POST OCCUPANCY EVALUATION
CHINLE HOSPITAL

Division of Health Facilities Planning
ORM/OM/OASH

(88)

FORWARD

During the week of September 19, 1988, a team of PHS/IHS technical personnel performed an on site survey and evaluation of the Chinle Hospital in Chinle, Arizona. The ultimate purpose of this effort was to prepare a Post Occupancy Evaluation (POE) Report. The survey team was composed of the following personnel:

Joseph J. Corliss, Civil/Structural Engineer, DHFP/OASH/PHS

Daniel Hightower, Architectural Engineer, DHFP/OASH/PHS

William Duncan, Mechanical Engineer, DHFP/OASH/PHS

Howard Minter, Electrical Engineer, OES Dallas, Texas

IHS program and technical staff were unable to participate in the survey.

Priorities were shifted after the site visit and the need for a completed POE Report was delayed indefinitely. Subsequently, the POE for this hospital never became a priority item again and some of the team members retired. The importance of POE's has been reemphasized by IHS and a new policy has been developed to finalize the POE's to provide feedback for the IHS Facilities Planning Manual. With this goal in mind, DHFP has decided to take all the existing information from the survey and produce a belated POE Report rather than archive the files.

POST OCCUPANCY EVALUATION
CHINLE HOSPITAL

INTRODUCTION

The Chinle Hospital is a comprehensive curative and preventive health care facility. The hospital consists of a 60-bed inpatient unit, including 14 obstetrical beds and 46 general acute care beds, and full outpatient diagnostic treatment facilities.

The hospital is the primary treatment center for the Chinle Service Unit and supports health centers at Many Farms, Lukachukai, Pinon, Rough Rock, Rock Point, and Tsaile. Cases too complex for care at Chinle are referred to the Gallup Indian Medical Center in Gallup, New Mexico.

The Chinle Service Unit comprises a geographical area of 3,600 square miles, located mainly in the counties of Apache and Navajo, Arizona. The area itself is considered to be marginally productive for farming purposes and is used for grazing. There are semi-desert plateaus with some wooded mesas and mountain ranges on the west side. There are deep canyons, plains, and valleys flanked by heavily wooded and forested mountains on the east. The valley lies south and north. The elevation varies from 5,500 feet to approximately 9,000 feet in the mountain areas.

The climate is semi-arid with an average annual rainfall of 8.5 inches. The weather is normally sunny with a predominantly mild climate. Mean temperatures are 74 F degrees in the summer and 28 F degrees in the winter. Extremes range from 105 F to -20 F. Winds up to 60 mph and sandstorms are common during the spring and summer months.

HISTORY OF CHINLE SERVICE UNIT

The Federal Government constructed a 15 bed hospital at Chinle in 1932. Prior to that time patients either went to the Presbyterian Hospital at Ganado, the Hospital at Fort Defiance, or more preferably, to the local medicine man. During January 1948, the Chinle Indian Hospital was converted to a health center.

The Navajo Evangelical Lutheran Mission Church opened a six-bed, six-bassinet hospital at Rock Point in 1952. It was converted to an outpatient clinic in 1961.

Pinon Health Station, located 49 miles west of Chinle, was constructed in 1957. During 1978 additional space was added to the Pinon Clinic with a modular unit building.

The Chinle Health Center was replaced in 1959, and later updated in 1969 with surplus mobile homes. The original structure was designed for 40 patient visits a day. In the first year of operation, the average daily patient load was 67 per day.

The Many Farms Health Center, 17 miles north of Chinle, was opened in 1972 in response to the needs of the large school population in the community.

HISTORY OF NEW CHINLE HOSPITAL

The new Chinle Hospital was built utilizing a phased construction process that has been debated in the Federal sector of the construction industry. This particular project is an example of successful phased construction using a Construction Manager. But, this process did create budgeting problems.

The design contract was awarded February 26, 1979, and the Construction Manager (CM) contract was signed March 26, 1979. The schematic design was approved May 2, 1979, and a Ground Breaking Ceremony was held July, 1979

In September, 1979 a contract was signed with the CM for site work.

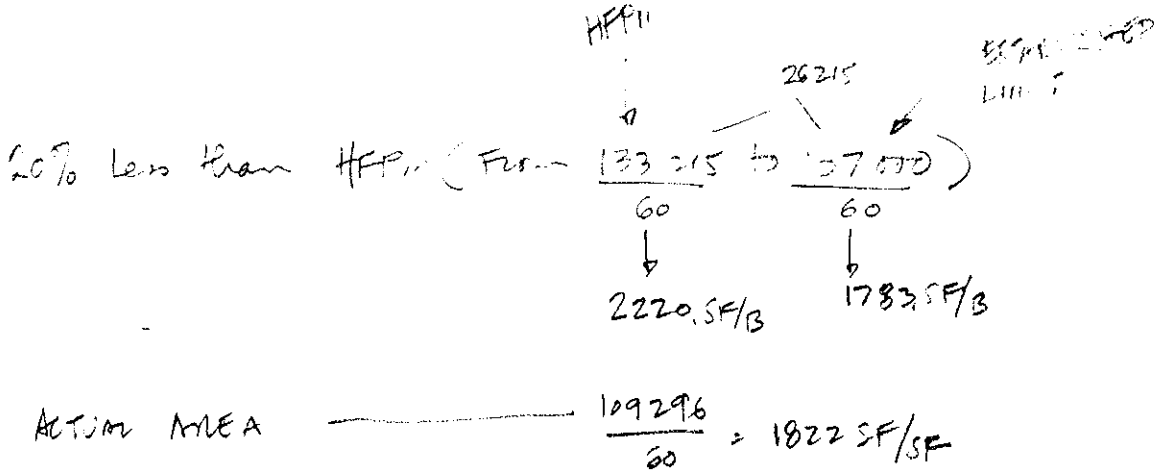
The new Chinle Hospital was completed in October, 1983 (See Photo A-1). Ambulatory care was available in June, 1982, and full Outpatient care in October, 1982. There was limited Inpatient care commencing November, 1982 and full Inpatient care October, 1983.

Congress appropriated design funds in FY 1978 ($650,000), first phased construction in FY 1979 ($3,000,000), second phased construction in FY 1980 ($9,000,000), and the final construction phase in FY 1981 ($13,108,000). The Department of Energy provided a grant of $350,000 for the solar heating system. In August, 1979, $1,750,000 was reprogrammed to allow immediate construction of 20 units of permanent housing to be used by construction workers and later by Chinle staff.

The original planning document requested a facility of 114,000 gross square feet (GSF) to house the 60-beds and expansion potential to 120-beds. However, Congress approved a hospital facility of 60 beds and limited the size of the facility to 107,000 GSF. IHS Health Facilities Planning Manual (HFPM) standards that were developed during the time of construction justify a total space allocation of 133,215 GSF. Calculations based upon the 1/16th inch equals one foot Floor Plan show the total to be 109,296. This is 2 percent over the established limit, but, 18 percent under the current allowable limit.

The PID projected the population for 1985 to be 21,444 (FY 85 actual-21,025), and now the population is 22,210. The current projection for 1995 is 27,506.

SERVICE AREA	POPULATION		EXISTING FACILITIES	
	1988	1995	IHS	NON-IHS
CHINLE	9,668	11,974	CHINLE HOSP.	
TSAILE	4,817	5,966	TSAILE HC	
			ROCK POINT HS	
PINON	7,725	9,566	PINON HS	
			DENNEBITO HS	
TOTAL	22,210	27,506		



BUILDING STRUCTURE AND ENVELOPE

The Chinle Hospital is a steel framed building, with stucco on board exterior walls, and a single-ply roof. A crawl space is created by having a steel joist floor system and pier foundation. This design for a crawl space should be considered for all future designs. The walkways allow easy access to all mechanical systems components.

The staff mentioned having problems with the stucco exterior, but, we could not verify this upon inspection. We did find the expansion joint material needed to be replaced, and this would be considered as normal maintenance.

