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Manhattan Project Buildings and Facilities at the Hanford Site: A Construction History

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Westinghouse
Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

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M. S. Gerber, PhD

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LIST OF TERMS

ACU	Advisory Committee on Uranium
AEC	Atomic Energy Commission
DE	destructive analysis
GC	General Commercial Contracts and Facilities
HC	Hanford Commercial Contracts and Facilities
HEW	Hanford Engineer Works
HW	Hanford Works
HCR	horizontal control rod
MED	Manhattan Engineer District
Met Lab	Metallurgical Laboratory
PP&L	Pacific Power and Light Company
OSRD	Office of Scientific Research and Development
SNM	special nuclear material
SWP	Special Work Permit
TC	temporary field construction structure
TDS	total danger sum
TIG	tungsten inert gas
VSR	vertical safety rod
XC	Commercial Contracts and Facilities for the 3000 Area Camp

METRIC CONVERSION TABLE

Into Metric

If you know:	Multiply by:	To get:
LENGTH		
inches	2.54	centimeters
feet	30	centimeters
yards	0.91	meters
miles	1.6	kilometers
AREA		
square feet	0.09	square meters
square yards	0.8	square meters
acres	0.4	hectares
MASS (WEIGHT)		
short ton	0.9	metric ton
VOLUME		
gallons	3.8	liters
cubic feet	0.03	cubic meters
TEMPERATURE		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius

1.0 DESCRIPTION, PURPOSE, AND SIGNIFICANCE OF THE MANHATTAN PROJECT AT THE HANFORD SITE

The Manhattan Project refers to the work of the Manhattan Engineer District (MED) of the Army Corps of Engineers during the period June 1942 to December 1946. The Manhattan Project had its genesis in the Advisory Committee on Uranium (ACU), which was formed in October 1939 by President Franklin D. Roosevelt to discuss and explore the feasibility of atomic weapons and atomic power. It embarked on an ambitious research program that was carried out through contracts with colleges, universities, and public and private research institutions.

Throughout its early life, the ACU concentrated on examining the possibilities of the highly fissionable isotope ^{235}U. However, in March 1941 a research group, headed by Dr. Glenn T. Seaborg at the University of California, succeeded in isolating the first submicroscopic amounts of ^{239}Pu. Later that month, this same group confirmed the theory that, under neutron bombardment, ^{239}Pu atoms fissioned as rapidly as atoms of ^{235}U.

In December 1941, the same month that the Japanese attack on Pearl Harbor precipitated U.S. entry into World War II, the ACU decided to sponsor an intensive research program on plutonium. The research contract was placed with the Metallurgical Laboratory (Met Lab) of the University of Chicago, under the direction of Nobel Prize winner, Dr. Arthur H. Compton. The purpose of this research project was to develop the knowledge to design, build, and operate a plant for the conversion of uranium into plutonium. On December 16 Dr. Vannevar Bush, head of the Office of Scientific Research and Development (OSRD), umbrella organization over the ACU, recommended that the Army Corps of Engineers carry out the construction work for such a plant.

While much scientific experimentation went forward at the Met Lab, there was very little involvement by the Army Corps of Engineers until June 1942, when Dr. Bush presented a feasibility report on the plutonium project to President Roosevelt. Bush stated that five basic plutonium production methods were "nearly ready for pilot plant construction," that an atomic weapon made from plutonium was feasible, and that it might be developed in time to influence the present war. The very next day, the Army Corps of Engineers began to form a new "district" (division) to build the plutonium production plant. Consciously searching for a name that would not arouse suspicions or connote technology nor secret weapons, they chose the name "Manhattan Engineer District," simply because the office of a key officer was located in Manhattan at that time. On August 12 the General Order announcing the formation of this new engineer district (the MED) was announced. On September 17 veteran supply and procurement officer General Leslie R. Groves was appointed to head the MED.

At that time the planned site for the plutonium production plant was the Clinton Engineer Works, located at present-day Oak Ridge, Tennessee. However, in discussions held in August, October, and December 1942 with key bomb development scientists, such as J. Robert Oppenheimer and others, the hazardous nature of the plutonium processes under development was pointed out to MED officials. Further discussions that autumn with officers and scientists of the DuPont Corporation, the company that Groves had asked to become prime contractor for the plutonium project, underscored these hazards. As a result, a consensus was reached at a December 14, 1942, meeting between representatives of the Met Lab, the MED, and DuPont, to seek a new site in a remote area of the American West.

The future Hanford Site was scouted eight days later and selected because of its abundance of clean water, electric power, rail service, and heavy aggregate for making concrete. The remoteness of the Site from large population centers also was an important factor in its selection. Land acquisition proceedings were begun with Secretary of War Henry Stimson's Directive RE-D 2161, issued on February 8, 1943. A petition of condemnation for the Hanford Site land was filed in the federal court for the Eastern District of Washington, in Spokane, on February 23, 1943. Ground was broken in March 1943 for Project 9536, the Hanford Engineer Works (HEW), which was the earliest name for the Hanford Site.

In the course of the next 29 months, the MED built the world's first full-scale, self-contained, plutonium production facilities at HEW. The three essential steps in the process took place as follows: uranium fuel elements were fabricated and jacketed in the 300 Area, irradiated in the 100 Areas, and chemically dissolved and separated into plutonium, unconverted uranium, and various fission byproducts in the 200 Areas. All other areas of the HEW functioned to provide support services to the crucial 100, 200, and 300 Areas.

The HEW plutonium production project succeeded, in that the special nuclear material (SNM) in the world's first and third atomic explosions, the Trinity bomb test on July 16, 1945, (at Alamogordo, New Mexico) and the bomb that was detonated over Nagasaki, Japan, on August 9, 1945, was produced at HEW. This feat represented enormous and unprecedented achievements in engineering and physics, the largest scaleup in the history of chemical engineering, pioneering accomplishments in uranium fuel fabrication and in environmental monitoring, and many other "firsts."

The MED was dissolved as an entity by the authority of the McMahon Atomic Energy Act of 1946. The act took effect at one minute after midnight on January 1, 1947, when the newly created Atomic Energy Commission (AEC) assumed control of all MED functions and property, including the Hanford Site. At that time, the AEC changed the name of the Site to Hanford Works (HW), and the HEW ceased to exist. The following historic context describes the buildings and processes created by the MED at HEW, during the period March 1943 through December 1946.

2.0 100 AREAS

The 100 Areas at the Hanford Engineer Works (Hanford Site) were the locations of the production reactors (known then as piles) and their ancillary and support facilities. The production reactors functioned to irradiate uranium fuel elements, the essential second step in the plutonium production process. Most of the support buildings operated to supply, treat, store, and carry away the reactor cooling water; to supply gas, electricity, fresh fuel, and materials to the reactors; to test reactor samples; and supply protection, first aid, training services, maintenance services, and other support functions to reactor operations.

Three production reactors were built at HEW during World War II: B Reactor, D Reactor, and F Reactor. The first was B Reactor, officially designated the 105-B Building. This structure has been named to the National Register of Historic Places. The Hanford Site's B Reactor was the first full-scale nuclear reactor to operate in world history. The first attempt to energize it took place on September 26, 1944. Loss of initial reactivity, leading to complete shutdown, occurred the following day. Gradually, over the next three months, larger and larger numbers of B Reactor's process tubes were "charged" (loaded) with uranium fuel elements. The first discharge of irradiated metal (uranium fuel elements) that had achieved goal exposure took place on November 24, 1944. Beginning on December 20, 1944, sustained operations took place through March 16, 1946. The reactor first achieved its full, nameplate design level of 250 MW in February 1945. D Reactor started up on December 17, 1944, and F Reactor started up on February 25, 1945.

With very few specific exceptions, the three 100 Areas at HEW were identical to each other in all of their essential components, sizes, and functions. Therefore, each specific type of building and building number within them will be grouped together and described only once for all of the three 100 Areas. Exceptions will be noted and described.

The 100-B Area contained 32 "permanent buildings" (not counting construction field offices, temporary construction supply huts, etc.) and 22 service "facilities" (including electrical systems, overhead and underground pipe lines, roads, fences, and parking areas). (Note: In each case, the MED definitions for permanent buildings and for facilities will be used.) The 100-D Area contained 33 permanent buildings and 23 facilities, and 100-F Area contained 29 permanent buildings and 24 facilities. Three general types of permanent building construction were used in the 100 Areas: reinforced mass concrete construction, structural steel framing together with concrete block and/or reinforced concrete, and wood-frame construction.

Each 100 Area contained at least 50 "TC" (temporary field construction) structures, including the Division Engineer's Office, Government Field Office, Layout Office, Cost Office, Safety Office, Labor and Concrete Office, Paint Office, Earthworks Office, Machine-Millwright and Sheet Metal Shop, Electrical Office and Shop, Transportation Office and Garage, Pipe Office and Shop, many Warehouses, and others. Additionally, over 100 very small support service TC structures were built in each 100 Area, including warming shed, privies, check booth, miscellaneous sheds, and guard houses. (See TC-30 through TC-32 Structures in Section 9.0.) In some cases, such structures were converted to permanent buildings near the end of the construction period. For each 100 Area, such occurrences will be noted. The TC roads, walks, water lines, fences, sewer and septic systems, electrical lines, steam lines, and other facilities are described under other TC number codes.

The three 100 Areas at HEW comprised 685 acres of land enclosed by 4.1 miles of fencing. They also contained 4.25 miles of broad-gauge rail track and 6.75 miles of gravel roads.

PERMANENT BUILDINGS

Reactor Buildings (105 Structures):

Strictly speaking, the HEW reactor buildings were known as the 105 Structures, and the reactor exhaust stacks were known as the 116 Structures. Each of these structures was constructed by a separate organization within the DuPont Corporation. However, in common usage, the reactor buildings in total, including their stacks, soon became known as the 105 Buildings. This usage persisted throughout the years and will be used herein.

One reactor was built within each 100 Area at HEW. Because of the wartime need for speed, almost no design variations were permitted. The only known variations are these: a concrete block enclosed storeroom was added beneath the structural steel framework adjacent to that portion of the buildings that housed the horizontal control rods (HCRs) at 105-D and 105-F. Also, the valve pit piping at the reactor front face and the water piping to and from the D Reactor building consisted entirely of stainless steel. At B Reactor and F Reactor, according to DuPont, wartime shortages of stainless steel led to a situation where this material was used "only in locations where replacement was either impossible or extremely difficult."

The HEW reactors rested on 23-ft-thick concrete foundations topped with cast iron blocks that served as a thermal shield. The 105 Building walls consisted of reinforced concrete in the lower portions and concrete block in the upper portions, varying from 3 to 5 ft thick. The roofs were composed of precast concrete roof tile, except over the discharge ("D") area enclosure (the rear face) and the inner horizontal rod room (the HCR access area). Over those areas, the roofs were composed of 6-ft-thick reinforced concrete.

The reactor cores themselves consisted of a graphite "stack" that measured 28 ft from front to rear, 36 ft from side to side, and 36 ft from top to bottom. The stacks were pierced front to rear by 2,004 process channels that held the fuel elements. Nine horizontal channels for control rods entered from the left side of each reactor, and 29 vertical channels for safety rods entered from the top. Additionally, six test holes labelled A through F, leading from the right side of each pile, existed for the irradiation of experiments, foils, counters, ionization chambers, and special samples. The HCR and vertical safety rod (VSR) channels, as well as the test holes, were lined with a thin sheet of aluminum known as a "thimbles." Of the six test holes, three had diameters of 3.5 in. (with the original aluminum thimble linings), and three had diameters of 0.5 in. (with the thimbles). The access areas to these experimental holes, located on the right side of the pile, were designated as the "X-levels" of the reactor. Level X_0 was at the main floor of the 105-B Building, level X_1 was 15 ft above X_0, and X_2 was 15 ft above X_1.

The function of the HCRs was to control the equilibrium and transient power levels of the reactor during routine operations and to maintain the desired neutron flux distribution. The HCRs each were about 36 ft long, with the poison (neutron absorbing segment) being about 29 ft, 4.5 in. Two of the rods were electrically driven, and seven were hydraulically driven. The latter were known as shim rods and were used to achieve ongoing operational control and desired fluctuations. The VSRs were 39-ft-long, stainless steel sleeves with 3/16-in.-thick, boron-stainless steel sleeves inside. The outside diameter (O.D.) of the VSRs was 2.25 in. Each VSR was inserted and withdrawn from the reactor via two separate cables wound around a winch located 40 ft above the top of the reactor. In cases of automatic shutdown ("scram") of the reactor, the electromagnetic clutch holding each rod in the out position would be deenergized (demagnetized), and the rods would free fall by gravity into channels penetrating the reactor. A "last ditch" safety system, a boric acid solution, was held in a large pedestal tank at the top of each reactor and connected to each of the 29 VSR channels via 0.5-in. pipes.

At the front and rear of each process channel penetration, a 7.5-ft-long, carbon steel entry and exit sleeve known as a "gunbarrel" served to transfer the weight of the thermal shield to the biological shield. It also protected the graphite during charging ("C") operations, maintenance activities, and other manipulations. The ends of each process tube flared out to facilitate a close fit and interface against the gun barrels. Additionally, an asbestos gasket lay between the flared ends and the stainless steel nozzle that projected from the front and rear of each process tube. The nozzles connected to the larger coolant delivery and exit systems.

The graphite cores were surrounded by a cast iron thermal shield layer that varied from 8 in. thick at the reactor sides, 8 1/8-in. thick at the top, 10 in. thick at the top and rear, and 10.25 in. thick at the bottom. Cooling for the top, side, and bottom shields was provided by circulating water tubes embedded in the blocks. The front and rear shields were cooled by regular reactor coolant flow that passed through the process tubes. The entire thermal shield was surrounded on all sides except the bottom by a 52-in.-thick biological shield that consisted of alternate layers of masonite and steel. While the thermal shield absorbed and converted to heat nearly 97% of the gamma energy produced by the fission process, the biological shield absorbed the fast neutrons that passed through the thermal shield. The biological shield slowed the fast neutrons to intermediate flux and absorbed the released nuclear energy.

The entire reactor block then was enclosed in a welded steel box that functioned to confine the inert gas atmosphere within the reactor. Expansion joints were placed on the corners of the block to allow for thermal expansion, and expansion bellows were located at each process tube opening. The bellows served as gas seals as the process tubes expanded and contracted with temperature and with the distortions of the graphite. Additionally, each process tube penetration through the biological shield was surrounded by a series of circular, cast iron shields known as "shielding doughnuts." The test holes had removable lead rods for plugs.

The three HEW reactors were modified considerably in major upgrades in the 1954 to 1958 time frame and also in many smaller modifications.

Purification Buildings (115 Structures):

One of these was built in each 100 Area, adjacent to each reactor (Figure 2-1). Their function was to house the equipment that supplied the reactor's gas atmosphere (within the welded steel shell). The atmosphere of the HEW reactors originally was composed of helium (He), an inert gas that removed heat, moisture, and foreign gases from the piles and also served as the detection mechanism for water leaks within the piles. Sampling tubes were located in the gas plenum between the rear-face biological and thermal shields. Water leaks in the core flashed to steam and were detected by measuring the amount of water vapor in the gas sampling tubes. The 115 Buildings contained apparatus for circulating the gas, three silica gel towers that dried the gas as it passed through them, and equipment to purify the helium by pressurizing and refrigerating it and then passing it through activated carbon. Underground piping connected the 115 Structures to the reactors. Late in the MED period, experiments with the heat transfer capacities of various gases led to the addition of carbon dioxide (CO_2) to the atmosphere of the HEW reactors. The CO_2 equipment was placed within the 115 Structures. Appendix A contains a physical description of the 115 Buildings.

Gas Storage Tanks (Also Called Gas Transfer and Unloading Stations) (110) Structures):

One of these structures was built in each 100 Area. Their function was to house the storage tanks and cylinders that held the helium and carbon dioxide for the reactor gas atmosphere. The helium arrived at HEW in rail cars, was unloaded into high-pressure storage tanks at the 110 Buildings, and then it was transferred into low-pressure tanks for makeup in the 115 Buildings. Appendix A contains a physical description of the 110 Structures.

River Pump Houses (181 Structures):

One of these structures existed in each 100 Area. Located at the shore of the Columbia River, these structures existed to draw cooling water for the reactors from the river. They did so by means of ten electric-driven pumps. Aside from these pumps, the 181 Buildings contained compressors, sluice gates, and three hoists and monorail trolleys each. Subsequent modifications, undertaken well after the MED period, enlarged the pumping capacity considerably. Extensive building modifications also took place at later dates. Appendix A contains a physical description of the 181 Buildings.

Reservoir and Pump Houses (182 Structures):

One of these structures existed in each 100 Area (Figure 2-2). The purpose of each of these structures was to provide reserve (secondary backup) water for reactor cooling, water for steam condensers, and raw water for HEW's 200 Areas (known as "export water"). Initially, the 182-B Buildings also supplied water for the 183-B Filter Plants. However, this latter function was modified in postMED modifications. The 182 Structures contained an inlet

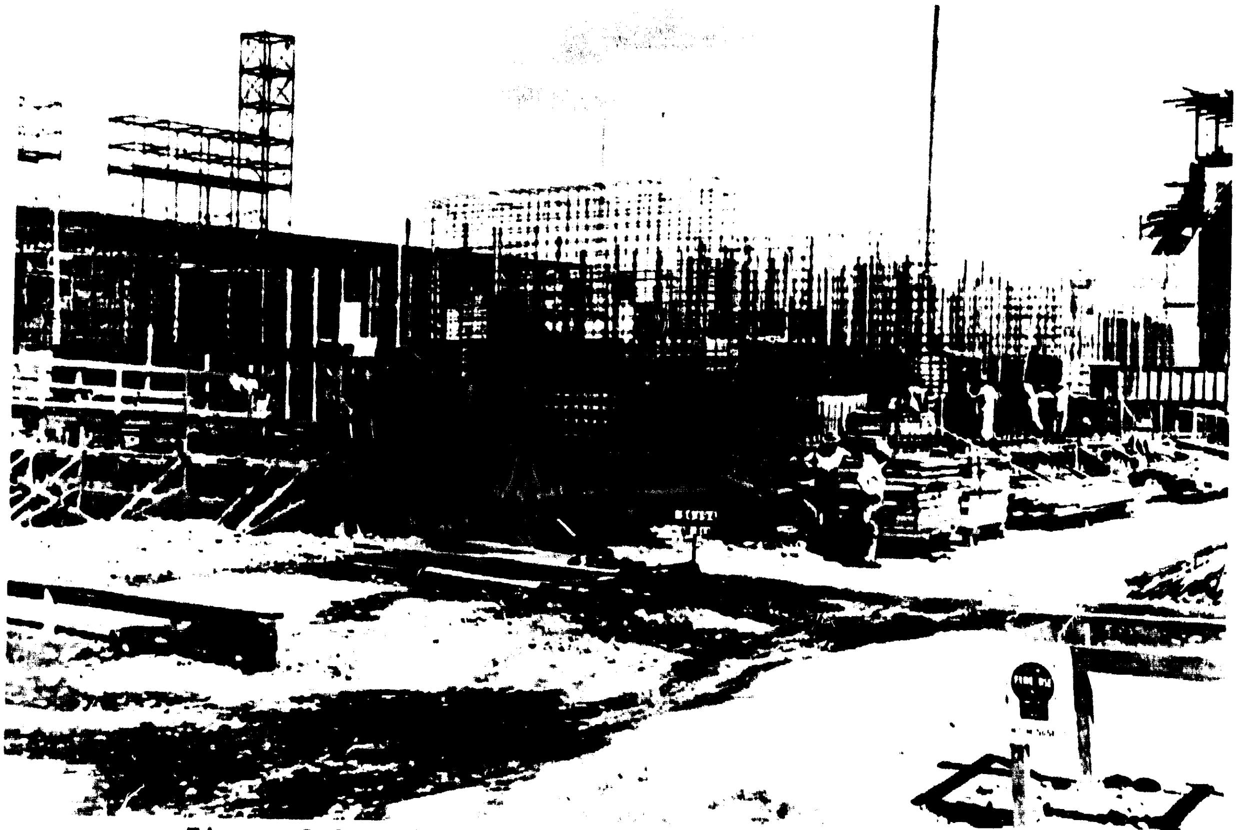

Figure 2-1. The 115-F Gas Purification Building Under Construction, September 1944.

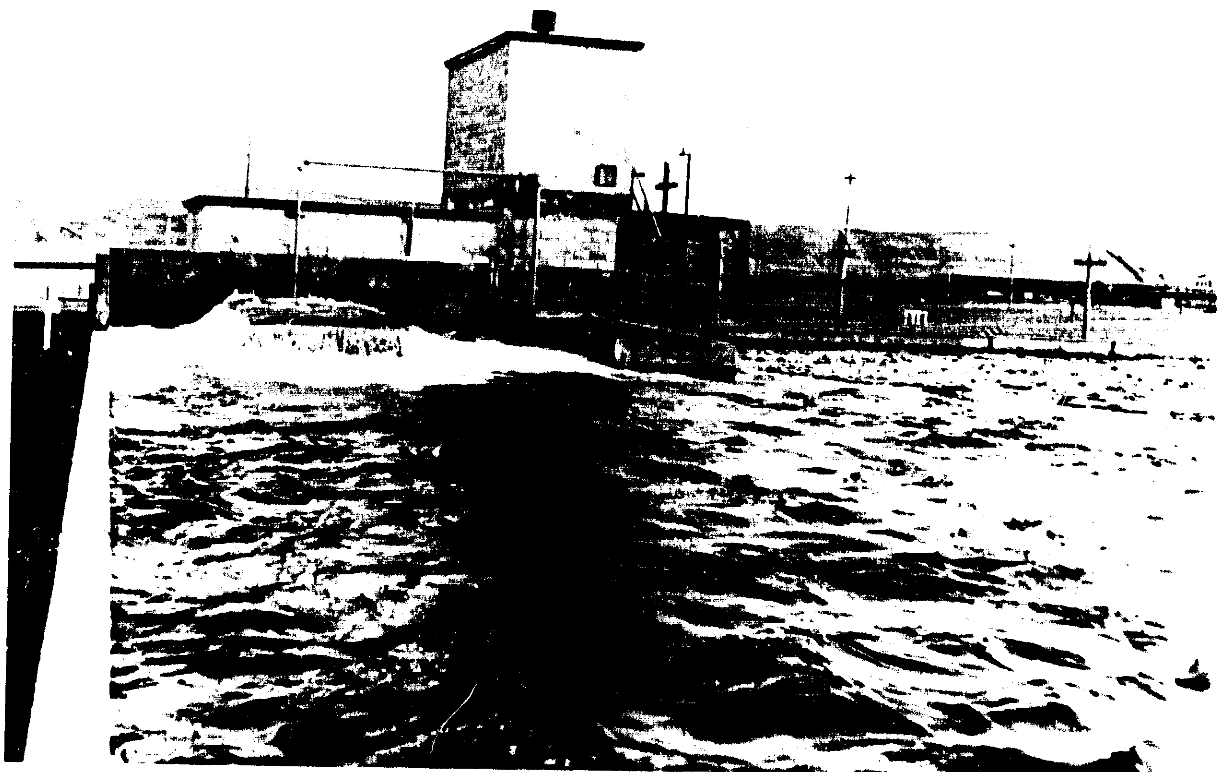

Figure 2-2. Reservoir Portion of the 182-F Reservoir and Pump House, World War II.

house, an open concrete reservoir capable of holding 25-M gal, flocculation and subsidence basins, and a pump room. Appendix A contains a physical description of the 182 Buildings.

Filter Plants and Chemical Treatment Buildings (183 Structures):

One of these structures existed in each 100 Area (Figure 2-3). The function of these facilities was to add chemicals to purify and ready the raw water for reactor use, to filter the treated water, and then to store it. In the MED period, the chemicals added in the 183 Buildings were sulfuric acid (to adjust water pH), lime, chlorine, and commercial products containing primarily ferrous sulfate (to coagulate suspended solids in the water, before filtration). The water then was passed through gravity filters consisting of sand, gravel, and anthracite coal (known as anthrafilt) and was stored in two underground "clearwells" (holding tanks having a capacity of 5-M gal each). A pump room separated the two clearwells and contained the necessary equipment for all of the water transfers that occurred within the 183 facilities. Appendix A contains a physical description of the 183 Structures.

