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No. 08

BASIC DESIGN SURVEY REPORT ON ESCUELA TECNICA NACIONAL DE SALUD PUBLICA IN THE REPUBLIC OF BOLIVIA

JULY. 1980

JAPAN INTERNATIONAL COOPERATION AGENCY

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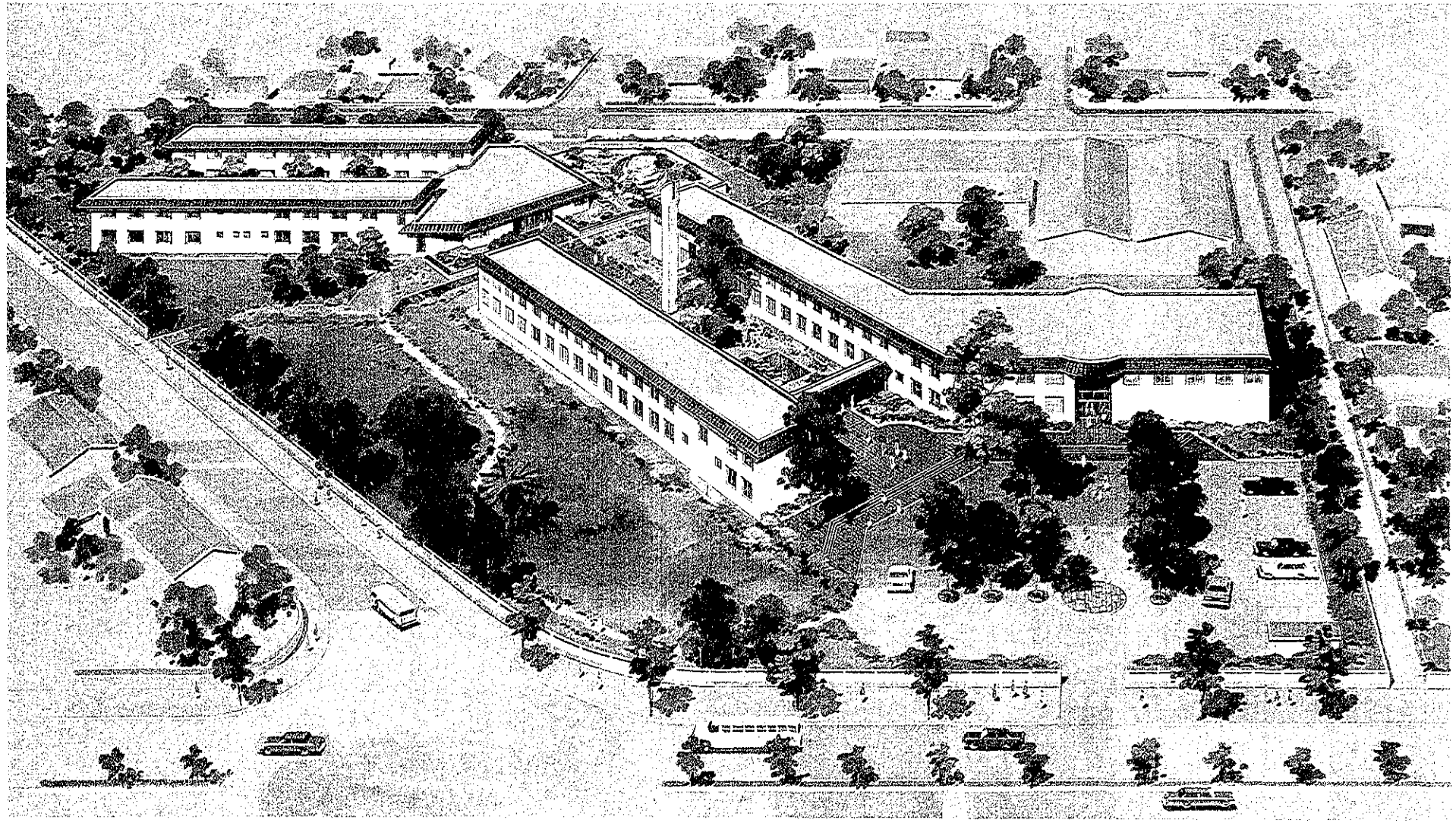
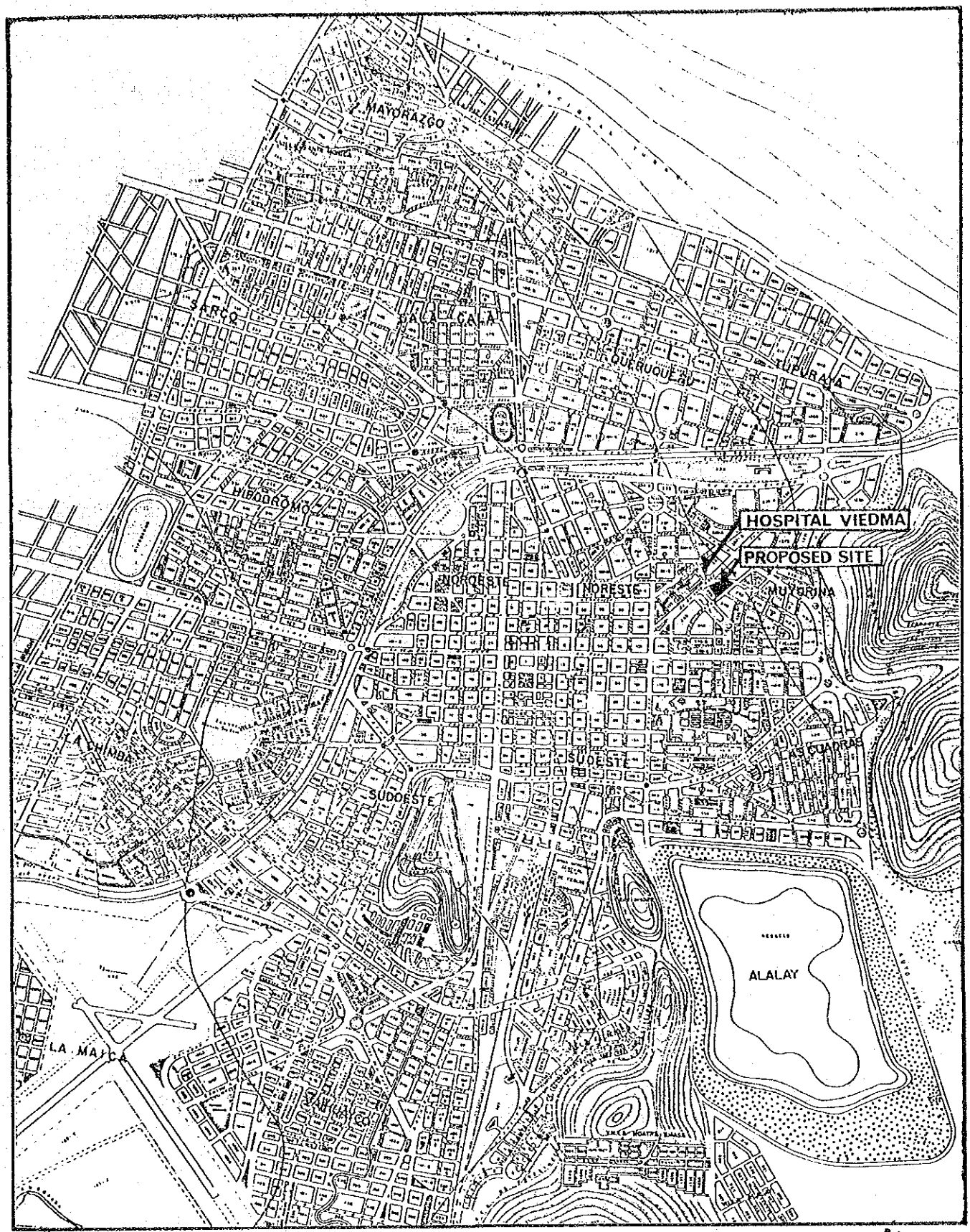


ESCUELA TECNICA NACIONAL DE SALUD PUBLICA
IN THE REPUBLIC OF BOLIVIA

THE REPUBLIC OF BOLIVIA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COCHABAMBA

PREFACE

In response to the request of the Government of the Republic of Bolivia, the Japanese Government decided to conduct a survey on ESCUELA TECNICA NACIONAL DE SALUD PUBLICA in the Republic of Bolivia and entrusted the Japan International Cooperation Agency with the survey. The J.I.C.A. sent to Bolivia a survey team headed by Dr. Shozo Tada, Assistant Professor, Toho University from April 15 to May 5, 1980.

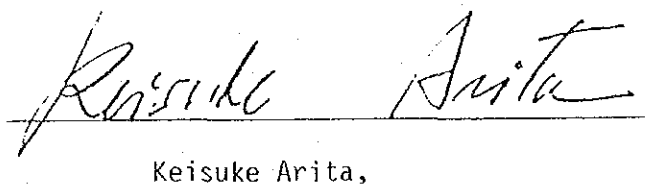
The team consulted with the officials concerned of the Government of Bolivia and conducted a field survey in Cochabamba, Bolivia.

After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of Bolivia for their close cooperation extended to the team.

June, 1980



Keisuke Arita,
President,
Japan International Cooperation Agency

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SUMMARY

SUMMARY

The close relations between the Republic of Bolivia and Japan, of long standing, date back to the prewar period. Since the end of the World War II, the Government of Bolivia agreed to accept Japanese immigrants and the cultural exchange and various cooperative programs have successfully been implemented between the two countries.

Especially in the sphere of medicine, Japan accepted Bolivian trainees, sent out Japanese medical experts to contribute to the improvement of medical services in Bolivia and offered grant aid to establish three gastro-intestinal disease centers at La Paz, Sucre, and Cochabamba.

The existing network of medical services and public health is yet extremely inadequate, having caused a wide gap of access to medical services between urban and rural areas in Bolivia. Half of the total population of about 6 million reside in rural areas, of which two-thirds are deprived of any medical assistance.

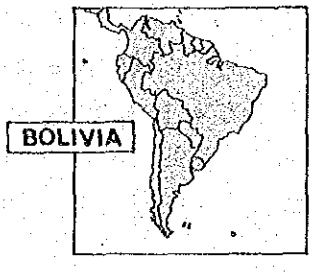
The Government of Bolivia has been attempting to remedy the inadequate medical services, especially in isolated rural areas. However, the country has markedly short of specialized paramedical personnel, such as, practical nurses and public health workers who serve rural patients and propagate the basic knowledge in health, hygiene and nutrition specialists in rural communities, and X-ray technicians and clinical technicians who are essential in improving the technical standards of medical services. It is felt urgently necessary to establish facilities for training these paramedics.