SITE

Staff, patient, and visitor parking for the facility is adequate, and has good access. Parking for the Outpatient Department, facility staff, Emergency, Administration, and loading dock area are located within different quadrants of the building and do not conflict.

The curbing system is a good practice for the roadways and parking. This controls runoff and minimizes soil erosion.

Navajo custom conflicts with the use of lava rock (blood rock) for landscaping a health facility. This was not mentioned in a tribal review, but, nevertheless points up the need to try and meet local customs. There is no reason to build a building that people will not use.

This facility does have a helipad designed into the parking lot. We recommend that all remote locations have this, but, separate from the parking area. We also support considerations for utilization of local landing strips.

DEPARTMENTAL LAYOUTS-- GENERAL

The Chinle floor plan should be considered in an attempt to develop a standard for IHS. Variations would depend on patient population size.

Although the Chinle structure is an expansive single story floor plan, the occupants felt the design layout was optimum. No one expressed difficulty with travel distances. In fact, when questioned, several felt that having a multi-story design would impede travel. They did not feel it would be a detriment (due to maintenance and service) to have elevators, but, felt a single-story design was more useful.

Patient and staff flow patterns are generally very good. The floor plan is axial with a double corridor between Outpatient and Inpatient departments. The hub for the Outpatient Department is the Health Records section and Nurses Station, and for the Inpatient Department the Nurses Station. Additional consideration should be given to cross flow patterns between the Outpatient Emergency and Pathology / Radiology Departments. The pros for this arrangement would be ease in staff flow between Exam Rooms and Emergency, and the cons are potential problems for patients.

Occupants felt the separation of Inpatient and Outpatient functions was optimum.

A paging system was considered as essential by the PID, but, was not included in the design. The staff voiced the need for such a system, both, in the Outpatient and Inpatient Departments.

The public corridors have adequate lighting. Patients and visitors are made to feel comfortable with painted wall designs and wall hung art work. Good signage provides directions for staff/patient flow and safety/security control. The mirrors at hall intersections should be considered as a standard for all of our facilities.

PHARMACY

The Pharmacy Department provides 24-hour coverage. The department was designed as a Dispensing-Clinical Pharmacy utilizing the unit dose system.

The Pharmacy Department felt the arrangement for Inpatient and Outpatient Pharmacies was optimum. They did not perceive the distance between the two as a problem. Consideration should be given to enlarging the Inpatient Pharmacy, as justified by the Program Information Document (PID).

Since the Outpatient Department operates on an appointment basis, the Health Records section doesn't have to be the hub. It may be more appropriate to have the Pharmacy as the hub. This would eliminate exterior building walls for Pharmacy, reduce security problems, and enhance Medical staff and Pharmacy interaction.

Although the Pharmacy staff felt the Inpatient Pharmacy was large enough, we would recommend more space for future designs.

NURSING UNITS

Separate Nursing Stations were provided for in the Outpatient (Emergency, Pediatric, and Medical Surgical) Department. For the Inpatient Department the PID called for three (3) Nursing Stations. The final design provided four (4); in Obstetrical, Intensive Care, Pediatrics, and Medical Surgical. This was considered as the optimum solution for patient control / flow / service.

The Chinle staff recommended having a Central Medical Storage or separate storage for each Nursing unit. Each storage unit should have separation of medical and administration supplies. There should also be a storage close to the Operating Rooms.

The PID called for a Nurses Station and Nurse Office in the Surgical Suite, and was provided in the design, but, had to be eliminated for a Doctor's Office. The PID required two Physician (Surgery) Offices, but, located them in the Community Health / Administration wing.

A Nurses Station was not provided in the Renal Dialysis Unit, and should be considered for in future designs.

MEDICAL SURGICAL / PEDIATRIC (INPATIENT)

The Hospital Inpatient Suites were designed to have a separation between Pediatric and Medical Surgical. This allows for children's activities that would disturb adult patients. A section of beds were designed that allows flexibility in this separation, creating a "swing bed" effect.

The Healing Room, used by Medicine Men, is located in this section of the building. Future designs should consider some sort of separation with a covered walkway (open or enclosed) to the main building for the purpose of respecting Indian beliefs.

OBSTETRICS/DELIVERY SUITE

The Obstetrics Department was designed for full delivery services and 14 beds. Complicated deliveries are performed in the Surgical Suite. The time it took to prepare the patient was not as critical as the time it takes to get staff to the OR.

The medical staff felt that Delivery Rooms were not required. They suggested future designs consider having only Birthing Rooms.

Labor/Delivery/Recovery

CRITICAL CARE UNIT / INTENSIVE CARE UNIT (ICU)

This section was closed during our survey due to lack of specialized staff.

The PID showed a direct relationship between the Emergency Room and the ICU, but, was not achieved in the design. The staff did not see the need to have the ICU close to the Emergency Room.

SURGICAL SUITE

The Surgical Suite should provide offices for both Doctors and Nurses and have a Nurses Station. The medical staff recommended offices to have outside windows.

The medical staff felt that the dressing rooms for OR were too small, and the lockers were inadequate. They also felt that the Operating Rooms should be the same size so all patients would be given the same considerations.

The Surgical Suite should provide a Cystoscopy Room, Isolation is currently being used for this.

The layout as designed has problems with potential cross contamination. A neutral corridor to Surgery Recovery and the addition of a bathroom could solve this problem.

WAITING AREAS

Waiting Areas are provided in both Outpatient and Inpatient sections. A General Waiting Area is located at the front entrance and smaller Waiting Areas are located at Pharmacy, Pediatrics Outpatient, Medical/Surgical Outpatient, Emergency, Pathology, Radiology, Physical Therapy, Audiology / Dental / Optometry, Mental Health, Renal Dialysis, and Medical/Surgical Inpatient.

The medical staff felt that the waiting areas were adequate, except for Emergency. However, we did receive negative comments concerning the Medical/Surgical Outpatient Waiting Area. Noise from this area affects staff and patients in the Exam Rooms.

Staff also felt that arrangements should be made to provide privacy for patients standing at the Nurses Station. This could be accomplished by restricting the view between the Nurses Station and the Waiting Room. This would help eliminate the noise problem, but, could hinder the Nurses control of patient flow. A paging system would be useful for this design.

The Inpatient Medical/Surgical Waiting Room is used as the Family Counseling Room. Future designs should consider a separate room adjacent to the waiting room.

STORAGE FACILITIES

All programs complained of lack of adequate storage at Chinle. The PID recommended 6,000-8,000 net square feet (NSF) be included in the design, but, recognized that only 2,500 NSF could be provided due to space limitations. It is interesting to note that the current IHS HFPM would require 6,441 gross square feet (GSF) for a building of this size.

A study should be conducted of storage requirements for Hospitals and Health Centers with varying requirements (ie. rural, remote, central supply arrangements, individual program requirements, etc.).

EMERGENCY SUITE

The medical staff expressed a need for additional exam rooms in the Emergency (ER) suite. The ER should be able to meet the needs of 6-8 patients. Additional Exam Rooms would provide space for this requirement and privacy for some patients. The current IHS HFPM would allow for two additional Exam Rooms. Also, the Emergency Waiting Room does not provide adequate space for the number of Exam Rooms.

The Emergency Suite was programmed to be easily accessible to the Pharmacy and the ICU. But, the priority was staffing the Emergency Suite, and this required access from the Outpatient Medical Surgical Section. Therefore, the Emergency Suite is located adjacent to Medical/Surgical Outpatient, Pathology, Radiology, and Health Records. The staff did not feel that having the separation between Pharmacy was a problem, except for IV control.

Emergency entrance automatic doors operated very efficiently. The two sets created an adequate vestibule for people or wheelchairs, but, would cause both to be open for stretchers. Doors were situated to provide maximum protection from prevailing winds.

PATHOLOGY

The PID required specimen collection in the Lab. The PID also required the Lab to be located next to Radiology, and this is how it was designed.

The staff felt their space was adequate, but, would like improvements of the HVAC system as mentioned in another section of this report.

The medical staff felt there should have been and EKG Room provided in the design. This was required in the PID as part of the Pathology Department, but, eliminated from the design.

