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Cambridge, Massachusetts

September 9, 1949

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Dear Dean Wurster:

In partial fulfillment of the requirements for the degree of
Master in Architecture, I submit herewith my thesis entitled
" A Health Center for Kiangwan, Shanghai, China ".

Sincerely yours,

TO MY PARENTS

WHO GIVE ME
GOOD EXAMPLES
IN LIFE

A HEALTH CENTER
FOR KIANGWAN
SHANGHAI CHINA

A THESIS FOR THE
DEGREE OF MASTER
IN ARCHITECTURE

SUBMITTED BY

H U A L I

SEPTEMBER 9 1949

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INTRODUCTION

Among the urgent needs that are necessary to bring China back to prosperity; such as education, industry, and communication; a common health education besides medical care for the people is one of the more important. For only a healthy people can endure the hardships in reconstructing a nation.

The general Chinese people are quite ignorant about good healthy living when they are fortunate enough to survive, and feel completely helpless if attacked by diseases.

Though the old medicines and medical men are still serving the large part of the country, they are too scare and unscientific. Very often, these meager facilities are available to the richer people only.

There are some mission hospitals, and a few governmental institutions sparingly scattered over the bigger cities, yet their scope of work is quite limited to the curing side. Very little has been done toward the improvement of people's health educations.

A health education for the general public is without doubt the most essential and effective method to raise the health standards of the people. The interest of the people in public health and personal hygiene can be roused more easily by demonstrations. Demonstrations in every means, in public talks, in slide shows, in moving pictures, in model exhibits and in model village living.

One very effective method to get people interested in the project is to make the people take part in it and contribute their effort too, for purely charity works can hardly

continue on forever. Moreover, the people might consider such institutions beyond their abilities to possess.

The Kiangwan Health Center of Shanghai suburb is a good example of this philosophy. They take care of the sick people in that small community where no modern medical means are available, but they do not believe free charity can do much good to the people. They let the recovered ones to pay back by working for the hospital, or let their families work for them while they are not able to work. So far, this method worked out quite satisfactorily. The hospital did not rely completely on donations and the people found themselves quite capable to afford western doctors and western medicines in this way.

All patients and their families began to share more interest in the health center. Some of them paid back more than they should. Others contributed what they have. People who had contact with this center began to live in a more hygienic way.

The present health center received nearly all its property from UNRRA. It now owns an auto repair shop, a woodwork shop and some farms. Though the scale is quite small, progress seem to be in the right direction and is growing quite steadily now.

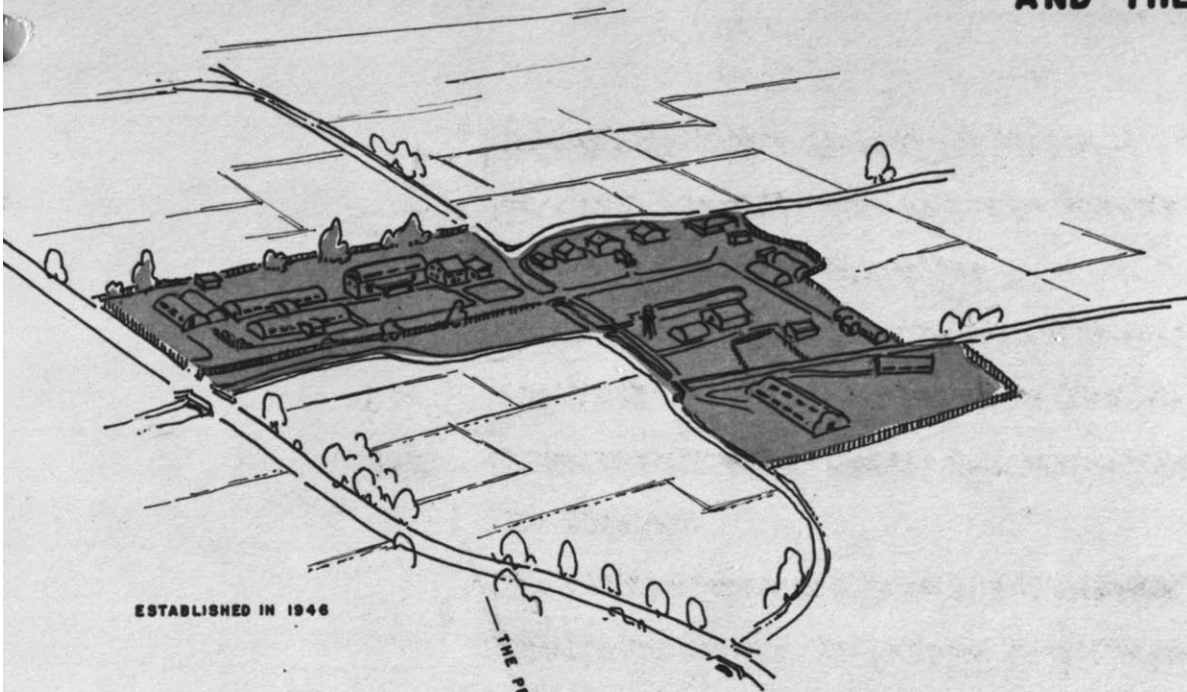
The writer had a visit to the project sometime before he left Shanghai. He was very much impressed by the spirit of the staff and the ways it solves its problems. Should more such health centers be established all over the country, one should say the revival of a great nation is not far ahead.

In choosing this subject for a thesis, the writer felt it very much his obligation to his countrymen to offer his best in attacking this problem

It is very difficult for the writer to follow everything straightly to actual conditions in Shanfhai. Some deviations are unavoidable since data was not available after the blockade.

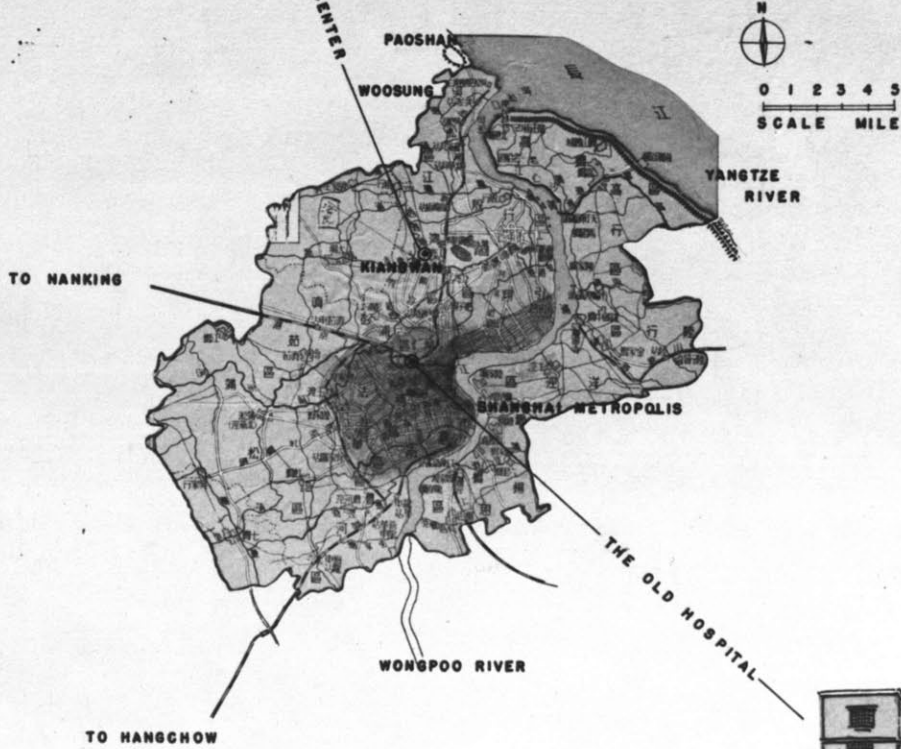
The solution presented here is not intended to be the final solution, but it is hoped that the problem is enlightened and that better solutions may be lead to later in similar projects by those who share the same interest.

THE PRESENT HEALTH CENTER AND THE OLD HOSPITAL



ESTABLISHED IN 1946

THE PRESENT HEALTH CENTER



THE OLD HOSPITAL



BUILT IN 1928
REORGANIZED IN 1945

HISTORY SKETCH

The Kiangwan Health Center is situated about 4 miles north of Shanghai Proper. It is a private institution, established by the senior staffs of Chieming Hospital in Chapei (northern part of Shanghai). To know the health center better, one should go back a little.