The Government of Bolivia accordingly requested the Government of Japan a grant aid to establish a paramedical training school. In response to the request, the Government of Japan entrusted the Japan International Cooperation Agency (JICA) to organize a basic design survey team and dispatched one to Bolivia in April and a confirmation team in June of 1980. The survey team had well over ten discussion meetings with Bolivian representatives and visited three candidate sites (one in La Paz and two in Cochabamba). Through the repeated meetings, it was decided that the proposed school should be called ESCUELA TECNICA NACIONAL DE SALUD PUBLICA and directed by the Ministry of Public Health, and that the school should be established in Cochabamba City inside the premises of the

Ministry of Public Health just across Viedma Hospital. Together with the details on the functions (such as types of courses and curricula, years of training, sizes of enrolments, numbers of faculties, etc.) and the physical facilities and equipment of the proposed school of public health, these agreements were duly made into Minutes signed by the representatives of the Bolivian Government and the survey team. Furthermore, the Government of Bolivia already started to consider a budget allocation for the operation and maintenance costs of the project and plan the staffing of the school's faculty.

The present report is based on the findings during the two surveys in Bolivia and the Minutes signed and exchanged between the representatives of the Governments of Bolivia and the survey team. The detailed design and construction of the proposed school are expected to begin immediately after an official authorization of this report. The Government of Bolivia expects, furthermore, that Japan will collaborate on the development of curricula and teaching materials, and the training of the teaching staff as the proposed paramedical school is the first of its kind to be implemented in the Republic of Bolivia.

The establishment of the school is expected to contribute greatly to the expansion and improvement of the public health administration and to the upgrading of the medical techniques in Bolivia. It is requisite in addition that the Government of Bolivia secures a sufficient budget allocation for the operation of the school, training and supply of competent teaching staff, an on-the-job training system at clinics or hospitals, clear-cut training regulations, and a qualifying system for graduates.



Chapter 1 GENERAL DESCRIPTION OF THE PROJECT

Chapter 1 GENERAL DESCRIPTION OF THE PROJECT

1-1 BACKGROUND

The Republic of Bolivia is a land-locked mountainous country bordering Brazil, Peru, Chile, Argentina and Paraguay and has a land area of 1.1 million square kilometers, three times larger than the size of Japan. Roughly one-third of the country consists of the Andean high plateaus at altitudes averaging 4,000 meters and approximately 84 percent of the population inhabit in the highlands at elevations of over 2,500 meters.

The total population is currently estimated to be approximately 6 million, half of which are aged 15 years and younger. The country's demography shows a typical high fertility-high mortality pattern with a crude birth rate of 45 per 1,000 inhabitants, twice as high as in Japan, and a death rate of 20 per 1,000, which is three times more than that of Japan. The infant mortality rate is extremely high at nearly 160 per 1,000 live births, approximately 16 times higher than the rate in Japan. Life expectancy at birth is only 45.7 years for males and 47.9 years for females. The frequent causes of death are mostly from communicable (diseases) and intestinal diseses which are rampant at all seasons, and commonly from enteritic and eruptive typhus, diphtheria, and malaria. In particular the rural people who are by nature nutritiously deficient, will be driven much more susceptible to various infectious diseases. Incidences of yellow fever, haemorrhagic fever and Chagas disease, are also reported in the eastern low plains. The causes of morbidity and mortality are made complex partly by the country's ecological conditions which vary from humid tropical low plains in the east to oxigen-deficient highlands exposed to stronger ultraviolet rays and lower temperatures.

The medical services are largely provided by private physicians in Bolivia. Graduates of the three existing medical schools are not subject to the national qualifying examination (which is yet non-existent in Bolivia) and can freely start their practices.

The mutual medical insurance and social insurance systems only benefit to employees (approximately 1 million) of the public administration and a limited number of large-scale companies.

Public health services are provided for low fees, or occasionally free-of-charge, depending on the income levels of the patients, but an access to such services is limited to those who inhabit in urban areas. The Government of Bolivia has been trying to improve its public health services by promoting coordination and integration of medical services in urban areas and establishing a network of health units in rural areas as part of its program of the Integrated Rural Development Units.* However, two-thirds of the total rural population (3 million) are still deprived of any access to medical assistance and there persists a wide gap of health standards between urban and rural areas.

Medical education and training are available at three national medical schools located at La Paz, Cochabamba and Sucre. These schools give courses to train medical doctors (2 years of general education and 4 years of special training), pharmacists, clinical nurses and clinical technicians (2 years of general education and 2 years of special training). However, only a limited number of students who finished the first two years of general education, advance to special paramedical training courses in general. Besides, the graduates from the medical, nursary, and technician courses, often seek for employment outside Bolivia. Moreover, there are quite a few X-ray technicians who are indispensable for medical care and who are extremely low in the technical standards, simply because there has established neither any specialized training facilities nor qualifying system up to date.

In view of the severe shortage of specialized paramedical personnel, the Government of Bolivia has decided to launch the aforementioned program of Integrated Rural Development Units and thereby plan to train 1,935 paramedics (excluding public health nurses and qualified midwives) in 5 years from 1980 to 1984. The Government is especially planned on increasing the supply of practical nurses, health and hygiene specialists, and nutrition specialists who would treat rural patients and propagate the basic knowledge in health,

* The network is to comprise basic health units provided for every 30,000 inhabitants, central health hospitals with 25-50 beds for every 10,000, medical posts for every 200-1,900 and sanitary posts for communities with less than 200 inhabitants.

hygiene, and nutrition in isolated rural areas, and it goes the same with the above for X-ray technicians and clinical technicians who are essential in improving medical standards.

In the light of the above, it was very urgent and necessary for the Government of Bolivia to establish paramedical facilities to meet the planned project. Then and there, the Government of Japan organized and dispached the basic design survey and the confirmation survey teams to Bolivia to response the urgent and yet serious request for the forementioned grand aid.

1-2 PROJECT DESCRIPTION

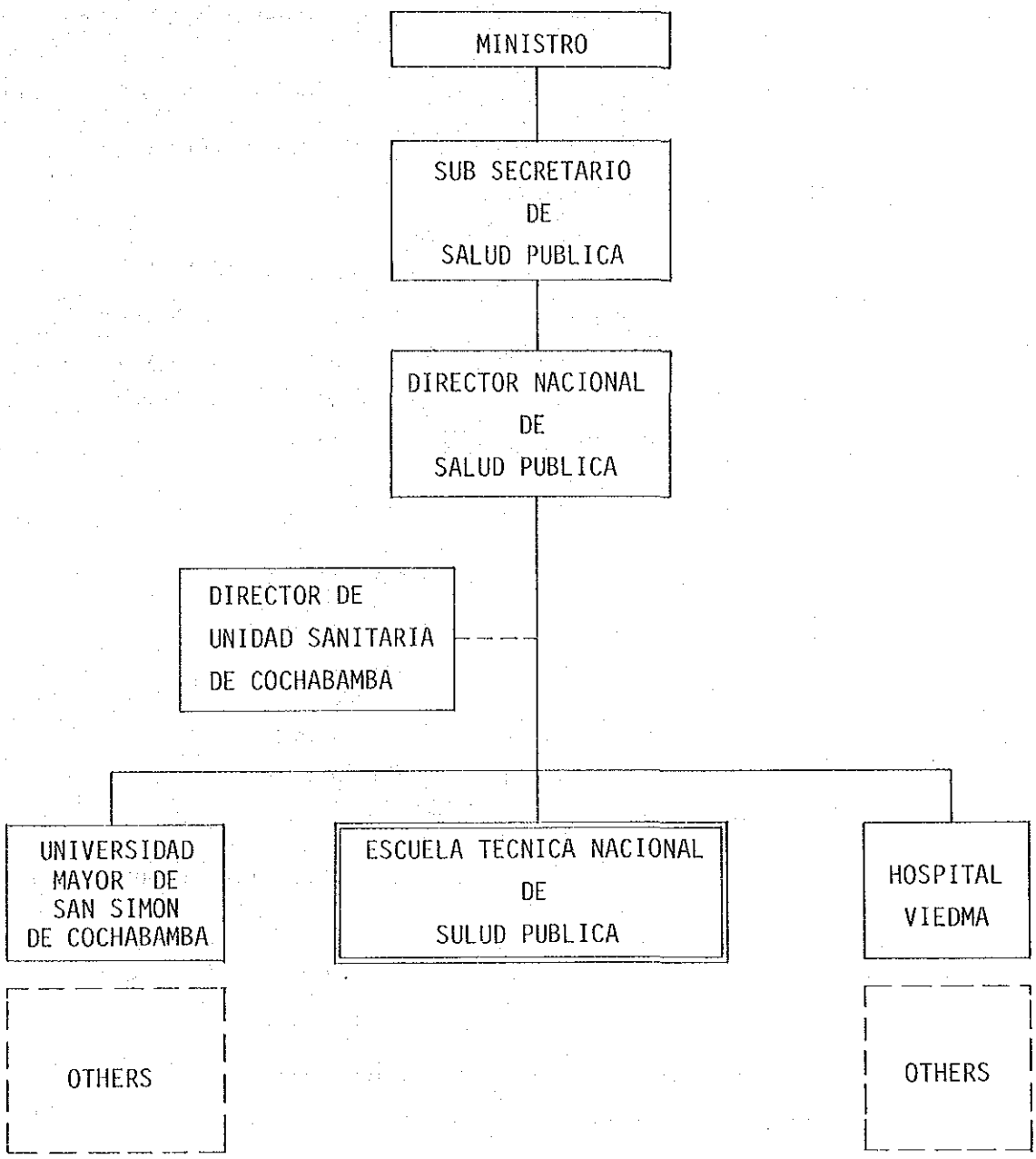
1-2-1 Objective

The proposed paramedical training institute, officially called ESCUELA TECNICA NACIONAL DE SALUD PUBLICA, is expected to train the specialized paramedical personnel indispensable to the expansion and improvement of the public health administration in Bolivia, specifically practical nurses, health and hygiene specialists, and nutrition specialists who will serve rural communities and X-ray technicians and clinical technicians who will contribute to the betterment of the technical standards of medical services.

During the earlier stage of school operation, more emphasis will be placed on securing a quick supply of the urgently needed paramedics through shorter training courses. In the later period, the curricula will be lengthened and diversified to train radiotherapists and physical and occupational therapists in order to upgrade the Bolivian medical services to the international standards.

1-2-2 Administration

The proposed ESCUELA TECNICA NACIONAL DE SALUD PUBLICA shall be established in Cochabamba City and subject to the supervision and operation by the Ministry of Public Health.



MINISTERIO DE PREVISION SOCIAY
Y SALUD PUBLICA

1-2-3 Training courses

1) Enrolments

a.	Practical nurses course	40 students/class, x 2 classes
b.	Clinical technicians course	20 students/class, x 2 "
c.	X-ray technicians course	20 students/class, x 2 "
d.	Health and hygiene specialists course	40 students/class, x 2 "
e.	Nutrition specialists course	20 students/class, x 2 "

Each course consists of two classes which are separately given lectures.