MORGUE

The Morgue is arranged to allow performance of autopsies by a contract pathologist. Storage of cadavers is in a refrigerated unit. The Morgue is housed in a separate building due to Indian religious beliefs.

RADIOLOGY

The Radiology Department provides both diagnostic and fluoroscopic radiology. The staff felt that the Radiology Department was adequate in size and layout.

COMMUNITY HEALTH

The overall area for this department was decreased, but, the Mental Health/Social Services section was increased. The suite for Mental Health/Social Services was changed to two separate areas. The PID space criteria did not reflect staff requirements, and therefore an adjustment was made during design.

The Mental Health staff felt this area was very good, but, stated the need for sound control. This was required in the PID, but, was not included in the design.

The Sanitation section was included in the PID, but, was eliminated from the design.

The Community Health Department could be housed in an entirely separate building adjacent to the health facility.

DENTAL/OPTOMETRY/AUDIOLOGY

The PID recommended that all three programs be located in one suite, and sharing the same waiting area. The design provides this adequately.

The Dental section has eight operatories (two for Oral Surgery), a Panorex Room, Dark Room, Lab, Doctor's Office, and Reception/Clerical area.

The Optometry section has two Exam Rooms, Dispensing area, and a Reception area.

The Audiology section has two Exam Rooms and a Reception area.

The only recommendation the staff had was to have the Dental Office/Receptionist space separated as shown in the PID.

Consideration should be given to the use of nitrous oxide in the Oral Surgery Operatories. This could be accomplished with proper exhausting systems.

PHYSICAL THERAPY

The Physical Therapy section provides services to both the Inpatient and Outpatient Departments. The medical staff felt this area was not large enough, and this is verified by the IHS HFPM requirements. A Physical Therapy Program requires an unusually large area due to the bulk of equipment and the need for staff to have maneuvering room to assist patients.

Consideration should be given for proper floor drainage of the Tub Room, and a non-slippery floor finish.

ADMINISTRATION DEPARTMENT

The PID required space for the Service Unit Director, Hospital Administration Officer, Clinical Director, Nurse Supervisor (Director of Nursing), Assistant Director of Nursing, Communication/Security Office, Office/Conference Room, Open Office space, Mail Room, and Clerical space. All space was provided except for the Director of Nursing Office. This, coupled with the loss of a Nursing Office in the Surgical Suite, has left Nursing with a critical shortage of office space.

MEDICAL RECORDS

The Medical Records section was reduced in size to accommodate the requirement for a Computer Room. This has created an expansion shortage, which will be required in the near future.

The PID required a design of 4,320 GSF, whereas, the HFPM would allow 6,480 GSF. We consider the IHS HFPM figure high, but, also feel the current arrangement is inadequate.

DIETARY

The PID required 3,260 NSF for full Cafeteria and Inpatient services. This was a reduction from the initial plan due to recommendations of the IHS Headquarters Dietary Consultant. This

section was designed for 34 persons to be seated in the Cafeteria and to serve 44 Inpatients 3 meals a day.

Due to the remote location and the number of Inpatients the Dietary facilities are heavily used. 3 meals are served as well as snacks and special meals.

The staff felt the Dining Room was an adequate size, and appreciated special features in the Kitchen like the self cleaning vents over the grill area and the washable ceiling. They did feel that the areas for food preparation, washing/cleaning, and storage should be larger. The current HFPM would allow 3,650 NSF, which would provide this space.

Consideration should be given for:

- o More counter space for food preparation.
- o Larger area for dish washing and cleaning cans. This area should be redesigned to improve the problem of clean and dirty dishes passing each other.
- o More freezer space. There should be refrigeration units provided at the Cafeteria serving counter for cold foods.
- o A moveable partition to separate the Dining Room from the Kitchen. This would allow the Dining Room to be used as a Conference Room.

MEDICAL SURGICAL/PEDIATRIC (OUTPATIENT)

With a facility of this size, consideration should be given to a larger Outpatient Department with an increase in exam rooms and professional offices (See photo A-2 for a typical exam room).

Further study is needed for the current IHS HFPM standards. The HFPM would require 10,789 GSF and the department was designed with 12,105 GSF. All staff voiced the need for a larger department.

RENAL DIALYSIS

The Renal Dialysis program is provided by a contract. The staff felt the area was too small. During our survey the facility was heavily used. But, according to the current IHS HFPM the space was over designed. We recommend further study for more accurate space standards. We would also recommend better arrangements for office space, reception, and waiting area.

STERILE SUPPLY

The staff felt this area was adequate in space and design.

HOUSEKEEPING

The staff felt this area was adequate in space and design.

MAINTENANCE

The maintenance staff felt their area was too small. They stated a need for more storage space.

The medical staff stated Bio-Medical Maintenance Shop was too small. The staff felt the service was excellent, but, could be more efficient if the shop had more counter space and storage area for parts.

MECHANICAL

The PID did not stipulate space requirements, the design provided 4,278 GSF (not including the crawl space), and the IHS HFPM standard would provide 9,868 (8%). We have agreed with IHS that the new standard is to be 10-12%, with any overage to be deleted from the design.

m - more than HFPM
L - less than HFPM

CHINLE
SPACE SUMMARY
SQUARE FOOTAGE:

PROGRAM AREA	PLANNED (NSF x 1.6=GSF) NSF	PLANNED (NSF x 1.6=GSF) GSF	DESIGNED GSF		CURRENT REQ. OF IHS-HFPM GSF
NURSING UNITS					
MED. SURG.	5,279	8,446	9,918	m	8,192
PEDIATRIC	4,300	6,880	6,510	m	5,730
OBSTETRICAL	3,570	5,712	5,110	m	4,755
NURSERY	620	992	840	L	1,566
CRITICAL CARE UNIT	1,312	2,100	1,888	L	2,803
DELIVERY SUITE	2,180	3,488	5,107	L	5,180
SURGERY SUITE	2,815	4,504	4,244	L	5,943
PATHOLOGY	1,970	3,152	2,691	L	4,368
MORGUE	450	720	440	L	998
RADIOLOGY	2,660	4,256	3,260	L	6,500
EMERGENCY	1,320	2,112	2,118	L	2,786
OUTPATIENT DEPT.	6,480	10,368	(12,105)	M	10,789
MCH			4,192		
PEDS			2,499		
MED/SURG			3,710		
AUDIO/OPT			1,704		
RENAL DIALYSIS	1,040	1,664	2,310	m	690
FIELD HEALTH	3,100	4,960	(4,359)	m	
COM HEALTH			2,710	L	3,491
MENTAL HLTH			729	m	432
SOCIAL SERVICES			920	L	1,354
SANITATION			0	?	1,037
DENTAL	1,560	2,496	2,248	L	2,574
PHARMACY					
OP	1,725	2,760	2,832	OK	2,820
IP	350	560	360	L	1,080
PHYSICAL THERAPY	1,120	1,792	1,440	L	2,028
RESPIRATORY THERAPY			558	L	734
ADMIN.	2,059	3,295	3,162	L	3,660
HEALTH RECORDS	2,700	4,320	2,441	L	6,480
EMPLOYEE LOCKERS	1,775	2,840	1,323	L	2,996
MICS.	1,640	2,624	1,610	L	2,526
PUBLIC AREA	4,680	7,488	4,416	36% m	11,220
PUBLIC CORRIDOR			9,260		
STERILE SUPPLY	1,570	2,512	2,538	m	1,573
CENTRAL STORES	2,500	4,000	3,009	L	6,441
DIETARY	3,260	5,216	3,630	L	5,256
HOUSEKEEPING/LIN.	910	1,455	1,261	L	2,719
MAINTENANCE	3,930	6,288	3,740	L	4,388
MECHANICAL			4,278	L	9,868
BUILDING SERVICES			450	m	238
CRAWL SPACE			140		—
TOTAL	66,875	107,000	109,296		133,215

MECHANICAL

1. GENERAL

a. The boiler room houses most of the mechanical equipment. The chillers, solar panels, and the incinerator are installed exterior to the building. The exhaust fans and the relief fans are on the roof and the air handling units are in the walk-crawl space along with other mechanical and electrical equipment.

b. The staff were very helpful in the post occupancy examination. The management and staff show pride in the facility by the cleanliness of the mechanical equipment and areas.