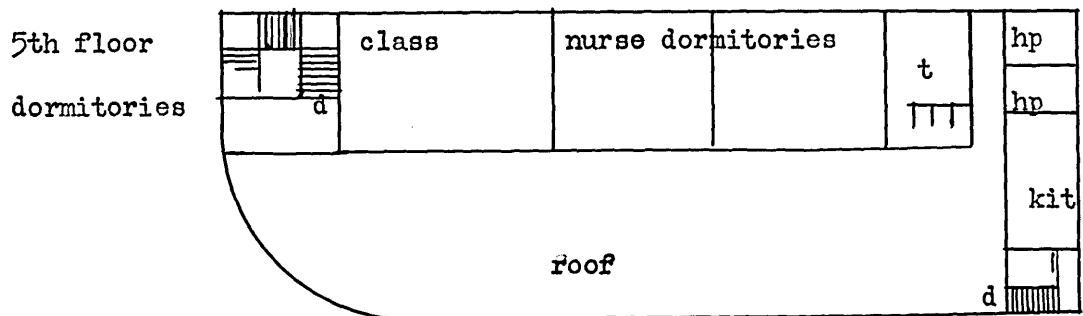
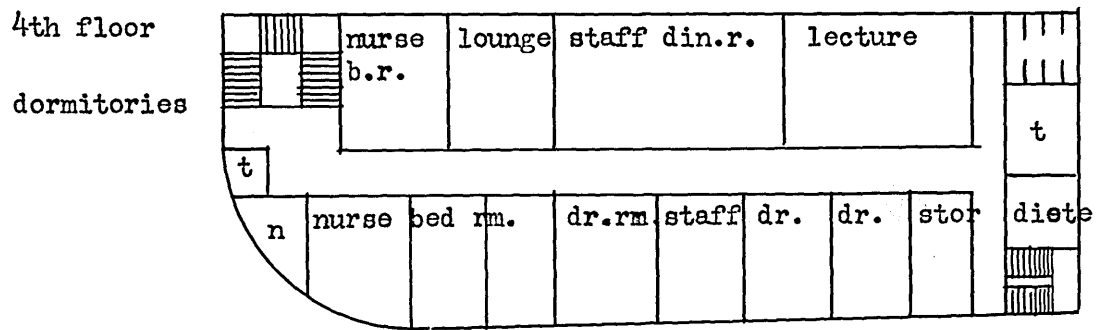
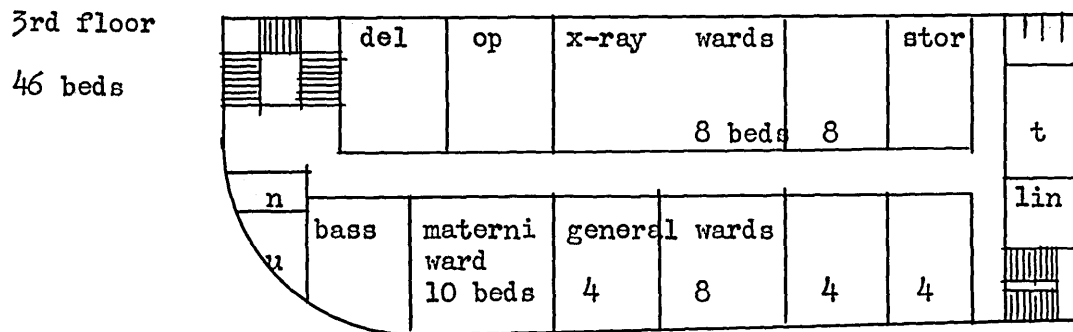
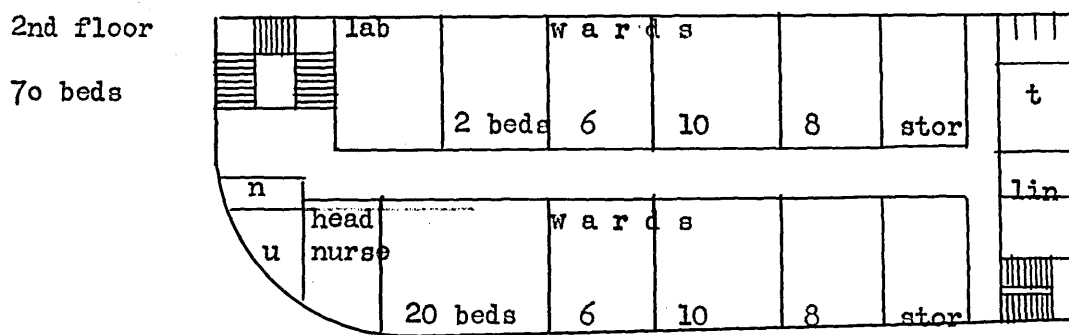
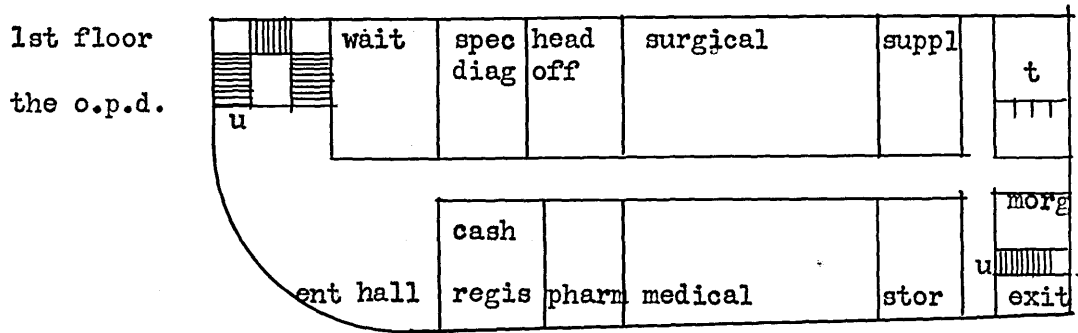
Early in the summer of 1945, a group of young Christian doctors graduated from St. Johns's Medical School in Shanghai was asked to render services in a semi-charity hospital in the war-torn area of the city - Chapei. The hospital was then called Shanghai Chinese General Hospital, and was built in 1928 by local merchants and municipal authorities as the Shanghai Infectious Disease Hospital.

In 1937, during the Sino-Japanese War, it was reorganized as the No. 1 Refugee Hospital in the International Refugee Relief Association. In 1941 with the onset of the Pacific War, the association had to vacate, leaving the hospital out of support.

The hospital's capacity was 120 beds, but it was taking only 30 patients and was quite disorderly and filthy. It was renamed Chie-ming Hospital (meaning relieving people hospital) after it was taken over by the group of energetic young doctors. Three months later, the hospital was again on its feet, treating about 100 out-patients every day and having about 70 in-patients. During the bombing period of Shanghai in July 1945, the hospital treated about 2,000 minor and 400 major cases.

These doctors, while doing charity works, believed the best way to serve the people is to make them to help them-

Floor Plans of Chie-ming Hospital, Chapei, Shanghai.



selves. Their idea was concentrated on a rural district in which they hoped to build up an institution which not only takes care of the sick but also teaches the people how to have a good health and better ways of living. To make the people conscious about their part in the community and to make them to give their effort to gain a better community were their chief purposes.

The suburb Kiangwan was finally selected as the most desirable location for the realization of their dreams. It is one of the small towns just outside of the big city - Shanghai, yet there was no hospital nor any Western doctors near by.

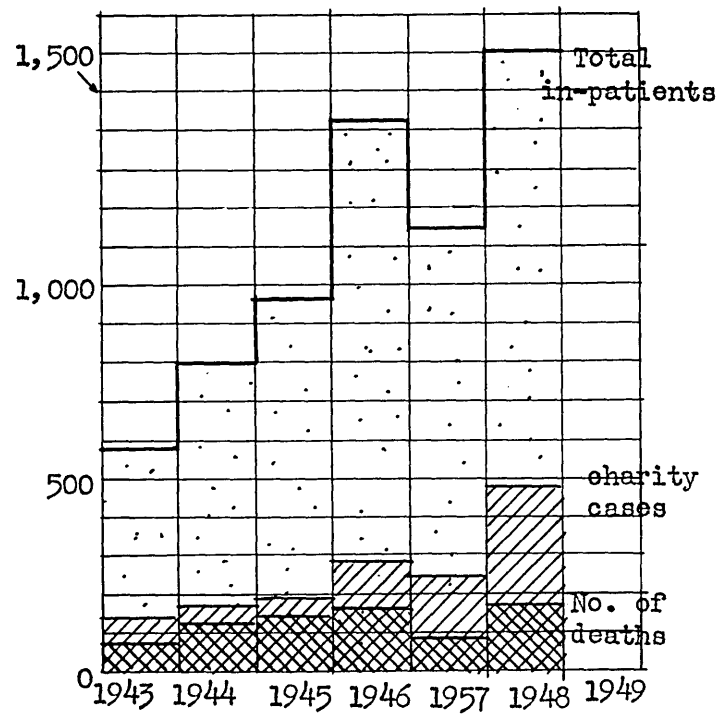
The population is about 40,000 with some 60,000 more in the vicinity. Most of them are farmers and some small shop owners.

Then the "True Light Society" was established by the senior staff of Chie-ming Hospital, and a fund was raised with the help of the Fitch Memorial Church Choir in giving concerts. Donations came from private institutions as well as from individuals.

Just a few months after the close of the war in 1946, land was purchased. Toward the middle of November in the same year, thru the recommendation of Dr. Outerbridge in the Canadian Red Cross, an ambulance was allocated to the project. This was followed by an allocation of quonset huts, cows and medical supplies from UNRRA, and series of helps and gifts from many sources, both local and foreign.