2) Training periods

		In Escuela	In Clinico
a.	Practical nurses course	0.5 year	0.5 year
b.	Clinical technicians course	1.0 year	1.0 year
c.	X-ray technicians course	1.0 year	1.0 year
d.	Health and hygiene specialists course	1.0 year	---
e.	Nutrition specialists course	1.0 year	---

3) Teaching and administrative personnel

a. Teaching staff

I.	Director	1 person
II.	Senior lecturers	5 persons
III.	Full-time lecturers	7-8 persons
IX.	Part-time lecturers	
	◦ Basic subjects	8 persons (in common)
	◦ Special subjects	
	Basic subjects	6-7 persons (in common)
	Clinical medicine	36 persons
	Sub Total	63-65 persons

b. Administrative staff

I.	Head officer	1 person
II.	Officers-in-charge	5 persons
III.	Clerks	5 persons
	Sub Total	11 persons
	Total	74-76 persons

1-2-4 Curricula

1) Hours of class works and clinical practices for each course are recommended as shown in Table 1-1.

Table 1-1 HOURS OF CLASS WORKS AND CLINICAL PRACTICES

Class works and practices / Course	Primary subjects (hours)	Special subjects (hours)	Subtotal		Clinical practices (hours)	TOTAL	
			(hours)	(weeks)		(hours)	(weeks*)
a. Practical nurses course	305	320	625	20.8	625	1250	41.6
b. Clinical technicians course	435	815	1250	41.6	1250	2500	83.3
c. X-ray technicians course	360	795	1155	38.5	900	2055	68.5
d. Health & hygiene specialists course	305	940	1245	41.5		1245	41.5
e. Nutrition specialists course	250	1000	1250	41.6		1250	41.6

* 30 hours/week

2) Curricula for Training Courses (The figure stands for hours of each subject.)

a. Practical Nurses Course

I.	Primary Subjects		305 h.
	1. Cultural and social sciences		30
	2. Natural sciences		80
	(1) Mathematics	30	
	(2) Chemistry	30	
	(3) Biology	20	
	3. Foreign language		40
	4. Health education and physical education		15
	5. Anatomy and physiology		45
	6. Bacteriology and disinfection		30
	7. Individual hygiene		20
	8. Alimentotherapy		20
	9. Introductory pharmacology		15
	10. Laws and regulations related to hygiene		10

II. General nursing 320 h.

1. History and philosophy of nursing 10
2. Principles and practices of nursing 85
3. Internal diseases and nursing (includes infectious diseases) 70
4. Surgery and nursing (includes orthopedics) 40
5. Pediatrics and nursing (includes health education of children) 35
6. Obstetrics and gynecology and nursing (includes newborn babies) 25
7. Psychiatry and nursing 20
8. Ophthalmology, dentistry and otorhinolaryngology and nursing 15
9. Dermatology and urology (includes venereal diseases) 10
10. Physical therapeutics 10

III. Clinical practice 625 h.

Training in Wards and Other Inpatient Facilities 507	Training in Outpatient Clinics 118
◦ Internal medicine (includes infectious diseases) 150	◦ Internal medicine (includes infectious diseases) 18
◦ Surgery 150	◦ Surgery 18
◦ Pediatrics 75	◦ Pediatrics 18
◦ Obstetrics and gynecology 56	◦ Obstetrics and gynecology 18
◦ Operation room 38	◦ Ophthalmology, dentistry and otorhinolaryngology 28
◦ Hospital kitchen (special diets) 38	◦ Dermatology and urology 18

b. Clinical Technicians Course

I.	Primary Subjects		435 h.
	1. Cultural sciences		30
	2. Social sciences		30
	3. Natural sciences		255
	(1) Mathematics	60	
	(2) Physics	60	
	(3) Chemistry	75	
	(4) Biology	45	
	(5) Introductory science and technology	15	
	4. Foreign language		105
	5. Health education and physical education		15
II.	Special Subjects		815 h.
	1. General medicine		15
	2. General public hygiene		50
	3. Introductory clinical pathology		65
	4. Introductory clinical examination I (Treatment of specimens)		60
	5. Introductory clinical examination II (Treatment of patients)		15
	6. Anatomy and histology		40
	7. Basic physiology		40
	8. Clinical physiology		65
	9. Pathology		60
	10. Biochemistry		60
	11. Clinical chemistry		60
	12. Haematology		55
	13. Microbiology		90
	14. Serology		55
	15. Medical zoology		25
	16. Experimental zoology		15
	17. General medical electronics		30
	18. Related laws and regulations		15

c. X-ray Technicians Course

I.	Primary Subjects		360 h.
	1. Cultural sciences		30
	2. Social sciences		30
	3. Natural sciences		165
	(1) Mathematics	45	
	(2) Physics	60	
	(3) Chemistry	30	
	(4) Biology	30	
	4. Foreign language		120
	5. Health education and physical education		15
II.	Special Subjects		795 h.
	1. General medicine		30
	2. Radioactive biology		15
	3. Anatomy		60
	4. Physiology		30
	5. Biochemistry		30
	6. Pathology		30
	7. Hygienics and public hygiene		30
	8. Radioactive physics		60
	9. Electrical engineering		60
	10. Electronics		45
	11. Mechanical engineering		30
	12. Radioactive equipment		120
	13. Development of X-ray photographs		75
	14. Techniques of X-ray photography		60
	15. Radioactive measurement		45
	16. Techniques of radio-therapy		30
	17. Techniques of radioactive control		30
	18. Related laws and regulations		15

d. Health and Hygiene Specialists Course

I.	Primary Subjects		305 h.
	1. Cultural and social sciences		30
	2. Natural sciences		80
	(1) Mathematics	30	
	(2) Chemistry	30	
	(3) Biology	20	

3. Foreign language			40
4. Health education and physical education			15
5. Anatomy and physiology			45
6. Microbiology and disinfection			30
7. Individual hygiene			20
8. Alimentotherapy			20
9. Introductory pharmacology			15
10. Laws and regulations related to hygiene			10
II. Special Subjects			583 h.
1. General nursing			123
(1) History and philosophy of nursing		4	
(2) Principles and practices of nursing		34	
(3) Internal diseases and nursing (includes infectious diseases)		26	
(4) Surgery and nursing (includes orthopedics)		15	
(5) Pediatrics and nursing (includes health education of children)		13	
(6) Obstetrics and gynecology and and nursing (includes newborn babies)		10	
(7) Psychiatry and nursing		8	
(8) Ophthalmology, dentistry and otorhinolaryngology and nursing		5	
(9) Dermatology and urology (includes venereal diseases)		4	
(10) Physical therapeutics		4	
2. Public health nursing			180
3. Health statistics			45
4. Epidemiology			60
5. Health care			100
6. Systems of social welfare and insurance			30
7. Introductory maternal and child health			15
8. Public health administration			30

III. Clinical practice 357 h.

Training in Wards and Other Inpatient Facilities 291	Training in Outpatient Clinics 66
◦ Internal medicine (includes infectious diseases) 86	◦ Internal medicine (includes infectious diseases) 10
◦ Surgery 86	◦ Surgery 10
◦ Pediatrics 45	◦ Pediatrics 10
◦ Obstetrics and gynecology 33	◦ Obstetrics and gynecology 10
◦ Operation room 23	◦ Ophthalmology, dentistry and otorhinolaryngology 16
◦ Hospital kitchen (special diets) 18	◦ Dermatology and urology 10

e. Nutrition Specialists Course

I. Primary Subjects 250 h.

1. Cultural sciences 30
2. Social sciences 30
3. Natural sciences 120
   (1) Chemistry 75
   (2) Biology 45
4. Foreign language 40
5. Health education and physical education 30

II. Special Subjects 1,000 h.

1. General nutrientology 80
2. Nutritional physiology 45
3. Nutritional biochemistry 40
4. Pathological nutrientology 60
5. Food science 200
6. Food hygiene 80
7. Public hygiene 120
8. Methods of cooking 40
9. Nutritional education 120
10. Practical exercise 215

1-2-5 Physical Facilities and Equipment

The proposed ESCUELA TECNICA NACIONAL DE SALUD PUBLICA comsist of;

1) School building: Classrooms to teach five different courses, practice rooms and a library, rooms for the faculty, an auditorium with 140 seatings, administration offices including conference rooms, the director room, the head officer room and anterooms for lecturers.

2) Dormitory: Two dormitories, one each for male and female students, respectively housing each 60 members, and a dining building which contains a dining hall, a lounge, a reading room and other welfare facilities.

3) Equipment to teach five courses (See Section 3-3 for details).

Chapter 2 BASIC DESIGN SURVEY

Chapter 2 BASIC DESIGN SURVEY

2-1 OUTLINE OF SURVEY

In response to the request from the Government of Bolivia, the Japan International Cooperation Agency (JICA) organized and dispatched a basic design survey team in April and a confirmation team in June of 1980, The basic design survey team that visited Bolivia in April, comprised Dr. Tada, team leader and assistant professor of the medical faculty at Toho University, Dr. Hosaka, lecturer at the same university, a JICA officer as coordinator, and four engineering specialists of AZUSA SEKKEI CO., LTD..

The basic design survey team had repeated discussion meetings with the official representatives of the Ministry of Public Health and visited three candidate sites (one in La Paz and two in Cochabamba). Through these discussions and site surveys, it was determined that the proposed school should be called ESCUELA TECNICA NACIONAL DE SALUD PUBLICA and that it be placed under the jurisdiction of the Ministry of Public Health.

Furthermore, agreements were reached the expected functions of the school (types of courses and curricula, respective years of training, size of enrolments and teaching staff, etc.) and the necessary physical facilities and equipment. The selected site for the school is in Cochabamba City inside the premises of the Ministry of Public Health near Viedma Hospital. The Minutes of these agreements were then signed by the representatives of the Governments of Bolivia and Japan.

The confirmation team was sent in June, comprising Dr. Tada as team leader, a JICA officer as coordinator and three engineering specialists of AZUSA SEKKEI CO., LTD.. The team presented to the Government of Bolivia a draft report of the basic design survey prepared on the bases of the Minutes and findings during the previous visit, confirmed the agreements over the details of the proposed school and exchanged views on the prospective implementation schedule of the project.

2nd May 1980,
SIGNED & EXCHANGED THE MINUTES

2-2 SELECTION OF TRAINING COURSES

In Japan, the basic design survey team had supposed that the proposed school would give four courses to train practical nurses, clinical technicians, X-ray technicians and physiotherapists.

When the team landed a shore in Bolivia, the Ministry of Public Health informed us to train approximately 30,000 medical and paramedical students under the Five-year Public Health Development Plan (1980-1984). According to this plan, it is deemed necessary to train 1,935 paramedics (excluding public health nurses and qualified midwives) in 5 years, starting with 395 in the first year of the plan.

Through repeated discussion meetings, the Bolivian representatives and the team members came to a conclusion that public health nurses and qualified midwives should be excluded from training at the proposed school since more specialized curricula and longer training periods would be required, and that the school should offer two courses in place of the above, namely, health and hygiene specialists, and nutrition specialists, who would be in a position to give direction and guidance directly to the rural people.

In general, nutrition specialists are qualified to conduct surveys on edible wild plants and instruct them how to preserve provisions and to prepare cooking with any available plants at a particular case.