2. BASIC SCHEME

a. This facility is single story, noncombustible construction and fully sprinklered above and below the ceiling on the main floor with portions of the walk-crawl (WC) space sprinklered. The construction is an elevated main floor on concrete piers with a structural steel frame. The WC space under this floor has excavated walkways, of concrete, for access to electrical and mechanical equipment and systems installed there. See photos M-1 & M-2 for WC space walkways and equipment installation. There are no penthouses on the roof and all equipment installed there is exposed to the elements.

b. The hot water-heating boilers, steam boilers, storage type-domestic water heaters, pumps, air compressors, and vacuum pumps are installed in the boiler room which is a slab on grade construction.

1) The heating boilers, hot water type, are located in the boiler room. The boilers are dual fueled, natural gas and oil, and are 4 pass scotch marine fire tube type. Each boiler is sized to handle 50 percent of the heating load. (See photo M-3). Each boiler is fueled through a separate duplex pump set.

2) The water softening system and the domestic water heating system are located on the north wall of the boiler room. (See photo M-4).

3) The high pressure steam supply boilers for the sterilizers and the kitchen equipment are located in the southeast corner of the boiler room.

4) Other equipment installed in the boiler room includes the medical; air compressors, tanks, refrigerated air coolers, and the vacuum pumps with tank. The control air compressor is installed on the west wall and has a duplex compressor with tank.

c. The incinerator, packaged water chillers, and solar panels, are installed on foundations exterior to the building. See photos M-5 for the incinerator, bottle gas storage, and the solar panels. Photo M-6 shows the maintenance yard with engine generator and water chillers.

1) Three air cooled compressor-condenser chillers are installed outside, south of the boiler room. Each of these units is sized to handle 35 percent of the total building load.

d. The air handling units are all installed in the WC space mentioned in paragraph "a" above, along with the air handling units are other pieces of equipment such as dental vacuum pumps and air compressors.

1) The WC space houses all of the air handling units (AHU) and other equipment such as the dental air compressors, vacuum units, solar system: storage tanks, pumps, and heat exchanger. Photo M-7 shows AHU 3 and the drip water lines, attached to the pier, that keep the drainage traps full to stop any sewer gas from escaping into the WC space. Photo M-1 gives a general views of the accessibility and construction of the systems and berms within the WC space.

2) There are 16 air handling units, 13 variable volume units and 3 constant volume units (7, 9, & 10). All of the AHUs run 24 hours a day except 1, 6, 12, & 14, which are controlled by time clocks. All of the AHUs are of the horizontal draw-thru type and installed on concrete pads in the crawl space. The constant volume units serve the delivery rooms (AHU 7), labor/nursery (AHU9), and the operating rooms (AHU10).

e. The roof area contains no penthouses since all of the AHUs are in the WC space. Access to the roof is by a vertical caged ladder on the exterior North wall.

1) Mechanical equipment, which is roof mounted, is very difficult to maintain, in northern and/or high elevation areas, where extremely low temperatures may be encountered. Under severe weather temperatures, when a breakdown occurs, a person must work heavily bundled up with gloves on or his hands will freeze to the metal. It is suggested that all mechanical equipment be installed in penthouses where adequate working conditions can be maintained for proper maintenance. Even exhaust fans should be installed in penthouses and exhausted externally.

2) The roof is covered by roll roofing material with other material laid on it for maintenance walkways. Photo M-8 gives a general idea of the roof walkways and equipment. The light area in the photo is the heat tape areas around a roof drain as shown in photo M-9. Freezing of precipitation on the roof next to drains is a serious problem in this climate.

f. The solar system plans are dated 6/7/82 and this system was installed after the hospital was almost complete. The system includes the 9600 sq. ft. flat plate collector field, four pumps, heat exchanger, expansion tanks, and the receiver tank. See photo M-5. Only the flat plate collectors are exterior to the building and the rest of the equipment is in the WC space.

3. DESIGN OBSERVATIONS

a. High temperatures in the laboratories and pharmacies: There are periods during the year when the sensible heat within these areas becomes extremely uncomfortable for human occupancy, and too hot for material storage. This condition has been observed in more than one hospital.

This problem has developed because of two conditions:

1) The increasing number of electrical devices being used, along with the high lighting intensity, have increased the size of the sensible air conditioning room load.

2) The chillers are turned off early in the fall, one month before the heating season, causing these areas to be overheated. Vice versa in the spring, when the cooling is needed before the heating season is over.

b. Access to the roof is by a vertical caged ladder on the rear exterior wall of the boiler room. The roof access is very poor from a maintenance point of view since all tool boxes and other equipment and materials have to be hauled up by rope or cable and boom. The roof access is not very conducive to good maintenance.

c. The roof mounted equipment is mostly fans as can be seen in photo M-8. In colder climates, all roof mounted equipment should be enclosed to facilitate maintenance and repair. There are 32 exhaust fans and 19 relief vents installed on the roof, all requiring maintenance.

d. The areas provided in the boiler room and in the WC space appear adequate for the mechanical equipment since the packaged air cooled chillers are installed exterior to the building. The boiler room and the switchgear room are 2-1/2 percent of the buildings gross (measured) area of 107,212 square feet or 2652 sq. ft. The area of only the concrete pads and the sidewalks in the WC space is approximately 7800 sq. ft., bringing the total mechanical electrical space up to 9.7 percent.

e. Coil pulling space - All drawings of air handling units, especially shop drawings, should show clear coil pulling space adjacent to the unit. If this space is not dedicated then there is an inordinate amount of time required to dismantle the unit to replace the coil, not to mention the loss of conditioned air to the space the unit serves.

f. Ventilation of rest rooms - A quick check revealed that the air changes in the toilets and rest rooms were at least 10 and negative to the hallway, as required by the plumbing code.

g. Incinerator - The incinerator is installed behind the building in an inclosure as shown in photo M-5. There is a need for a storage unit to house the excessive waste flow and left over material at days end.

h. The construction of the overhead roof system is composed of three layers. The top layer is the roll roofing and its support anchored to the open web roof trusses. The middle layer is gypsum board fastened to the bottom of the trusses. The lower layer consists of the hung ceiling with the lay in ceiling tiles. There are some areas in the lower layer where the ceiling is plastered or covered with gypsum board. The air supply, exhaust, and return air ducts are all installed between the bottom of the truss and the ceiling. The return air is designed to pass thru diffusers installed in the ceiling, travel in the space between the covered truss and the hung ceiling to the return air duct stubbed out at the top of the vertical chase. The problem is that there is no control damper on the ceiling return diffusers and if there were the ceiling tiles would just be lifted by the difference in pressure and air will short circuit back through the easiest path. This flow in the return air system makes proper air distribution thru out the hospital difficult.

j. Specifications

1) The specifications resemble a commercial type since all references, for control of the contract, is to the architect, owner or engineer. The federal government specification should only address the contracting officer as all his paperwork or contractual problems should be passed through him for action.

2) The specifications call for hot water boilers fired with dual fuel, natural gas and liquified petroleum gas. The drawings indicate that the boilers are to be fired with natural gas and oil. The drawings and specification should agree in this respect. Normally, if there is a difference the specs will govern and its system will be installed but, in this case the system shown on the drawings was installed.

3) The plumbing specifications are shown on the drawings and in the written specifications with no indication in the specifications nor on the drawings that there is a division.

n. Water Hammer Shock Absorbers

1) Shock absorbers were to be installed as per specification section 15400 paragraph 4.5.1. The plans indicate and they were installed on all toilet water supplies.

2) There does not appear to be any shock absorbers in the kitchen area and in other areas. Shock absorbers should be installed between the location of the water stoppage, especially rapid shut off valves, and the system that is to be protected.

