Figure 6.4: Road Cross-section in DC Area

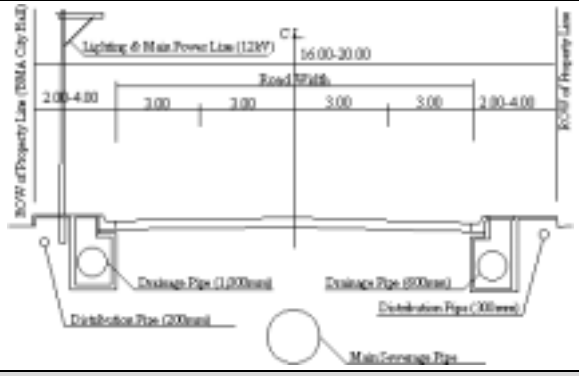
Asok-Din Daeng Road



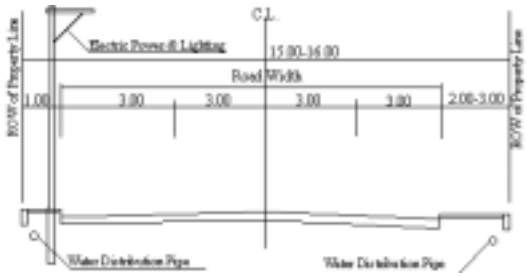
Pracha Songkhro Road



Mit Maitri Road



King's Road in front of Block A



(2) Water Supply System

Figure 6.5 shows layout of existing water distribution pipelines. Drinking water is supplied from trunk distribution pipelines with a diameter of 300 mm. Enclosing the northern part of Asok-Din Daeng Road, these pipelines are connected with transmission pipelines of 600 mm and 1,200 mm at three points. Distribution for inner parts from 300 mm pipelines is taken by pipes with a diameter between 150 mm and 200 mm.

Apart from those mentioned above, drinking water for Block E and Block A in the southern part of Asok-Din Daeng Road is directly supplied by 200 mm and 300 mm distribution pipelines.

(3) Sewage Treatment System

There is no central waste water treatment plant under operation to cover the DC Area. All building facilities therefore are equipped with individual treatment systems in accordance with regulations. Regarding the housing section, each building has a septic tank (community plant) with a capacity of 1,000 m^3/day operated by NHA.

The Department of Drainage and Sewerage (DDS), BMA is constructing Din Daeng central sewage treatment plant, which is designed to process 341,000 m^3/day for 697,000 population in Phase 1 and 463,000 m^3/day for 1,080,000 population in Phase 2. The plant will cover the entire DC Area by the combined system as presented in Part II of this report. The plant is scheduled to start operation in a few years.

(4) Rainfall Drainage System

DC Area is divided into two catchment basins: the eastern part and western part of Pracha Songkhro Road. Storm water in the western part is pumped out by pumps with capacity of 6 m^3/s at Block 2.8 after collecting through drainage pipes of 800 mm diameter. The western part is drained by culvert of 1,500mm along Asok-Din Daeng Road, as shown in Figure 6-6.According to DDS, the inundation areas in DC Area are pointed out at Pracha Songkhro Road and Block B.

(5) Electric Power System

Electric power for the DC Area is supplied from the Saen Saep substation (3×40 MVA) through 12 kV lines along Asok-Din Daeng Road, Pracha Songkhro Road, and Mit Maitri Road. Those distribution lines will be upgraded by MEA from 12 kV to 24 kV in 2002.

(6) Telecommunication System

The DC area is in the service area of Asok-Din Daeng (DD) switching station, which has a capacity of 40,000 lines. The switching station is connected to 93 distribution cabinets through 24 primary cable lines with total capacity of 72,000 lines.

There are 28 distribution cabinets with capacity of 900 lines/cabinet in the DC area. According to the Telecommunication Organization of Thailand (TOT), 4,953 lines were in use in 1999. It forecasts that the demand will increase to 8,641 lines in 2011.

Besides, there is a SDF for the branch city hall of BMA connected by special lines. There were 400 lines in use in 1999 and the demand in 2011 is assumed to be 800 lines.

The DC Area also has optical fiber lines along Asok-Din Daeng Road and a road in front of the Japan Youth Center, connecting to the DD switching station. Another optical fiber line is laid along Pracha Songkhro Road, and this is connected to Inthamara switching station.