Considering the present medical situations in Bolivia, it is quite natural that they should be by far important than physiotherapists to be trained, so that the team recommended them to drop it out unlike our initial understandings from her request.

It was decided that the training periods for the five categories of paramedics at the school should range from 6 to 12 months, with additional periods of clinical practices extending 6 months for practical nurses and 12 months for clinical and X-ray technicians. The training periods are devised shorter than normally the case in

other countries, in view of the overriding need, which the Bolivian representatives repeatedly stressed to the survey team, to supply paramedical personnel at a front line as quickly as possible.
It was agreed, however, that the training periods should be gradually lengthened in the future to the internationally acceptable level as recommended by the survey team.

2-3 SELECTION OF THE PROPOSED SITE

On the bases of the findings from the site surveys (one in La Paz and two in Cochabamba) and a series of discussion meetings with the officials of the Government of Bolivia and the Japanese Embassy staff, the survey team came to a conclusion that the suitable site for the proposed school is the one near Viedma Hospital in Cochabamba City. The selection of the proposed site was duly approved by the Bolivian representatives.

The survey team had initially been given an impression that the school be constructed in La Paz. It was subsequently revealed during the meeting with the Minister of Public Health on April 18 that the Government of Bolivia strongly preferred to have it established in Cochabamba on the basis of ten criteria for selecting an appropriate location out of six candidate cities. (see Table 2-1). The survey team agreed to take the offer that has selected in Cochabamba, but we proposed them to see three candidate sites with our own eyes and to decide which one of three it should be ideal for. A thorough examination was conducted through detailed observation and evaluated them in accordance with the following criteria.

a. The site must be located close to a hospital where clinical training can be given to the prospective students.
b. The site must be located close to a university with a medical faculty.
c. The site must be owned by the Ministry of Public Health.
d. The site must have an area of more than 10,000 m^2.
e. The site must be adequately provided with basic infrastructural facilities.
f. The site must be easy to construct on.

The suggested site in La Paz was judged unsuitable, because (1) its area is only 1,550 m^2, (2) 1,000 m^2 is already occupied by the warehouses which belong to the Ministry of Public Health, and (3) the nearest hospital is not less than 30 minutes walk from the site.

Of the two sites suggested in Cochabamba City, the survey team compared their advantages as shown in Table 2-2 and came to the conclusion that Site A (address: Aniceto Arze Av., 243, Muyurina, Cochabamba) would be more suitable, because (1) it is close to a hospital and a university, (2) its area is approximately 11,500 m^2 and (3) it is very easy to provide the infrastructural services, i.e. water, power, telephone, etc.

Table 2-1

CRITERIOS DE SELECCION PRELIMINAR PARA LA UBICACION DE LA "ESCUELA DE SALUD" PROYECTO "J.I.C.A."

ITEM / AREA	LA PAZ	CHUQUISACA	STA. CRUZ	COCHABAMBA	TARIJA	BENI
1.- Geopolitico	**	*		***	***	
2.- Accesibilidad	***	*	**	***	**	*
3.- Comunicaciones	***	*	***	***	**	*
4.- Disponibilidad de Terreno	***	***	***	***	***	***
5.- Vinculacion con la Facultad de Ciencias de la Salud.	***	***		***	*	
6.- Campo de practica	***	**	*	***	**	*
7.- Recursos Humanos	***	***	*	***	*	
8.- Densidad Demografica	***	***		***	*	
9.- Costo de Vida	*	***		***	***	
10.- Condiciones Ecologicas		**	**	***	***	*
TOTAL	24	22	12	30	21	7

Table 2-2 SITE COMPARISON TABLE IN COCHABAMBA
BY THE JAPANESE SURVEY TEAM

I T E M	SITE A (Close to HOSPITAL)		SITE B (CLose to AV.SACABA)	
	SITUATION	EVALUATION	SITUATION	EVALUATION
A. Ownership	Owned by M.S.P.	A	Owned by M.S.P.	A
B. Distance from Hospital	Close	A	Far	D
C. Distance from University (Medical school)	Close	A	Far	B
D. Distance from City Center	Near	B	Far	D
E. Area size	11,500 m^2	B	11,700 m^2	B
F. Access to main roads	Close	A	Close	A
G. Site preparation (Obstacles at site)	6 buildings (1,800 m^2)	C	Nil	A
H. Soil conditions	Allowable capacity of approx. 10 t/m^2	B	Allowable capacity of approx. 10 t/m^2	B
I. Electric power supply	Available	A	New wiring works required	D
J. City water supply	8" pipe placed along main road	A	Required to dig a well	D
K. Public drainage	8" pipe placed along main road	A	Required to install a septic tank	D
L. Fuel	Butane gas	B	Butane gas	B
M. Telephone	Available	A	New wiring works required	D
TOTAL JUDGMENT	SUITABLE		INFERIOR to A	

A: Excellent B: Good C: Adequate D: Poor E: Failure

2-4 SITE CONDITIONS

2-4-1 General

The Republic of Bolivia is an inland country locked away in the heart of tropical South America (Lat. 10°5' to 23°S), and has three major land regions. They are the Andes, the Altiplano, and the lowlands leveling 300 m to 4,000 m above the sea level. The total area is 1,098,581 km^2, namely three times larger than that of Japan.

The number of population is approximately 6 millions, consisting of Quechua and Aymara Indians (55%), Mestizos (32%), people of mixed Spanish and Indian descent, and whites (13%). Spanish is the official language of Bolivia and most educated people in Bolivia speak it. Bolivian Indian are taught Spanish in school. At home they may speak the language of their group, i.e. Quechua and Aymara.

Main industries are agriculture and mining, such as tin, zinc, and silver. In addition to the leading products like oil and natural gas, there are many other underground resources which are in needs of being exploited in the future.

2-4-2 Location

Cochabamba is the third largest city in Bolivia with a population of 250,000 (1979). It is located in the central part of the country (Lat. 17°23'S and Long. 66°09'W) and 380 kilometers to the south-east of La Paz. The city is situated in a basin with an elevation of 2,570 m surrounded by the mountains. Due to the milder climate, people from lowlands and highlands visit the city for resort. (See Fig. 2-1)

The proposed site for the school is opposite to Viedma Hospital across Avenida Aniceto Arce. The site is surrounded by this avenue (20 meters wide) and two other roads (12 meters) in three directions and the city plans to construct a road of 6 m in width right in the west of the site (See Fig. 2-2). The area around the site is mostly residential.

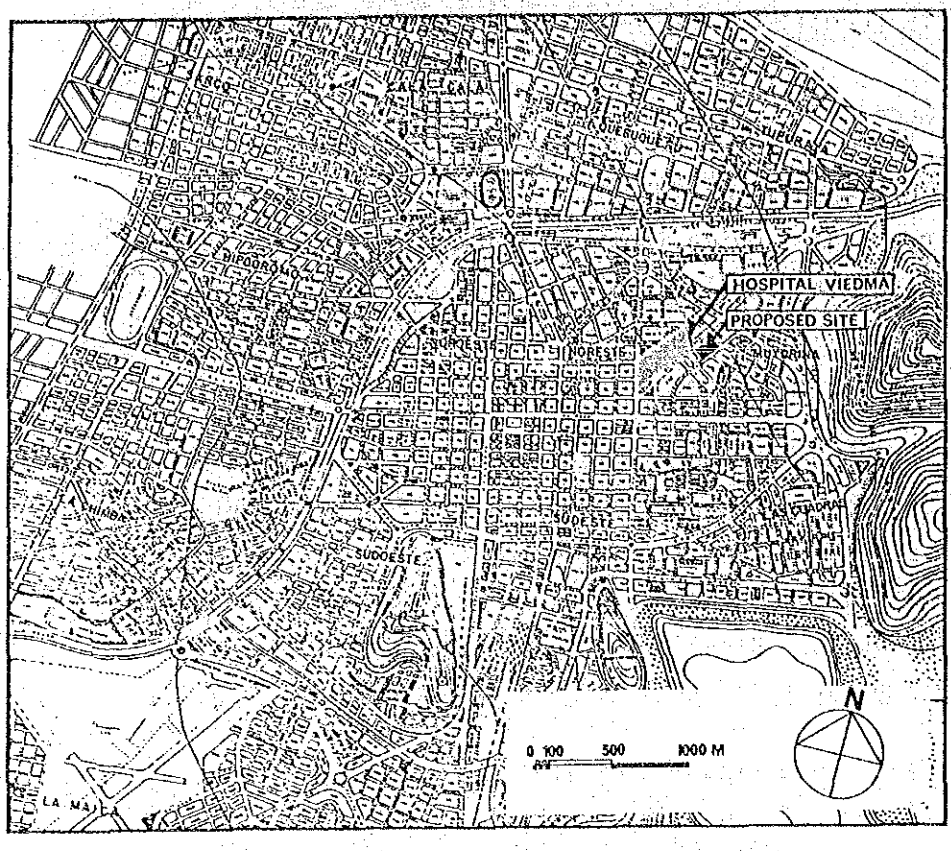


Fig. 2-1 INFORMATION MAP OF COCHABAMBA

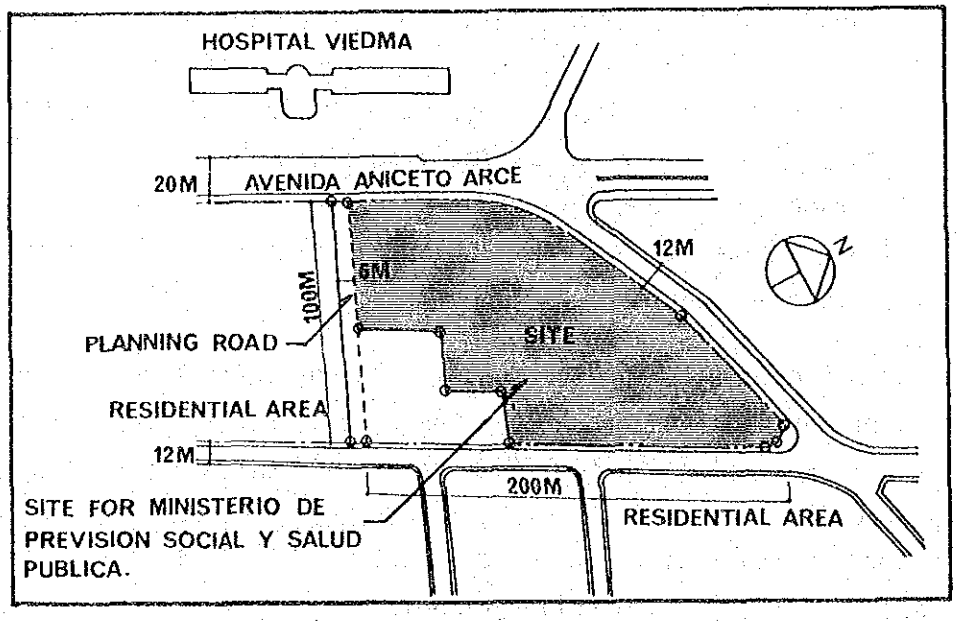


Fig. 2-2 SITE MAP

2-4-3 Geology and Geography

Cochabamba City used to be covered by marshes as the indigenous name signifies. The present basin was formed by alluvial deposits of Rocha River which flows through the city center. The proposed site for the school is located in the north-western part of the city. The terrains are generally flat with a gradient of 1% sloping from west to east. The surface soil, brown and hard, contains pebbles.