ELECTRICAL

1. GENERAL

a. Normal power is supplied by Navajo Tribal Utility (NTUA). The telephone cable and primary power from a utility pole on the northwest corner of the site was run underground in three 4" conduits encased in concrete to power and telephone manholes. The NTUA primary power transformer has a secondary distribution voltage of 277/480v, 3 phase, 4 wire plus ground to three phase loads, motors and branch circuit transformers. Branch circuit step-down transformers provide power to lights, offices, patient areas, and special systems. X-ray power is provided through a separate primary/secondary transformer located on the main transformer pad.

b. Motor control centers, secondary switchgear, secondary transformers and other equipment are located on concreted pads in the excavated walkways under the building (see photos E-1 and E-2).

c. Ice and snow melted heaters are provided at emergency and main entrance exterior walkways.

d. Emergency power is provided by a engine-generator that provides 1000kw at 0.8 power factor, 1550a, 480v, 3 phase, 4 wire, 60 hertz. This generator was moved from Crownpoint IHS hospital in 1991.

Life safety, critical, and some air handler units are transferred to the emergency generator. Most air handling units, x-ray, and ice melt systems are not connected to the emergency circuits. The hospital plans to add these loads to the emergency system. The generator is housed in a weatherproof enclosure. The engine has a crankcase and radiator water heaters.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

General - This section contains listings of major desirable and undesirable design features and also the major recommendations for consideration by the Design Criteria Committee for revision to the Facilities Planning Manual which would result in these criteria being included in future Programs of Requirements.. (See also Comments/Recommendations in individual chapters of report).

A. Desirable Design Features

1. The floor plan for this facility is excellent in terms of its general layout, interdepartmental relationships, and quality of public spaces.

2. The location of major mechanical equipment under the building rather than on the roof was a good design choice, and should be considered for any facility located in a severe climate (either hot or cold). There is ample access to the equipment for servicing and repair.

3. The morgue is located in a separate building.

4. The "Healing Room" should be considered as a standard for Indian Hospitals.

B. Undesirable Design Features

1. Storage problems were indicated for almost all departments. We understand that current HFPM standards provide for three times the 2000 square feet that was originally provided for Chinle. The additional 4000 square feet for storage would eliminate this problem.

2. Recommend that a central paging system be required for all IHS hospitals. This was required by the PID, but was not included in the design.

3. An inadequate grounding system was installed at the project. This apparently was due to an unusual geological formation at the site and conventional grounding equipment is marginal. This problem is currently being corrected.

4. Vestibules are not of sufficient size to accommodate a stretcher.

5. Lava Rock (Blood Rock) was used extensively in the landscaping, which conflicts with Navajo customs. Materials for IHS hospitals should be selected with consideration given to local customs and cultures.

6. There is no convenient direct access to the roof for maintenance personnel except for a vertical caged ladder on the north wall.

7. Inpatient pharmacy was inadequate in size.

C. Recommendations

1. High quality, durable and easily cleanable finish materials, components and hardware should be mandated in the POR and specified in the design documents. This would help avoid costly maintenance and repair, and numerous makeshift solutions required in the field.

2. Easy and independent roof access, without passing through program space (other than Maintenance Department) should be provided in all facilities with flat roofs. A ship's ladder or stairs is recommended for roof access in all facilities.

3. Include a requirement for planning a heliport at all rural IHS hospitals. Apply frequency of use data to determine the class of facility installed.

4. Include a requirement for separate independent central HVAC systems, with year round cooling capacity, for areas such as the laboratory and pharmacy, temperature and stringent ventilation requirements. We understand that this is now a requirement for laboratories in the IHS-FPM but mention it to reinforce the need for separate A/C units where A/C loads show such variation.

5. Provide switching so that half of the lamps in general lighting may be used as an energy-saving method.

6. Consideration should be given to making the pharmacy as the Hub for hospitals that operate on an appointment basis.

7. Consideration should be given to having a central medical storage or separate storage for each nursing unit.

8. A nurse station and nurse office should be provided in the surgical suite. A nurse station should be provided in the Renal Dialysis Unit.

9. Consideration should be given to eliminating delivery rooms and providing birthing rooms.

10. There should be a neutral corridor to the surgery recovery area.

11. A EKG room should be provided for hospitals of this size.

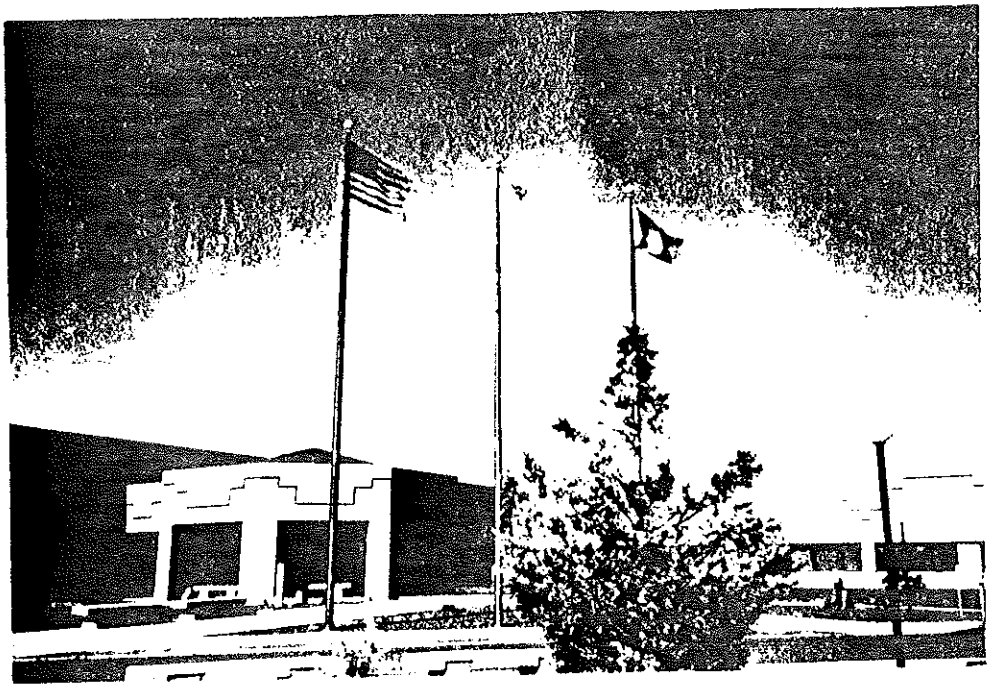
12. Consideration should be given to housing the Community Health Department in an entirely separate building adjacent to the hospital.

13. A Director of Nursing office is essential, and should have been provided.

14. Lightning protection is a must for IHS facilities where there is a high incidence of thunder and lightning.

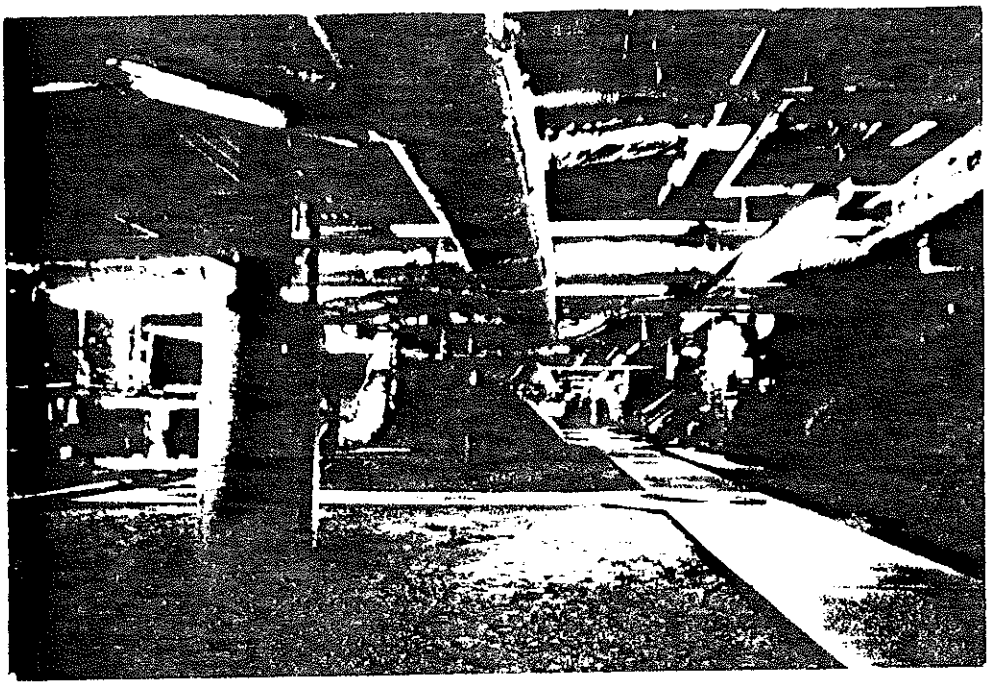
15. Proper grounding of building and equipment must be part of preliminary design studies and final design. All grounding provisions of the National Electrical Code, NFPA 70, Article 250 must be met.