Deaeration Plants (185 Structures):

One of these structures existed in each 100 Area. The function of these facilities was to remove dissolved gases and entrained air, particularly carbon dioxide and oxygen, from the water filtration process. It was believed by early engineers that the presence of such gases in process water could affect the heat transfer capacity of the coolant, but this problem turned out to have only minor significance, and the deaeration step was eliminated. The 185 Buildings contained four-stage deaerators, acid feed tanks, pumps,

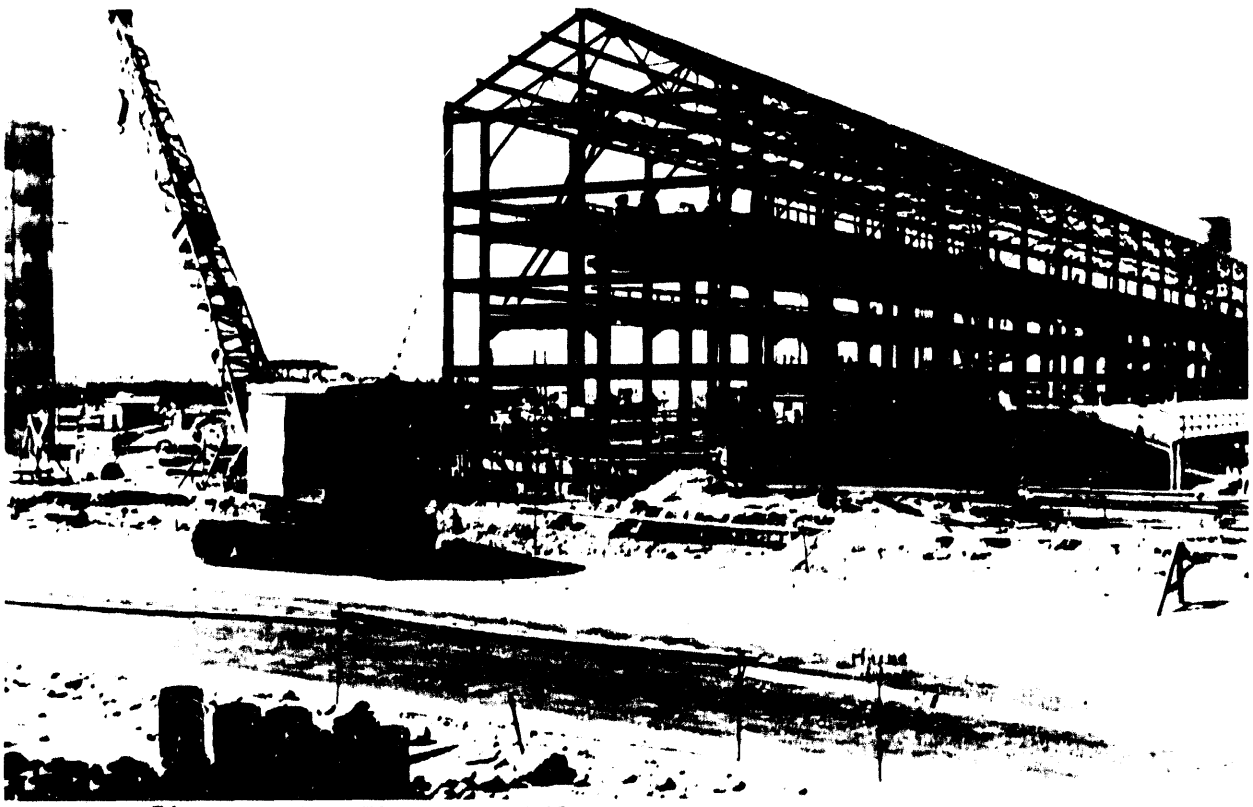

Figure 2-3. The 183-D Filter Plant and Chemical Treatment Building Under Construction, July 1944.

transfer monorails and hoists, and an instrument room. Subsequently, the structures were modified and used for various process laboratory development activities, including equipment mock-ups. However, these uses occurred after the MED period. Appendix A contains a physical description of the 185 Buildings.

Demineralization Plant (186 Structures):

Only one of these plants, 186-D, was built at HEW by the MED, although space was left for such structures in both 100-B and 100-F Areas. The purpose of the demineralization plant was to remove dissolved calcium, magnesium, and sodium salts from treated water intended for reactor cooling, by passing the salts through sulfonated coal. In this process, the salts would be converted to their corresponding acids and then removed by passing them through an acid-absorbing medium. The 186-D Building contained acid tanks, pumps, twelve clearwell tanks, and various hoists, trolleys, and conveyance equipment. However, it was realized before operations began that this step in process water treatment was not necessary, and the building was never used for its intended purpose. Other uses were found for the structure after the MED period. Appendix A contains a physical description of the building.

Refrigeration Buildings (189 Structures):

Two of these structures, 189-D and 189-F, were built at HEW by the MED. The 189-D Structure was approximately double the size of the 189-F Building. Their purpose was to cool the process water before it was sent through the reactors, thus allowing the reactors to operate at higher power levels and still not heat the process water to the point where it would flash to steam. The 189 Structures contained large refrigeration rooms, Freon[1] tank pits, ventilating rooms, pumps, a 25-ton crane and a 1-ton monorail hoist. Refrigeration of process water began at 100-D Area on April 25, 1945, and at 100-F Area the following day. Once again, it was learned that, while refrigeration worked, it was not a necessary step in reactor operations. Appendix A contains a physical description of the 189 Buildings.

During the MED era, the 189-D Building was converted to another use with potential historic significance. A "Flow Laboratory" (thermal hydraulics and coolant systems development studies laboratory) was established in about one-fourth of the structure. Its purposes were heat transfer and fuel corrosion studies. The 189-D "Flow Lab" consisted of a system of pipes and tubes that could be loaded with "dummy" fuel elements. These elements then were heated with water, so that heat transfer from film buildup could be studied. These studies continued after the MED tenure at the Hanford Site. After the MED period, other experimental operations were undertaken in another one-fourth of the 189-D Building.

Process Pump Houses (190 Structures)

One of these structures was built in each 100 Area. Basically, they housed the next step in the reactor cooling water treatment process after the treatment and filtration steps that occurred in the 183 Buildings, given the fact that the steps housed in the 185, 186, and 189 buildings were

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[1]Freon is a trademark of E.I. DuPont de Nemours & Company.

nonessential and either were never used or were eliminated early. Reactor process water was pumped to four 1,750,000-gal steel storage tanks in the 190 Pump House, where sodium dichromate ($Na_2Cr_2O_7$) was added to inhibit corrosion on the reactor's process tubes. Twelve sets of steam and electric pumps (a pair of each in each set), also located in the 190-B Buildings, then pumped the ready water through the reactor (105 Buildings). Appendix A contains a physical description of the 190 Buildings.

Retention Basins (107 Structures):

One of these structures was built in each 100 Area, with each one being divided into halves that held 6M gal each. The function of the 107 Structures was to hold or retain reactor effluent (spent cooling water or waste water) for a variable period ranging from a few hours up to eight hours, to allow for partial decay or stabilization of short-lived radionuclides in the waste water. Each basin sat on a 6-in. concrete slab and was constructed of concrete with reinforced steel mesh and retaining wall supports. Each was rectangular and contained two sluice gates at the intake and a discharge pipe (1904 Outfall Structure) and small pump house at the outlet. Adjacent to, and above, the pump house was a very small sampling laboratory that contained pumps and equipment to monitor the effluent. Appendix A contains a physical description of the 107 Structures.

Elevated Process Water Tanks (187 Structures):

Two of these were built in each 100 Area. Their function was to hold treated water to cool the reactors if the primary and secondary coolant systems should fail. They were the principal structures in the "last ditch" (tertiary) backup coolant system for the HEW reactors. Each tank held 300,000 gal and was supported by six columns. A standpipe and a valve pit completed the equipment. Appendix A contains a physical description of the 187 Structures. (Note: Additional water from the 182 and 183 buildings and from the export water system that fed the 200 Areas could be diverted and pumped to the reactors for emergency cooling purposes.)

Power Houses (184 Buildings):

One of these structures was built in each 100 Area (Figure 2-4). It was a steam plant that functioned to supply power to steam turbine pumps for the secondary reactor coolant system, located in the 181, 182, 183, and 190 facilities. The 184 Buildings also supplied office heat and other heating needs through overhead steam lines (1802 Structures) that looped throughout the various 100 Areas. A small turbine generator in each 184 Building also supplied emergency electrical power for area building lights and motors. The 184 Buildings each had twin, 300-ft-high exhaust stacks, and they contained coal bunkers, water softeners, coal conveyor and handling systems, a 1/4-ton trolley and hoist, a salt dissolving pit, a brine pump house, an ash pit below the coal furnace, and a sluicing trench that ran beneath the building and emptied the wet ash into a sump. These structures were modified considerably in power upgrades that occurred after the MED period. Appendix A contains a physical description of the 184 Buildings.

Figure 2-4. The 184-B Power House Under Construction, May 1944.

Ash Disposal Basins (188 Structures):

One of these structures was built in each 100 Area. Their function was to receive the furnace ash from the 184 Buildings, which was slurried and pumped to the 188 facilities via underground piping. Appendix A contains a physical description of the 188 Structures.

Fresh Metal Storage Buildings (103 Structures):

One of these structures was built in each 100 Area. Their function was to hold fresh (unirradiated) uranium fuel elements before their being charged into the reactors. The structures were rectangular, and each contained a loading platform and storage room. Appendix A contains a physical description of the 103 Buildings.

Chemical Pump Houses (108 Structures):

One of these structures was built in each 100 Area. Their function was to hold and pump the various chemicals needed in reactor water treatment and reactor purging (internal cleansing). They contained many holding and mixing tanks and pumps, along with storage bins for dry materials, conveyor systems, hoppers, and power shovels. Appendix A contains a physical description of the 108 Structures.

Test Building (111 Structure):

Only one such structure was built at HEW in the 100-B Area. The function of the 111-B Building was to house metallurgical tests and other as-needed tests on various irradiated materials associated with the reactors.

For example, failed or blistered irradiated fuel rods, corroded process tubes, irradiated metals from production tests, and other substances were examined under water in three steel tanks within this building. Appendix A contains a physical description of the 111-B Building.

Gate House and Clock Alleys (1701 Structures):

One of these structures was built in each 100 Area (Figure 2-5). Located at the entrance to each area, these structures functioned to verify the identification of employees entering for work and anyone else attempting to enter the 100 Areas. Employees punched time clocks in the "clock alley" on the way in and out of work. The buildings also contained storage rooms and a small laboratory. Appendix A contains a physical description of the 1701 Structures.

Supervisors' Offices and Laboratories (1704 Structures):

One of these structures was built in each 100 Area. They functioned to house offices for 100 Areas supervisory personnel and to house the process water control (sampling) laboratories. These laboratories conducted sample analyses to make sure that reactor process water was within specifications before being run through the reactors and also to verify some of the effluent sample analyses from the 107 Basins and from the 111-B Test Building. Appendix A contains a physical description of the 1704 Buildings.

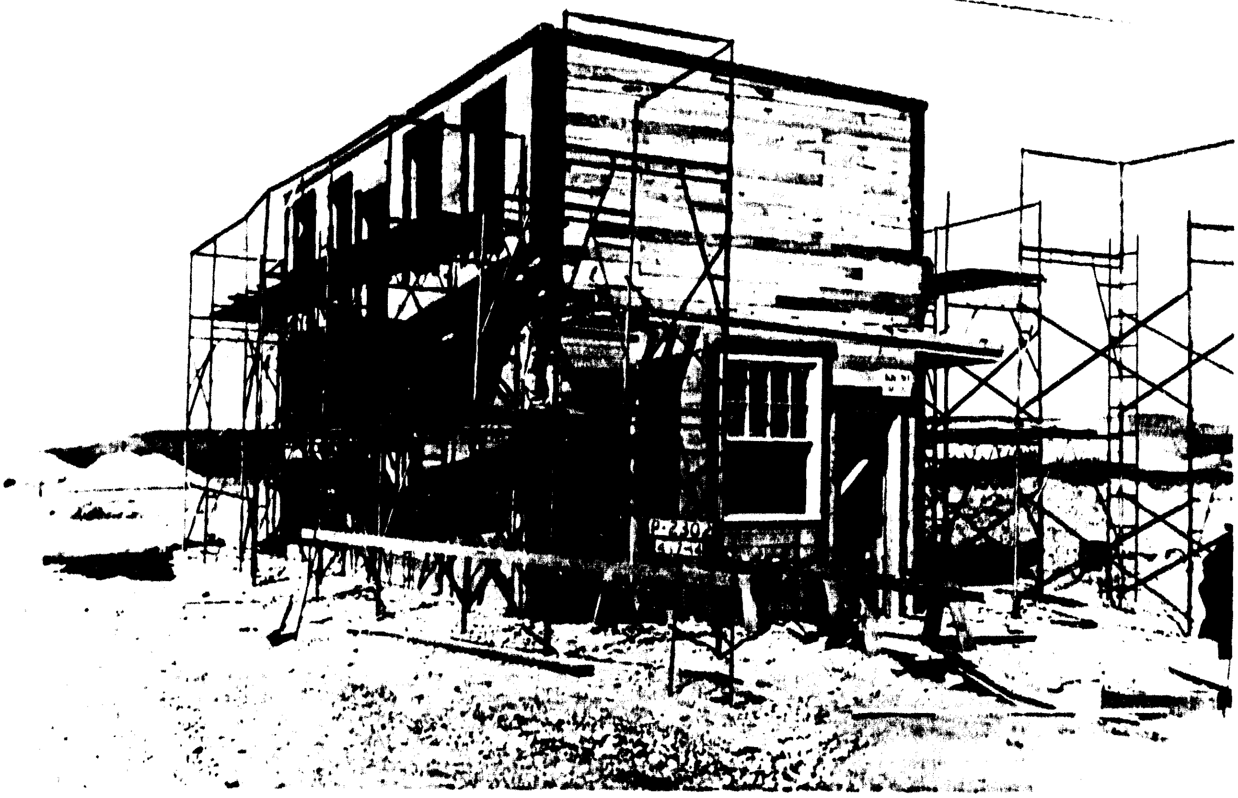

Figure 2-5. The 1701-F Gate House and Clock Ally Under Construction, April 1944.

Change Houses (1707 Structures):

Two of these structures were built in each 100 Area. They each contained a locker room, lunchroom, wash room, shower room, hot water heater room, rest room, and three vestibules. They functioned to provide facilities for employees to change from street clothes to clothes needed to perform work in the 100 Areas--coveralls or full "SWPs" (a Hanford term derived from the words Special Work Permit but applied to the white clothing worn while performing jobs with radioactive materials and covered by Special Work Permits). Appendix A contains a physical description of the 1707 Buildings.

Fire Headquarters (1709 Structures):

One of these structures was built in each 100 Area. They functioned to house fire protection equipment and personnel for the reactor areas. They contained garage space for three fire trucks, a hose room and hose tower, a fire extinguisher filling room, dormitory, office, and kitchen facilities for personnel. Appendix A contains a physical description of the 1709 Structures.

Storerooms (1713 Structures):

Three of these structures were built in 100-B Area, and two each of these structures were built in the 100-D and 100-F Areas (Figure 2-6). They functioned to hold miscellaneous materials necessary for everyday activities

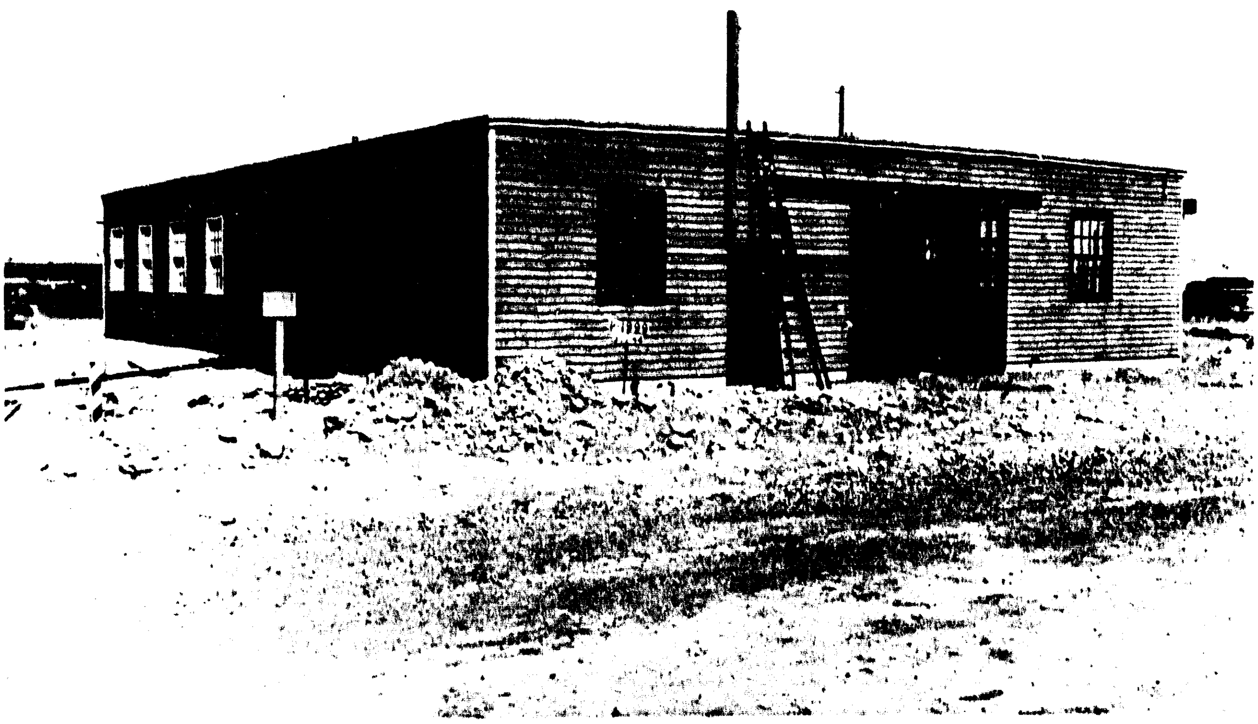

Figure 2-6. The 1713-B Essential Materials Storehouse Under Construction, March 1944.

in the 100 Areas, including janitorial supplies and small chemical stores used for nonprocess activities. Each storeroom also contained two gasoline tanks, an oil tank, and a safe. Appendix A contains a physical description of the 1713 Buildings. (Note: In the 100-B Area, one of the 1713 Structures was converted from the TC Division Engineer's Office.)

Essential Materials Storehouses (1713-A Structures):

One such structure was built in each of the 100 Areas. Converted from TC Receiving and Warehouse Buildings, each was much larger than the 1713 Storerooms and functioned to receive and store large equipment pieces and parts. The 1713-A Structures each consisted of several large bays that served as tool rooms (2), miscellaneous storage areas (4), receiving areas (3), equipment storage areas (4), and offices. A railroad spur and loading dock ran the length of each 1713-A Building. Appendix A contains a physical description of the 1713-A Buildings.

Oil and Paint Storage Buildings (1715 Structures):

One of these structures was built in each 100 Area. They functioned to hold the paint and oil supplies needed for maintenance in the 100 Areas. Appendix A contains a physical description of the 1715 Structures.

Automotive Repair Shops (1716 Buildings):

One of these structures was built in each 100 Area. They functioned to house vehicle servicing and repair bays for the many vehicles needed in everyday activities in the 100 Areas. The 1716-F Structure was slightly larger than the 1716-B and 1716-D buildings, in that an additional office of 80 ft^2 was attached to it. Appendix A contains a physical description of the 1716 Structures.

Combined Shops (1717 Structures):

One of these structures was built in each 100 Area. Each contained a machine shop, a carpenter shop, a pipe shop, and sheet metal shop, an electric shop, a forge shop, a tool room, six offices, and a rest room. These structures functioned to house the repair and fabrication facilities for everyday (nonproject size) repairs needed in 100 Areas operations. Appendix A contains a physical description of the 1717 Structures.

First Aid Buildings (1719 Structures):

One of these structures was built in each 100 Area. Each contained a first aid room with emergency treatment supplies, a cot room, office, laboratory, supply closets, and rest rooms. They functioned to provide immediate care for injuries received by 100 Areas personnel. Appendix A contains a physical description of the 1719 Buildings.

Patrol Headquarters (1720 Buildings):

One of these was built in each 100 Area (Figure 2-7). Each contained a locker room, assembly room, two offices, shower room, wash room, telephone

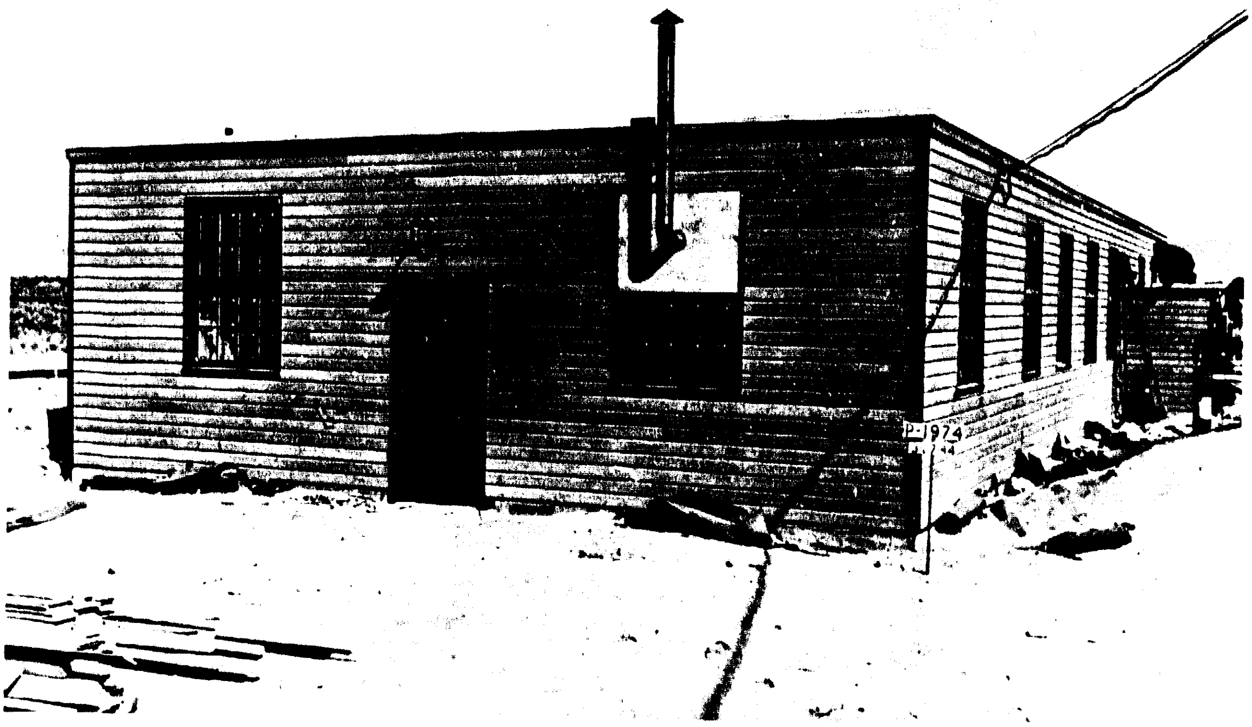

Figure 2-7. The 1720-D Patrol Building
Under Construction, March 1944.

room, rest rooms, and a hot water heater room. They functioned to house the patrol personnel who guarded the 100 Areas. Appendix A contains a physical description of the 1720 Structures.

Area Shops (1722 Buildings):

Two of each of these structures were built in the 100-B and 100-D Areas, and one such structure was built in the 100-F Area. Each of these buildings was 1/10 the size of each 1717 Combined Shop Building. Each contained a rigger's loft and a paint storage room. They functioned to provide auxiliary capability for small repair jobs on 100 Area equipment and parts. Appendix A contains a physical description of the 1722 Buildings. (Note: One 1722 Building was converted from the TC Electrical Shop in the 100-B Area, and one was converted from the TC Millwright Shop in the 100-D Area.)

Extra Machinery Storage Buildings (1729 Structures):

One each of these structures was built in the 100-B and 100-D Areas. None were built in the 100-F Area. They functioned as storage sheds for extra machinery. The 1729 Structures were 40 ft by 180 ft and 11 ft tall, with a total area of 7,200 ft^2. They were of wood frame, post and girder construction, with shed roofs. (Note: In each of the 100-B and 100-D Areas, the 1729 Building was converted from the TC Pipe Storage Warehouse.)

Gas Cylinder Storage Buildings (1734 Structures):

One of these structures was built in each 100 Area. Each of these buildings contained four storage areas lined with wooden storage racks curved to fit the shapes of gas storage cylinders. The four storage areas were allocated to provide one area for "live" (unused) oxygen storage, one for live hydrogen and acetylene storage, and two for "dead" (used or empty) cylinder storage. The side walls of these buildings were open at the top and the bottom. Appendix A contains a physical description of the 1734 Structures.

Training Headquarters (1735 Building):

Only one of these structures was built in the 100 Areas, in the 100-D Area. Its function was to provide a training center for 100 Areas personnel to receive instruction in safety, reactor operations, company policies, and other required training course work. It was the same size and configuration as the 1713 Structures and was converted from the TC Division Engineer's Office.

FACILITIES

Primary Substations (151 Structures):

One of these structures existed in each 100 Area (Figure 2-8).