The survey team conducted a boring test at two points as shown below. A square hole of approximately 1.0 m x 1.0 m and 1.0 m deep was dug at each point. The ground was so hard that the digging was not easy. The results of the borings are shown in Tables 2-3 and 2-4. The water level is approximately 4.2 m below the ground surface, according to the observation of the unused well in the vicinity.

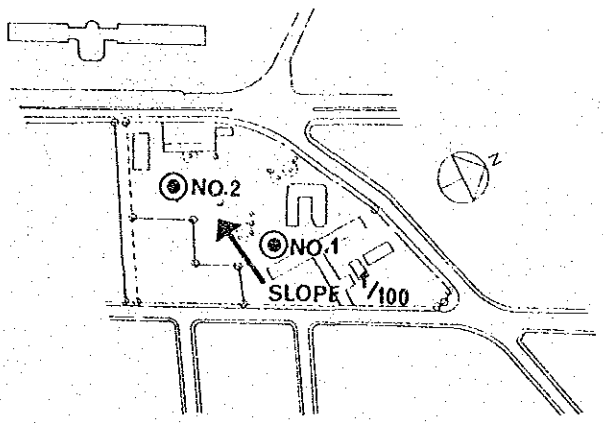
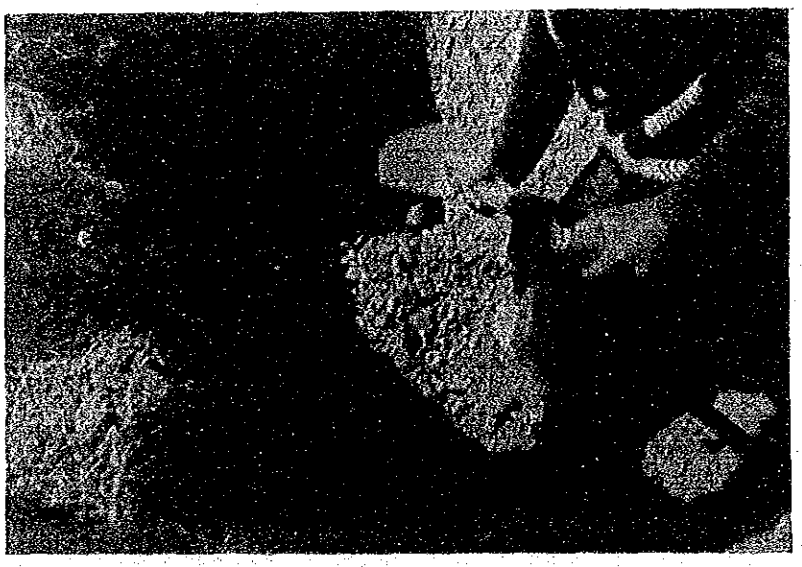


Fig. 2-3 TEST BORING POINTS

Table 2-3 No. 1 Point

Depth	Geological Description
G.L. 0 ~ -20 cm	Brown fine grained surface soil which cakes hard as it dries. Contains 10 - 30 m/m pebbles.
-20 ~ -60 cm	Compacted clay with pebbles. Contains more pebbles than the soil and forms hard compacted soil.
-60 ~ -90 cm	Sand and pebbles. Best to support the building.
-90 cm ~	5 - 20 m/m pebbles. Extremely compacted and hard.



No. 1 Point

Table 2-4 No. 2 Point

Depth	Geological Description
G.L. 0 ~ -30 cm	Same as No. 1 Point.
-30 ~ -60 cm	50 - 100 mm pebbles and bricks, as formerly used for backfilling. Contain no sand and clay, and not so hard at the depth.
-60 ~ -80 cm	Hard stones of approx. 40 cm x 40 cm, probably laid down as foundations for buildings before.
-80 cm ~	5 - 20 mm pebbles, extremely compacted and hard.

No. 2 Point

2-4-4 Climatic conditions

1) Climate

Annual meteorological data from 1969 to 1978 at Cochabamba is shown in Table 2-5. Mean temperature is 15°C - 20°C and mean humidity is 40 - 60 %. The diurnal difference of temperature is very high in winter. Annual precipitation is approximately 450 mm. (Dec. to Feb.). Most rain falls in summer from December to February, while precipitation is low in winter (May to July). The direction of wind is mainly northwesterly throghout the year and the wind velocity is not strong. The sun altitude is high. The country like Cochabamba receives northern sunlight in winter and southern sunlight in summer because of its tropical location.

2) Earthquake

The records of earthquakes for the past ninety years are available at San Charixto Meteorological Station of La Paz with the analysis conducted by Dr. Ramon Cabre S.J., director of the station. According to the analysis, the southern region (Oruro and Potosi) of Bolivia has many centers of earthquakes and volcanoes. The northern region (La Paz) is relatively stable and mostly affected by earthquakes in the Paciffic coast. The lowlands of the eastern region (Beni, Santa Cruz) have few earthquake. Cochabamba is located between the southern and northern regions and its stability is intermediate between these regions. There is the tension of the ground because the ground moves toward the Pacific Ocean and there are many shallow earthquakes. According to the result of the analysis, the most probable maximum magnitude is estimated to be V in Mercalli Modification (equivalent to the magnitude III in the Japanese system) and there is 15% possibility of the maximum acceleration of 0.05 g (50 gal).

Table 2-5 ANNUAL METEOROLOGICAL DATA (from 1969 to 1978)

Temperature in °C:												
Month	1	2	3	4	5	6	7	8	9	10	11	12
Monthly mean temperature	19.4	19.0	19.5	19.1	17.0	15.1	15.5	16.9	19.2	21.2	21.5	20.3
Monthly mean of daily maximum temperature	24.8	24.4	25.4	26.2	25.6	24.4	25.0	25.4	26.7	28.1	27.9	25.9
Monthly mean of daily minimum temperature	12.1	12.2	11.5	9.2	4.1	1.8	1.7	4.3	7.3	9.7	11.6	12.2
Maximum temperature over 10 years	33.8	32.0	29.5	31.0	30.4	28.0	29.4	30.0	31.5	33.2	34.0	32.5
Minimum temperature over 10 years	4.8	5.1	6.3	1.5	-4.5	-7.0	-5.2	-2.2	0.6	3.0	4.0	7.5

Relative humidity in %:												
Month	1	2	3	4	5	6	7	8	9	10	11	12
Monthly mean humidity	57	59.7	55.4	49.1	38.3	41.8	37.2	38.6	39.2	37.6	41.4	51.4

Precipitation in mm:												
Month	1	2	3	4	5	6	7	8	9	10	11	12
Cumulated mean monthly precipitation	138.1	103.9	44.6	16.2	5.4	1.6	0.1	8.4	8.3	12.4	40.0	74.5
Maximum precipitation in a day	42.5	31.3	44.0	15.8	12.5	5.2	1.0	19.4	15.5	9.6	29.8	37.1

Velocity and Direction of Wind in m/s:													
Month		1	2	3	4	5	6	7	8	9	10	11	12
Maximum	Wind direction	NW	SE	NW	NW SE	NW	N SW	SW W	SW W	NW	E	SE	SE E
	Wind velocity	3	3	2	2	1	1	2	4	5	4	4	3
Mean	Most frequent wind direction	NW	SE NW	NW SE	NW SE	NW SW	SW N	SW W	SW NE	N NW	E N	SE N	SE NW
	Wind velocity	1.7	1.8	2	1.1	0.4	0.6	0.6	2.5	3.6	3.2	2.9	2.5

2-4-5 Availability of utilities

1) Water Supply and Drainage

a. Cochabamba has a municipal waterwork.
The service lines are placed along Avenida Aniceto Arce which passes near the proposed site as shown below.
The service lines have about 1 kg/cm^2 of pressure each enough to supply 90 tons per day for the proposed school.
For school or commercial use, the lines can branch off to 2 inch ø piping. Extension from the municipal waterlines to intake water meters will be done by the municipal authority.

b. Drainage
The drainage line (8"ø) is also placed along the avenue, which is sufficient in the capacity of serving the proposed school.

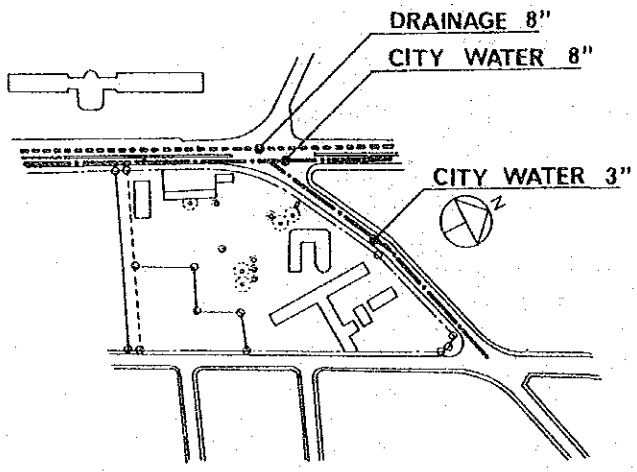


Fig. 2-4 SITE UTILITIES

2) Electric Power

The Cochabamba province is supplied power from the hydro electric power plant of Empresa De Luz Y Fuerza Electrica Cochabamba S.A. whose power is 10 KV, 3ø 3W, 50 HZ, and sufficient in capacity to supply 300 KVA for the proposed school.

3) Telephone

Telephone services for long distance calls are managed by ENTEL and city calls are run by Sistema Municipal De Telefonos Autimaticos (SMTA). The present capacity of telephone services will be able to accommodate the proposed school. Construction of telephone service lines will be done by SMTA upto MDF.

4) Gas

No city gas is available, but butane gas in cylinders are used as fuels.

2-5 TEAM MEMBERS AND BOLIVIAN REPRESENTATIVES

2-5-1 Japanese Team Members:

- Basic Design Survey Team

Dr. Shozo TADA	Assistant Professor Dept. of Microbiology, School of Medicine, Toho University Head
Dr. Hiroo HOSAKA	Lecturer Gastroenterologist, 2nd. Dept. of Internal Medicine, School of Medicine, Toho University.
Mr. Yoshihisa KONDO M.B.A.	Coordinator Japan International Cooperation Agency
Mr. Tokio ODA	Project Manager Quantity Surveyor and Architect AZUSA SEKKEI CO., LTD.
Mr. Hozumi OGAWA	Architect AZUSA SEKKEI CO., LTD.
Mr. Masaharu IWATA M.B.A.	Structural Engineer AZUSA SEKKEI CO., LTD.
Mr. Tsuneo SAFU M.B.A.	Mechanical Engineer AZUSA SEKKEI CO., LTD.