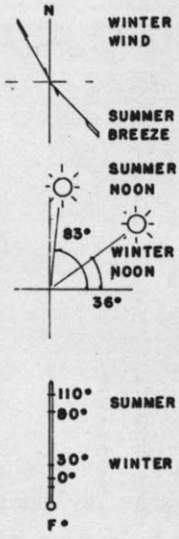
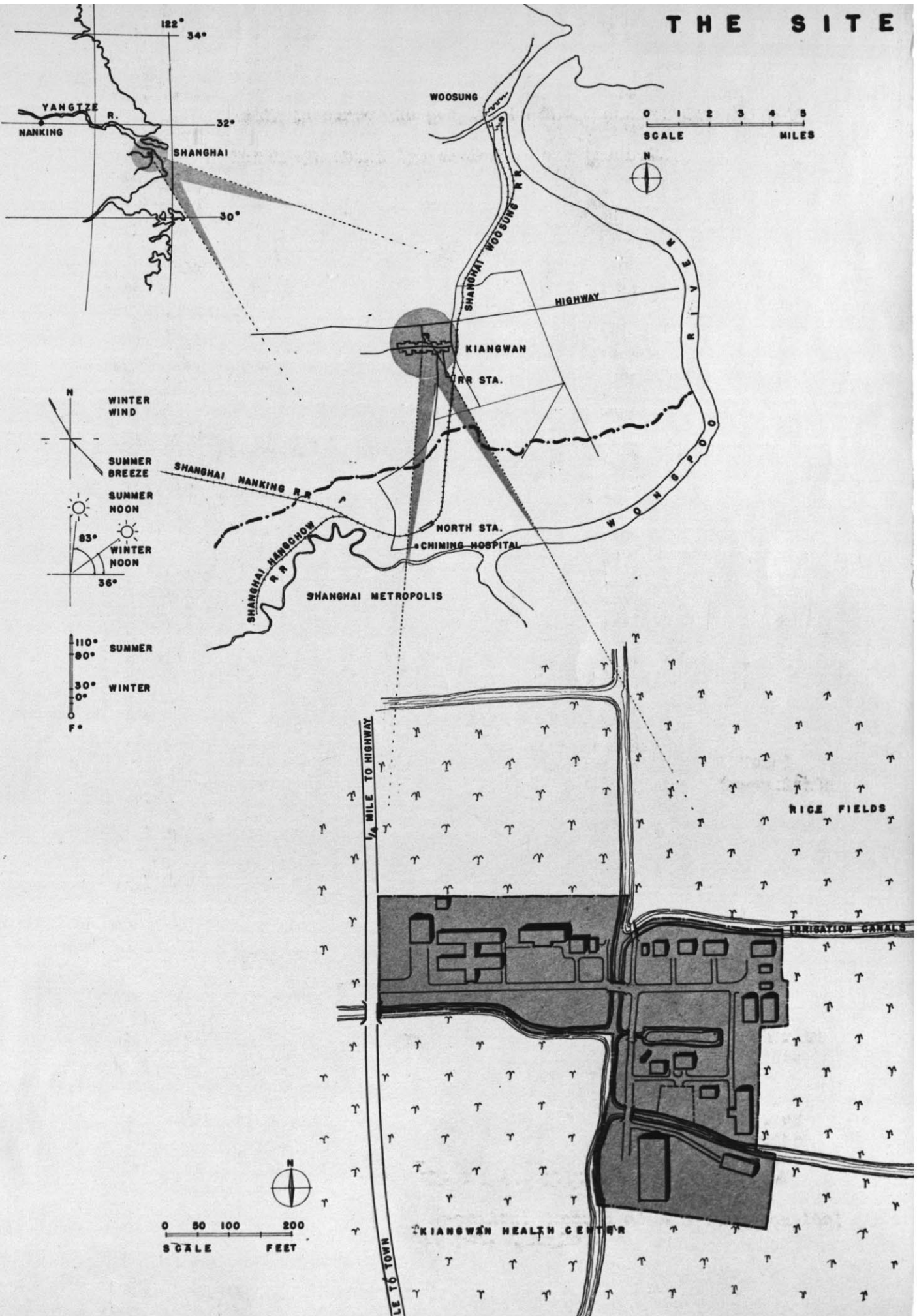
By the New Year Eave of 1946, the health center was all

ready to serve the people. On the opening day, January 1st 1947, about 150 patients were treated.



In-patient Records of Chie-ming Hospital
Chapei, Shanghai.

THE SITE



0 50 100 200
SCALE FEET

0 1 2 3 4 5
SCALE MILES

1/4 MILE TO HIGHWAY
1/2 MILE TO TOWN

KIANGWAN HEALTH CENTER

RICE FIELDS

IRRIGATION CANALS

SHANGHAI METROPOLIS

KIANGWAN

RR STA.

NORTH STA.

CHIMING HOSPITAL

YANGTZE R.
NANKING

SHANGHAI

WOOSUNG

SHANGHAI WOOSUNG R.R.

HIGHWAY

SHANGHAI NANKING R.R.

SHANGHAI HANGCHOW R.R.



THE SITE

Kiangwan is a small center of farming villages. The town takes a rectangular shape with the main street about 3,000 feet long running east-west thru the center. The Shanghai Woosung Rail Road runs in a north-south direction on the east end of the town. There is a station in the south east corner.

About 1/4 mile north of the middle of the main street is situated the present health center. It is accessible by an earth road. About another 1/4 mile north of the site, there is a main highway running also in the east-west direction. Some governmental organizations and a few small private industries are dotted along the highway.

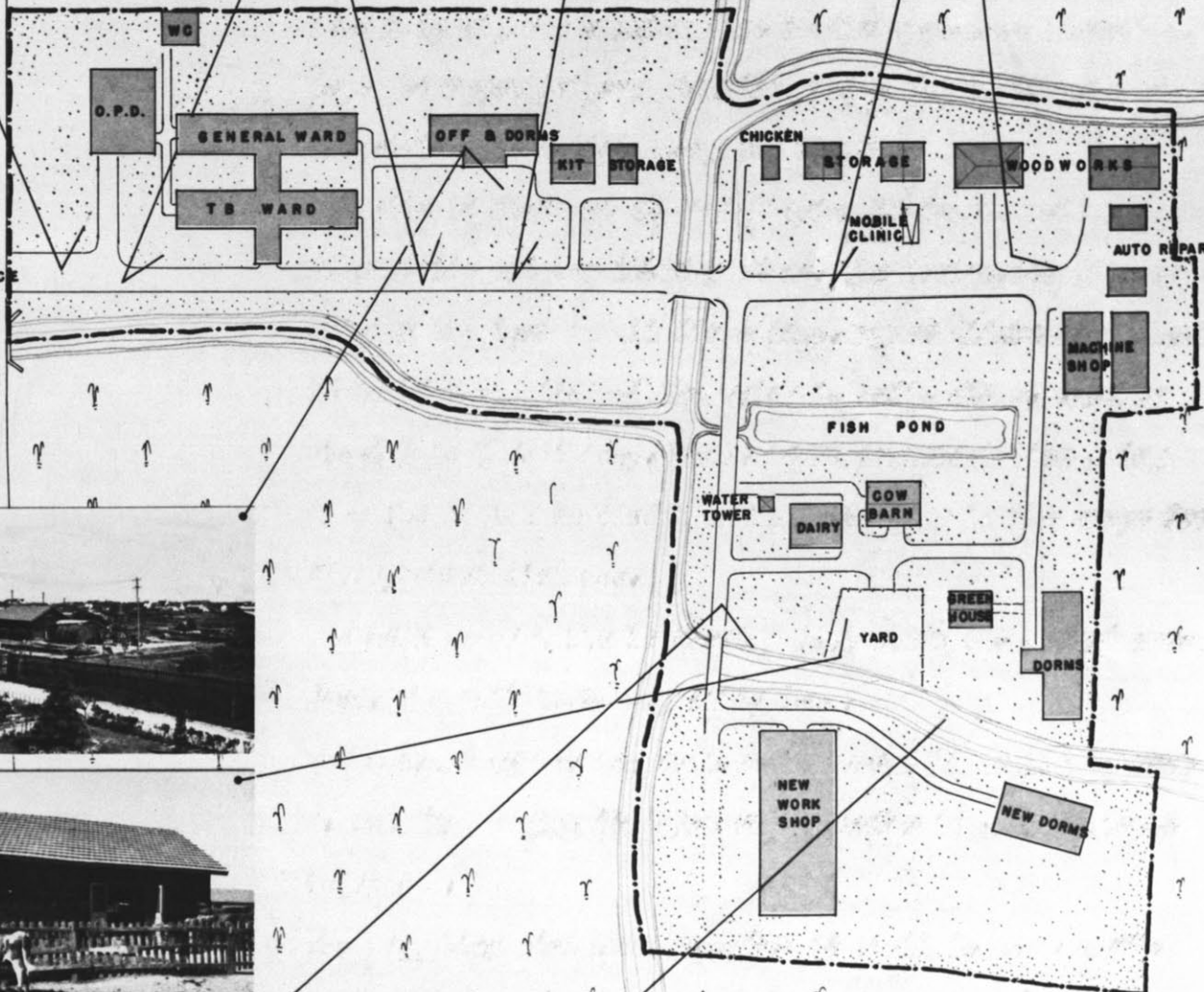
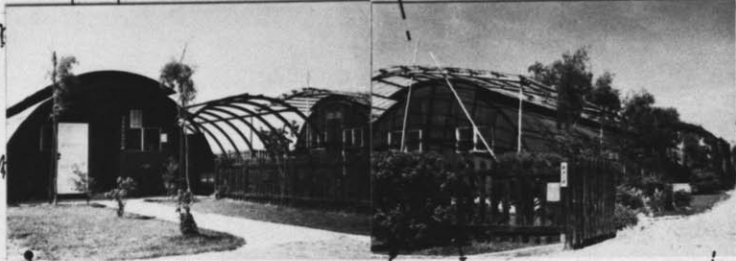
The site is flat and the neighboring lands are primarily rice fields and vegetable gardens. The irrigation ditches cutting the land in all directions. These ditches are about 20 to 30 feet wide and the water is quite clean, usually about 3 to 5 feet deep. There is no transportation going thru these ditches except small boats to ship the crops for a very short distance.

The mean water table is about 3 feet below the ground surface. The soil is mainly silty loam.

The average summer temperature is around 80 to 110 degrees F. and the average temperature in winter is about 0 to 40 degrees F.

The prevailing wind from November to April is west-north-west, and from May to October is south-east.