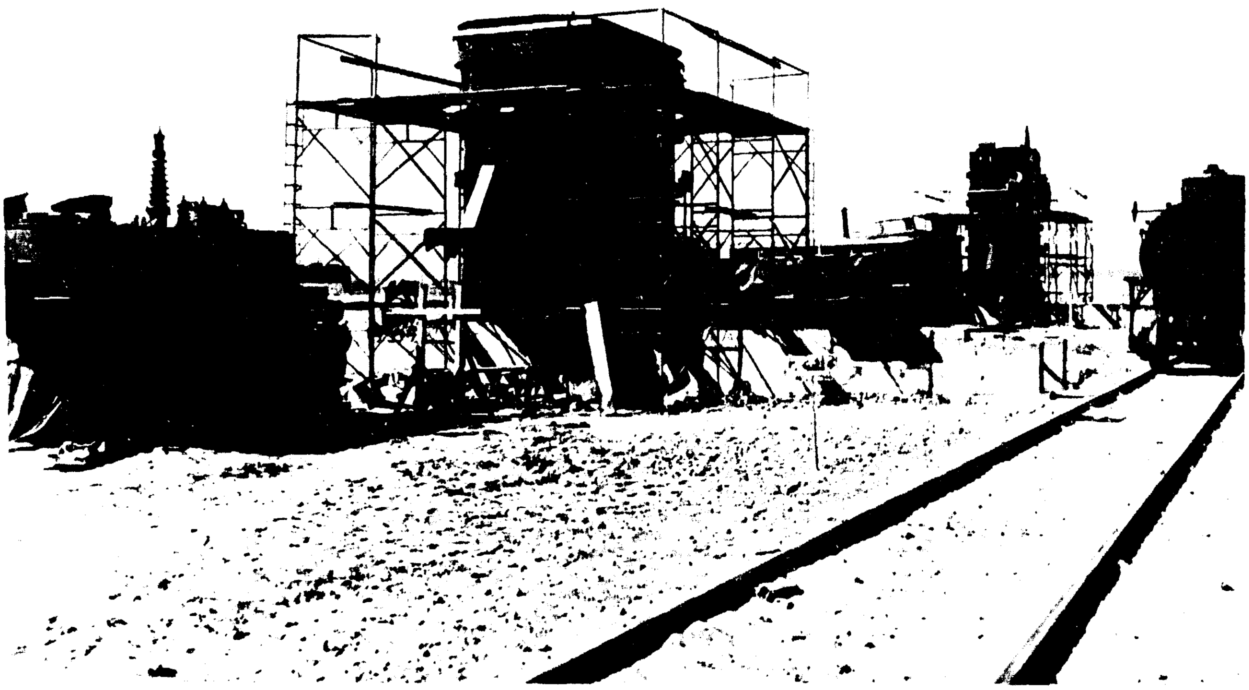

Figure 2-8. The 151-F Primary Substation Under Construction, March 1944.

Electrical power for the 100 Areas came from the Grand Coulee Dam-to-Bonneville Dam grid, via Midway Substation and the 151 Primary Substations. One 20,000 kVa transformer and one 15,000 kVa transformer were located in each 151 Building. The Primary Substations each contained a concrete block switch house, with a switch room, fan room, battery room, rest room, and a cable pit. A fenced area surrounded each block house and contained a wooden frame bus structure, two main transformers, circuit breakers, and terminal structures. Appendix A contains a physical description of the 151 Structures. (Note: The 151-B Primary Substation also supplied power to the nearby 652/653 Substations that distributed power to the Riverland Rail Yard. See Section 6.0.)

Secondary Substations (152 Structures):

Ten of these structures were built in the 100-B Area, 12 in the 100-D Area, and 11 in the 100-F Area. Each was an open, wooden pole structure surrounded by a picket fence and contained transformers at or near ground level, set on concrete pads. They served as a step in the electrical distribution system for the 100 Areas. Appendix A contains a physical description of the 152 Substations.

Distribution Substations (153 Structures):

Eight of these structures were built in the 100-B Area and six each in the 100-D and 100-F Areas. With one exception, each was an open, wooden pole structure surrounded by a picket fence, with the transformers located at or near ground level on concrete pads. The one exception was located next to the 107-B Retention Basin, where the transformers sat on an elevated wooden platform suspended between two poles. The 153 substations served as a step in the electrical distribution system for the 100 Areas. Appendix A contains a physical description of the 153 Structures.

Fence and Road Lighting (1501 Structures):

See Section 5.0 for discussion.

Outside Transmission Lines (Including Wooden Poles and Hardware) (1503 Structures):

See Section 5.0 for discussion.

Fire Alarm Systems (1505 Structures):

See Section 5.0 for discussion.

Telephones and Telephone Cable (1506 Structures):

See Section 5.0 for discussion.

Standard Gauge Railroad Tracks (1601 Structures):

See Section 6.0 for discussion.

(Note: In the 100-D Area 2,000 ft of such track was converted from the TC standard gauge track that had served to haul in construction materials and to haul away construction debris.)

Roads and Walks (1603 Structures):

See Section 6.0 for discussion.

Fences (Including Guard Towers) (1605 Structures):

Eleven guard towers were erected in the 100-B Area, ten in the 100-D Area, and eight in the 100-F Area. See Section 6.0 for discussion.

Underground Septic Tanks (1607 Structures):

Seven of these structures were emplaced in the 100-B Area, and five each were emplaced in the 100-D and 100-F Areas. See Section 6.0 for discussion.

Process Waste Lift Stations (1608 Structures):

One of each of these structures was built in the 100-D and 100-F Areas. None were built in the 100-B Area. Their function was to pump process waste (reactor effluent) from the reactor buildings to the 107 Basins. (The topography of the 100-B Area precluded the need for such a station.) The 1608 Buildings were located adjacent to the 105 Buildings, over the effluent discharge piping. One half of each structure was below ground, and they contained three pumps and a deep sump. Appendix A contains a physical description of the 1608 Structures.

Open Drainage Ditches (1612 Structures):

No such ditches were built in the 100-B and 100-D Areas, but 6,000 ft of open drainage ditching was built in the 100-F Area. Its function was to carry surface water and process water from the 105, 182, 183, 185, and 190 buildings north to the Columbia River by gravity flow. The main, north-flowing ditch was 6 ft wide, and it was intercepted by three narrower, east-west lateral ditches located in the southwest part of the 100-F Area. Reinforced concrete piping was laid in the ditch where it intercepted road and railroad crossings, and such crossings were reinforced with standard concrete and timber headwalls strengthened with stone rip-rap. No further physical description can be found.

Automobile and Bus Parking Areas (1613 Structures):

See Section 6.0 for discussion.

General Monitoring Stations (1614 Structures):

Three of these structures were built in each 100 Area. See Section 6.0 for discussion.

Emergency Gasoline Electric Generator Shelters (1621 Buildings):

Three of these structures were built in each 100 Area. See Section 6.0 for discussion.

Outside Overhead Pipe Supports (1801 Structures):

See Section 5.0 for discussion.

Outside Overhead Steam Lines (1802 Structures):

See Section 5.0 for discussion.

Outside Overhead Air Lines (1803 Structures):

See Section 5.0 for discussion.

Outside Overhead Process Lines (1805 Structures):

See Section 5.0 for discussion.

Outside Underground Water Lines (Including Elevated Storage Tanks) (1901 Structures):

See Section 5.0 for discussion.

Outside Underground Fire Lines (Including Elevated Storage Tanks) (1902 Structures):

See Section 5.0 for discussion.

Outside Underground Sanitary Sewers (1903 Structures):

See Section 5.0 for discussion.

Outside Underground Process Sewers (1904 Structures):

See Section 5.0 for discussion.

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3.0 200 AREAS

The 200 Areas at the HEW were the locations of the chemical separations ("processing") plants and their many ancillary and support facilities. The other important activities that took place in the 200 Areas were the storage of irradiated fuel rods awaiting chemical dissolution and of the finished product (plutonium nitrate paste) awaiting shipment to the MED installation at Los Alamos, New Mexico. The chemical separations plants functioned to dissolve irradiated fuel elements (known as "rods" or "slugs") and then to chemically manipulate the resultant, plutonium-bearing solution so as to separate the desired plutonium (^{239}Pu) from uranium (U) and from fission byproducts formed in the irradiated process. Most of the support buildings operated to supply solvents and other chemicals to the separations facilities, to test separations plant samples, and to supply heat, electricity, protection, first aid, training, and maintenance services to chemical separations activities.

Three 200 Areas were built at HEW during World War II: 200 North, 200 East, and 200 West. (Their designations often were shortened, even in official documents, to 200-N, 200-E, and 220-W.) The 200-N Area, completely different in design and function from the 200-E and 200-W Areas, operated to store the irradiated fuel rods after their removal from the reactors but before chemical processing, to store the finished HEW product before it was shipped to Los Alamos, and to store the empty product storage cans that were returned from Los Alamos awaiting refill. The 200-N Area was the first of the 200 Areas to "operate," in that it began storing irradiated fuel rods from B Reactor in November 1944. This area will be described separately.

The 200-E and 200-W Areas were very similar to each other, although not identical. The 200-W Area was the first to operate, in that T Plant (the 221-T Building, also known as T Canyon) executed the first dissolving of irradiated fuel rods at HEW on December 26-27, 1944. In the 200-East Area, B Plant (221-B Building, also known as B Canyon) began processing irradiated fuel in April 1945. With very few exceptions (which will be noted and described), specific types of buildings, and building numbers within them, were identical and will be grouped together and described only once for both the 200-E and 200-W Areas.

The 200-N Area contained 9 permanent buildings and 14 service facilities (according to MED definitions). The 200-E Area contained 60 permanent buildings and 33 facilities, while the 200-W Area contained 48 permanent buildings and 29 facilities. Five general types of permanent building construction were used in the 200 Areas: reinforced mass concrete construction, structural steel frame and concrete block construction, reinforced concrete frame and concrete block construction, structural steel frame and wood construction, and wood frame construction.

Each of the 200-E and 200-W Areas contained approximately 50 TC (temporary field construction) structures, including the Division Engineer's Office, Government Field Office, Layout Office, Cost Office, Safety Office, Labor and Concrete Office, Paint Office, Earthworks Office, Machine-Millwright and Sheet Metal Shop, Electrical Office and Shop, Transportation Office and Garage, Pipe Office and Shop, Reinforcing Steel Office and Shop, many

Warehouses, and others as needed. These areas also each contained nearly 70 very small, miscellaneous TC buildings, such as warming sheds, privies, guard houses, and others. (See TC-33 through TC-35 Structures in Section 9.0.) In some cases, such structures were converted to permanent buildings near the end of the construction period. For each 200 Area, such occurrences will be noted. The TC roads, walks, fences, water lines, electric lines, telephone lines, sewer and septic systems, and other facilities are listed under other TC number designations.

The 200-N Area comprised four separate fenced areas, totalling approximately 58.6 acres. The westernmost three of these sections (known as N, P, and R Sections) were quite small, totalling about 9.7 acres each. The easternmost section (known as the J-K Section) encompassed part of the southeast end of Gable Mountain and totalled 29.5 acres. Altogether, 2.4 miles of fencing surrounded the 200-N Area sections. The 200-E Area was nearly square, contained 2,115.7 acres, and was surrounded by 9 miles of fencing. The 200-W Area was rectangular, contained 1,901.7 acres, and was surrounded by 9.5 miles of fencing.

PERMANENT BUILDINGS: 200 NORTH AREA

Lag Storage Buildings (212 Structures):

Three of these structures were built in the 200-N Area, one each in the N, P, and R Sections (Figure 3-1). They were designated the 212-N, 212-P, and 212-R Buildings. Their function was to store the irradiated fuel rods that had exited the production reactors and that were awaiting dissolution in the chemical processing facilities of the 200-E and 200-W Areas. The storage of irradiated fuel rods before chemical processing was an important step in the environmental and personnel safety program at HEW, since storage time (also known as "cooling" or decay time) had a direct effect on how much fresh fission products would be released during dissolving. (The longer the cooling time, the more decay or stabilization of radionuclides could occur.) The 212 Buildings each contained a transfer room, where the irradiated fuel rods would arrive and leave in rail cask cars, a storage room (actually a 20-ft, 9-in. water-filled concrete pool), a fan room, and an overhead bridge crane and monorail. Appendix B contains a physical description of the 212 Buildings.

Magazine Storage Building (213 Structure):

One such structure was built in the 200-N Area (Figure 3-2). It was an earth-covered bunker located in the easternmost section of the 200-N Area in the southeast end of Gable Mountain. It was divided into two parallel vault sections (designated the 213-J and 213-K Vaults). The function of the 213 Structure was to store the product (purified plutonium nitrate paste) in containers that held 1 kg each. Ammunition for HEW protection also was stored in the building, which contained a loading platform, magazine room, vestibule, and instrument room in each vault section. The magazine rooms held the ^{239}Pu and were lined with concrete shelving interspersed with concrete brick partitions. Appendix B contains a physical description of the 213 Building.

Gate Houses and Guard Towers (2743 Structures):

Four of these structures were built in the 200-N Area, one in each section of the area. Their function was to guard the contents of the

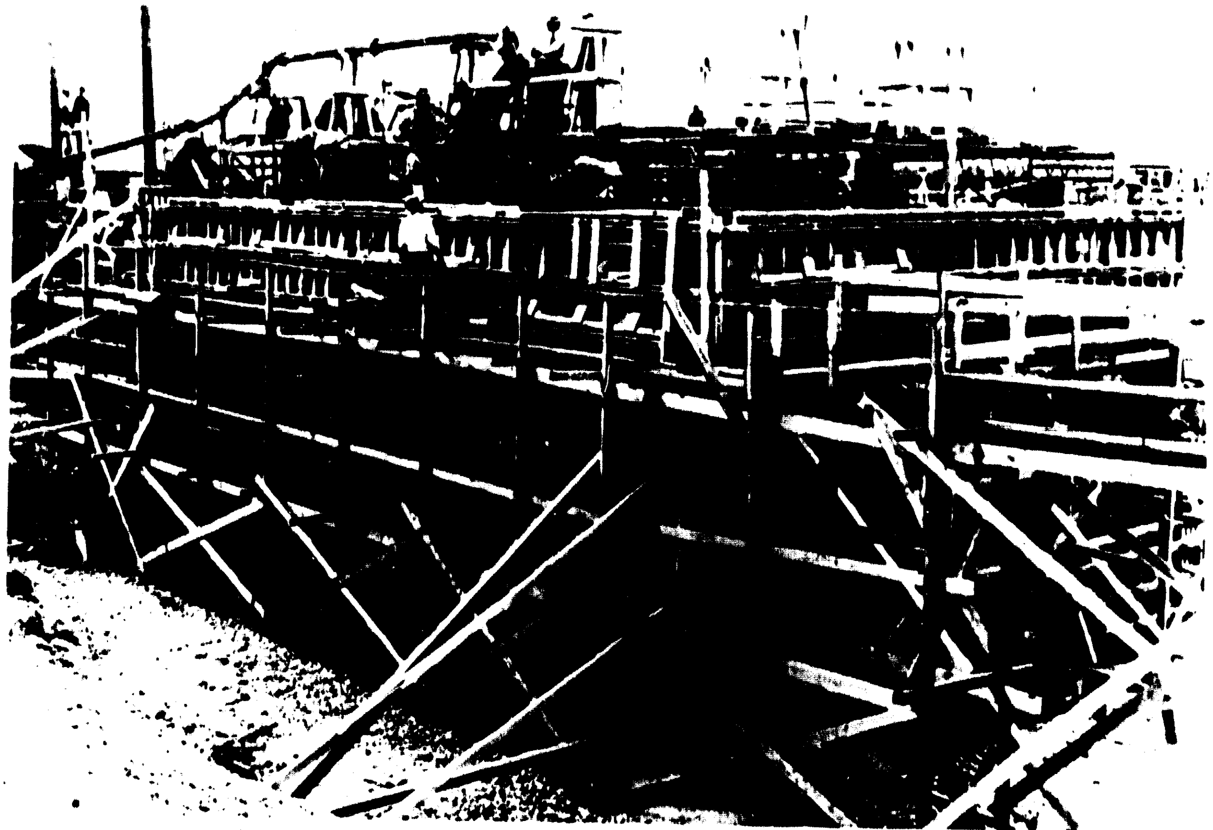

Figure 3-1. The 212-N Lag Storage Building Under Construction, April 1944.

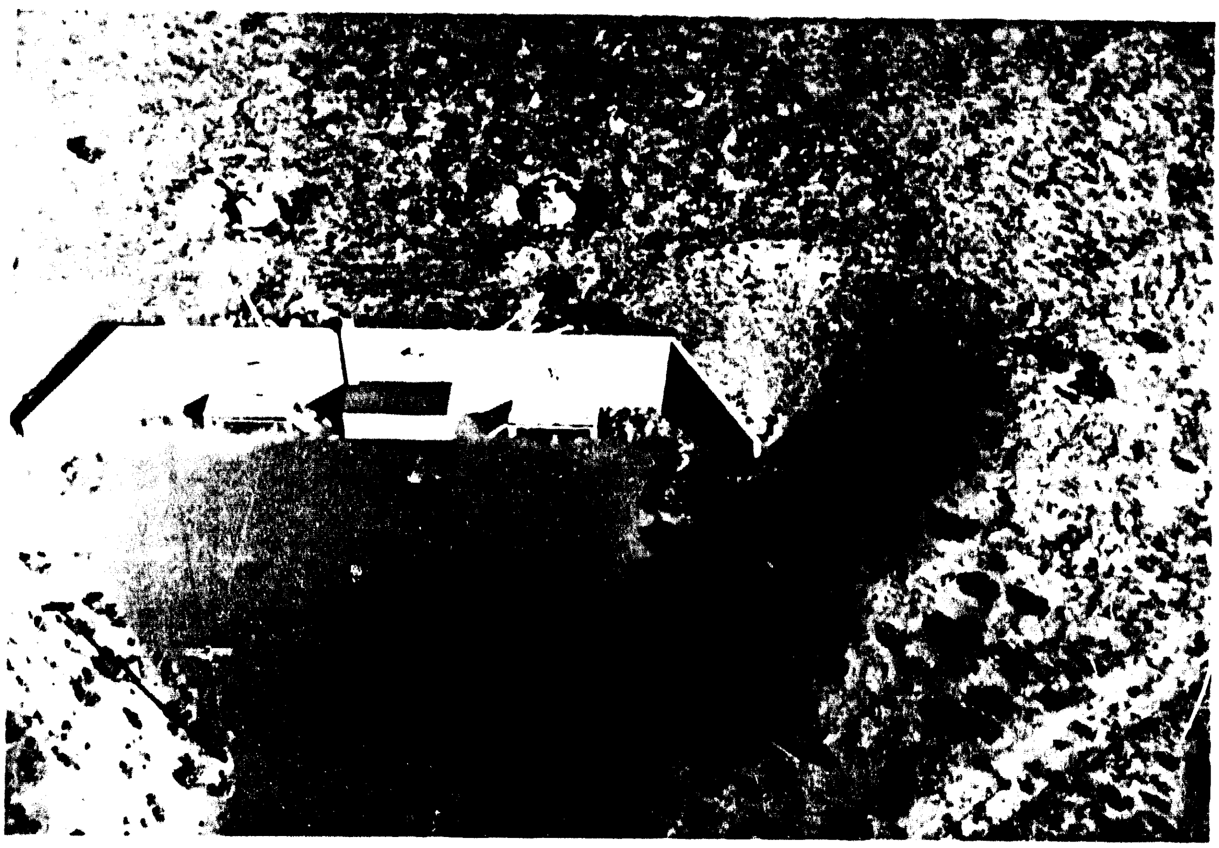

Figure 3-2. The 213 J and K Magazine Storage Vaults, Gable Mountain, World War II.

212 Buildings and the 213 Building against any disturbance. They were very small and simple, containing a rest room on the first floor and a second floor guard tower that was accessed via an outside stairway. Appendix B contains a physical description of the 2743 Buildings.

FACILITIES: 200 NORTH AREA

Primary Substation (251-N Structure):

One of these structures was built in the 200-N Area to serve all of the 200 Areas. Electric power for the 200 Areas came from the Grand Coulee Dam-to-Bonneville Dam grid, via Midway Substation and the 251-N Primary Substation. One 20,000-kVa transformer and one 15,000-kVa transformer were located in the 251 Building. The Primary Substation contained a concrete block switch house, with a switch room, fan room, battery room, rest room, and a cable pit. A fenced area surrounded the block house and contained a wooden frame bus structure, two main transformers, circuit breakers, and terminal structures. Appendix B contains a physical description of the 251-N Structure.

Secondary Substation (252-N Structure):

One of these structures was located just east of the 212-R Building to serve the entire 200-N Area. It was much smaller than the secondary substations built to serve the 200-E and 200-W Areas. It served as a step in the electrical distribution system for the 200-N Area. It consisted of a four-pole, wooden frame structure with the lower portion supporting a bus over a transformer and the upper portion supporting four pole-type oil circuit breakers, disconnect switches, lightning arresters, fuse mountings, etc., (one for each section of the 200-N Area). The entire structure sat on a concrete pad and was surrounded by a picket fence. Appendix B contains a physical description of the 252-N Secondary Substation.

Distribution Substations (253-N Structures):

Four of these structures were built in the 200-N Area, one for each section of the area. They served as a step in the electrical distribution system for the 200-N Area. All of them were of open-frame construction with a wooden pole surrounded by a picket fence. The 253-N structures that served the 212-N, 212-P, and 212-R facilities all were ground installations with the transformers resting on concrete pads. The 253-N structure that served the 213 Building was an elevated installation with the transformer resting on an elevated wooden platform suspended between two poles. Appendix B contains a physical description of the 253 Structures.

Fence and Road Lighting (2501-N Structures)

See Section 5.0 for discussion.

Outside Transmission Lines (Including Wooden Poles and Hardware) (2503-N Structures):

See Section 5.0 for discussion.

Telephones and Telephone Cable (2506-N Structures):

See Section 5.0 for discussion.

Standard Gauge Railroad Tracks (2601-N Structures):

See Section 6.0 for discussion.

Roads and Walks (2603-N Structures):

See Section 6.0 for discussion.

Fences (Including Guard Towers) (2605-N Structures):

See Section 6.0 for discussion.

(Note: Standard guard towers that were part of the fencing were erected in three of the Sections of the 200-N Area [the 212-N, 212-P, and 212-R Sections] in addition to the special 2743 Gate House and Guard Tower Structures.)

Septic Tanks (2607 Structures):

Three of these structures were emplaced in the 200-N Area, one to serve each of the 212-N, 212-P, and 212-R Sections. See Section 6.0 for discussion.

Open Drainage Ditches (2612-N Structures):

Each of the 212-N, 212-P, and 212-R Sections of the 200-N Area were provided with such a ditch, each 30 in. wide and just over 500 ft long. They flowed southeastward, with their end points connecting to the 212 Building process overflow sewers via reinforced concrete piping. Their purpose was to drain surface water from those sections of the 200-N Area. No further physical description can be found.

Automobile and Bus Parking Areas (2613-N Structures):

See Section 6.0 for discussion.

General Monitoring Station (2614-N Structure):

One such structure was built to serve the 200-N Area. See Section 6.0 for discussion.

Outside Underground Water Lines (Including Elevated Storage Tanks) (2901-N Structures):

See Section 5.0 for discussion.

Outside Underground Sanitary Sewers (2903-N Structures):

See Section 5.0 for discussion.

Outside Underground Process Sewers (2904-N Structures):

See Section 5.0 for discussion.

Wells and Pump Houses (2905-N Structures):

Two such structures were built in the 200-N Area, both in the 212-R Section. Their function was to house deep well pumping equipment to supply the water-filled pools in the three 212 Buildings. Appendix B contains a physical description of the 2905-N Structures.

PERMANENT BUILDINGS: 200 EAST AND 200 WEST AREAS

The key buildings in the 200-E and 200-W Areas were the Cell Buildings (221 Structures), the Bulk Reduction Buildings (224 Structures), and the Concentration Building (231 Structure, also known as the Isolation Building). In these buildings the actual chemical separation of plutonium from the unconverted uranium and attendant fission products took place. All other buildings and facilities in the 200-E and 200-W Areas served to support these structures.

The MED at HEW used a bismuth-phosphate (BiPO4) chemical separations process. This was a batch, precipitation process that achieved separation by varying the valent state of the ^{239}Pu and then by repeatedly dissolving and centrifuging plutonium-bearing solutions. It was based on the principle that bismuth phosphate is similar in crystal structure to plutonium phosphate. By precipitating bismuth phosphate, the ^{239}Pu in the +4 (tetravalent) state could be carried with it. In the +6 valent state (hexavalent), the ^{239}Pu would not carry with the bismuth phosphate, and a byproduct precipitation could be achieved. The plutonium was reduced (taken to the tetravalent state) by adding oxalic acid or ferrous ions and oxidized (taken to the hexavalent state) by adding sodium bismuthate (when bismuth phosphate was the carrier) or sodium dichromate or potassium permanganate (when lanthanum fluoride was the carrier).

Cell Buildings (221 Structures):

Four of these structures were planned at HEW, but only three were constructed. One, the 221-B Building, was built in the 200-E Area, and two, the 221-T and 221-U buildings, were built in the 200-W Area. The fourth such structure, the 221-C, was canceled in November 1943, when MED planners realized that it would not be needed. However, some of its ancillary and support structures were completed.

The function of the 221 Buildings was to carry out the first several steps in the separations process. These steps were as follows:

1. Dissolving

-The aluminum-silicon jackets of the irradiated uranium fuel rods first were dissolved in boiling sodium hydroxide, to which sodium nitrate slowly was added (to reduce the formation of hydrogen).

-The fuel elements themselves then were dissolved in nitric acid. Operators performed this step three times (i.e., three batches of nitric acid dissolved one batch of fuel rods).

2. Extraction

-This step separated the product (^{239}Pu) from most of the uranium. It also removed about 90% of the fission products and reduced the gamma radiation activity level in the dissolved metal solution by a factor of 10.
-The plutonium was kept in the +4 (reduced) valent state at this point. Bismuth nitrate and phosphoric acid were added to the tank, causing the formation of BiPO4, which precipitated, carrying the plutonium with it ("product precipitation"). Centrifuging then separated the solids from the liquid. The precipitate cake (containing plutonium) was placed in another tank. The liquid waste was jetted to single-shell, high-level waste tanks (see 241 Structures). The cake was then dissolved in nitric acid. Sodium bismuthate, sodium dichromate, or potassium permanganate was added to oxidize the plutonium to the +6 state. This step caused the BiPO4 to precipitate ("byproduct precipitation"), leaving the plutonium in solution.

3. Decontamination

This step essentially repeated the extraction step, but was called decontamination because it reduced the gamma activity level by a factor of 10,000 from that in the previous dissolved metal solution, giving an overall process "decontamination factor" of 100,000 below that of the original solution.