- Confirmation Team

Dr. Shozo TADA	Assistant Professor Dept. of Microbiology, School of Medicine, Toho University Head
Mr. Yoshihisa KONDO M.B.A.	Coordinator Japan International Cooperation Agency
Mr. Tokio ODA	Project Manager Quantity Surveyor and Architect AZUSA SEKKEI CO., LTD.
Mr. Hozumi OGAWA	Architect AZUSA SEKKEI CO., LTD.
Mr. Tsuneo SAFU M.B.A.	Mechanical Engineer AZUSA SEKKEI CO., LTD.

2-5-2 Bolivian Representatives:

◦ La Paz:

Dr. Hugo Palazzi	Ministro de Prevision Social Y Salud Publica
Dr. Joaquin Salcedo	Subsecretario de Ministerio de Prevision Social Y Salud Publica
Dr. Oscar Serrate	Subsecretario de Ministerio de Prevision Social Y Salud Publica
	Counter Parts:
Dr. Luis Rivera Cortes	Assesor en Relaciones Internacionales
Dr. Luis A. Valle U., M.S.P.	Director de Escuela de Salud Publica
Dr. Javier Es Tenssoro L.	Coordinador Nacional Proyecto JICA
	The Persons Concerned:
Dr. Juan Rivero Lazcano	Director de La Oficina de Relaciones Internacionales
Dr. Arnold Hofman - Bang Salet	Director de Centro de Gastroenterologia
Arg. Javier Aneiva Idiaquez	Jefe del Departamento de Arquitectura Ministerio de Prevision Social Y Salud Publica
Ing. Gustavo Quiroga	Ingeniero estructura del Departamento de Arquitectura Ministerio de Prevision Social Y Salud Publica

◦ Cochabamba:

Dr. Alfonzo Arzabe Soria	Director de Unidad Sanitaria, Ministerio de Salud Publica
Dr. Mario Argandona	Vice-Rector, Univercidad de Cochabamba
Dr. Tonchy Marincovic	Decano de Escuela Medicina, Univercidad de Cochabamba

Chapter 3 BASIC DESIGN

Chapter 3 BASIC DESIGN

3-1 DESIGN POLICY

The proposed school will be planned by the following design policies.

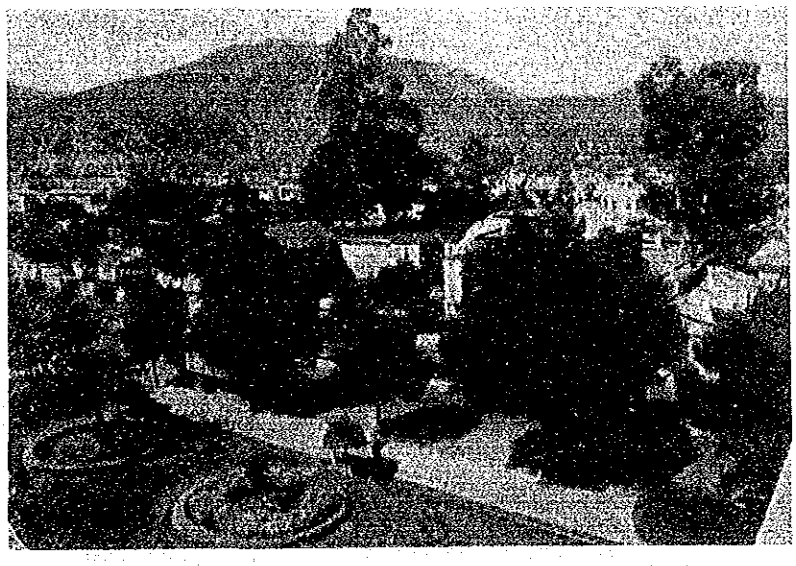
1) The school will be designed to reflect the findings by two basic design surveys.

2) The school will be provided with facilities and equipment which are necessary for the execution of the training functions envisaged for the school.

3) The school will be designed to conform to the local conditions, such as the climate, customs and religion at Cochabamba.

4) The school will be designed with reference to the city planning and construction regulations in Cochabamba.

5) Special attention will be paid to design facilities which are easy to operate and maintain after completion.



PROPOSED SITE

3-2 BUILDING DESIGN

3-2-1 Master planning

The master planning will be undertaken with the following considerations;

1) The main entrance of the school will face Viedma Hospital, because the activities of the school and the hospital are closely related.

2) The site will be divided by the school and the dormitory zones to separate the respective spheres of activities, but not to the extent of creative any inconvenience.

3) Based on above mentioned, two building zones will be designed to fit the flow of students.

4) Some of the existing trees will be kept and incorporated into the master plan.

5) No heating and cooling systems will be provided due to the comfortable climate.

6) The space for sports will be provided within the premises in accordance with the recommendation from the Ministry of Public Health.

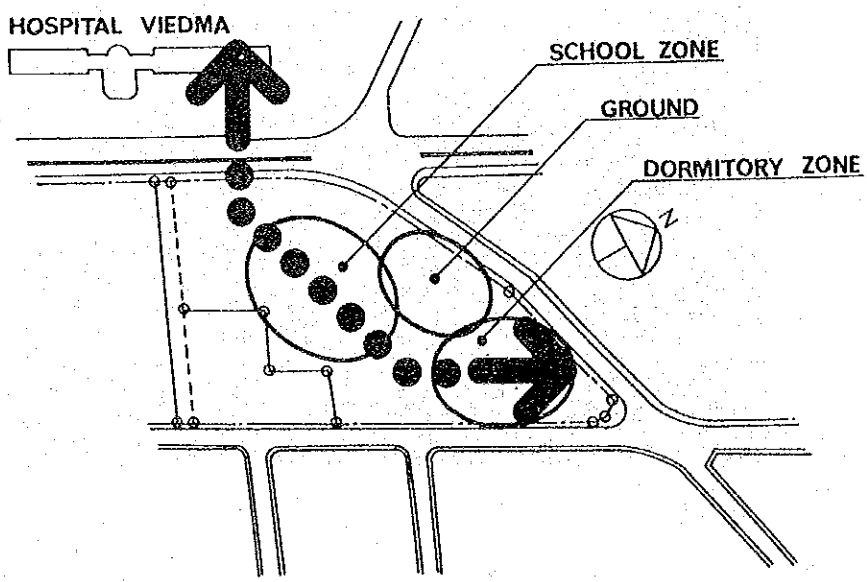


Fig. 3-1 ZONING

3-2-2 Architectural design

1) Plan

a) School building

The school building will be positioned roughly to match the shape of the site and divided into three sections (see Fig. 3-2) in accordance with major functions as follows;

- Administration -- Offices, a library, a head officer room, a director room, conference rooms and anterooms for lecturers, etc.
- Auditorium ----- Seating capacity of 140 persons and designed so as to accommodate people outside the school.
- Classrooms ----- Classrooms for five courses, practice rooms, laboratories and anterooms for full-time lecturers, etc.

These three sections will be connected with corridors and the entrance hall. Corridors will be provided in the inner side of the building to face the patio, following the traditional architectural style in Bolivia. The entrance hall will be designed to segregate students and instructors from visitors.

Between two buildings for class works, a patio will be provided to join the exterior space and interior space. The standard module for classrooms and practice rooms is to accommodate 20 students, and the span between the centers of columns is kept at 6.8 x 6 meters.

b) Dormitory

A dining hall and other functions will be designed to receive the flow of students from school building to two dormitory buildings and vice versa (See Fig. 3-3).

- Dormitory ---- Two dormitories, one each for male and female students, will be provided to give them privacy. Each bed room will house four persons. A lavatory, a shower room and a laundry space will be provided at each floor. Each dormitory will have one spare room to be used by visiting instructors who come from outside the city.
- Building for dining --- The space of the dining room will be large enough to serve students because of two shifts at every meal. A reading room will be provided for out-of-class hour students in the double shift system. A lounge will be positioned to open directly to the patio between the dormitories. Each dormitory will have a room for a janitor.

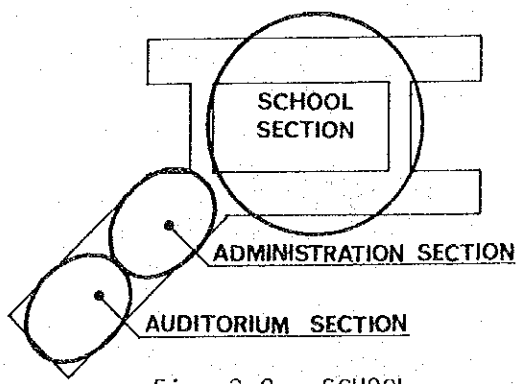


Fig. 3-2 SCHOOL

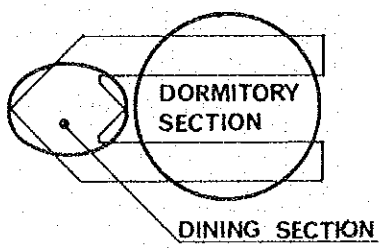


Fig. 3-3 DORMITORY

- Structure: Concerte structure
- Story: Two stories
- Floor area: G.F. 1,200 M^2
  1 F 1,000 M^2
  Total 2,200 M^2

- Structure: Concrete structure
- Story: Two Stories
- Floor Area: G.F. 800 M^2
  1 F 500 M^2
  Total 1,300 M^2

2) Section

a) School building

The effective height to the ceiling in classrooms and practice rooms shall be kept three meters.
On the window side, fixed laboratory side tables and sinks will be installed.
The ceiling height for the auditorium will be six meters.
The design will be prepared to provide good natural lighting and ventilation.

b) Dormitory

The ceiling height for dormitory buildings shall be kept at least three meters, with care taken to provide good natural lighting and ventilation and to keep a confortable living environments.

3) Materials for finishings

a) School building

∘ Major exterior finishings.

Roofs	: Elastomeric waterproofing. Heat insulation materials under the roof. Roofing tile on canopy facia.
Exterior walls	: Mortar painting.
Doors and windows	: Aluminium or steel with transparent glass. To ensure easy maintenance, glasses will be applied in normal dimensions.
Berms	: Gravels and planting.

∘ Major interior finishings
(Classrooms and others)

Floors	: Terrazzo tile.
Base boards	: Terrazzo tile.
Walls	: Mortar painting.
Ceilings	: Exposed concrete painting.

(Practice rooms)

Floors	: Terrazzo tile.
Base boards	: Terrazzo tile.
Walls	: Acid-proof mortar painting.
Ceilings	: Exposed concrete painting.

b) Dormitory

◦ Major exterior finishings

Roofs	: Same as the school building.
Walls	: Same as the school building.
Doors and windows	: Same as the school building.

◦ Major interior finishings

Floors	: Terrazzo tile.
Base boards	: Terrazzo tile.
Walls	: Facing brick.
Ceilings	: Exposed concrete painting.

3-2-3 Structural design

1) Structural Planning

In the Republic of Bolivia, the reinforced concrete structural system is normally employed for buildings. Therefore, reinforced concrete skeletal frames will be applied to the buildings included in this project. The bearing wall, which is constructed with reinforced concrete or concrete block, will resist the lateral force by earthquakes or wind.