BUILDINGS



0 20 40 60 80 100
SCALE FEET

THE PROBLEM

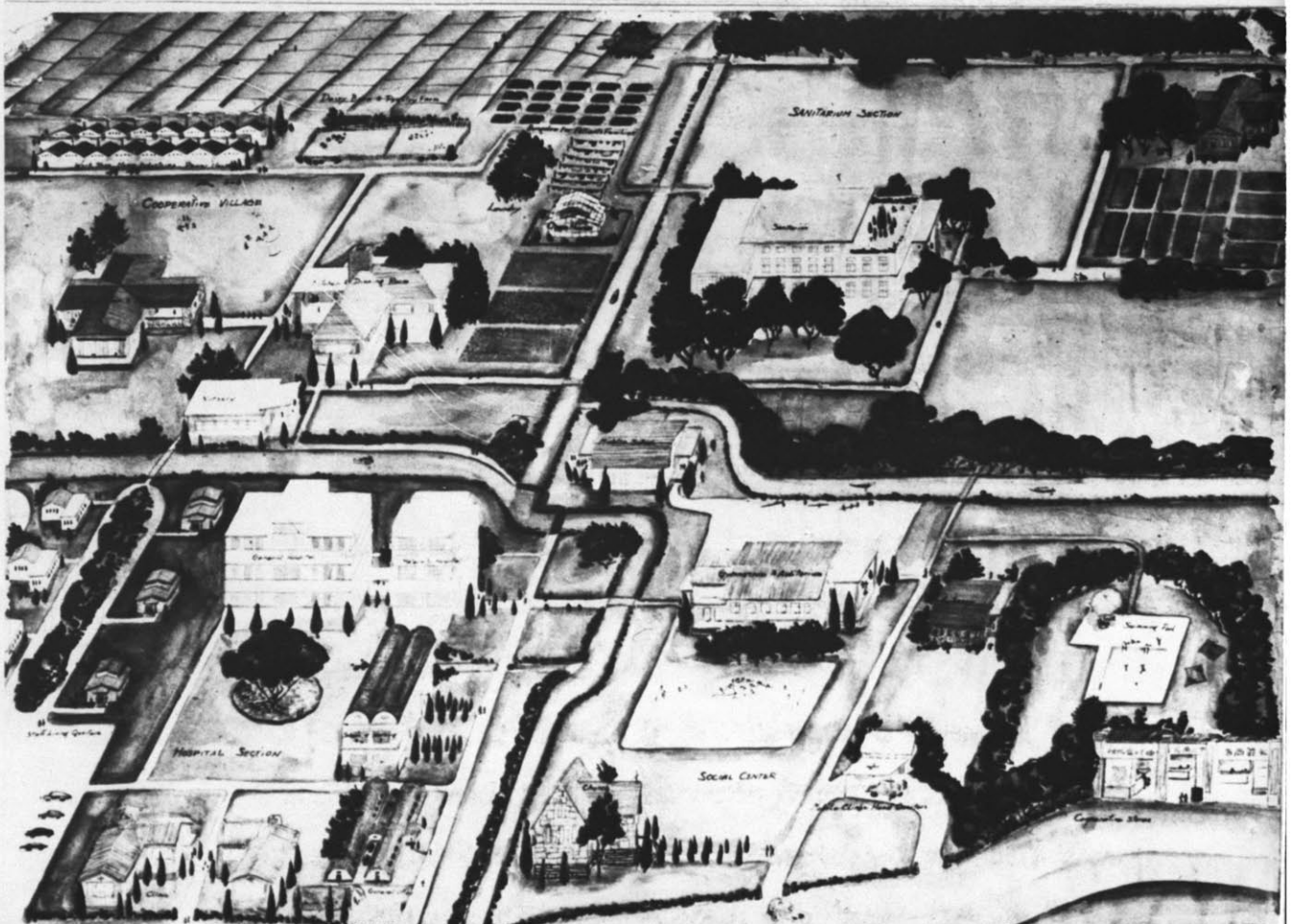
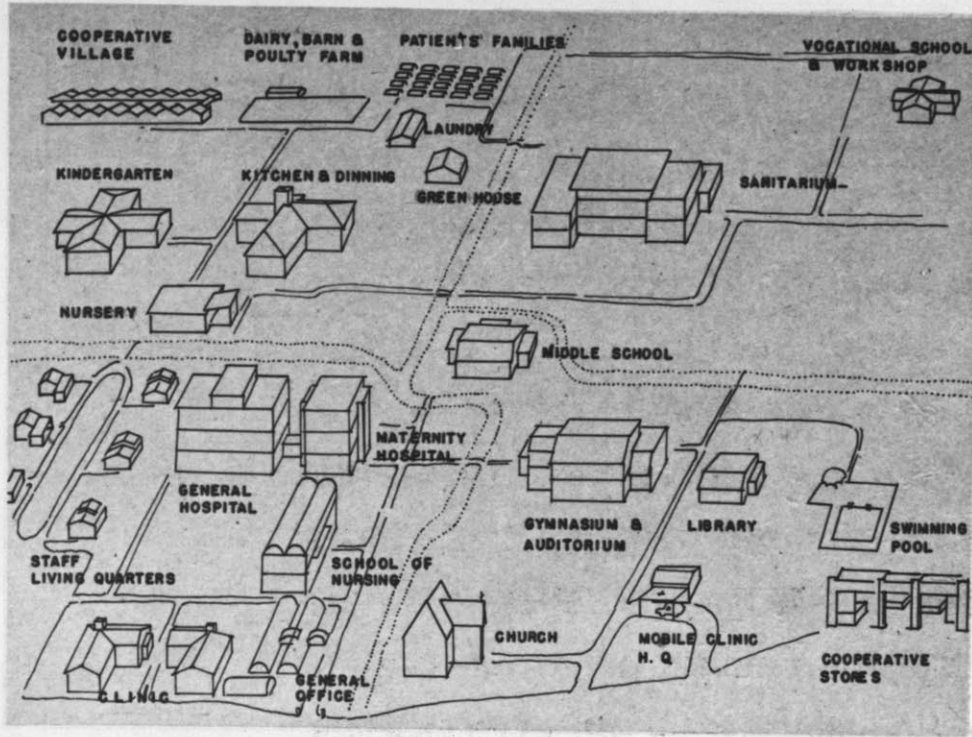
The present Health center consists of the following:

- * One out patient department giving treatment to about 40 patients a day. Some of the patient come from a distance as far as 3 miles. Most of them come from the village by walking; others come on rickshas and pedicabs(carts drawn by bicycles), and a few are carried to the clinic in cots.
- * One general ward of about 20 beds, which includes a few beds for more difficult maternity cases.
- * One tuberculosis convalescent ward takes about 20 in-patients.
- * One mobile clinic converted from the donated ambulance goes out into the village every day to give charity treatments to the very poor sick, and free prophylactic innovations to the general public. It does some house visitings and gives general health directions to the villagers. It also does the milk distribution work. About 300 pounds of milk supplied by CNRRA daily are given free to about 600 children under the age of 15. Those recipients receive regular simple health examinations and hygienic directions too.
- * The mother hospital - Chi-ming Hospital still plays an important part in the health center. All the important cases and contagious patients are transferred there to be treated because the equipments there are more complete.

Besides these medical activities, the health center takes a very active role in educating the patients and the patients' families in handcrafts and vocational trainings. These activities, being productive, help the economic side of the center a great deal. Moreover, as the group of doctors got

nearer to the people, they saw it very clearly that people are unhealthy because they are poor and they are poor because they are not healthy. They realized that in order to bring the people to real health, the economical side of the problem should be solved too. They believe, therefore, vocational training is as important as medical care. The health center can not rely upon relief funds and donations forever. If the people are not able to pay the fees, they may render themselves serviceable to the institution while at the same time they receive vocational trainings. For the convalescent patients, if they can not work for themselves, their families can work for them. Thus on its fundamental principle - to help people to help themselves - the health center keeps several productive shops and farms. These include:

- * A wood work department manufacturing hospital furniture for other hospitals.
- * An artificial limb department serving those who need help at much lower prices than those in the market. At present 3 boys from the patients' families are receiving training in the shop.
- * An auto repairing and machine shop rendering service to the various nearby organizations. There are 6 student workers at the present time. They are going to receive a 2-year course.
- * A chicken farm raising enough chicken and eggs for the hospital's own consumption and extra for the market too.
- * A cow barn and dairy. The health center allocated 7 cows from UNRRA. At the present time, they have already 11 cows



The dairy, with some 300 pounds of raw milk received daily from CNRRA, has enough supply for 600 village children besides the hospital's own consumption.

- * A hot house and a vegetable garden producing enough for present daily use and extra for the market.
- * A fish pond was dug to raise fish.

Miscellaneous:

- * Gas supply. The health center is very fortunate to find a source of natural gas which is now piped to the central kitchen, the wards and the workshops for cooking and heating.
- * Electricity. For lighting and power the Shanghai Power Co. supplies the center with a branch line.
- * Water. For water supply, the health center has a large quantity of wholesome supply from its own artesian well.
- * Drainage. The drainage problem is quite simple. Rain water goes to the canals very easily and the sewage is now collected by the neighboring farmers daily.
- * New structures. Under construction now are some more quonset structures (appearing in the photos), one for the out patient department, one bigger workshop and another dormitories for the workers.

Other existing buildings are shown in the site map and photos.

The Vision of the Owner

It has always been the idea of the True Light Society that the health center should be educational as well as medical.

It is the hope to have in future the following buildings:

- * A general hospital.
- * A maternity hospital.
- * A sanitorium for the tuberculosis patients.
- * A mobile clinic headquarter.
- * A nursing school to train the villagers' daughters to serve their own people.
- * A public health education and social work headquarter.
During the evenings, educational lectures, educational moving pictures and other instructive programs will be given freely to the public by the staff. Mother classes and baby care demonstrations should be carried out. Personal hygiene and public health will also be taught.
- * A cooperative village formed by the patients' families.
In the cooperative village, they will be given chances to see in living examples the difference between life just for one's self and life with and for others. They can also learn how to live more hygienicly.
- * A dairy farm, a poultry farm and^a green house.
- * A vocation school. In the training shops, the patients or their families produce while receiving more scientific vocational trainings.
- * A kindergarten and n^risery.
- * A small church for the community and the town.
Some optional buildings will be:
 - A primary school.
 - A middle school.
 - A gymnasium and auditorium.
 - A library.