16. Power line conditioning and uninterruptible power systems should be part of the design after studies have established that the commercial power is not "clean" and/or reliable.

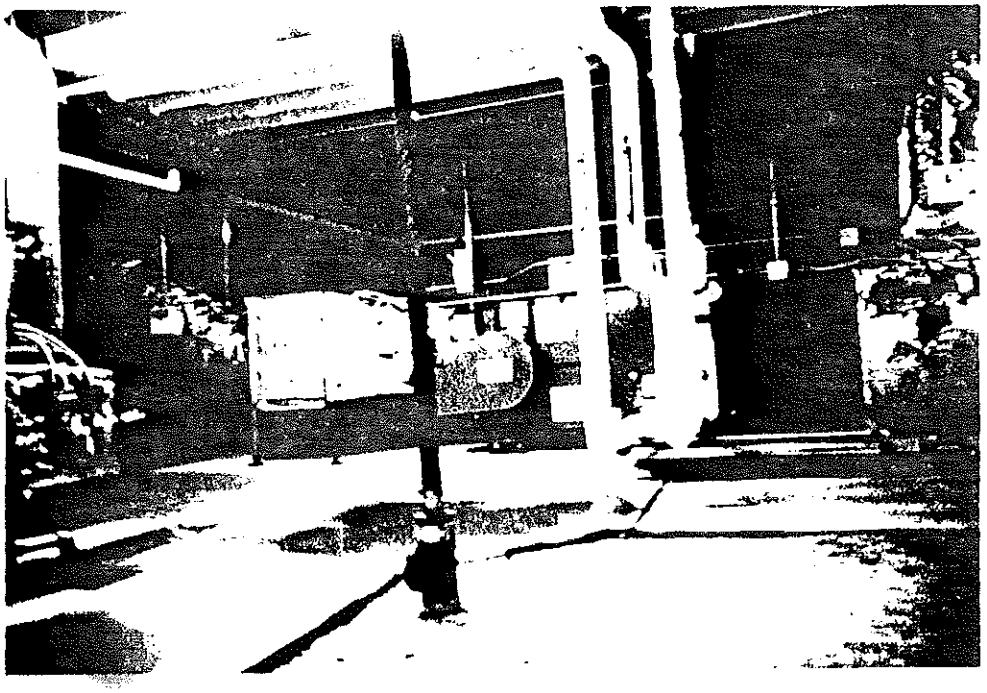


A-1 Main Entrance of Hospital

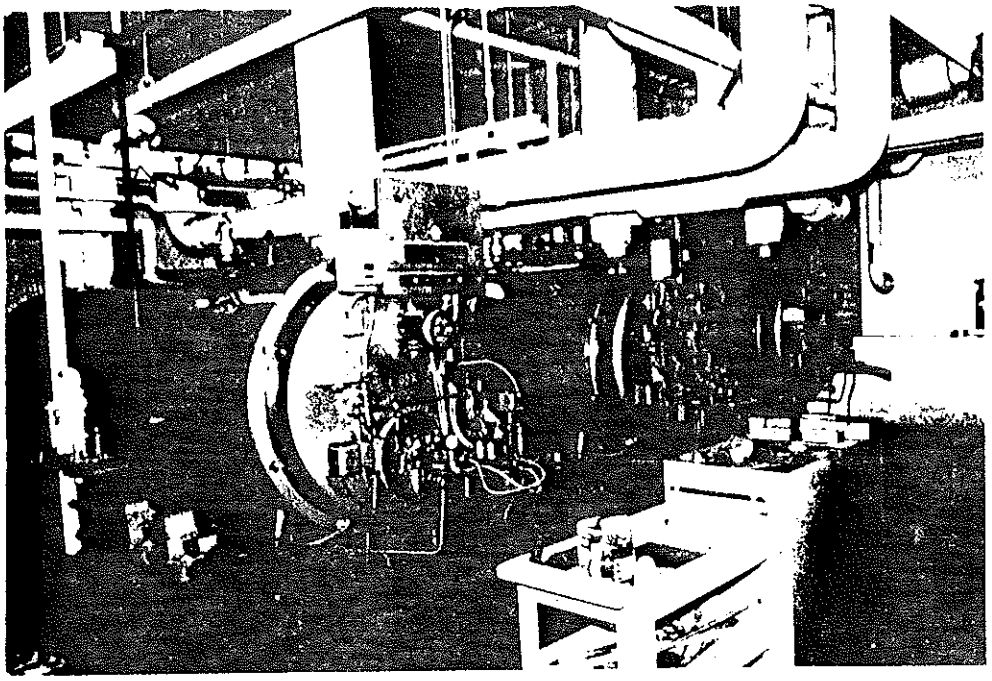
A-2 Exam Room



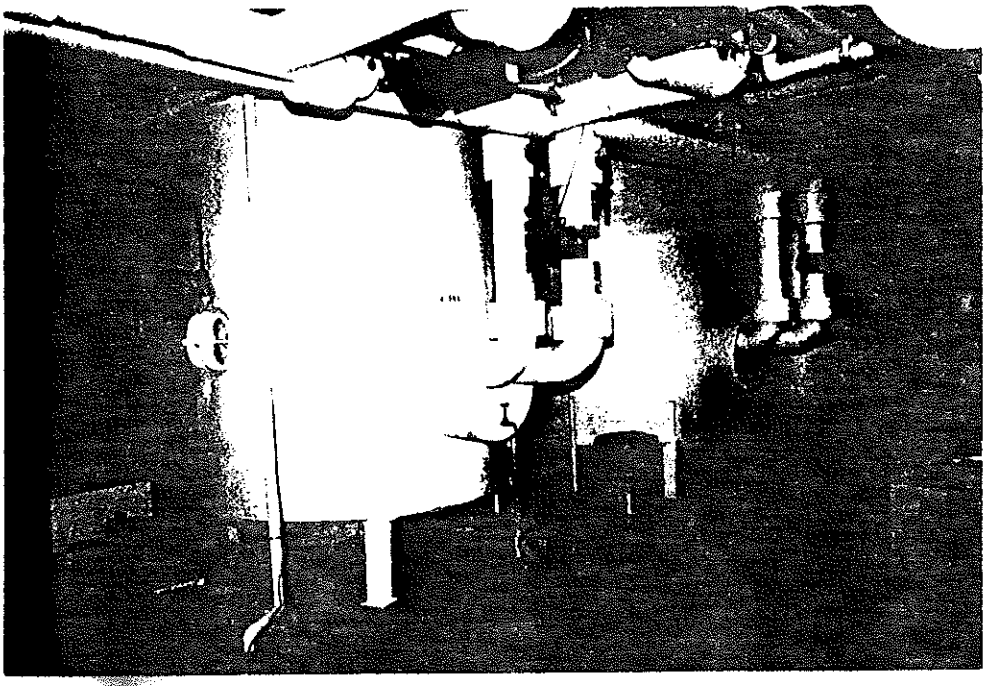