The three Cell Buildings (Figures 3-3 through 3-6) that were constructed at HEW were identical to each other, with the exception of the fact that T Plant contained a special 65-ft addition at the "head end" (southwest end). This addition consisted of two double-size equipment cells and continuations of the three galleries and crane rails, and it functioned as a "hot semi-works laboratory" (pilot-scale laboratory that worked with "hot" [irradiated] materials) to study, evaluate, and improve the various steps in the BiPO4 process. The head end addition was separated from the main portion of T Plant by a 7-ft-thick concrete barrier wall, and it contained 14 process vessels, each scaled down to 5% the size of the main plant equipment.

The rest of T Plant and the entire lengths of B Plant and U Plant contained 40 concrete process cells, arranged in 20 pairs (called sections) along the lengths of the buildings. Each section was 40 ft long, and each individual cell was approximately 13 ft by 17 ft, 8 in. by 22 ft high, with 7-ft-thick concrete walls and a 6-ft-thick cover. The exception to this size limitation in each building was Cell 3, which was designed to provide a 23-ft cell with adequate shielding to house the railroad tunnel into the buildings.

The cover of each cell consisted of removable sections with stepped, interlocked edges to prevent the escape of radiation. Twelve of the 20 sections in each building contained a standard grouping of process equipment that consisted of four pieces: a precipitator, a catch tank, a centrifuge, and a solution tank. (These were Sections 6, 7, 8, 9, 10, 13, 14, 15, 16, 17, 18, and 19.) All pipe, instrument, sampling, and control lines into the cells

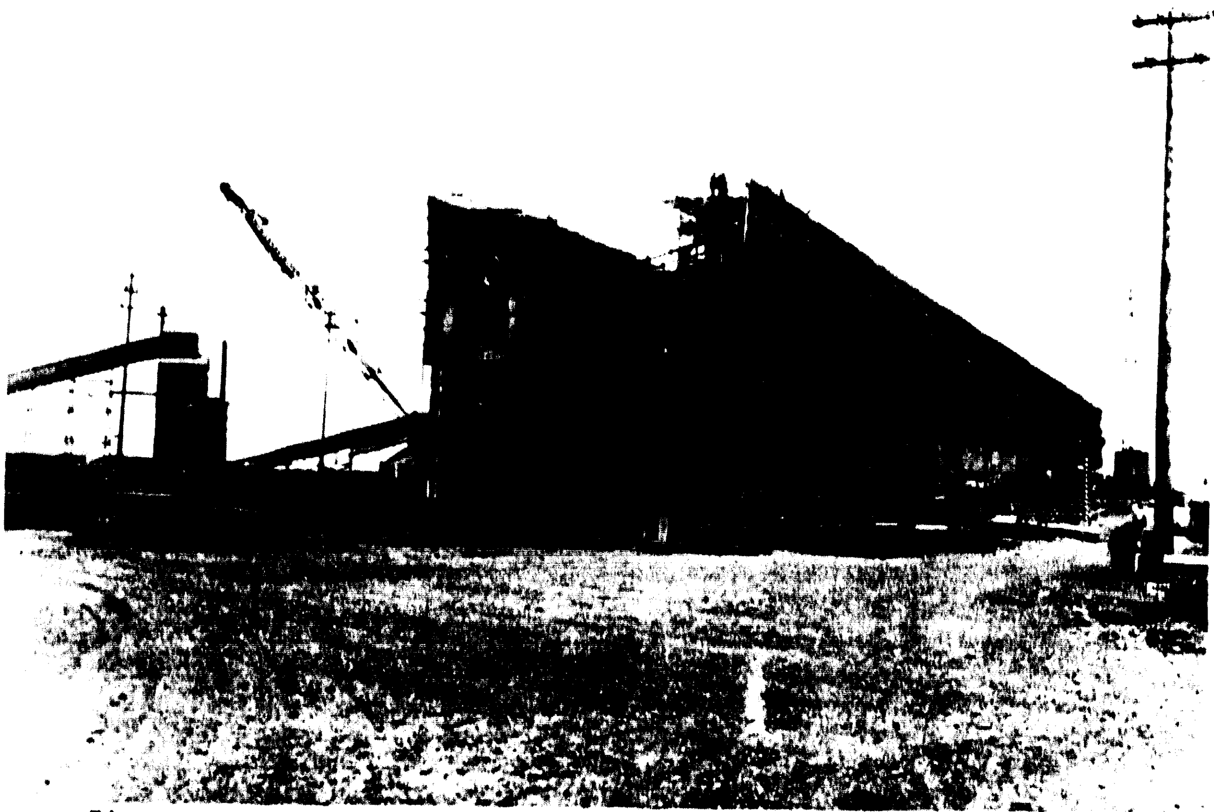

Figure 3-3. The 221-T Cell Building, Also Known as T Plant or T Canyon, Under Construction, Early 1944.

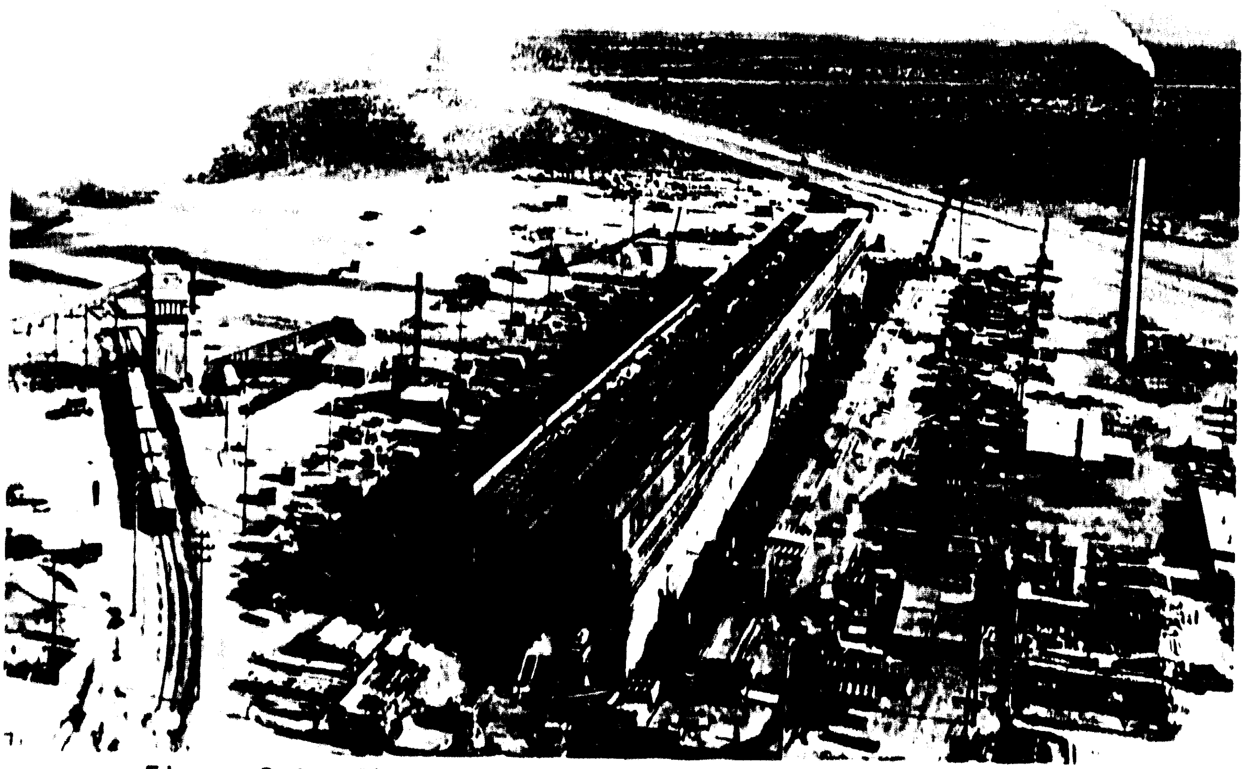

Figure 3-4. The 221-T Cell Building and 291-T Stack Under Construction, April 1944.
(The white discharge coming from the 291-T Stack was sulfur dioxide, a "fogging" agent used in early meteorological testing at HEW.)

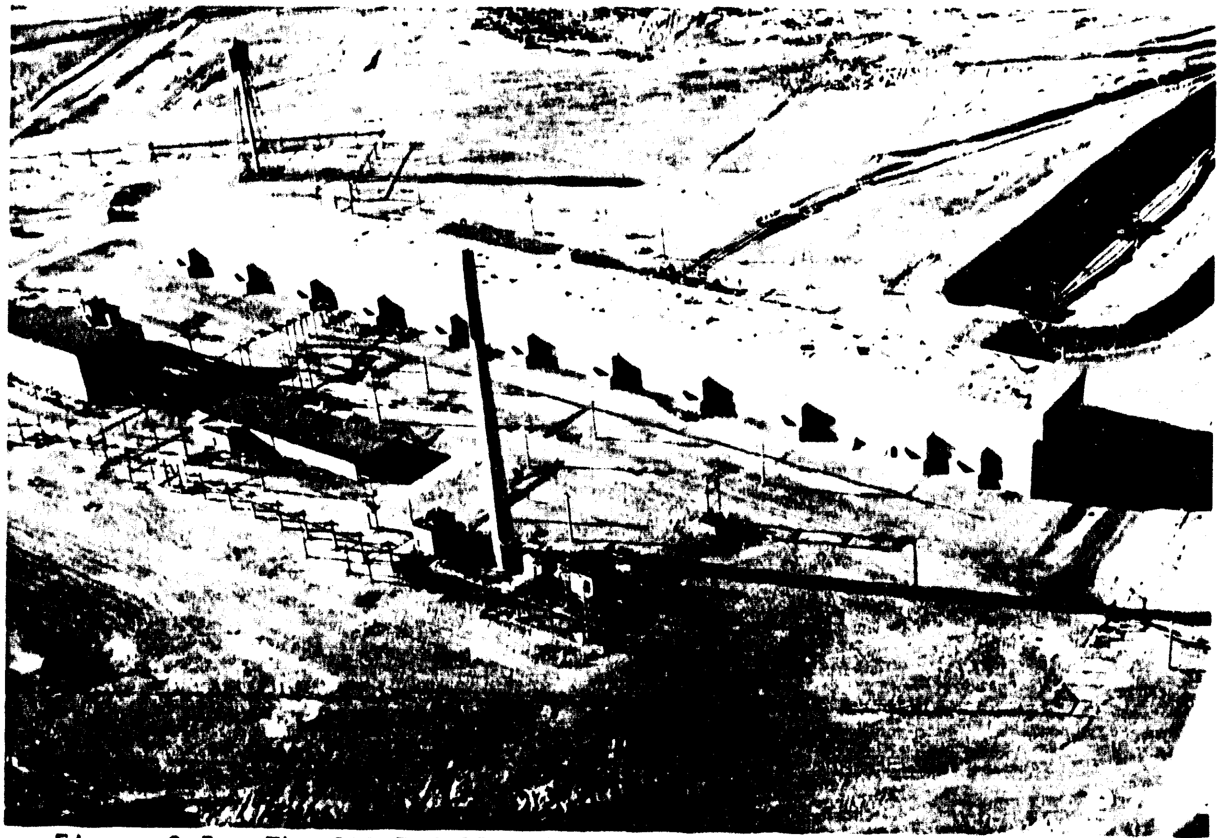

Figure 3-5. The 221-T Cell Buildings, the 222-T Sample Preparation Laboratory, the 291-T Exhauster Building and Stack, and the 292-T Exhaust Gas Laboratory, New in Early 1945. (The 225-T Bulk Reduction Building is partially visible at the far left.)

Figure 3-6. The Beginnings of the 221-B Cell Building (B Plant) in April 1944. (The plant began the chemical processing of irradiated fuel rods one year later in April 1945.)

were buried in the concrete and terminated in standardized connector flanges on the cell walls. Each of the electrical lines contained six leads. The other instrument, hydraulic, and lubrication lines contained four small pipes. The chemical feed, steam, and water lines consisted of single 2-in. or 3-in. pipe. To minimize the escape of radiation into the pipe gallery, an S-curve was built into the piping as it ran from the cells to the gallery. Within each section of the Cell Buildings, process lines between cells were run directly through cell walls. However, no piping pierced the walls between sections. An operating gallery and an electrical gallery also ran the full length of each Cell Building.

The original uses and designations for the 221 Building sections and cells are as follows.

Head-End Addition (Cells A and B, T Plant only): Originally used as the radiochemical process improvement semiworks for HEW. Later modified for other uses.

Section 1 (Cells 1 and 2): Storage of contaminated, discarded equipment.

Section 2 (Cell 3): Railroad tunnel for bringing in irradiated metal.

Section 2 (Cell 4): Storage of slugs with ruptured jackets. (Note: This cell was kept filled with water.)

Section 3 (Cells 5 and 6): Coating removal, metal dissolving and reduction.

Section 4 (Cell 7): Coating removal, metal dissolving and reduction.

Section 4 (Cell 8): Metal solution storage.

Section 5 (Cell 9): Sewage disposal, holding tanks.

Section 5 (Cell 10): Sewage disposal, sewer cell.

Section 6 (Cells 11 and 12): Spare. Sometimes used for a byproduct precipitation before extraction.

Section 7 (Cells 13 and 14): Extraction (spare).

Section 8 (Cells 15 and 16): Extraction.

Section 9 (Cells 17 and 18): Treatment of waste metal solution.

Section 10 (Cells 19 and 20): Treatment of waste metal solution (spare).

Section 11 (cells 21 and 22): Spare (unequipped).

Section 12 (Cells 23 and 24): Storage and oxidation of metal solution.

Section 13 (Cells 25 and 26): First decontamination cycle, byproduct precipitation.

Section 14 (Cells 27 and 28): First decontamination cycle, product precipitation.

Section 15 (Cells 29 and 30): Treatment of decontamination wastes.

Section 16 (Cells 31 and 32): Second decontamination cycle, byproduct precipitation.

Section 17 (Cells 33 and 34): Second decontamination cycle, product precipitation.

Section 18 (Cells 35 and 36): Third decontamination cycle (spare).

Section 19 (Cells 37 and 38): Third decontamination cycle (spare).

Section 20 (Cells 39 and 40): Spare (unequipped).

The 221 Cell Buildings all were modified considerably after the MED era. Appendix B contains further physical description of the original 221 Buildings.

<u>Bulk Reduction Buildings (224 Structures):</u>

Four of these structures were planned in at HEW, but only three were constructed (Figure 3-7). In the 200-E Area, the 224-B Building was built while the 224-C Building was canceled at the same time as the 221-C Building. In the 200-W Area, the 224-T and 224-U buildings were constructed. The 224-T Building was the first to operate, beginning the last week of December 1944. The function of these structures was to house the chemical separations steps that followed those steps carried out in the 221 Buildings.

The steps executed in the 224 Buildings were as follows:

-The starting batch size received from the 221 Buildings was 330 gal.
-Plutonium solution from the Cell Buildings was oxidized with sodium bismuthate.
-Phosphoric acid was added to produce a byproduct precipitation (with the plutonium still in solution). At this point, HEW operators wanted to get rid of ALL the $BiPO_4$.
-The solution and precipitate were separated by centrifuging.
-Nitric acid was added to dissolve the byproduct cake, and this solution was removed as waste.
-The plutonium was oxidized with potassium permanganate ($KMnO_4$).
-Then hydrogen fluoride and lanthanum salts were added to the plutonium solution (the "crossover" step), producing plutonium lanthanum fluoride. Lanthanum was such a good carrier solution that plutonium could be carried with very little bulk or volume of carrier.
-Impurities were precipitated in a byproduct cake (as the plutonium was oxidized at this point). Fission products were carried with the lanthanum. This byproduct cake contained all the lanthanides (cerium, strontium, lanthanum, etc.) that the $BiPO_4$ could not carry out of the stream.
-The cake was dissolved in nitric acid, neutralized with sodium hydroxide, and sent to tanks for settling.
-Plutonium then was reduced to the +4 state by adding oxalic acid.
-Potassium hydroxide then was added to metathesize the plutonium lanthanum fluoride, forming a solid plutonium lanthanum oxide. (Metathesis is a chemical process to convert a solid to another solid. Plutonium lanthanum

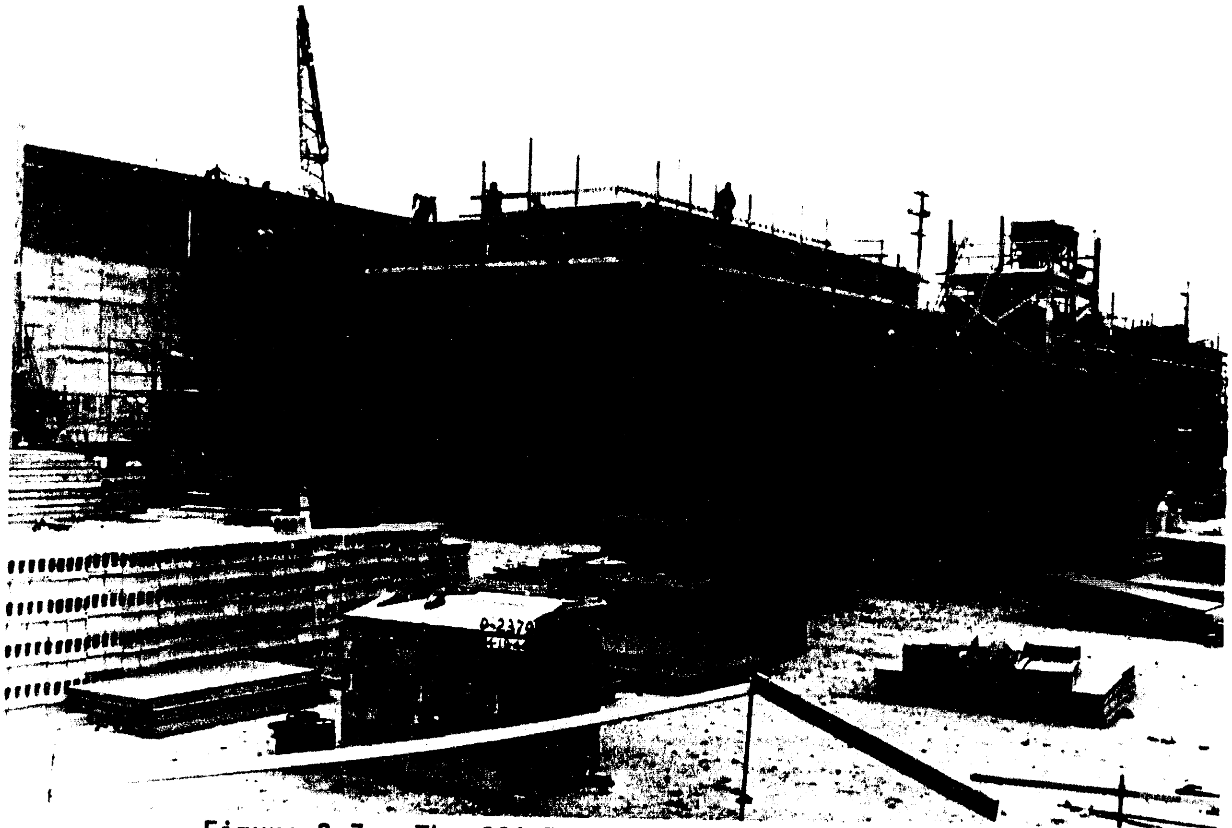

Figure 3-7. The 224-T Bulk Reduction Building Under Construction, April 1944.

fluoride and plutonium lanthanum oxide are both solids. There then was a solid plutonium lanthanum oxide in solution.)
-The liquid was removed by centrifugation (a product precipitation). The solid plutonium lanthanum oxide was then dissolved in nitric acid, making plutonium nitrate (the HEW product).

By this time, each original 330-gal batch of plutonium-bearing solution that had entered the 224 Buildings was concentrated down to 8 gal.

The 224 Bulk Reduction Buildings all were modified considerably after the MED period. Appendix B contains a physical description of the original 224 Buildings.

Concentration Building (Isolation Building) (231 Structure):

Only one such structure was built at HEW in the 200-W Area. It was sometimes called the 231-W Building and sometimes referred to as the 231-Z Building because it housed the last (Z) step in the plutonium production process at HEW. Its function was to complete the chemical separations and plutonium purification process as far as the HEW technology was capable of taking it. A final step (the conversion of plutonium nitrate paste to metallic plutonium) was performed at the MED's Los Alamos installation.

The steps executed in the 231-W Building were as follows:

-Ammonium nitrate was added to the plutonium-bearing solution to reduce the hexavalent plutonium to +4.
-Sulfates and peroxide were added. The plutonium precipitated out as plutonium peroxide.

-Nitric acid then was added to dissolve this precipitate.
-The plutonium nitrate then was placed in small shipping cans and boiled right in these cans, using hot air. It was reduced to a wet nitrate paste. In this form, the plutonium was shipped to Los Alamos.

The 231 Concentration Building was modified considerably after the MED era. Appendix B contains a physical description of the original 231-W Building.

Tank Farms (211 Structures):

Three of these Tank Farms were built at HEW; 211-B facility in the 200-E Area and 221-T and 221-U facilities in the 200-W Area. (221-C Tank Farm was canceled at the same time as were the 221-C and 224-C buildings.) Like the T process group structures overall, the 211-T structure was the first of its kind to operate at HEW. These tank farms functioned to supply fresh chemicals directly to the 221 Buildings, in some cases, and indirectly to the 221 and 224 buildings via the 271 Chemical Preparation and Service Buildings. These tank farms should not be confused with tank farms built to hold waste products (see 241 Structures).

The 211 Tank Farms were located aboveground, at the rear of the 221 Buildings, in the angle between the 271 Buildings and the railroad tunnels that entered the 221 Buildings. Each tank farm consisted of nine vertical storage tanks that held nitric, phosphoric, and formic acids; six horizontal tanks that held nitric acid; three tanks that held 50% caustic solution for neutralizing the acids; one tank that held sulfuric acid; one tank that held anhydrous hydrofluoric acid; and a small expansion tank to prevent rupturing and provide for overflow. Transfer and circulation pumps and coolers completed the equipment in the 211 Tank Farms. The 211-T Tank Farm also contained drum-filling facilities, but the other 211 Tank Farms did not. Appendix B contains a physical description of these facilities.

Process Waste Disposal Trench (216 Facility):

Only one of these facilities originally was constructed in the 200-E Area, and none were constructed in the 200-W Area. It was an open, fence-enclosed, process waste burial trench, whose function was to receive and hold solid buried wastes. It was 16 ft wide at the top, with a V-sloped bottom, 8 ft deep, and 200 ft long. It was located on an east-west axis, beginning approximately 2,600 ft east of the 284-E Power House. Appendix B contains a physical description of the 216-E Waste Disposal Trench.

Sample Preparation Laboratories (222 Buildings):

One of these structures was constructed in the 200-E Area (222-B), and two of these structures were built in the 200-W Area (222-T and 222-U). As with T Canyon and the 224-T Building, the 222-T Laboratory was the first to operate. The function of these laboratories was to test the solutions samples from the 221 and 224 buildings at various steps in the separations process. Because the entire separations process was conducted remotely, the only way to verify that the process was working within specifications was to draw and test samples. The 222 Laboratories were located between the 224 and 292 buildings, paralleling the 221 Buildings. They each contained 22 rooms, including chemical and sample preparation laboratories, a sample measurement room, balance room, instrument repair room, equipment and machinery rooms, receiving room, conference room and offices, rest rooms and locker rooms, and a janitor's closet. Appendix B contains a physical description of the 222 Buildings.

Process Waste Disposal Systems (241 Structures):

Two of these "systems" were built in the 200-E Area (241-B and 241-C), and two more in the 200-W Area (241-T [Figure 3-8] and 241-U [Figure 3-9]). (Note: When the 221-C Building was canceled, its associated process waste disposal system was retained, with the exception of the 241-C-361 settling tank and the 241-C-351 and -352 [Figure 3-10] retention basins.) Each system comprised 16 underground, single-shelled tanks for the storage of high-level wastes, a gunite catch tank (or "sump tank"), a settling tank, four reinforced concrete diversion boxes, two retention basins, and eight observation wells. Like the T process group structures overall, the 241-T structures were the first of their kind to "operate" (receive active wastes) at HEW.

The high-level waste storage tanks in each system were built of reinforced concrete with a 0.25-in. welded steel plate lining. Twelve of these tanks were 75 ft each in diameter and were numbered in series from 241-101 to 241-112. A letter placed between the numbers designated the process group to which the tanks belonged (i.e., 241-T-101 was the first tank in the system that served T Plant). Four of the high-level waste tanks were only 20 ft each in diameter and were designated with numbers from 241-201 through 241-204.

A 20-ft diameter catch tank, numbered 241-301, was located underground in each system, approximately 112 ft away from Tank 241-112. A 20-ft diameter settling tank, numbered 241-361, also was located underground in each system to hold the process wastes from the 224 Building on a short-term basis. In each system, this tank then discharged its contents into a cooling water line that discharged into one of two 500,000-gal retention basins that overflowed into open, earthen drainage ditches. The retention basins were numbered as 214-352 and 241-353. Once again, a letter designated the process system (i.e., 214-T-352 and 241-T-353 were the retention basins serving the 221-T and 224-T buildings and their ancillary structures. Additionally, four underground diversion boxes containing piping, pipe connectors, and water spray nozzles were a part of each process waste disposal system. They functioned to direct the flow of process wastes to the various tanks. Seven of the wells were 150-ft deep, and one was 300 ft deep. Appendix B contains a physical description of the 241 Process Waste Disposal Systems.