2) Design Criteria

- Stress Analysis : Elastic Analysis
- Member Design : ACI* Standards 318 - 77
- Materials : ASTM* Standards
- Loads : UBC* Standards

3) Materials

- Reinforcement : Hot Drawn Deformed Bar
  ASTM A 615 Gr 40 for #2, #3, and #4
  ASTM A 615 Gr 50 for #5 and #6
- Concrete : Normal weight concrete
  Design strength : Fc = 180 kg/cm^2
  (required 28 days strength is more than 180 kg/cm^2
  and required mixing strength is more than 240 kg/cm^2)
  Specific gravity : γ = 2.3
  Slump : 15 cm - 18 cm
  Air content percent : less than 4 %
  Minimum cement weight per volume : 300 kg/m^3

  Actual proportioning of concrete shall be determined by the test mixing on the site.

* ACI : AMERICAN CONCRETE INSTITUTE
* ASTM : AMERICAN SOCIETY FOR TESTING AND MATERIALS
* UBC : UNIFORM BUILDING CODE

4) Seismic Load

According to the records of the earthquakes near the proposed site, the acceleration of the ground motion is about 50 gal, i.e. V - VI in Mercalli Modification.
Because of the small natural period of the buildings, seismic coefficient (k) can be set as K = 0, 05.

5) Live Loads

Classrooms and Practice Rooms	195 kg/m^2
Auditorium (Movable seats)	488
Balconies	244
Corridors	488
Roofs	98

6) Foundation

Buildings will be supported by direct foundations on the compacted clayey layer with small gravels (G.L. - 60 cm or more). The soil bearing capacity is as follows;

fe = 25.0 ton/m^2 (for permanent load)
fe = 33.3 ton/m^2 (for temporary load)

3-2-4 Mechanical works design

Designs and material standards and code of practice will refer to the Japanese Industrial Standards (JIS), Heating and Air Conditioning and Sanitary Standards in Japan (HASS) and local conditions.

Plumbing:

1) Design Conditions

◦ Staff	full time	25 persons
	part time	41 persons
Students		240 persons
Clerical and other workers		appropriate number

◦ Water Consumption (potable water)

Dormitory	100 l/person
Practice rooms	200 l/person

2) Portable water supply

Water from the town main will be led to the proposed site and joined to the water reservoir and pumped up to the elevated tank and distributed to plumbing fixture and equipment which requires water by the gravity flow system (See Fig. 3-4). The branch line to the proposed site will be equipped with a water meter encased in a box by the water works company.

Volume of water consumption	90 m^3/day
Size of the branch line to the building	50 A
Required water pressure	2 kg/cm^2

3) Domestic hot water supply

Hot water for the school building will be generated by instantaneous electric hot water boilers.
Hot water for the dormitory will be preheated by solar collectors located on roof to ecoromize electrical energy (See Fig. 3-5).

4) Drainage

Drainage will be divided into two separate systems, one for sewage and waste water, and the other for waste water of practice rooms. The sewage and waste water from the buildings will be led to the catch basin and led into the final manhole and discharged to the public drainage system.
The waste water of practice rooms will be led into the final manhole and discharged to the public drainage system.

5) Plumbing fixture

Western-style water closets, washbasins, service sinks will be installed as required. Shower sets, hose bibb, drains will be installed as required.

6) Gas supply

To be installed in practice rooms and the kitchen.

7) Ventilation

- Following areas will be ventilated by mechanical devices, toilets, shower rooms, practice rooms and offices etc. (See Fig. 3-6)
- The rest of the areas will be naturally ventilated.

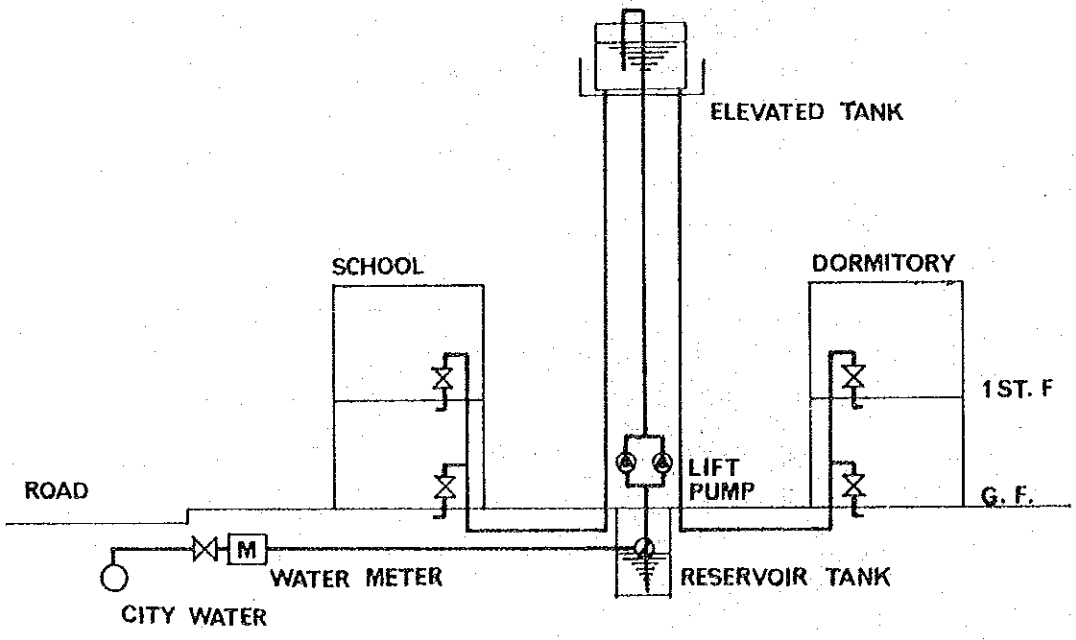


Fig. 3-4 DIAGRAM OF POTABLE WATER SUPPLY SYSTEM

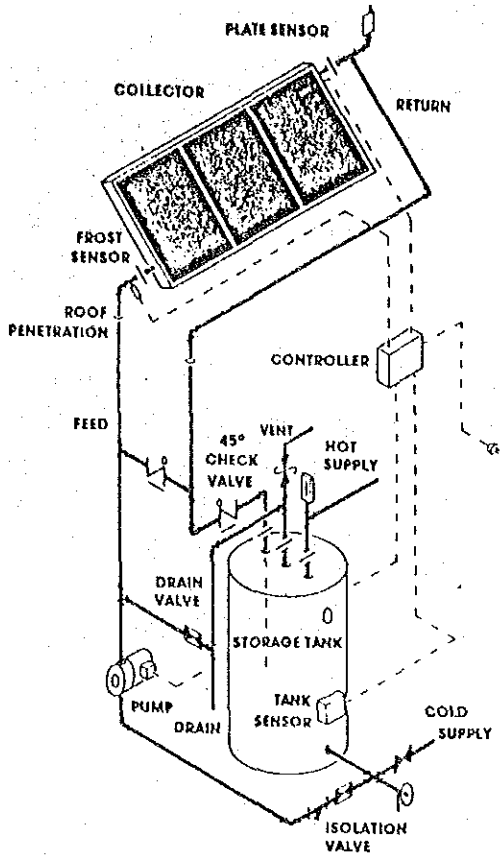


Fig. 3-5 DOMESTIC HOT WATER SUPPLY SYSTEM (FOR DORMITORY)

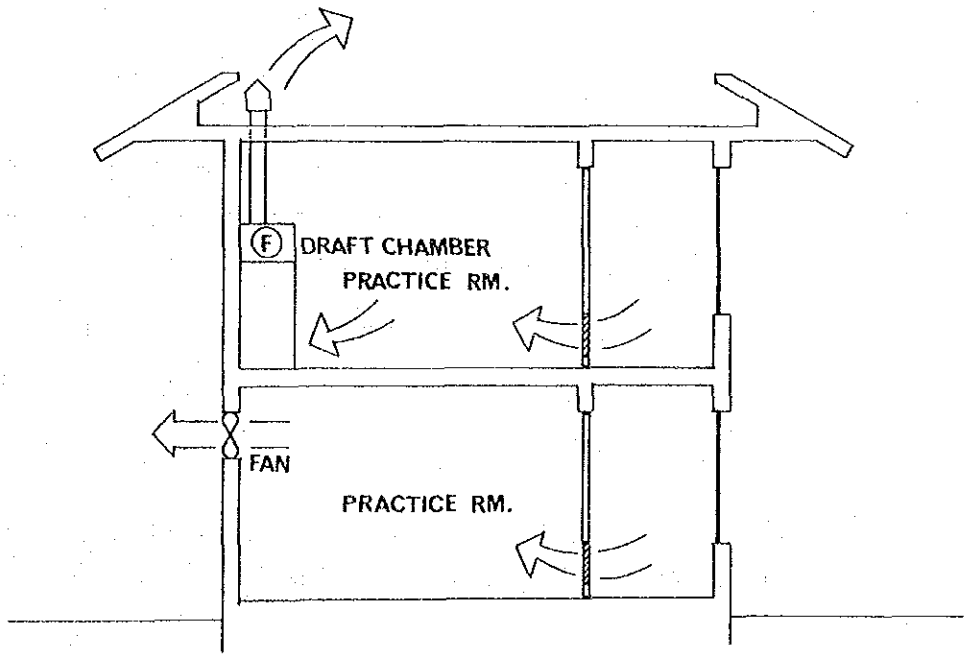


Fig. 3-6 VENTILATION SYSTEM

3-2-5 Electrical works design

Desings and materials standards and codes of practice will refer to the Japanese Industrial Standards (JIS), Japanese Electrotechnical Committee (JEC) and The Standard of Japan Electrical Manufacturer's Association (JEM) and local conditions.

1) Lighting

Typical room lighting will be as follows:

Administration offices	250 lx
Practice rooms	300 lx
Anterooms	300 lx
Lavatories, storage and corridors	100 lx
Classrooms	200 lx
Dormitories	200 lx

2) Power incoming

Power will be supplied as follows:

Voltage	: 3ø 4W, 10 KV/380 - 220 V
HZ	: 50 HZ
Capacity	: 300 KVA

AVR will be installed between the step down transformer and the main distribution panels.

3) Power distribution

Wiring will be designed by the cables from the main distribution panel in the electrical room to the power control panels, lighting panels and branch panels (See Fig. 3-7)

3ø 4W 380 V	: for power & medical equipment
1ø 3W 220 V	: for lighting & medical equipment

4) Lighting fixture

Fluorescent lamps will be mainly used in each room and practice rooms with incandescent lamps in some places.

5) Power and control system

Motors of the lift pump will be automatically controlled. Ventilation fans will be manually operated.

6) Telephone system

A cross-bar type telephone exchange equipment will be installed in one of the offices in the school building and internal telephone instruments as required (See Fig. 3-8). At least 4 external circuits and a total of about 40 internal circuits will be necessary.