(7) Solid Waste Disposal System

The Din Daeng district office of BMA is in charge of solid waste collection in the DC Area, and operate on the following basis.

1) Separation of Solid Waste

Solid waste is separated into four types as follows:

- Green for general;
- Yellow for recyclable waste;
- Grey with red lids for hazardous waste; and
- Blue for ordinary garbage.

2) Frequency of Collection

- Major road : three times a day
- *Soi* road : once in two days
- Housing : two or three times a week
- School and market : once a day by 4 m^3 containers

Figure 6.5: Existing Water Distribution Pipelines in the DC Area

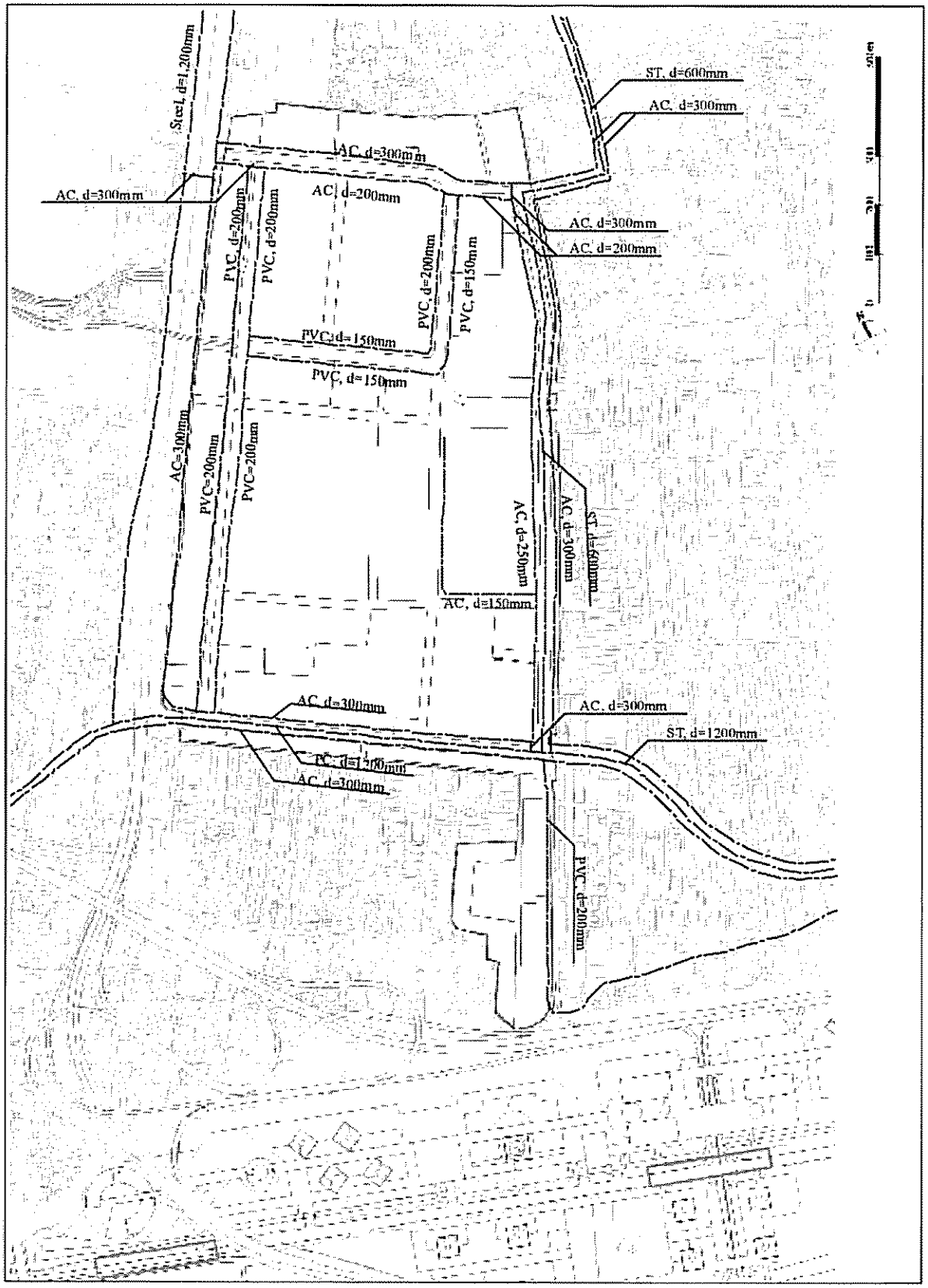


Figure 6.6: Existing Drainage System in the DC Area

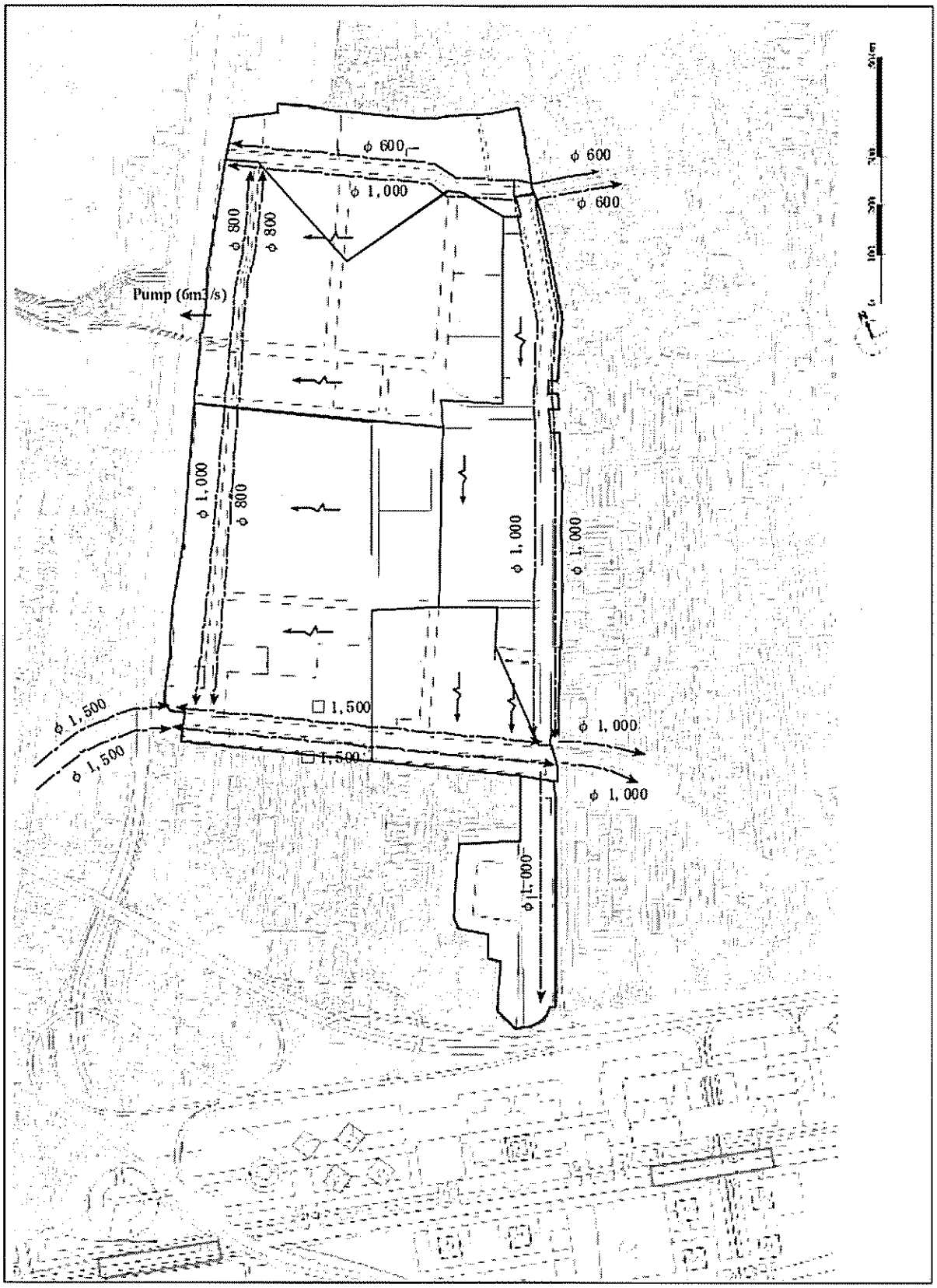


Figure 6.7: Existing Telecommunication System in the DC Area