A swimming pool.

Some cooperative stores.

A more general impression of the health center which the True Light Society is now visualizing can be obtained from the " Castle in the Air" view, rendered by the staff.

THE SOLUTION * The Master Plan.

It is assumed as shown also in the owner's rendering that the neighboring lands can be purchased. The present site occupies about 4.5 acres of land while the future health center, when fully developed, will cover about 30 acres. Because land is still cheap, it is more economical to acquire more land than to build higher structures, and as the price of land is bound to be higher later, it is advisable to purchase them at the earlier stage.

As the neighboring lands are still used as farming lands, all the irrigation canals will be kept. They can be filled in when they are no longer required.

Since the function of the health center is two-fold; to educate the people and to cure the sick, two main entrances are provided. The entrance to the medical part is near to the town, while the other entrance, also the service entrance, will be on the north.

All the departments that have more relation to the public are placed near to the entrances. The land use map shows that the general services, such as laundry and kitchen, are placed in the middle of the site. This gives conveniences to all departments. The medical department in the south has the best position with unobstructed view towards the south. The irrigation canals serve as natural means for isolations of the different hospitals.

The living quarters will be on the east side, which is more remote from the entrances. The area for working will be on the north of the central service area. It is nearer to the

public road and gives easy access for the workers who do not live in the campus.

All the departments surrounding the central service area have fair possibilities to expand outward. They are tied together by roads and green areas which include open lawns, trees, gardens and play grounds.

The traffic map shows that only one loop of motor road is provided. It gives access to the medical and service buildings where sometimes ambulances and small trucks may appear. In a case like this, where a private automobile is an absolute great luxury, the traffic and parking problem is much simplified. However, a small parking area is provided for hired pedicabs of the patients who come from a great distance. The road on the north of the workshop is wide enough for parking of a few cars.

The traffic is conducted by the gate keeper. He has a good view of the roads leading to the hospitals. The water tower helps visitors to orientate themselves.

Nearly all the buildings have south and south-east exposures to receive the sun's heat in the winter and the cool breeze in the summer. Photos of the model both in winter and in summer show every building has plenty of sunshine.

* Medical Buildings.

Building type . In a project like this, low construction cost is most desirable. Because vertical circulation needs more expensive mechanical means - the elevators, or needs more circulation area in ramps and stairs , single story buildings are used for all the medical buildings. They give every patient a chance to be out in the terraces without costing much more. Two-story buildings would require more fireproofing and heavier constructions.

The traditional wood frame, tile roof and brick wall construction is used. This kind of construction, being fairly fire resistant, using mostly local materials, is quite permanent yet not too expensive.

Fire walls. For fire stopping, every bigger building is divided into units, and each unit is separated from the neighboring one by solid brick walls with all wood members stopped at the wall.

Partition walls. The interior partitions ^{are} either metal lath or wood lath and plaster which are very light and could be altered easily. They can be painted for easy to keep clean.

Ceilings. Sugar cane fiber boards available in the market, which are sound absorbing and have a warm natural color are used for ceilings in the wards and all the public rooms. For the utility rooms and medical rooms, wood lath and plaster ceilings are used.

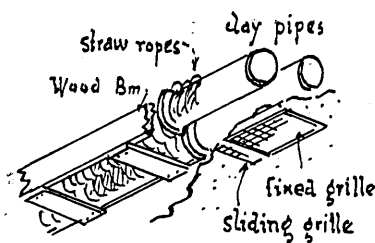
Insulation slabs. Underneath all the wood floors, lime and broken brick concrete slabs are used to keep the moisture and rats away. To keep the spaces between the wood floors and the insulation slabs ventilated, vent holes with covers are provided on the

exterior walls.

Heating.

For winter heating, natural gas is piped to small heating units in each building. The air space below the wooden floor is used to conduct the hot air. Thin brick walls supporting the floor joists are used to separate the air space into channels to direct the flow.

In those parts of the buildings that have solid floors, galvanized iron overhead air ducts are used. They can be exposed below the ceiling to keep the heat lost within the building. They can also be installed above the ceiling, as shown in the drawings. In such case, heavy straw mats are used as heat insulations for the ducts.



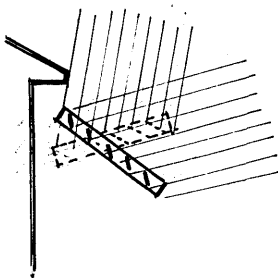
A substitution for galvanized iron ducts is vitrified clay pipes resting on wood beams.

Hot air flow is controlled by sliding grilles.

Terraces.

Nearly every ward has its own terrace for patients to get out into the open for sunshine and fresh air. The terraces are built of bricks laid sidwise on top of lime concrete foundation slabs. The color of the brick reduces glare from the sun;

Sun shades.

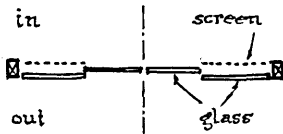


A kind of simple and unexpensive movable sun shade is developed to control the amount of sunshine getting through. It can also give a completely shaded area to the patients at any altitude of the sun. It is painted white outside, and green inside. The operating cord can be led inside of the building.

Windows and Doors

For warmth from the sun during the cold months of the year, as well as for cool breeze in the summer; for the psycho-

logical well-being of individuals; and for the germicidal power of sunlight a maximum amount of window and door is provided. The open side of the ward is always orientated to the most favorable south and south-east with half glazed sliding doors. The glass area is brought down to the height where patients can look out from their bed. Cheaper doors can be have by using thin glass and subdivided glass panels. Behind four glass sliding doors in each bay, there are two bronze wire screen sliding doors. Hardwares and screened area are kept to the minimum.



On the north side, there are as many as possible high windows in the service rooms. All the operable ones are built with wire screens.

Eave gutter and side ditches.

There are galvanized iron eave gutters with down pipes over the entrances only. All rain water will run down directly to the brick lined side ditches.

The wards.

In accordance with the nature of this health center, and the economic conditions of the inhabitants, only critical cases and annoying patients are isolated in separate rooms. The major group would be nursed in big wards.

The number of beds in one ward is under twenty. They are separated into group of four arranged in the Rigs system.

Cubicle screens. Each group of four beds is separated from the other by movable screens. These screens are made of colored oil cloth or bamboo or straw mats, which are detachable from the frames for sterilizing or dumping. The frames are wooden with bent metal tube or bent bamboo legs.

The head screens are furnishing one bed light, one dim

night light and a calling bell to each bed. The switches are within the reach of the patient. Four beds share one calling number which reduces wiring greatly without causing too much inconvenience.

The side screens are without these attachments. They can be easily moved to form cubicles.

These screens can be quite colorful to avoid the usual dull atmosphere existing in most hospitals. The different colored screens also help the patient to identify his bed.

The plans.

THE O.P.D., HEALTH CENTER AND GENERAL HOSPITAL BUILDING

The three departments are housed in one big building for the economy of technicians and ease of administration.

The out patient department is nearest to the public, the health center is a little farther, and the general nursing wards are isolated from the public. The wards are again separated from each other by green courts.

The O.P.D.

In the O.P.D., there is a long and wide corridor which is also the waiting space for out patients. The specialists, who are parttime doctors from the mother hospital have their offices in one end, and the general medical and surgical departments are on the other, nearer to the wards.

The registration office with its record room and cashier's desk is located in the middle. The pharmacy is also located near the entrance.

All patients have their registration in the registration counter; after they see the doctor, they get medicines in the pharmacy and pay fees at the cashier's counter. If they require charity, they go to the employment office where details are arranged.

Though there are very few emergency cases, but if such cases happen, the patient is arrived next to the surgical room.

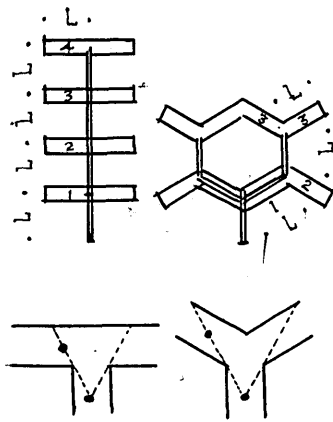
A contagious patient, when discovered, is transferred to the separated contagious ward directly without going through the main hospital. When the doctor thinks a patient needs to be hospitalized, he is then admitted to the hospital.

The health center. The health center is occupying the north-east wing of the building. Only two of the medical staff have their office there. The one is the head officer who also takes charge of public health, and the other is the head nurse who gives health and hygienic advice to individual. In the immunizing counter free injections are given to the public. The social officer takes care of patient employments, charity works and other social affairs. Baby care and mother classes can be conducted in the demonstration room. For bigger groups in public talks and health or educational moving picture shows the chapel is to be used.

All the departments in the O.P.D. and the X-Ray room and the general laboratory of the general hospital are also part of the health center.

The general hospital.