7) Loudspeaker system

Several loudspeakers will be installed in the school building and the dormitory (See Fig. 3-9).

8) TV and Radio antennas

Outlets for TVs and Radios will be installed in the conference room, the director room, the head officer room and the office in the school building and the lounge in the dormitory (See Fig. 3-10).

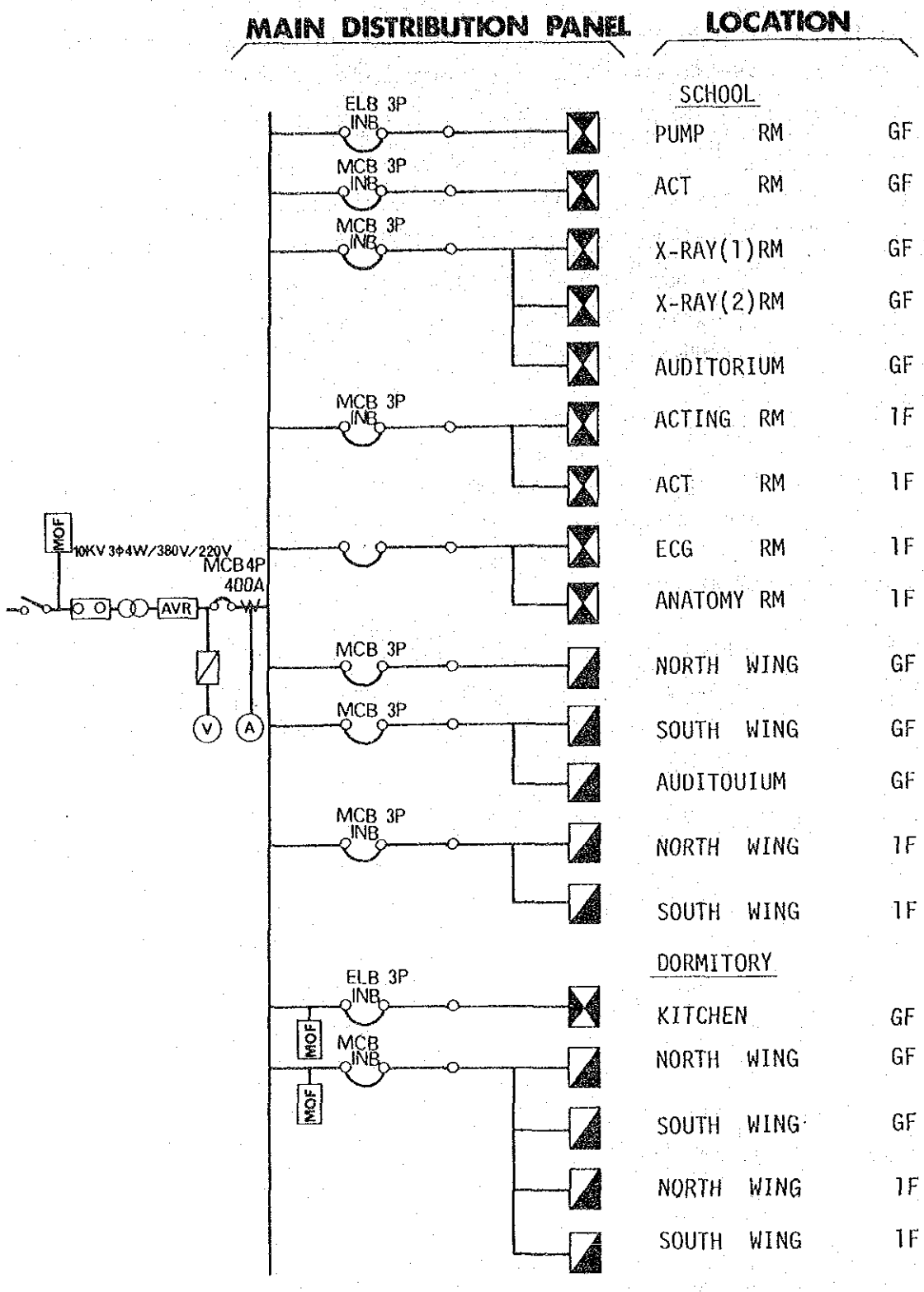


Fig. 3-7 POWER DISTERIBUTION SYSTEM

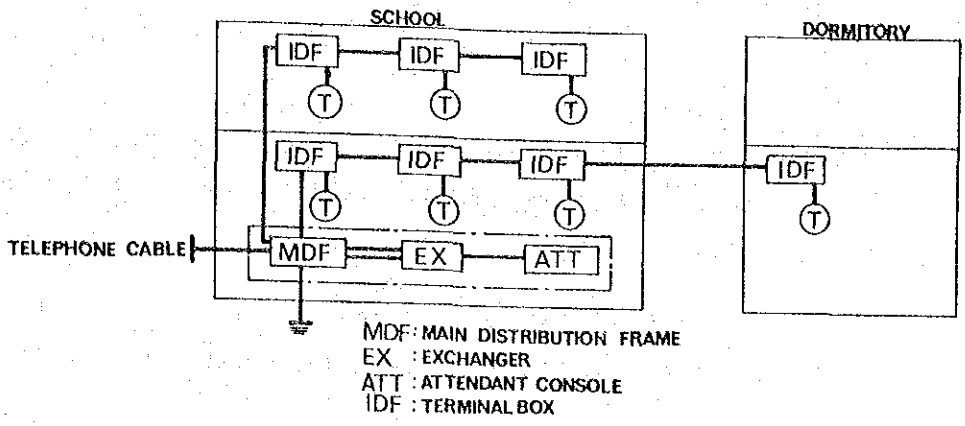


Fig. 3-8 TELEPHONE SYSTEM

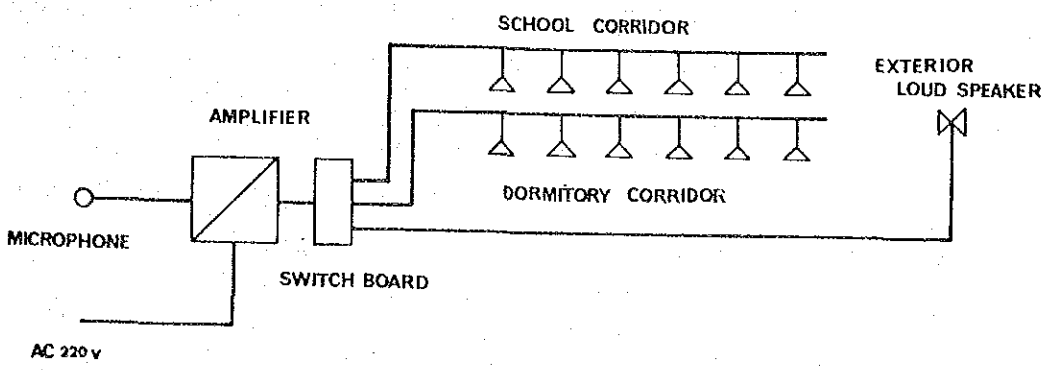


Fig. 3-9 LOUD SPEAKER SYSTEM

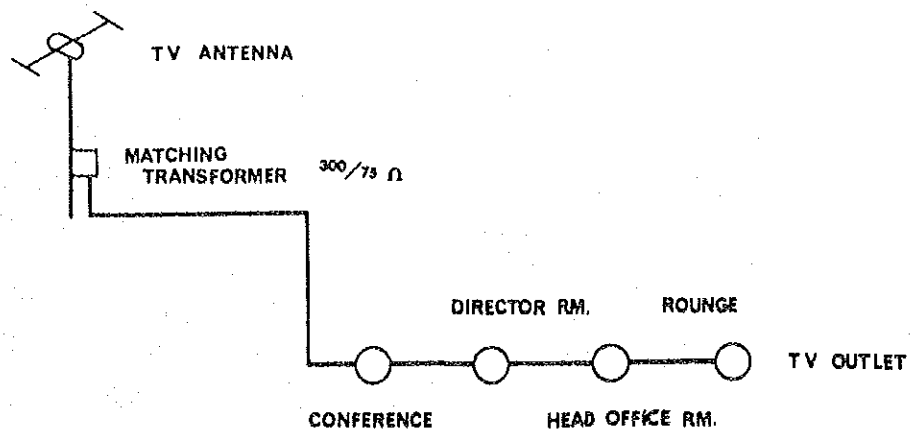


Fig. 3-10 MASTER ANTENNA SYSTEM

3-3 PROVISIONS OF MEDICAL EQUIPMENT AND MATERIALS

3-3-1 General

Provisions of medical equipment and teaching materials for the proposed school are determined by taking note of the following requirements;

1) The school should be so equipped that the trainees will acquire the capability of operating effectively in an isolated rural milieu.

2) The selection of equipment and materials conforms in principle to the standard requirements* for the similar training establishments in Japan, with due modifications to suit the conditions in Bolivia. With regard to health and hygiene specialists and nutrition specialists, for which there are no corresponding paramedical categories in Japan, the regulations pertaining to the training of public health nurses and qualified midwives are applied, with appropriate modifications, to select necessary equipment and materials.

3) Upon completion of the proposed school, the Government of Bolivia will bear the costs of repair and maintenance of equipment and continued supplies of various materials.

* Practical Nurses: The Guideline Requirements for Practical Nurses Training Institutions.

Clinical Technicians: The Guideline Requirements for Hygiene Technicians Training Institutions.

X-ray Technicians: The Guideline Requirements for Radiotherapeutic and X-ray Technicians Training Institutions.

3-2-2 List of medical equipment

A) Practical Nurses Course

1) Bed set
2) Bed side nursing equipment set
3) Therapeutical equipment set
4) Diagnostic equipment set
5) Model of human body (Adult, Child and Newborn)
6) Walker
7) Stret her
8) Boiling bath
9) Incubator
10) Negatoscope

B) Clinical Technicians Course

1) Equipment for microbiology
2) Equipment for anatomy
3) Equipment for physics
4) Equipment for public health
5) Equipment for physiology
6) Equipment for pathology
7) Equipment for haematology
8) Equipment for biochemistry
9) Balance set
10) Centrifuge
11) Microscope
12) Electric refrigerator
13) Water purifier

C) X-ray Technicians Course

1) X-ray apparatus set
2) TV for X-ray set
3) X-ray protective equipment set
4) X-ray measurement set
5) Electrical measurement set

6) Photo equipment
7) Phantom for X-ray
8) Negatoscope
9) Magnet switch
10) Signal generator
11) Equipment for X-ray control
12) Equipment for physical exercise
13) Equipment for chemical exercise

D) Health and Hygiene Specialists Course

1) Equipment for haematology
2) Equipment for physiology
3) Microscope
4) Electric refrigerator

E) Nutrition Specialists Courese

1) Equipment for biochemical analysis
2) Spectrophotometer
3) Balance set
4) Centrifuge
5) Cooking equipment

F) Specimen and Model

1) Human body
2) Skeletal structure
3) Intestinal organs
4) Pregnancy
5) Histopathological specimen and model
6) Specimens