Chemical Preparation and Service Buildings (271 Structures):

One such structure was built in the 200-E Area (271-B Building) and two such structures were constructed in the 200-W Area (271-T and 271-U buildings). Although the 271 Buildings were independent structures, each of them was attached to the back wall of the 221-Building that it served at about the midway point (adjacent to Sections 10-13). Like the T process group structures overall, the 271-T Building was the first such structure to operate at HEW. The function of the 271 Structures was to receive, store, mix, and deliver the chemicals used in the 221 Buildings processing operations and to supply compressed air to the 211, 221, 222, 224, 271, and

Figure 3-8. The 241-T Tank Farm For the Storage of High-Level Wastes Under Construction, March 1944.

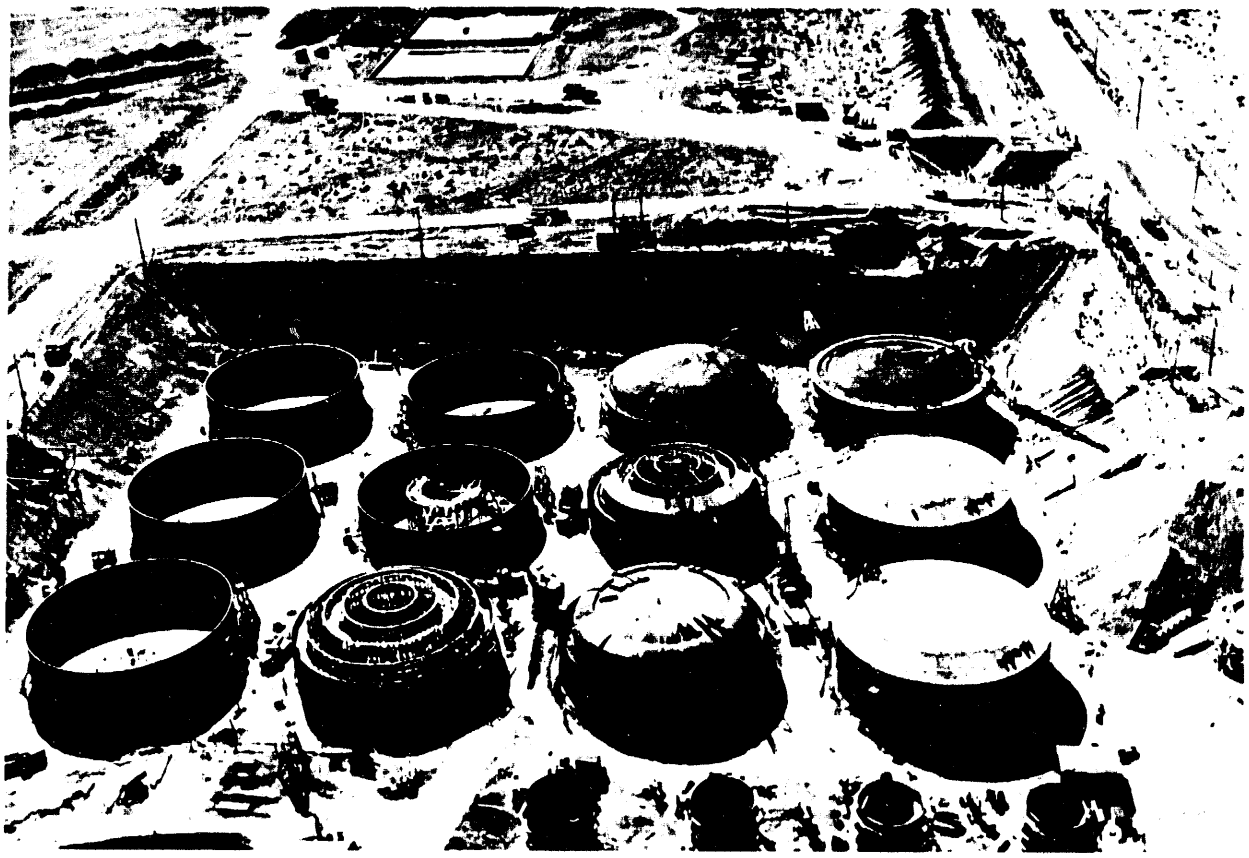

Figure 3-9. Another Original 241-T Tank Farm Under Construction, Mid-1944.

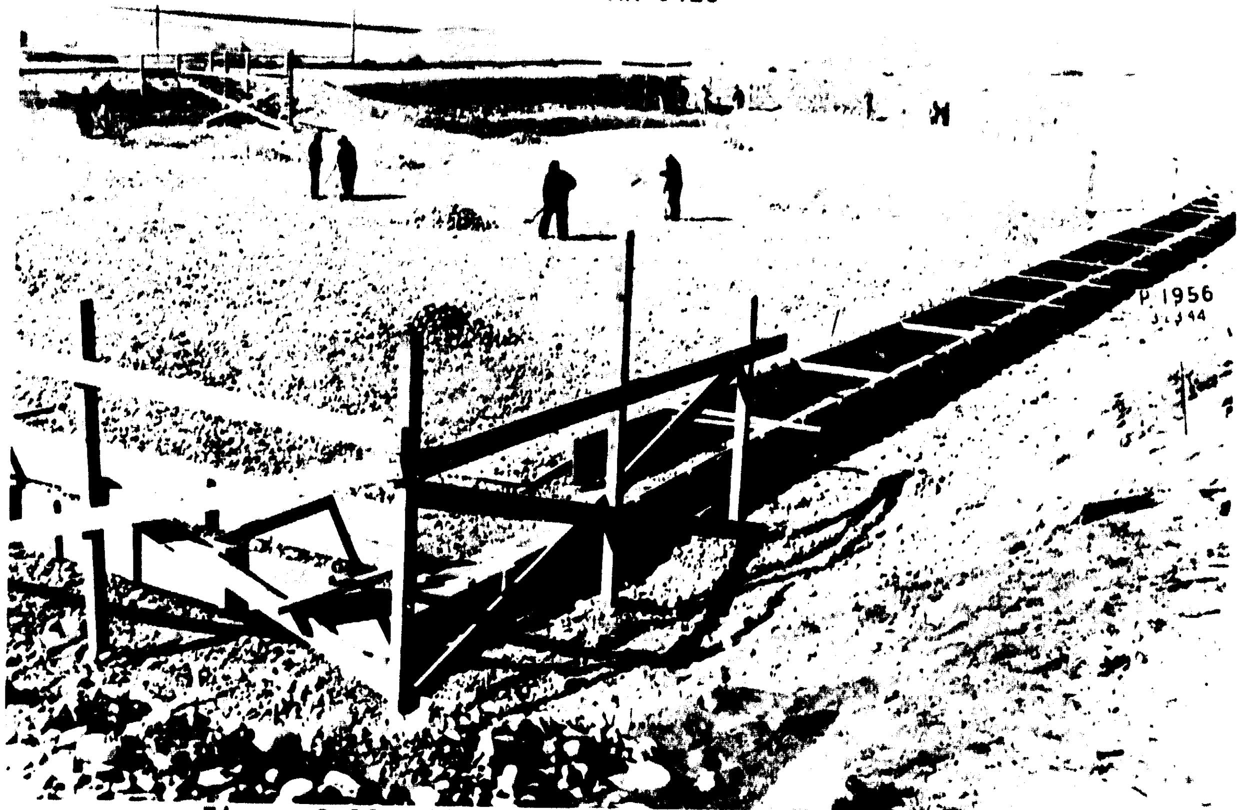

Figure 3-10. The 241-T-352 and 241-T-353 Retention Basins Under Construction, 1944.

291 buildings. The 271 Buildings contained large storage rooms, a compressor room, a large chemical preparation room encompassing nearly the entire third floor, a smaller chemical control laboratory to sample the fresh chemical mixtures before they were used in the process plants, heater rooms, a communications signal and control room, locker and rest rooms, shower room, and doctor's office and medical laboratory, and two labyrinth accessways to the 221 Buildings. A portion of the roof of each building was reinforced to be able to support a 10,000-gal demineralized water tank, in case such a tank became necessary for chemical process operations. Appendix B contains a physical description of the 271 Buildings.

Area Shops (272 Buildings):

One of these structures was built in each of the 200-E and 200-W Areas (Figures 3-11 and 3-12). The specific function of these 272 Shops was to assemble and fit the equipment used in the cells of the 221 Buildings. The two 272 Buildings were different from each other in some ways. Both structures contained a machine shop, electrical shop, pipe shop, forge and welding shop, carpenter shop, tool room with crib, six offices, and a rest room. In addition to these features, the 272-W Shop contained a sheet metal shop and a sand blasting room. The 272-E Shop contained ten working bays, while the 272-W Shop contained only six bays with the remainder of the ground floor a large enclosed space. A high portion of each building also contained three dummy or mock-up cells that were identical to the cells within the 221 Buildings. The south end of 272-E Building and the north end of 272-W Building each were served by a railroad spur that extended the length of the buildings to handle large tanks and heavy equipment. Appendix B contains a physical description of the 272 Buildings.

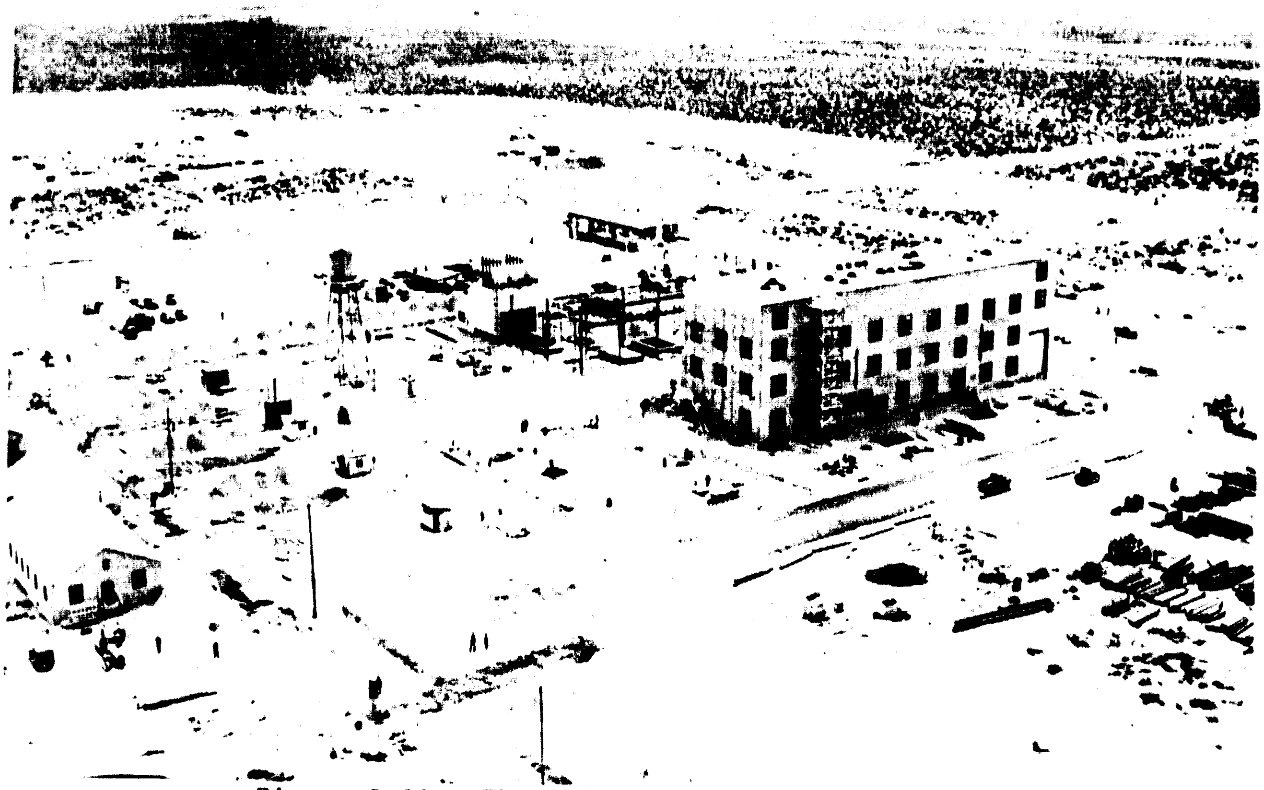

Figure 3-11. The 272-E Area Shop Building Under Construction, Early 1944.

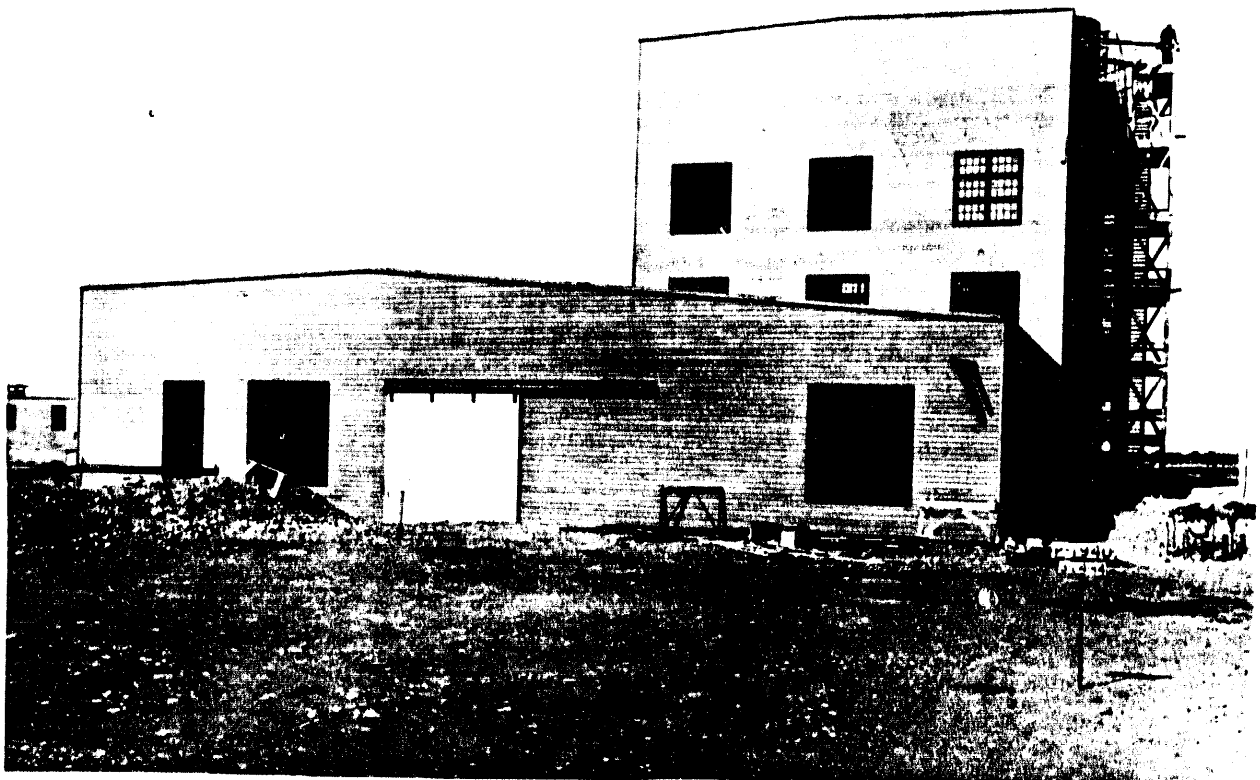

Figure 3-12. The 272-W Area Shop Building Under Construction, March 1944.

Heat Treating Furnace (273 Structure):

Only one of these structures was built in the 200-E Area, and none were built in the 200-W Area. (The 273-E Structure served both the 200-E and 200-W Areas.) Its function was to heat treat and "pickle" (treat with corrosion resistance materials, such as acids) the process equipment being fabricated for the 221 Building cells. The 273-E Structure was located next to the 272-E Building, "connected" to the latter structure by a section of transfer rail track. The 273-E Structure consisted of a heat treating furnace enclosed in a small structural steel building, a water spray quenching station supported by an overhead steel framework, an equipment transfer station, pickling tank and wash area, and four nearby chemical and oil storage tanks. Appendix B contains a physical description of the 273-E Heat Treating Furnace Structure.

Machinery Storehouses (274 Buildings):

One such structure was built in each of the 200-E and 200-W Areas. The function of these buildings simply was to store extra machinery for use in the chemical processing plants and/or their support structures. Appendix B contains a physical description of the 274 Buildings.

Chemical Storehouses (275 Structures):

One such structure was built in each of the 200-E and 200-W Areas (Figure 3-13). The function of these buildings simply was to store extra chemicals for use in the chemical processing plants and/or their support structures. The 275 Buildings were identical to the 274 Buildings. The same physical description contained in Appendix B for the 274 Structures applies to the 275 Buildings.

Reservoir and Pump Houses (282 Structures):

One of these structures was built in each of the 200-E and 200-W Areas (Figure 3-14). The function of the 282 Structures was to furnish raw water to the 283 Filter Plant Buildings, cooling water to the chemical process areas, and an emergency backup water supply to the 284 Power Houses. The 282 Structures each consisted of an open concrete reservoir with a capacity of 3M gal; an inlet house (half belowgrade), which housed the valving and piping that diverted the incoming concrete "export" water line from the 100 Areas to steel pipe lines; a pump house building; and a covered pit next to the pump house for the storage of chlorine cylinders. The pump house consisted of a belowgrade section that housed three raw water, steam, and electrical pumps, and a superstructure portion that housed electrical and chlorination equipment. The 282-E and 282-W Structures were identical except for the fact that in the 282-E Structure the inlet house was on the west side of the reservoir and in the 282-W Structure the alignment was the opposite. Appendix B contains a physical description of the 282 Structures.

Filter Plant Buildings (283 Structures):

One of these structures was built in each of the 200-E and 200-W Areas. The function of the 283 Buildings was to filter all of the 200 Areas water, except that used for process cooling and for the 284 Power Houses.

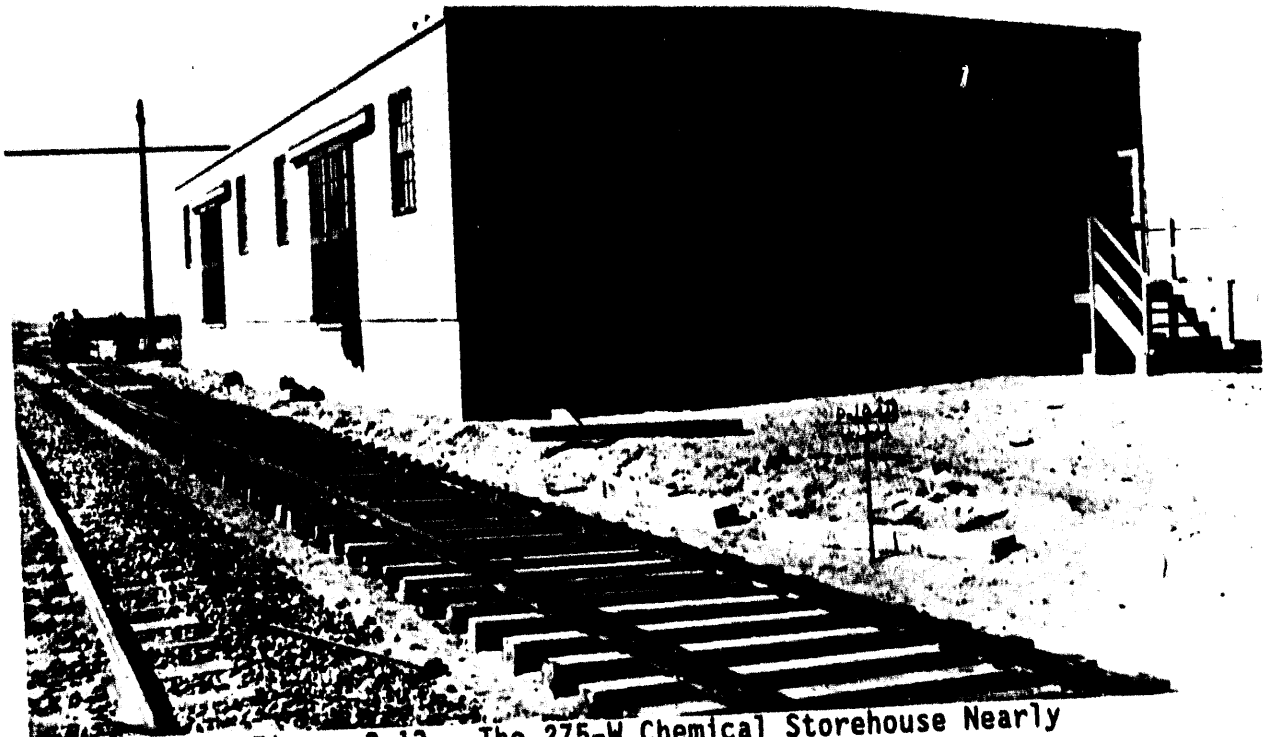

Figure 3-13. The 275-W Chemical Storehouse Nearly Completed, March 1944.

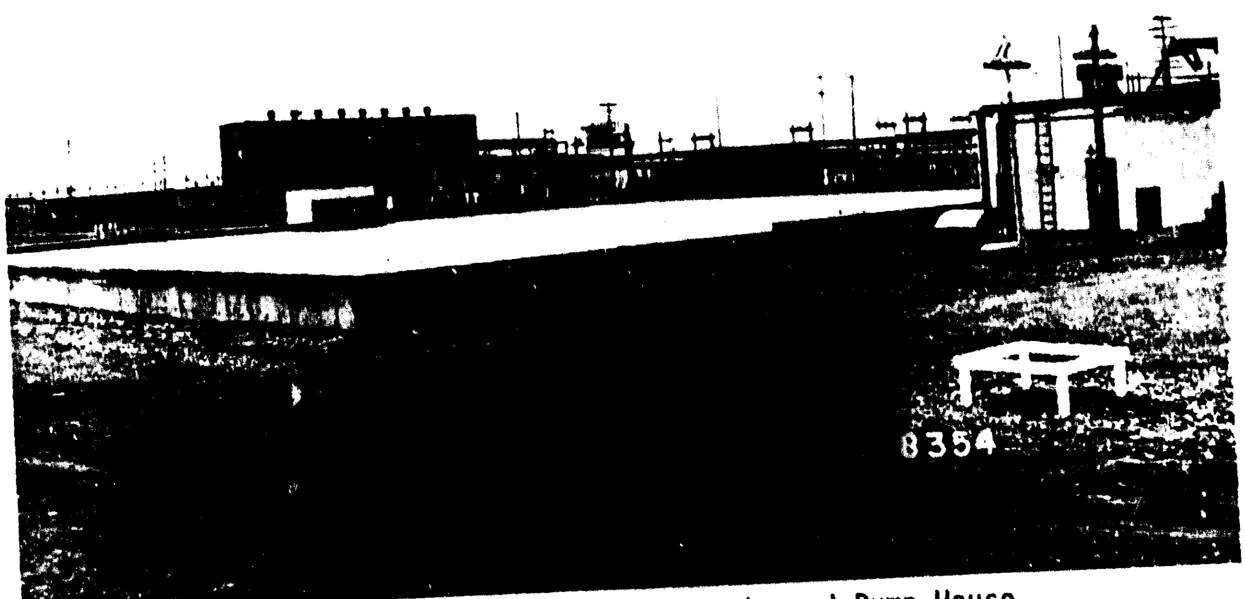

Figure 3-14. The 282-E Reservoir and Pump House Looking Northwest, Late 1944.

The 283 Buildings each consisted of two settling basins with a capacity of 80,000 gal each; a chlorination room; chemical mixing room; chemical storage floor with monorail hoist; alum, lime, and carbon feeders and hoppers; two filters (14 ft by 16 ft each, consisting of gravel, sand, and "anthrafilt"); a pipe gallery; a pump room containing four pumps; a 200,000-gal-capacity "clearwell" reservoir that held the treated water; offices; and rest rooms. Appendix B contains a physical description of the 283 Structures.

Power Houses (284 Buildings):

One such structure was built in each of the 200-E and 200-W Areas (Figure 3-15). Each 284 Building was a steam plant that functioned to supply power to steam turbine pumps for the heating and process needs of 200 Area buildings. Overhead steam lines (2802 Structures) conveyed the steam throughout the 200 Areas. The 284-E Building lay just east of the 283-E Building, and the 284-W Building lay just south of the 283-W Building. The 284 Buildings each had twin, 250-ft-high exhaust stacks, and they contained coal bunkers, water softeners, coal conveyor and handling systems, a salt dissolving pit, a brine pump house, an ash pit below the coal furnace, and a sluicing trench that ran beneath the building and emptied the wet ash into a sump. The 284 Buildings were identical to the 184 Buildings, except that they were smaller (5 ft less in width and 56 ft less in length), and they contained one less boiler each. These structures were modified considerably in power upgrades that occurred after the MED period. Appendix B contains a physical description of the 284 Buildings.

Ash Disposal Basins (288 Structures):

One of these structures was built in each of the 200-E and 200-W Areas. Their function was to receive the furnace ash from the 284 Buildings, which was slurried and pumped to the 288 facilities via underground piping. No physical description of the 288 Structures can be located.