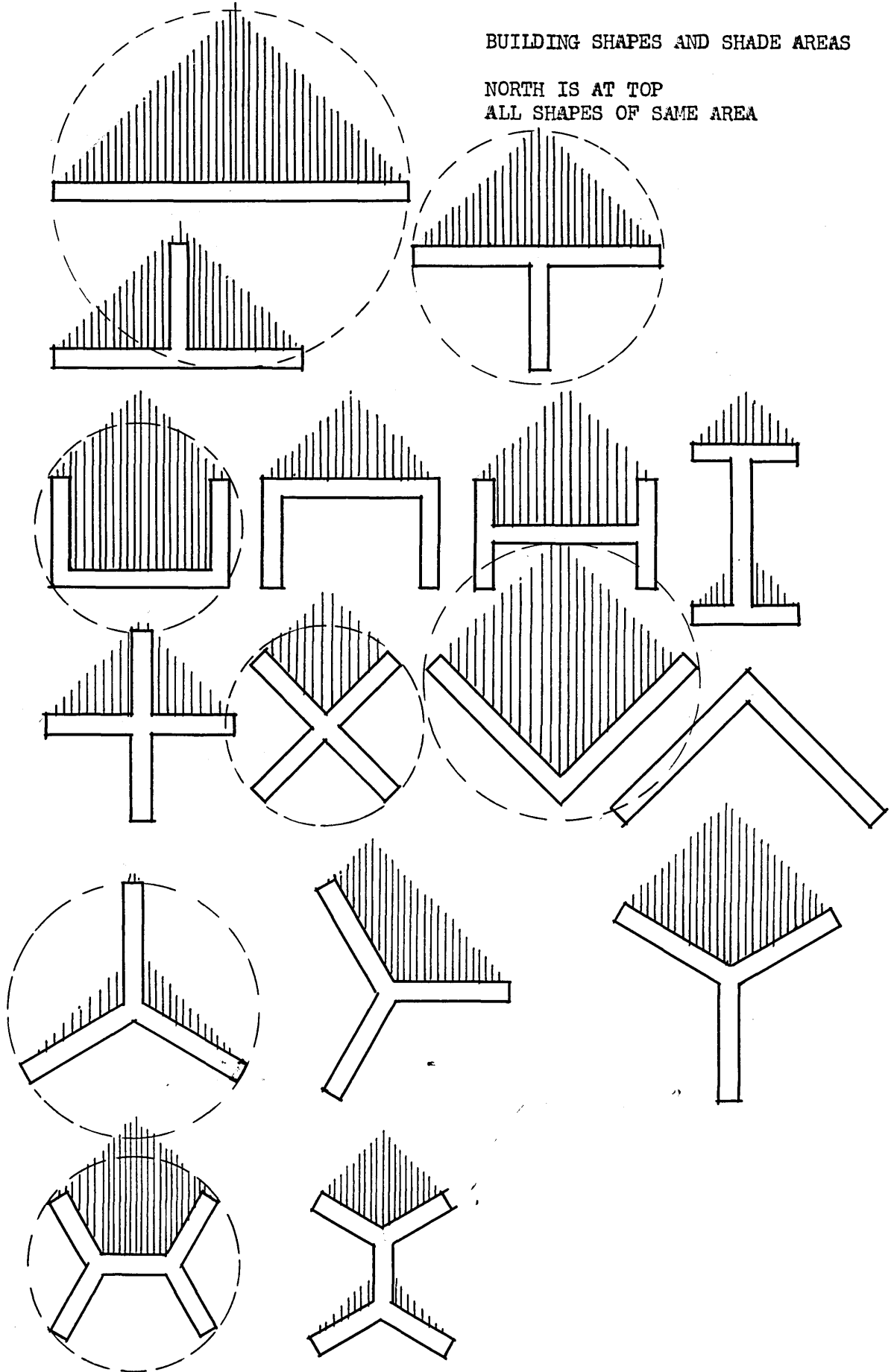
The nursing wards of the general hospital are arranged in a shape of an organism. This is developed from the point that a "Y" circulation system has a shorter and more direct road, than the usual single long corridor system. Assuming the Y's are in 60-degree angles, with the same number of wards, the "Y" system has 2 wards at 3L from the entrance while the other system has 2 wards at 4L from the entrance.

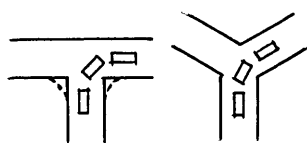


In the Y-corridors, one has a farther view which allows him-

BUILDING SHAPES AND SHADE AREAS

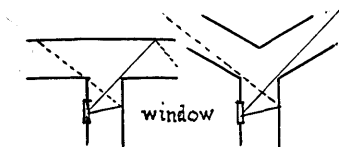
NORTH IS AT TOP
ALL SHAPES OF SAME AREA



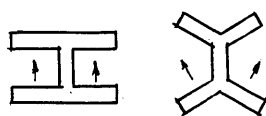


self a faster movement.

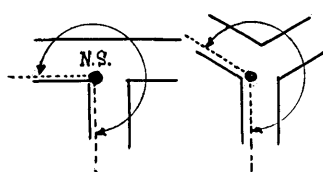
The major advantage seems in the easier movement of the stretchers and push carts. It also permits a narrower passage way without widening at the junctions for easy flow of traffic.



In lighting the corridors, the Y shape gives better reflections from the side walls at the junction.



The bending of the wings in a "Y" plan gives wide courts and farther views to the patients while at the same time the straight wearisome corridors are avoided.



If the nurse station is located at the junction of the corridors, the "Y" system gives an easier observation for the nurse from her station.

see diagram

It has been recognized that a "Y" plan has probably the least amount of shaded area compared with other shapes with the same orientation.

Size of hospital. According to the standards in the United States, 4.5 beds per thousand of population was suggested and 3.5 beds per thousand of population has been used for estimations. The average bed number actually existed in the United States is 2.5 beds per thousand. The minimum being in Alabama, is 1.0 bed per thousand.

Because hospitals are still not popular among the Chinese farmers, and as patients admitted to this hospital are the ones that are really required to stay in the hospital, a smaller number of beds per thousand of population is used. For people living far away from the hospital, 1.0 bed per thousand, and for those who live in the town, 0.5 bed per

thousand are used in calculating the total number of beds to be provided. The total number of beds is 80.

60,000 on the outskirts at 1.0/M . . 60 beds

40,000 in the town at 0.5/M 20 beds

Male and female
wards

Dr. Sutherland of the Henry Lester Institute of Medical Research in Shanghai, made a study of the hospital records in China for 1933 and 1934. He found out that in the Yangtze Region, there are only about 30 female patients for every 100 patients. This is due to the fact that the males have more contact in the society, and women are much more restricted in seeking western medical treatment. In south China, the female patient percentage is higher, but still below 43% of the total.

In this hospital, the number of female beds is about 35% of the total.

children ward.

Dr. Sutherland also found, that the percentage of patients under the age of 15 was about 12%. In this hospital, the number of beds for children under 15 is about 20% of the total.

Critical rooms.

The American hospital statistics show that about one critical bed is sufficient per 10 hospital beds. A total of seven critical beds are provided besides the contagious ward of 5 beds in this hospital.

The critical rooms are located in a less sunny side of the building. They are near to the nurse stations to receive more attendance.

Contagious ward.

The contagious ward has a separate entrance. The five isolated rooms there take care of the temporary stays and lighter cases.

- Seasonal patient number. The study made by Dr. Sutherland also shows that monthly distribution of patients is correlated with monthly temperature. The peak load, about 120% of the average, is between July and August. For a hospital of 85 beds, the peak is about 100 patients. The day rooms in the hospital can take care of these 15 overloads without much difficulty.
- Service rooms. All services such as toilets, bed pan closets, treatment and utility rooms and patients' lockers are on the north side of the wards.
- Food is served from the central kitchen thru two pantries located in the centers of the groups of wards. A separate pantry is provided for the contagious ward.
- Three separate heating rooms are provided to heat up the whole building.
- Nurse stations. Three nurse stations located in the junctions of the wards take care of the 80 beds. A separate nurse station is provided to take care of the contagious ward.
- Helpers. Two helpers room are also centrally located among the wards. They are near to the nurse stations and the utility rooms.
- Operation room. The operation suite occupying one of the core departments, is easily accessible from both the male and female wards.
- Visitors. Because visitors are admitted only for a short time in a day, and as the visiting hour will not conflict with the office hours of the out patient department, the same entrance will be used for out patients and visitors. During visiting hours, attendents will conduct the visitors.

THE MATERNITY HOSPITAL

- Location.** The maternity hospital is separated from the general hospital because the natures are different. Patients coming to this hospital are generally healthy ones. Equipments and specialists required for them are also different.
- It is located a little away from the main entrance, but is still within the sight of the gate keeper. As this hospital has much fewer patrons, the location is satisfactory.
- The plan.** The shape of this hospital is like a horizontal "Y". The north west wing is the delivery suite, easily accessible from the two other wings in which contain the maternity beds. The entrance is near to the junction where the nurse station is situated. From the nurse station, one may have the two wards in view while helping the doctor and taking charge of the visitors. The service entrance is in the north side of the longer wing.
- The wards and the service rooms are about the same as those in the general hospital, but the terrace is omitted.
- size.** Since the Chinese rural people are quite adverse to have their babies born away from home, only 19 beds are provided. This is equivalent to 0.2 bed per thousand of population. Nevertheless, space is reserved for expansion if it become popular in the future.

THE SANITORIUM

- Location.** The sanitorium is located in the most remote south corner of the whole site. The approach is from its north. It is isolated from the general hospital and the maternity hos-

pital by the existing canals.

The patient is apt to see the internal medical doctor in the O.P.D. the first time, and if he is found to have tuberculosis disease, he is sent here to receive treatments or be hospitalized. This is an independent department, has its own doctors, nurses and equipments.

The plan.

The shape of this building is like two "Y" letter joined together. The entrance is in the west end of the north-west wing. This wing contains the central treatment and examination rooms which is convenient for both the in-patients and the out patients. The wards have maximum amount of sun light, fresh air and good views.

The service entrance is located in the west side of the branch joining the two Y's. Service rooms and bed arrangements are similar to that in the general hospital. Two smaller semi-isolated wards are provided for patients of similar stage of illness.