M-1 Hospital Walk/Crawl Space



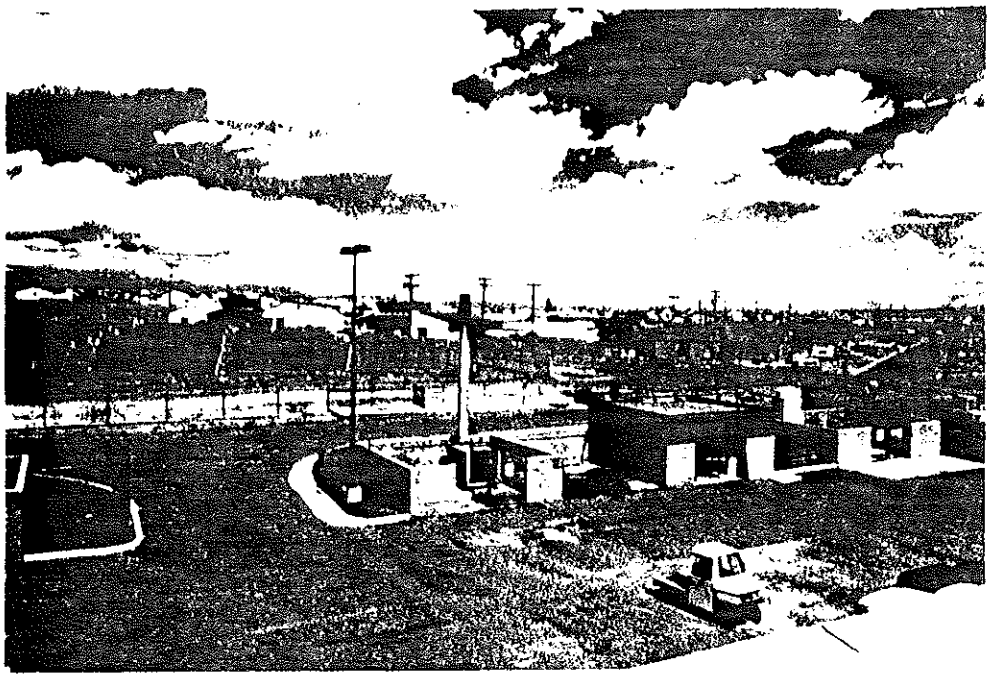
M-2 Walk/Crawl Space - Air Handling Equipment



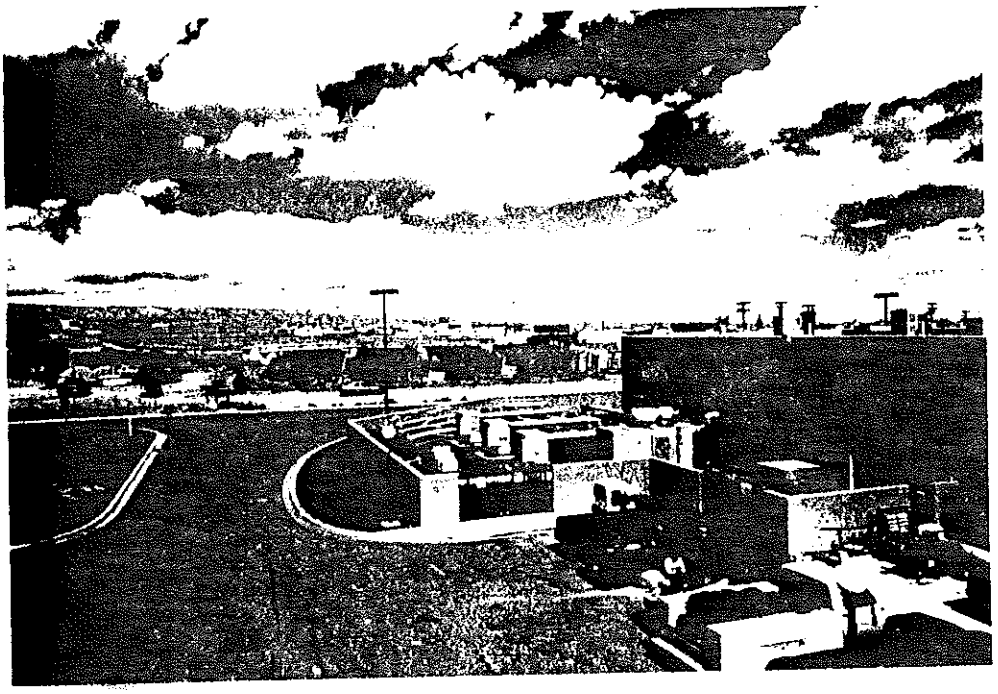
M-3 Boiler Room



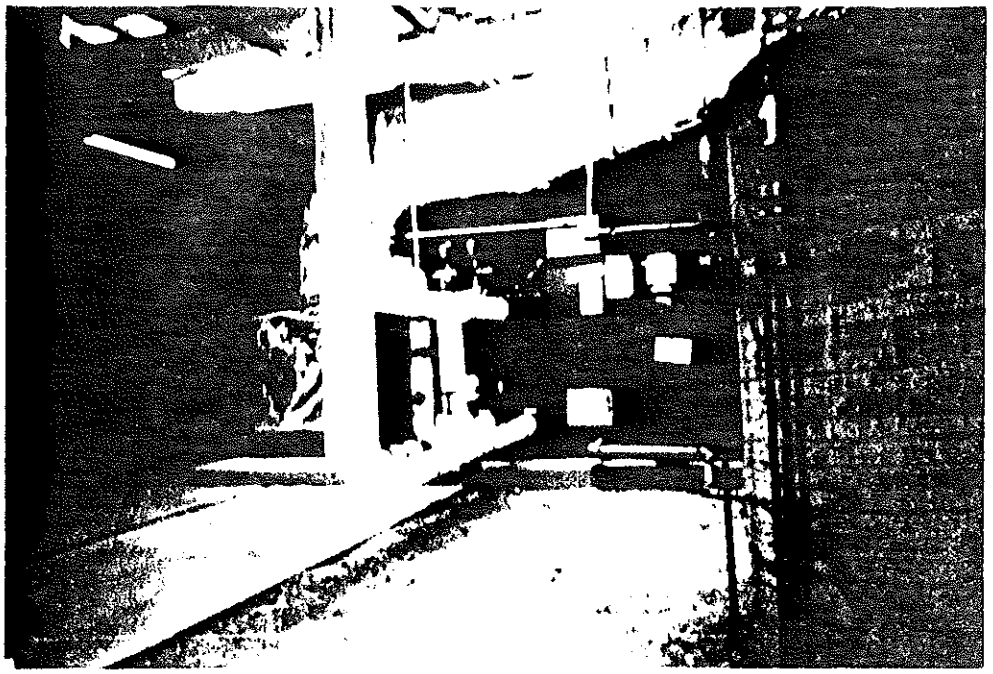
M-4 Water Softening System



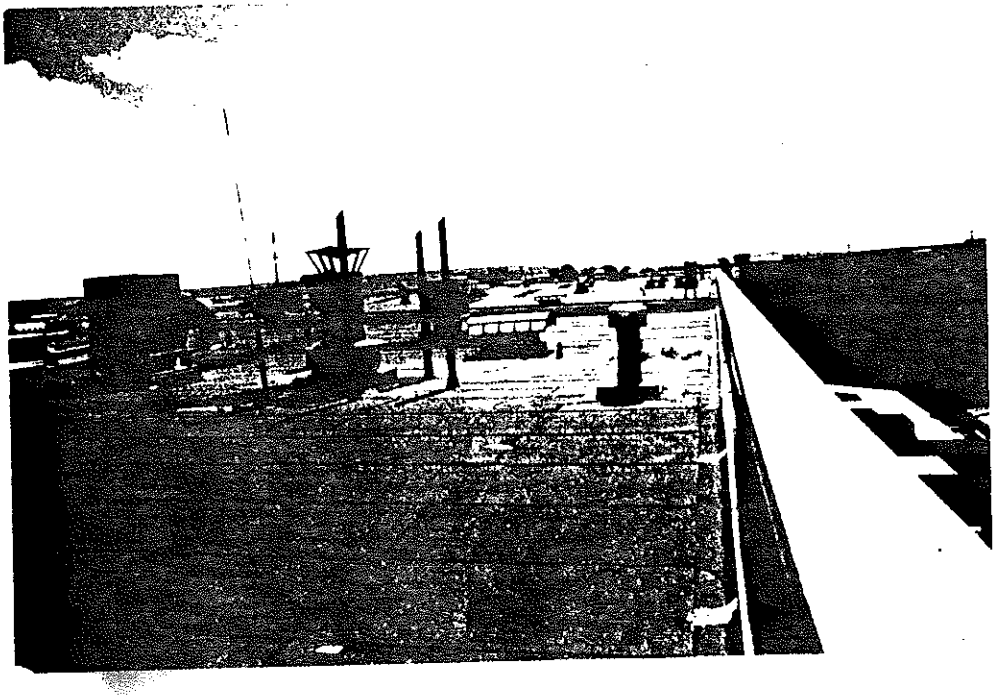
M-5 Solar Panels, Incinerator, and Bottle Gas Storage