Exhauster Buildings and Stacks (291 Structures):

One of these structures was built in the 200-E Area (291-B Structure) (Figure 3-16) and two such structures were built in the 200-W Area (291-T and 291-U structures). Like the T process group structures overall, the 291-T Structure was the first such HEW structure to operate. The function of the 291 Structures was to exhaust process gases from the 221 Buildings to the atmosphere, along with additional diluting air supplied by fans. The actual stacks were 200 ft high each and were located 187 ft from the head end face of the 221-B and 221-U buildings and 252 ft from the head end face of the 221-T Building. They were connected to the 221 Buildings via underground air ducts, with the connection point located between Cells 5 and 6 (at the midpoint of Section 3) of the 221 Buildings. (This location was chosen because the dissolver offgases from the head-end dissolver cells were the exhaust gases of concern to MED officials and scientists). Another essential part of the 291 Structures consisted of three stainless steel exhaust fans, mounted on concrete foundations adjacent to the inlet and outlet air ducts. These fans were emplaced because the MED believed that additional diluting air would render the dissolver offgases safe for release into the surrounding atmosphere. Other key parts of the 291 Structures were the inlet and outlet

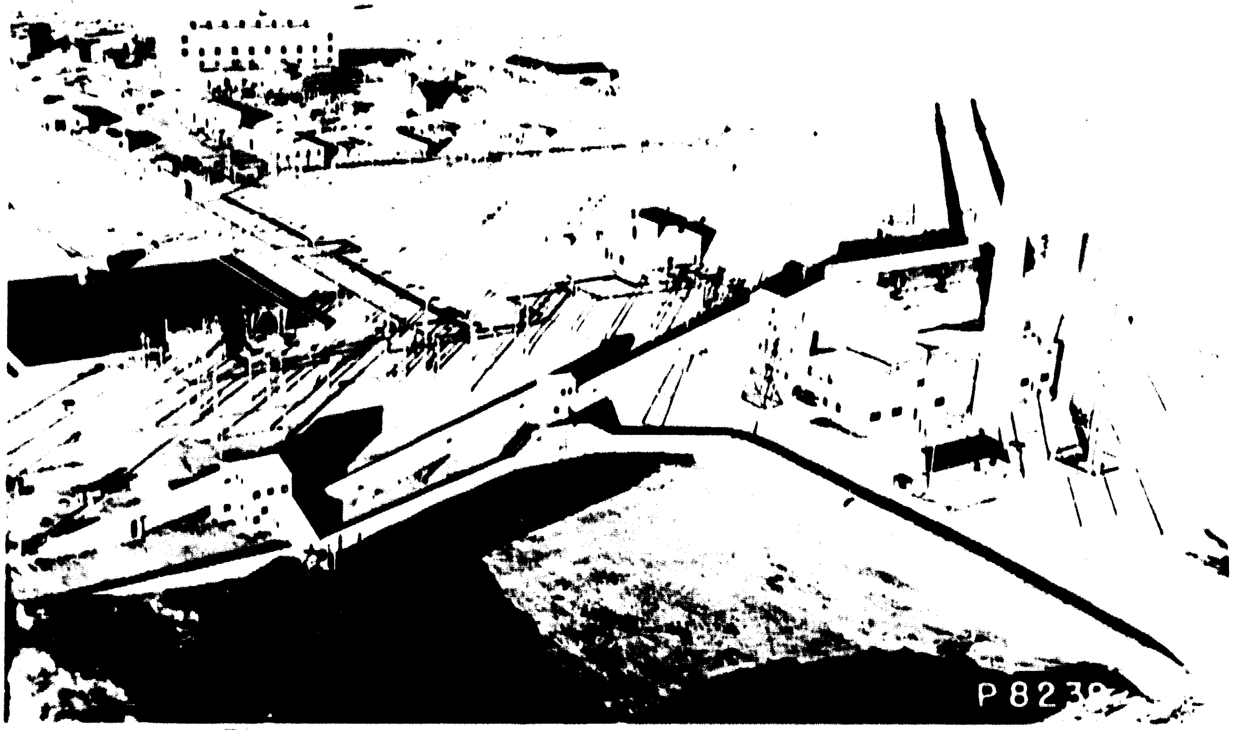

Figure 3-15. The 284-W Power House, New in 1944.

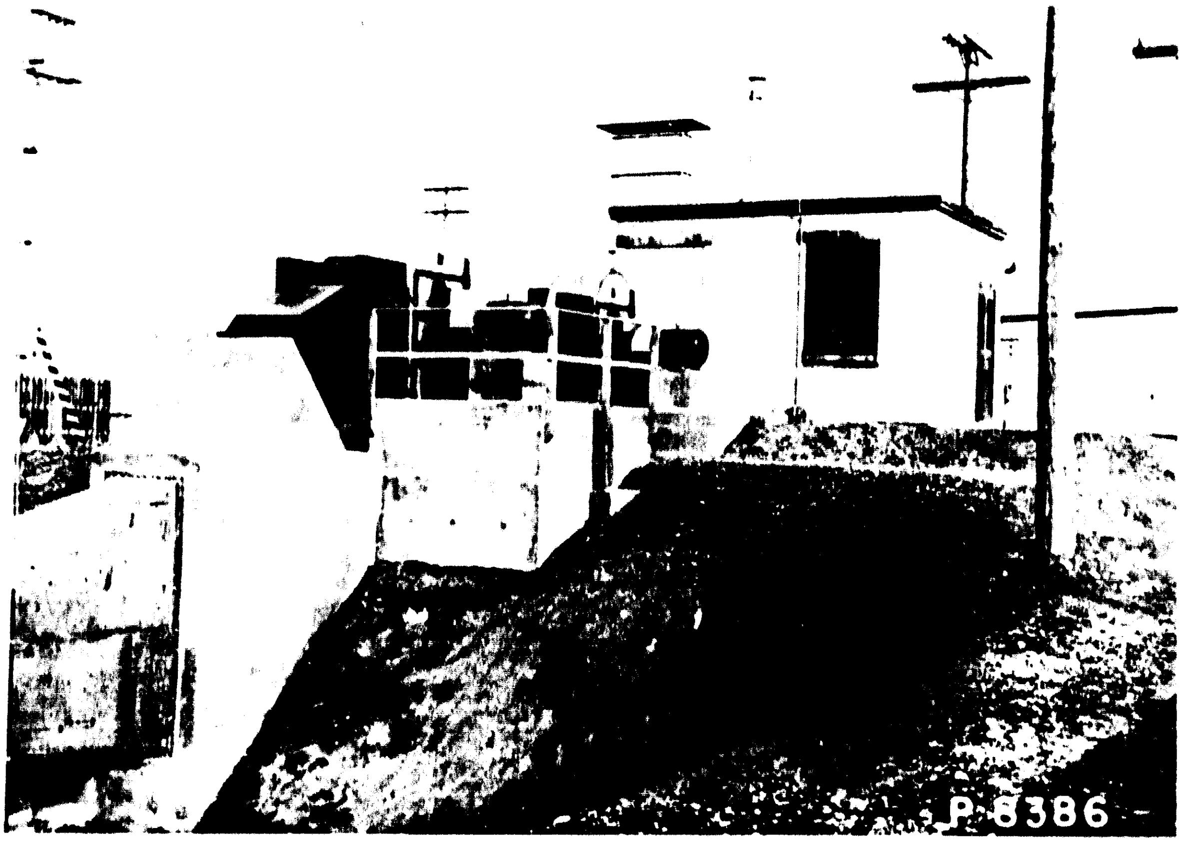

Figure 3-16. Duct Work That Supplied Diluting Air From the 291-B Exhauster Building to the 291-B Stack, Early 1945.

ducts (literally underground passageways between the stacks and the 221 Buildings) and the control houses. The control houses were small concrete buildings that housed the third fan furthermost from each stack, a steam engine, and controls. Appendix B contains a physical description of the 291 Structures.

Exhaust Gas Laboratories (292 Structures):

One such structure was built in the 200-E Area (292-B Building), and two such structures were built in the 200-W Area (292-T and 292-U buildings). Like the T process group structures overall, the 292-T Building was the first such structure to operate at HEW. The function of the 292 Structures was to house equipment to test the 291 exhaust gases for levels of chemical and radioactive contaminants. These buildings were very small and were located approximately 40 ft from the centerline of the 291 Stacks in the direction of the 222 Buildings. They contained no windows; two outside doors; roof ventilators; and various gas refrigeration, blowing, and testing equipment. Appendix B contains a physical description of the 292 Buildings.

Gate Houses and Clock Alleys (2701 Structures):

One such structure was built in each of the 200-E and 200-W Areas. Their function and physical description were identical to those of the 1701 Structures. (See 1701 Structures in Section 2.0.)

Gate House Building (2701-WA Building):

Only one such structure was built at HEW in the 200-W Area. Its specific function was to guard the access gate to the 231 Building enclosure. Appendix B contains a physical description of the tiny 2701-WA Building.

Supervisors' Office Buildings (2704 Structures):

One such structure was built in each of the 200-E and 200-W Areas. The function of each of the 2704 Buildings was to house offices for various area supervisors. The 2704 Buildings were smaller than the 1704 Structures in that they did not include any laboratory facilities. They each consisted of 27 rooms, including two rest rooms, the area telephone exchange room (housing the telephone switchboard), a janitor's closet, and several offices. Appendix B contains a physical description of the 2704 Buildings.

Change Houses for Service Areas (2707 Buildings):

One such structure was built in each of the 200-E and 200-W Areas. The function of each of the 2707 Buildings was to provide clothes-changing facilities for personnel working in the chemical processing areas and the support buildings (excluding the Power Houses). Each 2707 Building contained a large locker room, lunchroom, wash room, shower room, rest room, and heater room. Appendix B contains a physical description of the 2707 Buildings.

Change Houses for Power Areas (2707-A Buildings):

One such structure was built in each of the 200-E and 200-W Areas. Located adjacent to the 284-E and 284-W buildings, the function of the 2707-EA and 2707-WA buildings was to provide clothes changing facilities for personnel working in the Power Houses. These facilities were much smaller than the 2707 Buildings and consisted of five rooms each: a small locker room, lunchroom, rest room, heater room, and vestibule. Appendix B contains a physical description of the 2707-A Buildings.

Fire Headquarters (2709 Buildings):

One such structure was built in each of the 200-E and 200-W Areas (Figure 3-17). The function and physical description of the 2709 Buildings was identical to that of the 1709 Buildings. (See 1709 Buildings in Section 2.0.) (Note: In each of the 200-E and 200-W Areas a TC Barracks Section was converted for use as the 2709 Buildings.)

Storerooms (2713 Buildings):

One such structure was built in each of the 200-E and 200-W Areas. The function and physical description of the 2713-E and 2713-W buildings was identical to that of the 1713 Buildings. (See 1713 Buildings in Section 2.0.)

Essential Materials Storehouses (2713-A Buildings):

One such structure was built in each of the 200-E and 200-W Areas. The function and physical description of the 2713-EA and 2713-WA buildings was identical to that of the 1713-A Buildings. (See 1713-A Buildings in Section 2.0.) (Note: In each of the 200-E and 200-W Areas the TC Division Warehouse for the area was converted to the 2713-A Building.

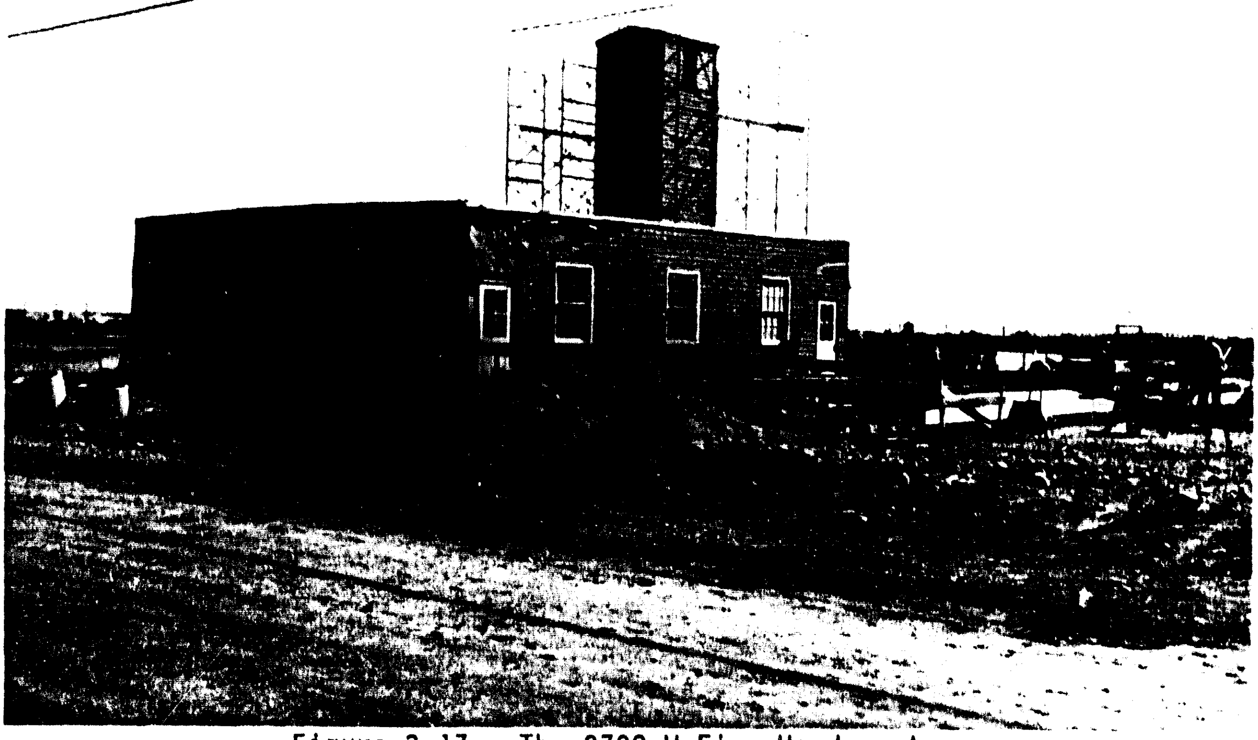

Figure 3-17. The 2709-W Fire Headquarters Under Construction, 1944.

Miscellaneous Storehouse (2713-B Buildings):

One such structure was built in each of the 200-E and 200-W Areas. The function and physical description of the 2713-EB Building was identical to that of the 1729 Buildings. (See 1729 Buildings in Section 2.0.) The 2713-WB Building's function was to provide extra storage space for process equipment, and it was much smaller than the 2713-EB Building. Appendix B contains a physical description of the 2713-WB Building. (Note: The 2713-EB Building was formerly the 200-E Area TC Pipe Warehouse. The 2713-WB Building was formerly the TC Igloo Warehouse structure.)

Oil and Paint Storage Buildings (2715 Buildings):

One such structure was built in each of the 200-E and 200-W Areas. The function and physical description of the 2715-E and 2715-W buildings was identical to that of the 1715 Buildings. (See 1715 Buildings in Section 2.0.)

Automotive Repair Garages (2716 Structures):

One such building was constructed in each of the 200-E and 200-W Areas. The function of the 2716 Buildings was to maintain and repair vehicles used in 200 Areas work. These buildings were approximately double the size of the 1716 Automotive Repair Shops. The 2716 Buildings contained six bays containing automotive repair equipment, a grease pit, tire repair facilities, and offices. Adjacent to each building were two gasoline pumps and two underground fuel oil storage tanks. Appendix B contains a physical description of the 2716 Structures. (Note: In each of the 200-E and 200-W Areas, the 2716 Automotive Repair Garage was the former TC Transportation Garage.)

First Aid Buildings (2719 Structures):

One such building was constructed in each of the 200-E and 200-W Areas. The function and physical description of the 2719-E and 2719-W buildings was identical to that of the 1719 Buildings. (See 1719 Buildings in Section 2.0.)

Patrol Headquarters (2720 Buildings):

One such structure was built in each of the 200-E and 200-W Areas. The function and physical description of the 2720 Buildings was identical to that of the 1720 Buildings, except that the 2720 Buildings were slightly smaller than the 1720 Structures. (See 1720 Buildings in Section 2.0.)

Paint and Riggers' Shops (2722 Buildings):

One such structure was built in each of the 200-E and 200-W Areas. The function and physical description of the 2722-E and 2722-W shops was identical to that of the 1722 Area Shops (albeit with a different name). (See 1722 Buildings in Section 2.0.)

Laundry (2723-W Building):

Only one such structure was built in the 200 Areas at HEW. Located in the 200-W Area, this laundry functioned to repair the work shoes and cleanse the work clothing worn in the 100 and 200 Areas. For some jobs, only coveralls and shoe covers were needed, but in many other cases, protective clothing and gloves (to protect against radioactive and/or chemical contamination) were worn. The 2723-W Laundry performed contamination removal, as well as surveying and testing of contamination levels, on such clothing. It consisted of 12 rooms: a wash room, pressing room, laundry storage and receiving room, sorting room, two testing rooms, glove washing room, shoe repair room, storeroom, office, shower and locker room, and rest room. Appendix B contains a physical description of the 2723-W Building.

Extra Machinery Storehouse (2729-W Building):

One such building was constructed in the 200-W Area. (The Miscellaneous Storehouse Building in the 200-E Area was the 2713-EB Building and is described in Section 3.0.) The function and physical description of the 2729-W Building was identical to that of the 1729 Buildings. (See 1729 Buildings in Section 2.0.) (Note: The 2729-W Building was the former 200-W Area TC Miscellaneous Stores and Pipe Warehouse.)

Slab Yard or Salvage Yard (2730-W Structure):

Only one such facility was built in the 200 Areas at HEW. Located in the 200-W Area, the 2730-W facility was located between the 221-U Building and the 241-U Process Waste Removal Facilities. Its function was to store salvage material and equipment for the 200-W Area. The 2730-W facility consisted of six reinforced concrete paved aprons. Three parallel, standard gauge railroad tracks transported materials and equipment to and from the storage facility, and two open-ended buildings covered some of the tracks. Two concrete pits adjacent to these buildings completed the facility. Appendix B contains a physical description of the 2730-W Structure. (Note: The 2730-W Structure was the former TC Slab Yard and was used during the HEW construction period to fabricate and paint the concrete cover blocks used to cover the cells of the 221 Buildings.)

Burning Pit (2731-W Structure):

Only one such facility was built in the 200 Areas at HEW. Located in the 200-W Area, the 2731-W facility was an open pit used to burn scrap lumber and miscellaneous materials. Appendix B contains a physical description of the 2731-W facility. (Note: The 2731-W facility was the former TC Burning Pit, used during the construction phase to burn scrap lumber and construction waste materials.)

Cylinder Storage Building (2734 Structure):

One such structure was built in each of the 200-E and 200-W Areas. The function and physical description of the 2734-E and 2734-W buildings was identical to that of the 1734 Buildings. (See 1734 Buildings in Section 2.0.)

FACILITIES

Secondary Substations (252-E and 252-W Structures):

One such structure was built for each of the 200-E and 200-W Areas (Figure 3-18). The function of the 252-E and 252-W structures was to serve as a step in the electrical distribution system for the 200-E and 200-W Areas. Much larger than the 252-N Structure, these facilities each consisted of a six-pole, wooden frame bus structure over two transformers supported by separate concrete pads. The bus structure also supported two small, low-voltage transformers that provided power for the transformer fans.
A separate, concrete switch house housed switchgear and test rack equipment. Appendix B contains a physical description of the 252-E and 252-W secondary substations.

Distribution Substations (253 Structures):

Thirteen of these structures were built in the 200-E Area, and 21 were built in the 200-W Area. Each served as a step in the electrical distribution system for the 200-E and 200-W Areas. All of them were of open-frame construction with a wooden pole surrounded by a picket fence. Most of the 253 substations were ground installations with the transformers resting on concrete pads. However, those structures that served the 241 and 291 buildings were elevated installations with the transformer resting on an elevated wooden platform suspended between two poles. Appendix B contains a physical description of the 253 Structures.

Figure 3-18. The 252-W Secondary Substation Under Construction, March 1944.

Fence and Road Lighting (2501 Structures):

See Section 5.0 for discussion.

Outside Transmission Lines (Including Wooden Poles and Hardware) (2503 Structures):

See Section 5.0 for discussion.

Fire Alarm Systems (2505 Structures):

See Section 5.0 for discussion.

Telephones and Telephone Cable (2506 Structures):

See Section 5.0 for discussion.

Standard Gauge Railroad Tracks (2601 Structures):

See Section 6.0 for discussion.

(Note: In the 200-E Area, 4,200 ft of such track [5,000 ft in the 200-W Area] was converted from the TC standard gauge track that had served to haul in construction materials and to haul away construction debris.)

Roads and Walks (2603 Structures):

See Section 6.0 for discussion.

Fences (Including Guard Towers) (2605 Structures):

Eighteen guard towers were emplaced in the 200-E Area, and 16 were emplaced in the 200-W Area. See Section 6.0 for discussion.

Underground Septic Tanks (2607 Structures):

Four of these structures were emplaced in the 200-E Area, and seven were emplaced in the 200-W Area. See Section 6.0 for discussion.

Open Drainage Ditches (2612 Structures):

Two such ditches were built in the 200-E Area, and four were dug in the 200-W Area. The function of the 2612 Structures was to carry process and waste water away from major buildings and into open areas for ground percolation. In the 200-E Area, a total of 8,100 ft of ditching was dug, all flowing to the east and southeast. One ditch carried waste water away from the 221-B Building and the 241 Retention Basins. The other 200-E Area ditch carried water from the main power and service areas waste water sewers. In the 200-W Area, a total of 11,620 ft of ditching was dug. One ditch ran northwest from the 221-T Building, another ran northwest from the 241-T Retention Basins, another flowed southwest from the 241-U Retention Basins and the power and service areas, and the fourth ran southwest from the 231 Building. Ditch sections varied from 3 ft to 8 ft wide. Vitrified clay piping with "acid-proof" joints and reinforced concrete piping was laid in the ditches where they intercepted road and railroad crossings. Standard concrete and timber headwalls with stone rip-rap were used where the open drainage ditches met with process sewers and road and rail crossings. No further physical descriptions can be found.

Permanent Parking Lots (2613 Structures):

See Section 6.0 for discussion.

General Monitoring Stations (2614 Structures):

Four of these structures were built in the 200-E Area, and six were built in the 200-W Area. See Section 6.0 for discussion.

Emergency Gasoline Electric Generator Buildings (2621 Structures):

Three of these structures were built in each of the 200-E and 200-W Areas. See Section 6.0 for discussion.

Outside Overhead Pipe Supports (2801 Structures):

See Section 5.0 for discussion.

Outside Overhead Steam Lines (2802 Structures):

See Section 5.0 for discussion.

Outside Overhead Air Lines (2803 Structures):

See Section 5.0 for discussion.

Outside Overhead Process Lines (2805 Structures):

See Section 5.0 for discussion.

Outside Underground Water Lines (Including Elevated Storage Tanks) (2901 Structures):

See Section 5.0 for discussion.

Outside Underground Fire Lines (Including Elevated Storage Tanks) (2902 Structures):

See Section 5.0 for discussion.

Outside Underground Sanitary Sewers (2903 Structures):

See Section 5.0 for discussion.

Outside Underground Process Sewers (2904 Structures):

See Section 5.0 for discussion.

4.0 300 AREA

The 300 Area (Figure 4-1) at HEW was the location of the uranium fuel fabrication plants; the chemical process research and development laboratories and pilot plant; the "test pile," a small reactor that tested samples of the graphite, uranium, and other metals used in essential Hanford Site operations; and the ancillary and support structures associated with all of the former key facilities. As the area that manufactured the uranium fuel that allowed the HEW reactors to operate, the 300 Area housed the first essential step in the plutonium production process. As the area that housed chemical "process improvement" activities and essential materials testing facilities, the 300 Area housed historic activities that were somewhat outside, although related to, the direct production cycle.

No two buildings in the 300 Area were alike, with the exception of storage warehouses and repair shops. Therefore, each building must be examined and described separately. Just as the reactors were the most significant buildings in the 100 Areas, and the chemical process buildings were the most significant buildings in the 200 Areas, the most significant buildings in the 300 Area were the 305 Test Pile, the 313 Metal Fabrication Building, the 314 Press Building, the 321 Separation Building, and the 3706 Technical Building.

The 300 Area contained 34 permanent buildings and 25 facilities. Three general types of construction were used: reinforced mass concrete, structural steel framing along with concrete blocks and/or reinforced concrete, and wood frame construction.

The 300 Area contained far fewer TC buildings than did the 100 and 200 Areas because more of the 300 Area work was done by subcontractors who provided their own facilities. The 300 Area TC buildings were designated as TC-36 Structures, and at least seven of them are known to have existed: a Division Engineer's Office, an Automotive Repair Shop, a Paint Shop, a Supervisors' Office, an Area Shop, a Receiving Miscellaneous Warehouse, and Fuel Pumps. All were converted to permanent buildings at the end of the construction period, and these occurrences will be noted.

The process and support buildings of the 300 Area were enclosed by just over two miles of fencing. This portion of the area comprised 52.5 acres. The overall 300 Area comprised 115.5 acres, with the areas outside the fence being a strip of land between the western fence and the main road between Richland and the 100 and 200 Areas and a wider strip between the eastern fence and the Columbia River. The unfenced areas included the locations of the parking compound, the process sewage disposal basin, and the sanitary sewage treatment facilities.