Size.

The total number of beds provided is 50, which is equivalent to 0.5 bed per thousand of population. The State of New York had 0.83 beds per thousand in 1942. The present health center has only 20 beds.

Construction.

The standardized roof spans and construction system are used all over in this hospital.

MOBILE CLINIC HEADQUARTER

Location.

This unit is located along the public road running on the west side of the site. The garage opens directly to the public road.

Size.

It is expected in the future there will be two mobile clinic

units and one ambulance.

The plan.

Since their activities are mainly in the town and the vicinity farming villages, there are storage spaces for supplies and sterilize room for equipments in the headquarter only. The office is mainly spaces for the staff to keep records, to make conferences and for person in charge of ambulance calls. The gate keeper's office and bed room are attached to the south end of this building. They are sharing the same waiting room and utility rooms.

THE MORGUE

Location and plan.

It is an isolated quarter located north of the mobile clinic headquarter, surrounded by trees and high fencing walls. The small court opens directly to the public road. The morgue has two separated compartments neighboring to a funeral room. A rest room for the funeral's family is provided. Such arrangement is required by the Chinese customs.

Comparison of nursing service areas: (units in sq.ft.)

	War Emergency Hospital		General Hospital 85-bed	Sanitorium 50-bed	Maternity Hospital 19-bed	Average 154-bed	Chi-ming Hospital 116-bed
	50-bed	100-bed					
Total			16,600	9,400	4,730	30,730	12,480*
Per bed	250.4	228.5	195	188	250	200	108

War Emergency Hospitals Figures Are From Time Saver Standards.

* Only Two Nursing Floors Are Nursing Service Areas.

* Living Quarters.

THE STAFF'S HOUSES

- Locations. The staff's houses are located on the south-east corner of the plot. They are near to the hospitals for convenience . Two living units are near to the workers' houses. They are for the senior staff taking charge of the vocational trainings and the workshops.
- Number of units. The senior staff of the whole project consists about fourteen members. Some of them may be of one family, but fourteen living units are provided.
- The plan. Only one typical plan is worked out as an example. Each unit has a floor area of 1140 sq. ft. Two units join together to form a twin house. The entrances are placed in the north. They are also used as service entrances. Because the Chinese way of cooking produces more fume and smells, the kitchen is half way out of the main room, and a door is provided on the out side so that the main part of the building can be kept clean easily. The dining space is near to the kitchen also it is near to the covered entrance porch. This covered area can be used as children's play area, place for bicycle parking, place for housewife out door working, and place for shaking off the rain in a wet day. It is also the outdoor dining space. On the second floor, there are two bigger bed rooms and one small bed room. The bath room is on top of the kitchen. It is conveniently placed for both up and down stairs occupants .
- Construction. The structure is built of brick exterior walls on the first floor and wooden frame and walls on the above floor. Roofing

material is local made clay roofing tile, similar to that of the other buildings. On the second floor, all wall finishings and ceilings are ply wood.

WORKERS' HOUSES

- Location. The patients' cooperative village is also the workers' living quarter. It is situated on the north-eastern part of the site. There is plenty of space for expansion.
- Type of house. For economy of construction as well as for the demonstration of group life, the row house is most suitable.
- Number of units. From the pass records, it was found that about 40% of the tuberculosis in-patients require charity. A 50 bed sanatorium would have 20 patients whose families need to be taken care. However, for demonstration, a total number of 30 families is provided for.
- The plan. One row house contains 6 units, each has a plan similar to that of the staff's. The floor area is smaller, being only 750 sq. ft. On the second floor, there are only two small bed rooms.
- The distance between rows is about 100 ft. Privacy in the covered entrance porches is obtained by bamboo screens and plantings.
- Construction. On the first floor, the exterior walls and the walls separating the units are brick. The separating walls on the second floor are also brick, but the exterior are wood. The roof frames are salvaged Quonset ribs and the roofing material is the salvaged galvanized corrugated iron sheets. The ceiling under the roof is covered with fiber boards for heat insulation. Quonset arch ribs are spaced as de-

signed, at 4 ft. on centers, and are all exposed on the inside. The gable roof is built on them with new wood members and light iron bracings as shown. As the quonset hut is not adaptable to this kind of climate, such alternations seem necessary. Moreover, by so doing, the leaking problem is eliminated.

* Work and Service Buildings

THE LAUNDRY AND GAS HOUSE

Location. This building is centrally located in the site. It serves the whole health center. The workers here are the patients' families. The location is convenient for both the hospitals and the workers.

The plan. In the laundry department, all the subdivisions, such as receiving, shaking, sorting, extracting, washing, drying, sewing and pressing are arranged in a loop.

The transportation of laundry is on push carts. They enter and leave on the west entrance. The drying yard is on the east. Hot air drying is in a chamber next to the washing department. The keeper's room is in the middle.

Adjoining the laundry on the north is the gas house, where natural gas is collected from the well and distributed to the whole community. Gas pressure is maintained by an automatic pump and a pneumatic tank.

In case the gas source is exhausted, a central heating unit can be installed here.

Construction. Brick walls, wood frames and tile roof are used. No ceiling is provided.

WATER TANK

Location and Construction. Water supply is from the existing well. If the capacity is not enough, more wells should be driven. The water tank is built of reinforced concrete raised to a height of about 60 feet on reinforced brick piers. Its location may be directly above the existing well or more centrally located,

as shown.

THE DAIRY, THE COW BARN AND THE GREEN HOUSE

Location.

This group of building is on the north. Its position is convenient for the workers and for servicing. Space for expansion is unlimited. The person in charge of this department can also take charge of the vegetable garden and the poultry farm with ease.

The plans.

In the dairy, milk is coming in from one end, after being processed it is bottled near the shipping entrance. The cold storage room is neighboring the bottling department. Washing of bottle is to be done near the shipping entrance. On the other side of this entrance is the office.

The cow barn is on the north-east of the dairy. It has a central aisle for passageway and side aisles for feeding. Hay is stored on the upper floor, and served down through holes above the side aisles. Part of the barn is separated for the pigs. To the north and east of the barn, there are the pastures and pig yards.

The green house is in front of the dairy, with a tool room and a small heating room on the north.

The chicken farm is surrounded by chicken wire and is located in a bamboo grove which shades the strong sun but gives good ventilation.

Construction.

Brick walls, wood trusses and tiled roof with plaster ceiling are used for the dairy. The floor is terrazzo finished and 6 feet high of terrazzo dado is provided in the milk processing room.

The Lower part of the cow barn has brick exterior walls

and wooden interior columns raised about the floor on concrete bases. The floor and troughs are paved with non-absorbing tiles. The upper part of the barn is the hay storage room with salvaged corrugated iron roof support on modified quonset ribs. To ventilate the central part of the barn, wooden stacks with metal ventilator are used.

The glass house is also built of salvaged quonset ribs with additional wooden members. Side aisles are added to give a more economical plan. Below the floor are two lines of vitrified clay tile hot air duct.

WORKSHOP AND WARE HOUSE

Location. This group of building, having more relation with out side, is situated in the north-west corner, very near to the north entrance. The ground to the north of the canal is available for future expansion.

The plans. The workshop contains four divisions; The auto repairing division in the central north, the artificial limb division in the central south, the wood work division in the south-west and the machine shop in the south-east. They are separated by non-permanent partitions. The managers room is on the central north, a fairly good position for directing the work and receiving the client. Because most of the orders come from phone and by mail, office space is small. The lockers and wash room are in the north-east corner. North light is obtained by using saw tooth roofs.

To the east of the work shop, and separated by a motor road there locates the warehouse. Inflow and out flow of materials and finishes articles are controlled by the shipping office,

Adjoining the shipping office in the warehouse is the gate keeper's quarter;

Construction.

Both the warehouse and the workshop have brick walls and corrugated iron roofs reclaimed from the quonsets.

The workshop has wooden columns and wooden saw tooth roof trusses. Lateral bracings of the roof trusses are also trusses supporting the intermediate saw tooth trusses. Spacing of trusses is 12 feet in order to use smaller size of purlin,

The floor is lime concrete with tar felt dampproofing.

Hot air heating may be installed with galvanized iron air duct running in the trusses.

* Educational Buildings

THE NURSING SCHOOL AND CENTRAL KITCHEN

Location.

The nursing school is located north of the hospital group.

The plan.

This building consists of 3 units; the nurses' dormitories, the nurse training center, and the central kitchen.

In the south wing, there are the two story dormitories.

Each room is big enough for 2 occupants. The total number of occupants in this wing is 35 nurses. On the north side of the corridors, both up and down stairs, are the separate bath and toilet units. The stairs are located on both ends. All the bed rooms are given a south exposure and an open view in front.

The class rooms and laboratories are on the west limb of the building. It has a long open corridor along the west to shade away the hot afternoon sun in the summer. During the winter, this corridor may be covered up with glass sliding panels. Access is from the southern or northern junction. Out students may come in through the west corridor without passing the dormitories.

There are two laboratories, one biological and one chemical. The demonstration room has the same arrangement as the ward. Because the training is collaborated with the Chiming Hospital in the city, no complete set-up is required. However, two lecture rooms are provided. They can accommodate about 40 students. Neighboring the central kitchen, is the dietetic laboratory providing convenience for observation and supervision.

The main kitchen, supplying chiefly the food for the patients

and trainees of both the nursing school and the vocation school, may also supply food for the staff and the workers. It occupies the northern branch of the building.

Food is received through the service yard, it is being washed cut and prepared in the western part of the room, then it is cooked in the middle , and distributed in the eastern end.