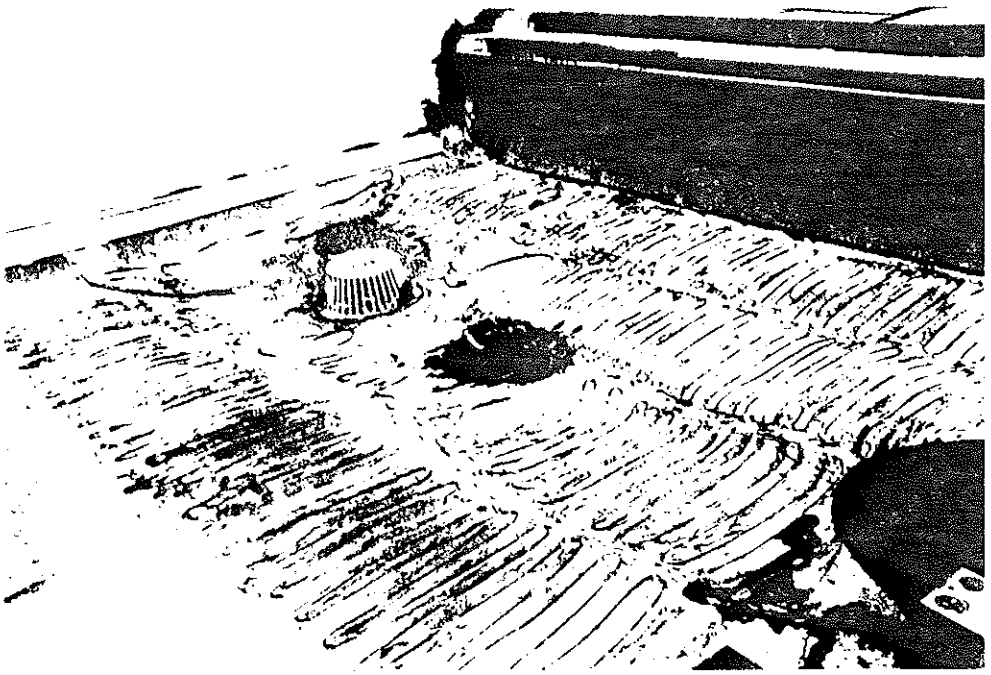
M-6 Maintenance Yard with Chillers and Generator



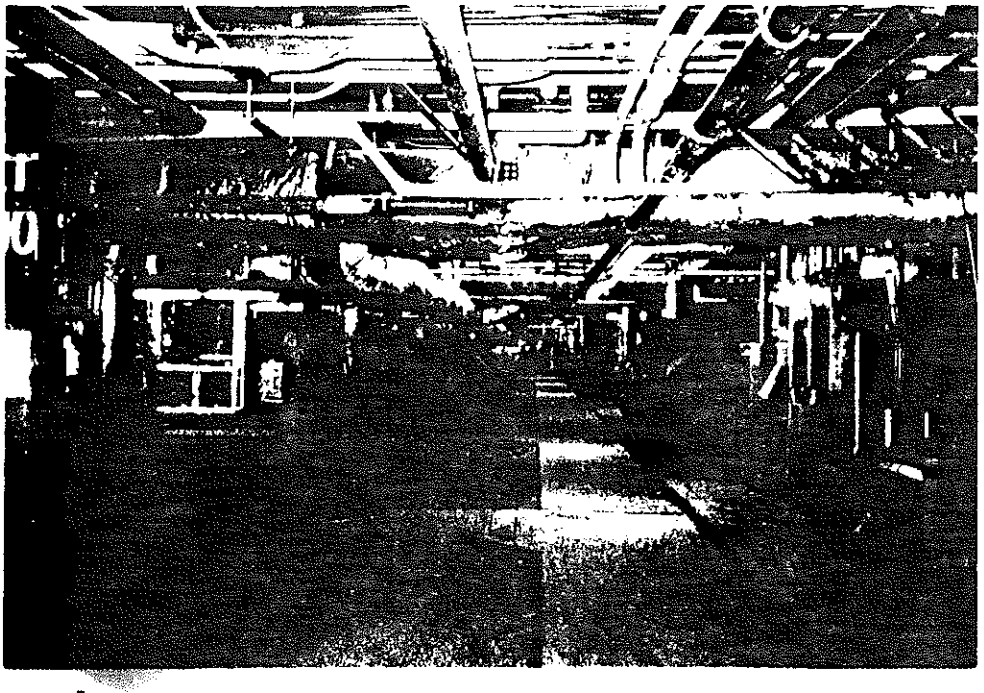
M-7 Air Handling Unit 3



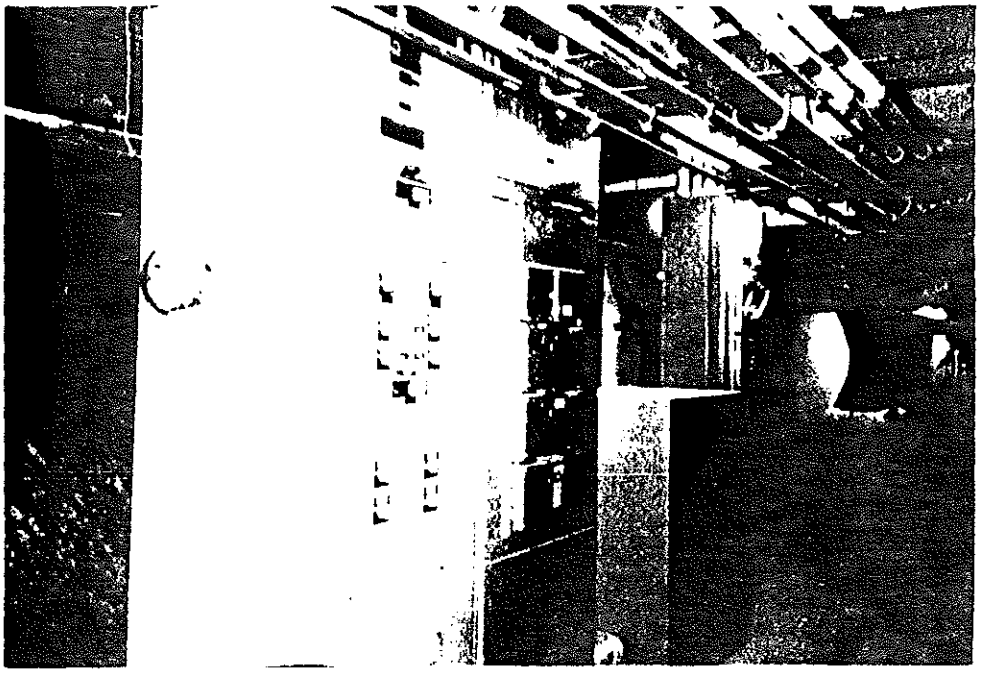
M-8 Roof and Walkways



M-9 Heat Tape Around Roof Drain



E-1 Pad Mounted Transformers; Walk/Crawl Space



E-2 Motor Control Center in Walk/Crawl Space

E-3 Flagpole Base with Lightning Damage