PERMANENT BUILDINGS

Pile Building (Test Pile) (305 Building):

One such structure was built in the 300 Area (Figure 4-2). The 305 Test Pile (reactor) was the first operating reactor at the Hanford Site. It

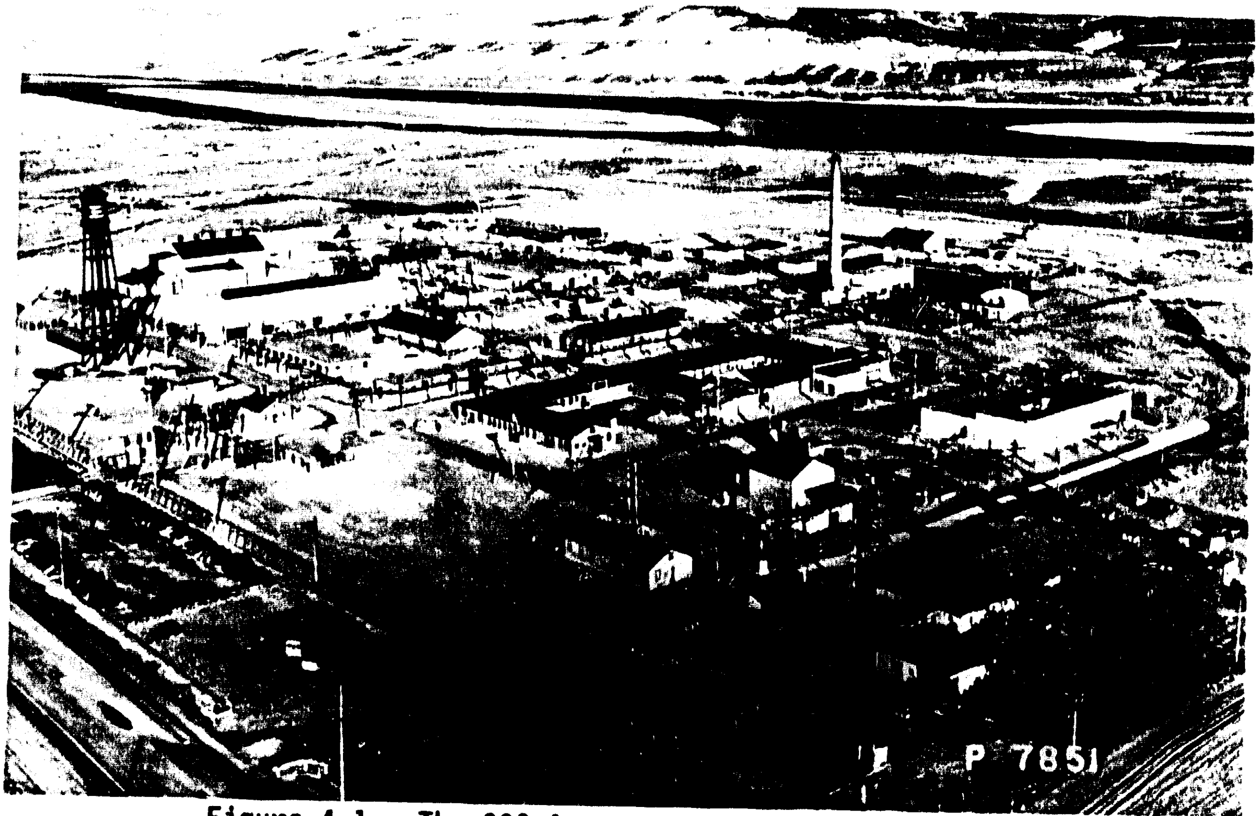

Figure 4-1. The 300 Area, Newly Completed in 1945.

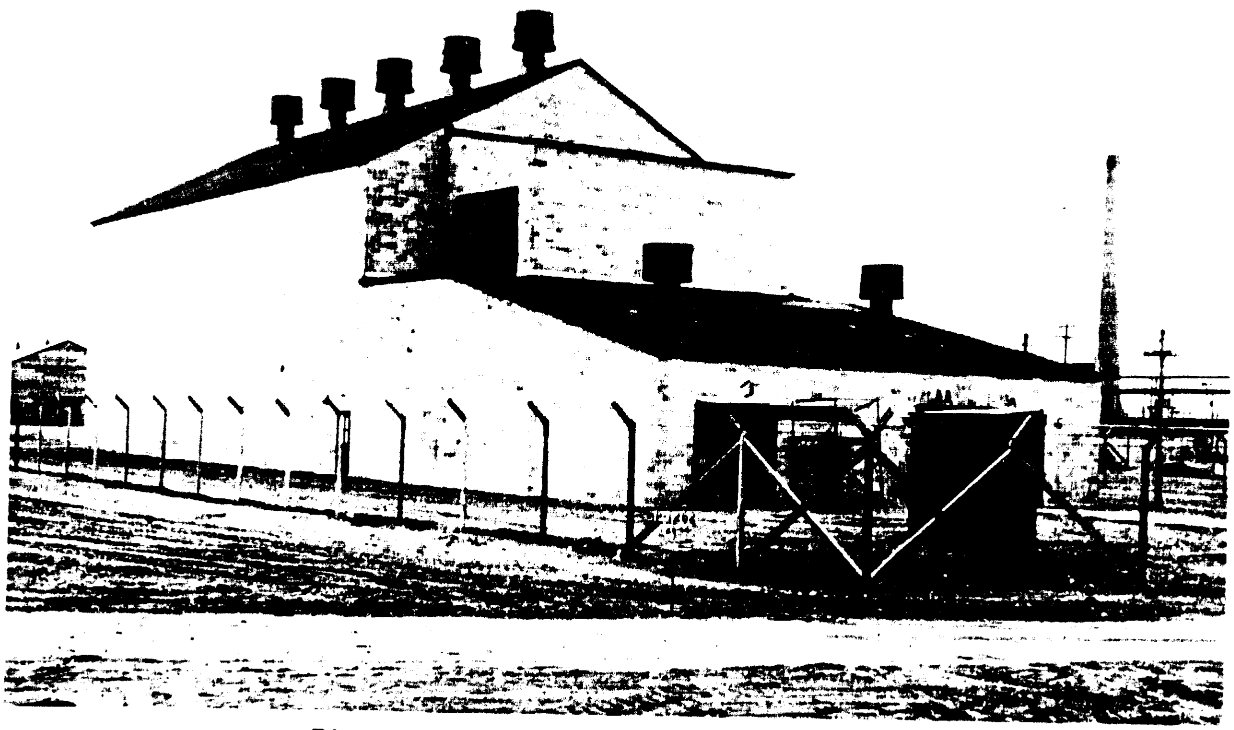

Figure 4-2. The 305 Test Pile, 1944.

functioned as a quality assurance tool to house testing of samples of each lot of graphite, uranium, aluminum tubes, aluminum jacketing material (for fuel element cladding), and other materials used in the large HEW production reactors. Measurements of material purity using instrumentation and calculations were too time consuming for wartime schedules, and actual performance tests of material samples for HEW in the experimental reactor at the MED's Met Lab in Chicago was deemed impractical because of the long distance. Therefore, material samples trials, comparisons of the performance of material samples under irradiation with samples of known quality, were conducted in the 305 Test Pile, and groups of materials were graded based on the in-reactor tests. This reactor also served as a radiation source for technical and instrument development work undertaken at HEW.

The 305 Test Pile operated at a very low critical level usually less than 50 W. The average operating thermal level was 20 °C to 22 °C. It sat aboveground inside a concrete shielding barrier that could be opened on the south side for charging and discharging operations and for maintenance. After each assembly (or charging), a south barricade and a roof barricade made from concrete blocks were emplaced.

The reactor was natural uranium fueled and air cooled. One solid vertical, boron steel safety rod hung above the pile that could be dropped in to "poison" or tamp down reactivity. Additionally, a smaller metal safety rod on top of the pile could lower small boron steel pellets, or shot, down another hole in the reactor. Three solid boron steel horizontal control rods also could be inserted into the pile from the south side. These rods operated as emergency safety controls. However, the normal operating control rods, used to adjust reactivity in the pile, consisted of one mild steel shim rod and one cadmium-mild steel strip control rod, each 200 in. long.

The pile itself consisted of 51 layers of graphite block, configured into an 18-ft cube. This core was pierced by 519 circular holes and 20 rectangular holes (for "stringers"), which served as the channels to load and unload materials from the reactor. There were 10 uranium-bearing stringers (known as metal stringers) and 20 graphite stringers, of which one each, metal and graphite, were used routinely. Because the stringers ran from east to west through the reactor, materials were said to rest in the east stringers or the west stringers. Each stringer totalled about 500 in. in length, including the central test bed portions, end portions, and maple "pushers" that moved the stringers in and out of each side of the reactor. Graphite used in the production reactors had to be very pure, or it would capture too many neutrons and "poison" (slow down or stop) the reactivity.

During the most hectic months of reactor construction at wartime HEW, so much graphite testing was needed that the 305 Test Pile was placed on a two-shift schedule almost as soon as it began to operate in March 1944. Two months later, the facility began to operate three shifts around the clock. Graphite testing slowed considerably after August 1944. From that time until the war's end, the 305 Test Pile operated only three to four days a week, on a day-shift basis only. During 1946, it operated only one to two days each week.

Graphite testing consisted of comparing one to four graphite bars of unknown purity with two standard bars in the central sections of stringers 11 and 12. The purity of the test bars was reported as the difference in reactivity between the test and the standard bars, corrected to the density of the standard bars. The secondary standards of the test bars were then measured by "poisoning" the graphite with known amounts of neutron absorbers (in this case, copper wires).

Samples of newly arrived uranium billets were termed "billet eggs" or simply "eggs." They were taken from the end of every fifth or sixth uranium ingot and submitted for pile testing to determine the level of impurities (especially rare earths) in the uranium. Egg testing consisted of comparing eight eggs of unknown quality (spaced along the centers of stringers) with 16 test eggs. The difference in reactivity between test and standard eggs was reported as the total danger sum (TDS) or the change in reactivity multiplication that would result if a production reactor were loaded with the te^t uranium instead of with the uranium containing no impurities.

Machined slug testing consisted of comparing 11 test slugs with 11 standard slugs in the central portion of metal test stringers. Slugs were tested both before and after jacketing, first to determine the quality of metal going into the canning process and afterward to detect any accidental inclusion of high cross-sectional elements (i.e., elements having a high ability to absorb neutrons). The latter test, an impurity calibration, was performed by artificially poisoning each of the 11 test slugs with copper foils. First one, then two, then three, and then four copper foils were added for each fuel element, to act as neutron absorbers on the surface of the element. Changes in reactivity values were then measured and compared.

Various other metal foils, including aluminum, gold, indium, and others, were also placed in the 305 Test Pile to vary reactions and to obtain different measurements. Indium foils were used to measure neutron intensity. Under irradiation, this short half-lived element would reach a point where its rates of neutron absorption and beta decay were nearly equal. Therefore, measurements of its decay rate could give a good indication of neutron intensity at any point in the pile. Samples of iron, aluminum welding rods, lubricant oil, and boron used in the construction of the large HEW production reactors also were tested in the 305 Test Pile. Instrumentation for the 100 Areas reactors, including counter tubes, gas chambers, thermopiles, shim-stock chambers, and neutron and gamma chambers also were calibrated in the 305 Test Pile. Appendix C contains a physical description of the 305 Test Pile.

Metal Fabrication Building (313 Building):

One such building was constructed in the 300 Area (Figure 4-3). The building's mission was to machine bare uranium rods to desired dimensions for use in the HEW production reactors, jacket ("can") the sized fuel elements, and test the jackets for proper bonding and sealing.

Originally completed in the autumn of 1943, the 313 Building was rectangular in shape, with overall dimensions of 199.5 ft by 65 ft by 20 ft (high). However, eight subsequent additions made in late 1943 and in 1944 brought the overall dimensions to 199.5 ft by 182.5 ft by 20 ft (high). The latter dimensions and configuration are the ones described in the final MED construction reports for this building.

Figure 4-3. The 313 Metal Fabrication Building, Early 1945. (The building is surrounded by several of the 303 Fresh Metal Storage Buildings, the 384 Power House [upper right], and the 351 Primary Substation [lower center]).

The continual early additions were caused by process improvements and changes in the very new, untried, and unique uranium fuel fabrication activities being carried out in the building. Perhaps no other structure at HEW was more impacted by design changes and resultant additions than the 313 Building. The first addition, on the east side, provided additional space for furnaces and presses, and the second, on the west side, provided a tool room and shop. The third addition ran the entire east side of the building and allowed space for welding booths and jacket (can) washing. The fourth addition, on the northwest corner, furnished an electrical control room, and the fifth addition, along the west side, included a locker room, women's rest room, and shower room. (The locker and shower rooms later were eliminated in favor of a storeroom.) The sixth addition was again on the northeast corner of the facility and provided more space for can washing. The seventh addition, on the southeast of the building, allowed for a second canning process section and for "recovery" (uranium scrap recycling) process equipment. However, this latter equipment soon was moved to the nearby 314 Press Building. The eighth and final addition of WWII was on the northeast corner, and it furnished space for a third canning process section.

As finished in 1944, with all eight additions, the 313 Building's area was 33,020 ft^2, containing three fuel jacketing areas, a welding area, a fuel jacket (can) cleaning area, a control room, a tool room and shop, various offices, storerooms, and sanitary rest rooms.

In the 313 Building, uranium fuel rods were machined into elements (also known as slugs or cores) 1.3 in. in diameter and 4 in. or 8 in. in length.

Operations commenced in the facility in December 1943, when lathes began to operate to machine bare extruded uranium rods down to specific core dimensions. The following month, operators began degreasing the machined cores before inspection, using a commercial solvent degreaser product that contained primarily trichloroethylene. Core canning operations actually began in the 313 Building in March 1944.

The first fuel jacketing equipment to go into operation was known as the "experimental line." This equipment included an electric heater press, known by Hanford workers as the "whiz bang," to heat and bond the uranium fuel cores to their aluminum jackets. However, the heaters burned out frequently, did not heat the elements and cans to consistent temperatures, and did not produce a uniform bonding. This problem was serious because nonuniform bonding caused thin places in the jacketing that, under irradiation, heated up more than other places. These "hot spots" could cause fuel element ruptures in the reactors.

Beginning in August 1944 in the 313 Building, the uranium fuel cores were jacketed in a triple-dip method that consisted of bathing them in molten bronze, tin, and then a molten aluminum-silicon mixture. The bronze used in this process at HEW was relatively high in tin content (53% tin and 47% copper), and the bronze bath itself had a flux cover composed of barium chloride, potassium chloride, and sodium chloride.

A more detailed description of the triple-dip canning process performed in the 313 Building is as follows:

First, the bare uranium cores were cleaned by passing them through a trichloroethylene vapor degreaser, then through a nitric acid tank, two rinse tanks, and a hot air dryer. The nitric acid rinse was known as "pickling" the slugs. Meanwhile, a steel "sleeve" that would surround each can during the dipping process was cleaned in sodium hydroxide. Aluminum end caps and cans were cleaned first with trichloroethylene, then an industrial soap, then phosphoric acid, then a sodium dichromate solution, and lastly a methanol rinse.

The bare uranium cores were dipped in a bronze bath to heat them to a uniform temperature within the uranium beta phase (660 °C to 770 °C) and then placed in a tin bath to cool them into the uranium alpha phase (less than 660 °C) and to remove excess bronze. Next they were centrifuged to throw off excess tin. Then the cores were immersed quickly in an aluminum-silicon brazing bath (also in the uranium alpha phase) and water quenched. The various heating and cooling procedures were done to randomize the uranium grains, thus inhibiting the uranium "growth" (expansion under irradiation) problem. After water quenching, the steel sleeve was pulled away and cleaned with sodium hydroxide and soap to remove any remaining aluminum-silicon. The sleeve then could be reused many times.

The thickness of the residual end cap on the element was then measured with a fluoroscope and marked with a punch to indicate the amount that needed to be removed in subsequent end machining. Identification numbers were stamped on the can base end, and the brazeline on the end cap was tungsten inert gas (TIG) welded to seal the porous braze to the end cap and can. A final etching in nitric acid completed the procedures.

The finished elements then underwent three tests, two of which took place in the 313 Building. The first, the frost test, consisted of spraying the can with acenaphthene mixed with carbon tetrachloride (CCl_4). The canned element was then placed into an induction coil to heat its surface. If there was a gas bubble or a nonbonded spot, this spot would become shiny, and the element then would be rejected and sent back through a recycling process. If the bond was good, the acenaphthene was removed with trichloroethylene, and the element was inspected in one of several autoclaves located in the 314 Building. In that inspection, the canned element was placed into a steam autoclave, which operated at about 100 lb/in^2 gauge (psig) at 175 °C for more than 20 hours, to reveal any pinholes or incomplete welds. Water from the steam would be conducted through any such openings, and the uranium core would expand rapidly, resulting from the formation of a uranium oxide compound known as U_3O_8, and split the aluminum can. If an element passed the autoclave test, it then underwent a final radiograph (X ray) test in the 314 Building to detect porosity in the end weld bead. Any porosity could have become a pathway for water to contact the uranium fuel and cause the element to rupture.

Fuel elements of other types, as well as some nonfuel materials, also were fabricated in the 313 Building during the MED period. Bismuth fuel targets welded into nonbonded aluminum cans, irradiated to make ^{210}Po in 100 Areas production reactors, were fabricated in the 313 Building beginning in 1944. (Polonium-210 was the initiator in the earliest atomic weapons.) An even larger number of lead-cadmium fuel rods, also welded into nonbonded aluminum cans, were produced for use as "poison" elements in the 100 Areas reactors and in the 305 Test Pile beginning in 1944.

Some early scrap recovery processes also took place in the 313 Building. During the earliest fuel fabrication operations at HEW, uranium scraps consisted of lathe turnings, rod ends, and many rejected cores from the machining and canning operations in the 313 Building. Difficulties with early fuel canning techniques produced thousands of rejected cores by mid-1944. These were washed in nitric acid and reused. Also, sodium hydroxide and sodium nitrate were used to strip aluminum and braze off of rejected uranium cores. Additionally, an intermetallic compound layer of uranium and copper (specifically UCu_5) on the rejected cores was removed by using hydrofluorosilicic acid. However, most of the early reclamation operations for fuel fabrication wastes at HEW took place in and near the 314 Building. Appendix C contains a physical description of the 313 Building.

Press Building (314 Building):

One such structure was built in the 300 Area (Figure 4-4). Its primary function was to house a 1,000-ton extrusion press that allowed HEW to process raw uranium billets into extruded rods that were suitable for fabrication into fuel elements. (The outgassing and straightening of extruded rods was included in this operation.) Because the 314 Building was not completed as early as the original 313 Building, the first uranium for the fabrication of reactor fuel was sent to HEW in October 1943 as rods that had been extruded offsite. However, MED plans called for a completely self-contained and self-sufficient fuel fabrication operation at Hanford.

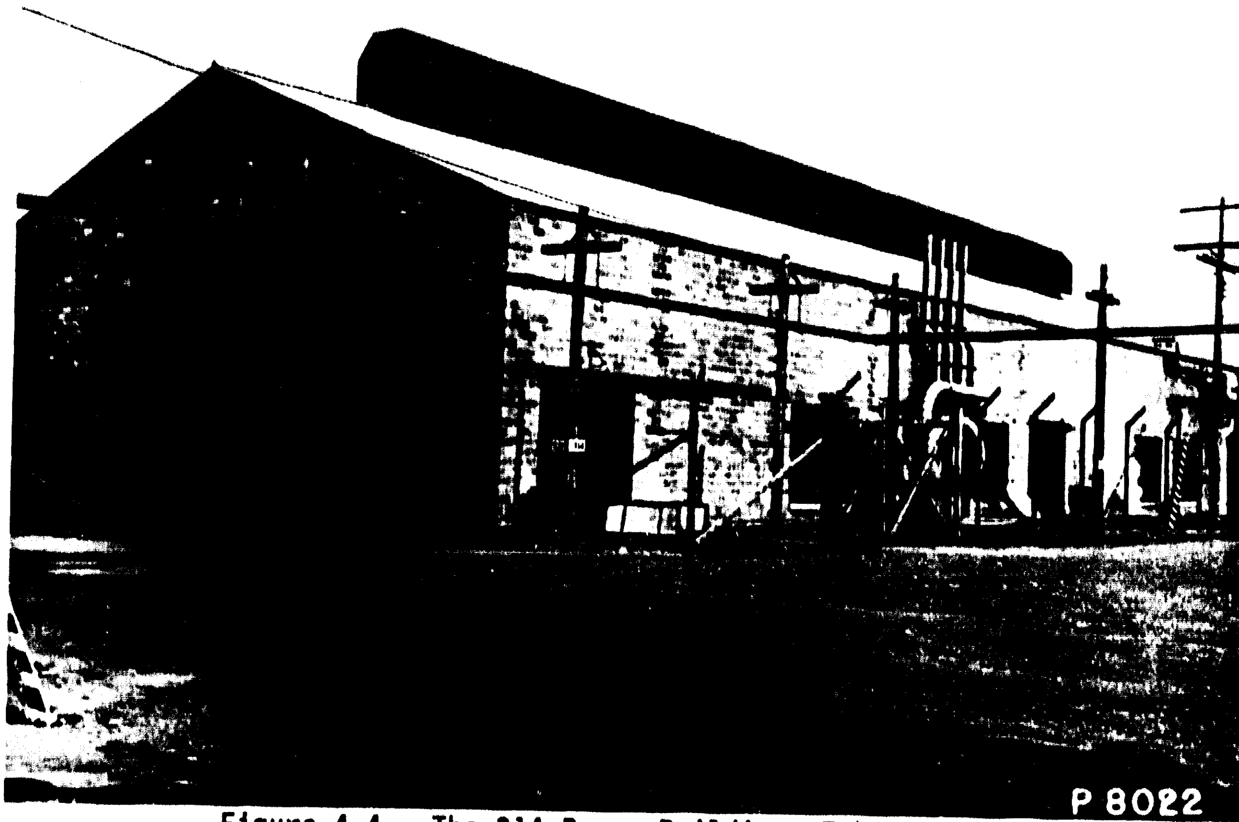

Figure 4-4. The 314 Press Building, February 1945.

The first fabrication function to be performed in the 314 Building, autoclave testing of fuel elements jacketed in the 313 Building, started in July 1944. If an element passed the autoclave test it then underwent a final radiograph (X ray) test in the 314 Building, to detect porosity in the end weld bead. Any porosity could have become a pathway for water to contact the uranium fuel and cause the element to rupture.

Outgassing and straightening operations started in the 314 Building in September 1944, but HEW's uranium rods still were being extruded offsite. Beginning in November 1944, uranium was transported to HEW as billets, which were stored until the extrusion process began to operate in the 314 Building in January 1945. The press testing phase lasted into mid-spring, and then fuel operations commenced. From that time onward throughout the MED period, a complete cycle of metal preparation occurred at HEW. Raw uranium billets arriving from offsite were taken to the 314 Building and heated in a muffle-type furnace with an interior, inert gas atmosphere. (The helium or argon atmosphere was used to reduce the oxidation of metal during heating.) The uranium was then transferred through a closed passageway to the extrusion press, which also operated in an inert atmosphere. After being extruded, the rods were outgassed, straightened, and sent to the 313 Building for machining, jacketing, and initial inspection. They then went back to the 314 Building for autoclave and radiograph testing.

The other important function of the 314 Building was uranium scrap recovery. Beginning with the startup of extrusion press tests in January 1945, extrusion butt ends, oxides, and container residues were collected and placed in 5-gal cans. By early 1946, however, the volume of uranium scraps accumulating from 314 and 313 building operations and the expense and fire and security hazards of shipment brought a change in policy. A "chip recovery" operation began in the 314 Building. It operated only a few days a month and involved collecting all chips and turnings from machining operations, sorting them, breaking them into small pieces, washing, drying, and then pressing them into briquettes. At first the briquettes themselves were shipped offsite. In May, however, the MED ordered briquetting to be discontinued because of a number of uranium chip fires within the centrifuging step at other sites.

In the spring of 1946, an additional scrap recovery operation known as the "oxide burner" began on the north side of the 314 Building. All uranium-bearing dust and particulate matter that could be collected from the fuel fabrication facilities, as well as the tailings or settlings from washes and quenches, was burned to convert it to oxide (powder) form. The UO_2 was then collected in 5-gal buckets for compact shipment offsite.

Aside from the extrusion press, the 314 Building contained electric furnaces, a rod-straightening machine, a 7.5-ton overhead crane, an autoclave area, a control room, a shop and repair area, pumping units for the press, and various offices and sanitary rest rooms. Appendix C contains a physical description of the 314 Building.

Separation Building (321 Building):

One such structure was built in the 300 Area. The MED builders defined the 321 Building's original mission as that of "troubleshooting" immediate problems as they developed in the bismuth phosphate ($BiPO_4$) chemical separation plants (the 221, 224, and 231 buildings). The 321 Separation Building was constructed as the HEW's cold "semi-works," or pilot-scale plant, for testing chemical process improvements using unirradiated or low-activity substances. However, at the same time that it was being built, a small pilot plant to test actual runs with the bismuth phosphate process was being constructed at the Clinton Engineer Works (now the U.S. Department of Energy [DOE] Oak Ridge Site in Tennessee). This pilot plant, called the Clinton Semi-Works, began to operate in the summer of 1944 and quickly demonstrated that many variables, including acid strengths, batch size, the use of different reducing and oxidizing agents and other factors could affect processing operations. Additionally, equipment corrosion studies and methods of decontamination immediately were recognized as necessary because the operation was so corrosive and the need for remote equipment repair was so limiting.

For all of these reasons, HEW builders decided in the early autumn of 1944, during the equipment installation phase for the 321 Building, to add a Field Project Request for a laboratory for work with small amounts of "active solutions several tenths of a curie to a curie of radioactivity." Consequently, the laboratory to the left of the center door on the north side was modified with lead brick shielding, additional ventilation, a connection to the waste tanks buried south of the building, and other facilities. (Work with very high-activity solutions and/or large amounts of radioactive solutions was still intended for and performed in A and B Cells of T Plant. See 221 Building in Section 3.0.) However, the 321 Building soon assumed the wartime mission of demonstrating the effects of proposed process changes on decontamination factors in the 221, 224, and 231 buildings, conducting isotope separations experiments on small samples irradiated in the HEW production reactors, and preparing "tracer activities" (small amounts of irradiated materials used to examine and trace nonradioactive processes).