South of the food distribution end, there is the nurses' and staff's dining room, and on the north, the workers' and vocational trainees' dining room. Both rooms have an south-east view and receive the summer breeze.

Construction.

Like the medical buildings, exterior walls are brick, interior partitions are wood lath and plaster, floors are wood and cement finished and roofs are tile. Three brick fire stopping walls cut the whole building into four units. Class rooms, dining rooms and dormitories have fiber board ceilings, while the kitchen has slopping metal lath and plaster ceiling for fire resistance and easy ventilation. Directly above the stove is a louvered monitor to insure good natural ventilation.

The second story of the nurses' dormitories has wooden outside walls with plywood finish inside.

The corridor between the nurse dining room and the dormitories is open on both side to receive the summer breeze. It has wood columns and trusses with tile roofing.

THE VOCATIONAL TRAINING CENTER AND THE TRAINEE'S DORMITORIES

Location.

The training center is located between the work shops and

the farms. It is in the center of the working area. The dormitories are in a single story building situated between the training center and the trainees' dining room. They have an eastern exposure, looking out across the canal is the flower garden and the green house.

The plans.

Since the training is mostly conducted in the working places, only one lecture room is provided. The reading room, next to the library may also be used as a class room in the day time. The library is also the director's office. The coop sells tea and a few small things. It takes orders for articles that can be purchased from the town or from Shanghai. Adjoining to this store is the tea and game room for trainees' and workers' recreations between working hours and in the evenings.

In the dormitory building, along the west side of the corridor are the common wash room, heating room and storage room. As most of the trainees are also members of the patients' families, living in the cooperative village or outside of the campus, a total number of 20 beds is provided. Nevertheless, the building is detached from the training center so that stairs may be added later for another story on top of it.

Constructions.

Both of these two buildings are built of brick walls, wood trusses and tile roofs. All interior partitions are wood lath and plaster. The main floors are wooden. Ceilings are fiber board.

THE CHURCH

Location

It is located next to the main entrance building, giving

easy access to the public for Sunday services or educational lectures and moving picture shows,

The plan.

The front of the chapel is on the south, with two entrances on both sides. It has no central but side aisles. The sanctuary is raised three steps higher than the nave. Light is coming in from the entrance end and from the sides and sky lights.

The social room is attached to the east of the north side. It is used for smaller social gatherings mostly for the public. The room for the pastor, who comes on Sunday from the city to give Church service is located in between the chapel and the social hall. No toilet is provided since the toilets in the main entrance building are very near.

Construction.

The 20 foot span quonset huts are being used in this building. For the chapel, the ribs are rested on wooden beams and raised 8'6" above the floor level on wood columns. On both sides of the quonset nave are the side aisles built of wood columns and beams to brace the quonset ribs. The floor is wood, the walls are brick and the roof is corrugated iron. Below the wood floor is the hot air heating space. Fiber boards are used for the ceiling.

The social hall is built of quonset ribs rested on top of a short brick wall. Windows are placed along the edge of the roof on the south, and in a little higher position on the north. The east end of the hall is glazed above the short wall.

THE NURSERY AND KINDERGARTEN

- Location.** Its location is among the living quarters, between the staff's houses and the workers' houses. It is facing to the south with a canal beyond the play area.
- The plan.** The building is divided into two big rooms, one for the nursery and the other for the kindergarten. The nursery is on the east, has a more quiet position. The nurse is so located, that she can take care of the babies and the visiting mothers without much travelling.
- The kindergarten is on the west, with the teacher's room in the middle. It can be subdivided into two by movable screens. Services rooms are located on the central north.
- Construction.** This building is also built with 20 foot span quonset hut materials. The ribs are raised about 4 feet above the floor level on brick walls. The attached portion of the building has a low pitch slanting roof. All roofing materials are corrugated irons came with the quonset huts. Fiber boards are used for all the ceilings.

Personals in the New Health Center

Department	Senior Staff	Junior Staff	Nurses	Helpers	Workers				
O.P.D.	Surgical	1	Cashier	1	day	4	day	2	
	medical	1	Register	1					
	Eye Etc	1*	Pharmacist	1					
	Venereal	1*			Spec	3*			
	Dentist	1*							
Health Center	Head Off	1			day	2			
	Head Nurse	1							
	Social	1							
General Hospital	Operating	1*	Admission	1	day	5	day	3	
		x-ray	1	night	4	night	2		
		Laboratory	1						
Sanitorium	Doctor	1	X-ray	1	day	2	day	2	
			Admission	1	night	2			
			Laboratory	1					
Maternity	Doctor	1			day	2	day	1	
					night	2	night	1	
Mobile HQ	Director	1	Junior	1	day	3	day	3	day
Entrance									3
Laundry				1					2
Gas and Water									7
Dairy and farms				1					2
Work shop and Training Cter		1		2					6+
Nursing School		1		2					20
Central Kitchen				1					10
Total		14		17		29		14	50+

* are part time personals

APPENDICES

- * Present state of medical education in China.
- * Present state of medical personal in China.
- * Some building material costs in Shanghai.
- * Hygiene among the Chinese
- * References
- * Acknowledgements

PRESENT STATUE OF MEDICAL EDUCATION IN CHINA *
 Compiled by the Chinese Ministry of Education Feb. 1948

Items	Descriptions	Medical School	Pharmacy School	Dental School	Nursing School	Midwifery School
No. of School	National	21	8	3	58	46
	Provincial	9	1		Reg'd 64	Reg'd 14
	Private	12	3	3	Non " 122	Non" 28
	Total	42	12	6	254	88
Total Enrollment	Male	8,404	460		Total No. reported 3,413 App. 7,112	
	Female	3,230	561			
	Total	11,634	1,021	323		7,756
Total Grads In 1947	Male	704	64		Average Yearly 50-60 Approx. 2,921	Approx. 1,000
	Female	309	81			
	Total	1,013	145			
Up to 1947			1,974			
Total Teaching Hospital Beds		7,834				
Total Teaching Staff		2,294	240			

* Tabulation is by the writer.

PRESENT STATUE OF MEDICAL PERSONAL IN CHINA
 Complied by the Chinese Ministry of Health. Oct. 1948

Number of hospitals: Government	9
Provincial and	
Municipal	206
Missionary	217
Private	654
Total	1,086

Registered Medical Personals

Doctors	21,422
Nurses	2,567
Pharmacists	1,053
Dentists.	438
Midwives.	3,775
Total	29,255

Number of Nursing Schools:

Government	12
Provincial.	26
Municipal	5
Reg'd Private	90
Total	133

SOME BUILDING MATERIAL COSTS IN SHANGHAI

Data Supplied By The Shing Ho General Contractors
Shanghai March 1949

Material	Cost in US \$	Per Unit
2"x4.5"x9" hand made brick	120.00	10,000 pc
2"x4.5"x9" machine made brick	250.00	10,000 pc
Clay roofing tile	600.00	10,000 pc
Lime	1.50	100 kg
Broken stone	10.00	100 ft ³
Sand	12.00	100 ft ³
Cement	3.00	100 kg
White cement	30.00	100 kg
Reinforcing steel bar	200.00	1 ton
Wire nail	10.00	85 lb
No 30 galvanized iron, plain	3.60	1 sheet
No 26 galvanized iron, plain	5.40	1 sheet
Door lock	2.00	1 set
wire screen	17.00	1 roll
Galvanized barbed wire	15.00	50 kg
2" hinge . . . . .	.50	1 doz
4" hinge	2.00	1 doz
4" shutter . . . . .	.30	1 doz
"Luon" wood . . . . .	.15	1 bm
American pine . . . . .	.14	1 bm
Local pine . . . . .	.04	1 bm
"Luon" 3'x6' plywood	1.00	1 sheet
4' wood lath . . . . .	.50	1 bundle
16 oz. glass . . . . .	.17	1 sq.ft.
24 oz. glass . . . . .	.30	1 sq.ft.
$\frac{1}{4}$ " glass in 60"x80"	1.50	1 sq.ft.
Painting, labor and material	1.30	100 sq.ft.
4" cement pipe . . . . .	.06	1 ft
9" cement pipe . . . . .	.13	1 ft.
Tar paper, Chinese made	1.70	216 ft.sq.
Tar paper, American made (No.2)	10.00	216 sq.ft.
Asphalt tar . . . . .	.10	1 lb.
Laborers:		
Mason, carpenter, and tinsmith . . . . .	.65	1 manday
Painter	1.00	1 manday
coolie . . . . .	.30	1 manday

"Hygiene Among the Chinese" by Arthur Stanley

China Medical Journal. April 1903

"With regard to food, close observation will reveal the fact that there is little or nothing that the Chinese eat that is not subjected to the temperature of boiling water or boiling oil."

"In their houses there is usually an abundance of ventilation, during the day time, when the doors and windows are thrown wide open, and in the case of shops, most of the front of the house is taken down as well. The chinese dwelling has plenty of natural ventilation. . . . At night the house is closed."

"With the Chinese, there is the perfect appreciation of the sun light in preference to artificial illumination. They rest, work and sleep in periods that precisely accord with the periodicity of nature."

"In the disposal of refuse, modern hygiene has least to teach and most to learn from China. The principle of returning ordure and garbage to the soil is the only true and economical one, where the earth is replenished, and the refuse purified by the most complete bacteriological processes."

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ACKNOWLEDGEMENTS

The writer likes to express his gratitudes to all the professors and instructors of the department who gave him many valuable criticisms and guides.

He also wishes to thank Mr. D. M. Streissguth for reading over the manuscript and making it readable.

To his brother, Dr. Y. T. Lee, who went thru all the difficulties in collecting the data and in taking the site photographs during the time of war, the writer is deeply grateful. Without his constant inspirations and encouragements, this paper would not be possible.