A series of cells and tanks ran the entire length of the 321 Building in the south half on a level 12 ft belowground. This section was known as the "canyon," and a mezzanine floor on the south wall held gauge boards and weight tanks. A large chemical storage room, heating and ventilating equipment, Sample Room One, and a pipe gallery extending the entire width of the building occupied the belowground level of the north half. The aboveground or second floor of the north half contained offices, various service rooms, a lunchroom, laboratory, receiving room, and Sample Room Two. This second level also held the control gallery, located above the pipe gallery along the center of the building. To the south of the building about 120 ft lay four belowground tanks, each 40 ft long and 10 ft in diameter and encased in concrete. Constructed to hold the strongest wastes from 321 Building processes, these tanks were accessed by stainless steel piping that sloped down to them from the building cells. Their tops were 3.5 ft belowgrade. Appendix C contains a physical description of the 321 Building.

Technical Building (or Laboratory) (3706 Building):

One such structure was built in the 300 Area. The 3706 Building was the original radiochemistry laboratory for HEW. Its mission was to perform small-scale experiments with both low- and high-activity radioactive materials in support of all HEW processing activities. The largest portion of staff and facilities in the building performed radiochemical trials aimed at improvements in the bismuth phosphate process. During the MED period, some of the important variables and factors studied in the 3706 Building were the substitution of potassium permanganate for sodium dichromate as an oxidizing agent for plutonium, variations in acid strengths in several steps of the separations process, a decrease in the "digestion time" in the reduction step, improvements in method of centrifuging lanthanum fluoride, the solubility of plutonium compounds and other substances in process solutions, methods of counting specific plutonium activity, characterization of fission products and plutonium decay products, the effects of hydrazine and lead in the dissolution process, and process equipment decontamination and corrosion studies.

Other large sections of staff time and laboratories in the 3706 Building were devoted to metallurgical examination (both destructive and nondestructive) of irradiated fuel elements from the reactors, fuel development for the 313 Building, examination of graphite from the experimental levels of the 100 Area piles, special sample analyses from the 231 Plutonium Isolation Building and the 200 Areas separation plants, spectroscopy and radiocounting activities, and multifaceted sample analyses for environmental and personnel survey programs.

The hottest work (i.e., work with substances having the highest radioactivity levels) was done by the Analytical Development group in rooms 57, 59, 62, 64, and 66. However, the Metallurgical Technology and Essential Materials groups, using rooms 7, 8, 9, 10, 11, and 13, often produced and encountered very hot conditions when they drilled into irradiated fuel elements to obtain fission gas and metallurgical samples. Physics group work in room 33 was not as hot as it might have been if the graphite samples had not first been cut and prepared in another structure. The Spectroscopy group occupied rooms 56, 58, and 60, analyzing the isotopic content and decay curves of plutonium, uranium, and fission products. Other laboratories shared or interchanged various activities. (Note: The 3706 Building was renumbered in 1956 so that the room numbers listed above do correspond to current room numbers.)

Aside from the 313 Building, no other structure at HEW received as many modifications and additions during its initial construction phase as did the 3706 Building. Design changes began almost as soon as ground was broken for the structure in September 1943 and continued until the building was completed in early 1945. The planned building size was increased by 100%, rooms originally planned as offices were turned into laboratories, and laboratory equipment was relocated in many cases (necessitating tearing up floors to install and reroute drainage systems). The originally planned ventilation system consisted of two separate portions, but the number of such systems was increased to seven during the construction phase (necessitating major changes in duct work, roofing, service piping, and electrical connections).

As finally finished, the 3706 Building was a huge rectangular structure with a center court at one end and an open court at the other end, giving it a winged appearance. It housed 57 laboratories, 19 offices, 2 shops, a dark room, 2 storerooms, a lunchroom, locker room, ventilating equipment room, and sanitary rest rooms. The roof contained several dormers to accommodate the seven ventilating systems for air conditioning and laboratory exhausts. Two fire walls located near the center of the building divided the structure roughly in half. Exterior walls consisted of drop siding over sheathing, but the southeast portion of the building had concrete block walls. Inside that section near the center of the structure was a special laboratory reserved for the very hottest, largest volume work done in the building. It had 2-ft-thick concrete walls and roof and two separate offset concrete entrances, one from the outside and one from a central corridor. Appendix C contains a physical description of the 3706 Building.

Air Conditioning Equipment Building (3706-A Building):

One such building was constructed in the 300 Area. Located just a few feet south of, and parallel to, the 3706 Building, the 3706-A Air Conditioning Equipment Building was built as one of the design changes necessitated by the increased ventilating capacity required by the many 3706 laboratories. It functioned to house the ventilating and air conditioning equipment for the Technical Laboratory Building. A physical description of this small concrete block facility is included with the description of the 3706 Building.

Storage and Fabrication Building (301 Structure):

There was one such building in the 300 Area. Its function was to provide space for the storage of materials (mostly metals) that might be needed to fabricate new and untried types of tools and equipment for area operations and to house a fabrication shop to perform such experimental work. Appendix C contains a physical description of the 301 Building.

Paint Shop (301-A Building):

There was one such building in the 300 Area. Its function was to store paint and to provide an area in which to paint equipment and other surfaces that did not need to be painted in place. No physical description of the 301-A Building can be located. (Note: The 301-A Building was the 300 Area's

TC Paint Shop during the construction period. It continued to be used in the same manner, with no "conversion" necessary, as a permanent building.)

Magazine Structures (Fresh Metal Storage Buildings) (303 Structures):

Nine such buildings were built in the 300 Area at HEW. The function of these structures was to store the fresh (unirradiated) uranium, chemicals used in the fuel fabrication processes, and uranium scraps left from these processes. Eight of the 303 Buildings were identical and were designated as 303-A, -B, -C, -D, -E, -F, -G, and -K. The 303-J Building was larger but performed the same function. A physical description of the two types of 303 Buildings is contained in Appendix C.

Sodium Storage Building (304 Structure):

One such building was constructed in the 300 Area. Its function was the storage of sodium needed for fuel fabrication activities. However, it was torn down in mid-1944 because it stood in the way of urgent additions needed on the 313 Building. (The 304 Building had been located just off the northeast corner of the 313 Building. Subsequently, sodium for process operations was stored inside the 313 Building.) The 304 Building, built by the MED, was a concrete block structure approximately 6 ft square by 8 ft in height. No further physical description can be found.

(Note: In 1952 a different 304 Building was constructed at Hanford. It served as a pilot plant for testing new fuel fabrication processes known as "lead dip" and "hot die sizing." In 1971 it was renamed the Uranium Scrap Concentration Storage Facility [sometimes called the Concretion Facility]. This building should NOT be confused with the 304 Sodium Storage Building constructed and torn down by the MED.)

Disposal Ground (Process Waste Disposal Trench) (316 Structure):

One such structure was built in the 300 Area. Its function and physical description were identical to the 216-E Process Waste Disposal Trench. (See 216-E Structure in Section 3.0.)

Transfer Platform (363 Structure):

One such structure was built in the 300 Area. Its function was to facilitate the transfer of fresh uranium billets and fuel elements between the 303 Warehouses and their various destinations (fuel fabrication buildings, further storage, or transport to the 100 Areas). Appendix C contains a physical description of the 363 Transfer Platform.

Reservoir and Pump House (382 Building):

One such building was constructed in the 300 Area. Its function was to supply treated water to the 384 Heating Plant and to supply the remainder of 300 Area fire and process water needs. Because of the expansions to the 313 and 3706 Buildings that took place during 1944, additional water treatment capacity was needed in the 384 Building. Because of late delivery of this additional equipment, completion of this building was delayed until March 1945. As finished, the 382 Building was much smaller than the 182 and

282 buildings. It consisted of a pump house containing pumps, engines, a generator, chlorinating equipment, and a 200,000-gal reservoir. Appendix C contains a physical description of the 382 Building.

Heating Plant (384 Building):

One such structure was built in the 300 Area. Its function was to supply steam heat, via coal-fired boilers, to the area buildings. The 384 Heating Plant was much smaller than the 184 and 284 power houses. It contained two boilers and stokers, seven pumps, various tanks, and a monorail hoist. A small addition on the west end of the building contained water softening equipment, and an elevated tank nearby stored the softened water. A 150-ft high brick exhaust stack also was located at the west end of the 384 Building. Appendix C contains a physical description of the 384 Heating Plant.

Gate House and Clock Alley (3701 Structure):

One such structure was built in the 300 Area. Its function and physical description were identical to those of the 1701 Structures. (See 1701 Structures in Section 2.0.)

Supervisors' Office Building (3704 Structure):

One such structure was built in the 300 Area. Its function and physical description were identical to those of the 2704 Buildings. (See 2704 Buildings in Section 3.0.) (Note: The 3704 Structure was converted from the TC Division Engineer's Office for the 300 Area.)

Change House and Patrol Headquarters (3707-A Building):

One such building was constructed in the 300 Area. Its function was to house both changing facilities for area personnel who wore protective clothing and the area patrol headquarters. The change house portion of the building consisted of a large, general locker room, shower room, rest room, wash room, and lunchroom. The portion of the building that housed the patrol group contained an office, storage room, and patrol locker room. Appendix C contains a physical description of the 3707-A Building.

Change House (3707-B Building):

One such structure was built in the 300 Area. Its function and physical description were identical to those of the 2707-EA and 2707-WA buildings. (See 2707-A Change Houses in Section 3.0.)

Fire Headquarters (3709 Building):

One such building was constructed in the 300 Area. Its function and physical description were identical to those of the 1709 and 2709 fire headquarters. (See 1709 Buildings in Section 2.0.)

Receiving Storeroom (3713 Building):

One such structure was built in the 300 Area. Its functions were to receive and store spare machinery and miscellaneous stores for the 300 Area and to hold materials waiting for salvage. The building contained three sections for the above activities, plus an office. It was larger than the 1713 and 2713 storehouses. Appendix C contains a physical description of the 3713 Storeroom.

Automotive Repair Shop (3716 Building):

One such building was constructed in the 300 Area (Figure 4-5). Its function was to house the repair and maintenance facilities for 300 Area vehicles. It is believed that the 3716 Automotive Repair Shop was identical to the 1716 Buildings, but no specific confirmation nor physical description can be found. (Note: Twin TC Fuel Pumps from the construction period became part of the 3716 facilities.)

Instrument Shop (3717 Building):

One such structure was built in the 300 Area. Its function was to house the fabrication and testing equipment needed for the specialized instruments used in 300 Area work (chemical experimentation, fuel fabrication, and test reactor operations). The 3717 Building contained a general repair and test shop, a valve repair assembly and test shop, another assembly test room, three offices, a storeroom, rest rooms, and a two-ton monorail and hoist. Appendix C contains a physical description of the 3717 Building.

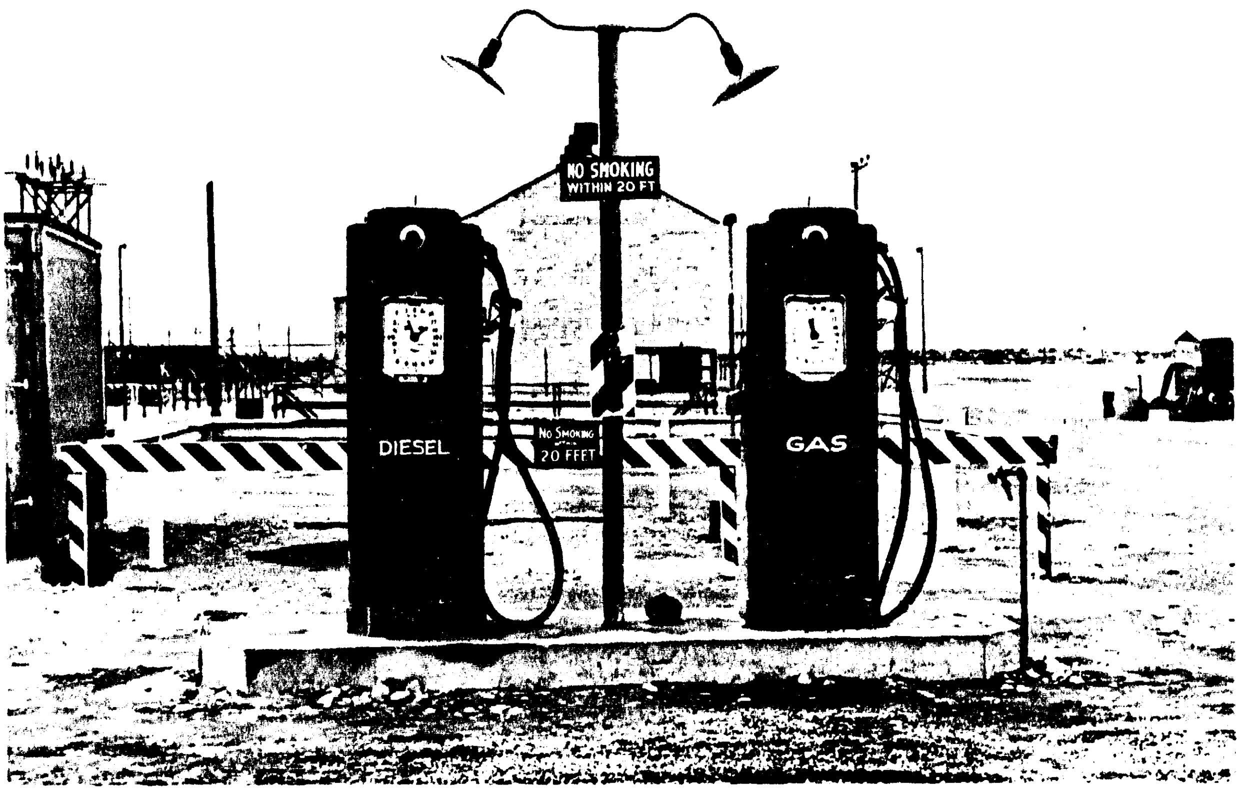

Figure 4-5. The Two TC Fuel Pumps That Became Part of the 3716 Automotive Repair Shop During World War II.

First Aid Station (3719 Building):

One such building was constructed in the 300 Area (Figure 4-6). Its function and physical description were identical to those of the 1719 Buildings. (See 1719 Buildings in Section 2.0.)

Area Shops (3722 Buildings):

Two such structures were built in the 300 Area (Figure 4-7). Their function was to house fabrication and repair facilities for various area equipment (although not for the specialized instruments handled in the 3717 Building). The 3722-A Building was converted from the 300 Area's TC Receiving Warehouse. It is believed to be identical in design to the 1713-A and 2713-A buildings, although no direct confirmation of this likeness can be found. The 3722-B Building was considerably smaller but was increased in size by one-third during its construction because of the increased needs of the 300 Area. It contained a rigging and portable equipment storage area, a general storage space, tool room, general shop, a woodworking shop, office, and rest room. Appendix C contains a physical description of the 3722-B Building.

Propane Storage Building (3726 Structure):

One such structure was built in the 300 Area. Its function was to store propane gas needed for various area uses in a 2,600-gal metal tank. The building was simply an open-sided, wooden frame supported by six wooden posts and resting on concrete piers. Appendix C contains a physical description of the 3726 Building.

Cylinder Storage Buildings (3734 Structures):

Two such structures were built in the 300 Area. Their function was to house both "live" (unused) and "dead" (used or empty) cylinders that held various gases (mostly oxygen, hydrogen, and acetylene) used in 300 Area operations. One such structure, designated simply the 3745 Building, was identical in physical description to the 1734 Buildings. (See 1734 Buildings in Section 2.0.) The 3734-A Building was much larger than the 3734 Building, but its function was similar. Appendix C contains a physical description of the 3734-A Building.

Box Storage Building (3741 Structure):

One such structure was built in the 300 Area. Its function was to store and prepare samples of irradiated graphite, uranium, and flux wires from the 305 Test Pile. Irradiated samples were stored in cardboard containers, hence the code word "box" storage. The building sometimes was called the "special machine shop" by Hanford workers because it contained lathes, drills, saws, and other equipment for sectioning and preparing samples for "destructive analysis" (DE). Appendix C contains a physical description of this one-room building.

Standards Building (3745 Building):

One such structure was built in the 300 Area (Figure 4-8). Its function was to calibrate a large variety of radiation detection instruments, using

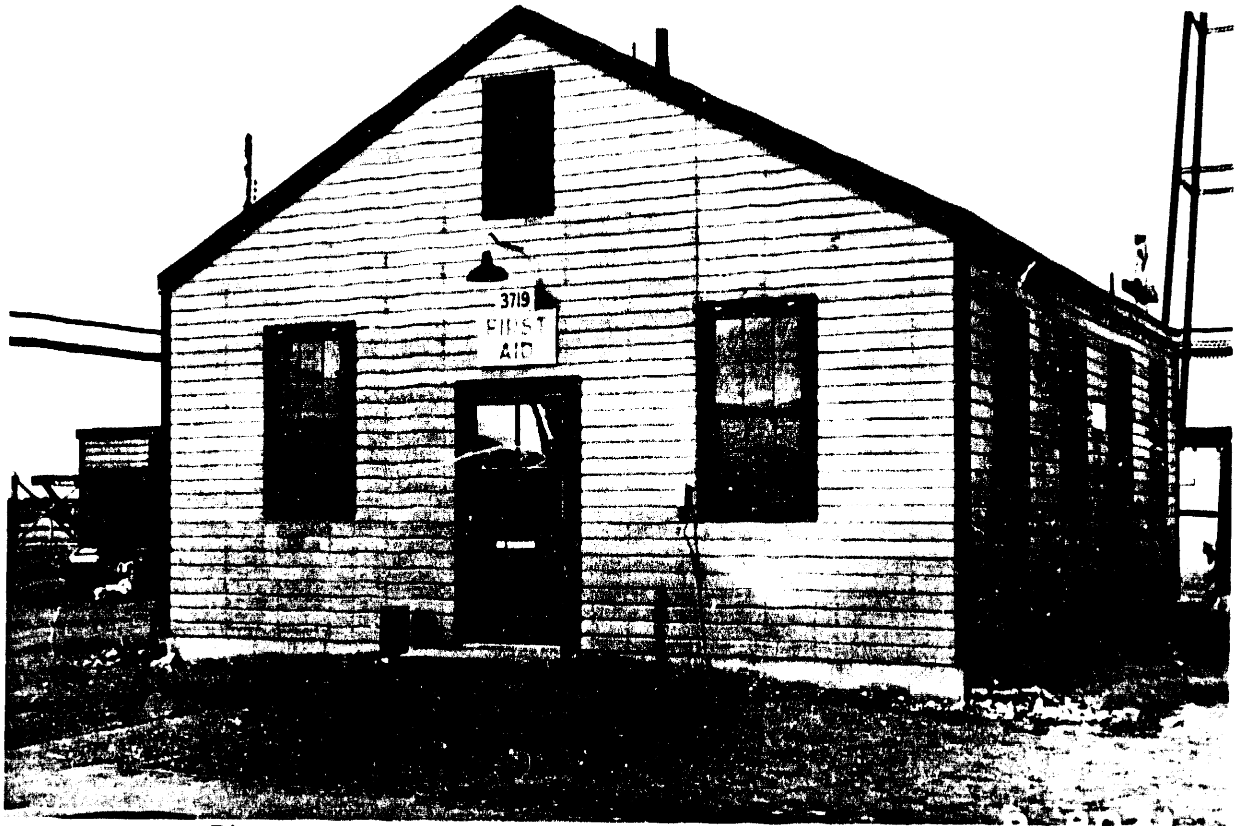

Figure 4-6. The 3719 First Aid Station, Early 1945.

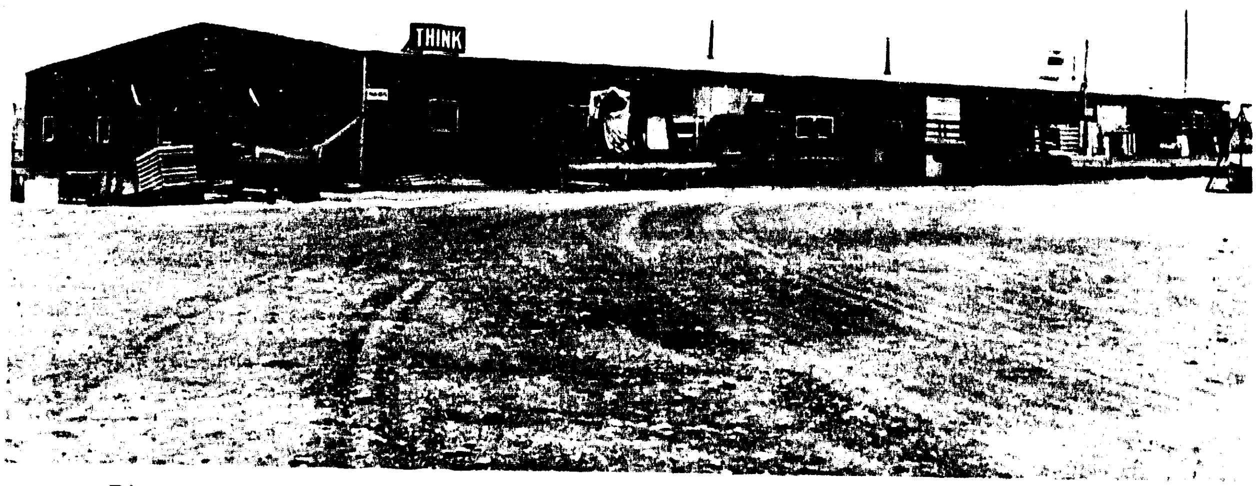

Figure 4-7. The 3722-A Area Shop, Converted From the 300 Area's TC Receiving Warehouse, 1944.

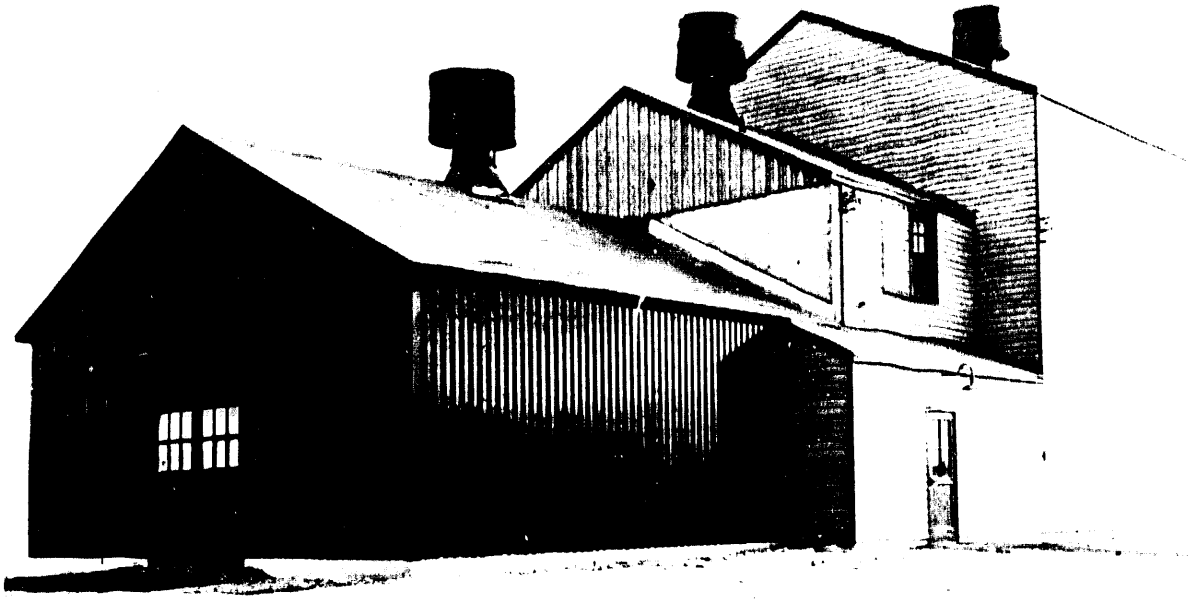

Figure 4-8. The 3745 Standards Building, World War II.

X ray, alpha, gamma, and neutron sources. The building contained a large calibration room, three laboratories, a ventilating equipment room, and a reinforced concrete vault. Appendix C contains a physical description of the 3745 Building.

Control Building (3746 Structure):

One such structure was built in the 300 Area (Figure 4-9). Its function was to perform tests to verify that the composition of various process substances was within specifications. It contained a laboratory, shop, dark room, four offices, a storeroom, and two rest rooms. Appendix C contains a physical description of the 3746 Building.

FACILITIES

Primary Substations (351 Structures):

Two such structures were built in the 300 Area. The 351-B Substation was the larger of the two, but still it was considerably smaller than the 151 and 251-N substations. The 351-B Substation functioned to supply power to the 305 Test Pile. The 351-A Substation functioned to supply power to the remainder of the 300 Area. Electric power for the 300 Area came from the Grand Coulee Dam-to-Bonneville Dam grid via the Midway-Walla Walla tie line. Delivery of power to the 300 Area actually was made through the Pacific Power and Light Company's (PP&L) substation at Pasco and former substation at the town of Hanford and then to the 351-A and 351-B primary substations. The 351-A Primary Substation consisted of a gravel surfaced, fenced area containing a wooden bus structure, three 250-kVa transformers, three circuit breakers, and terminal structures. No switch house building was provided.

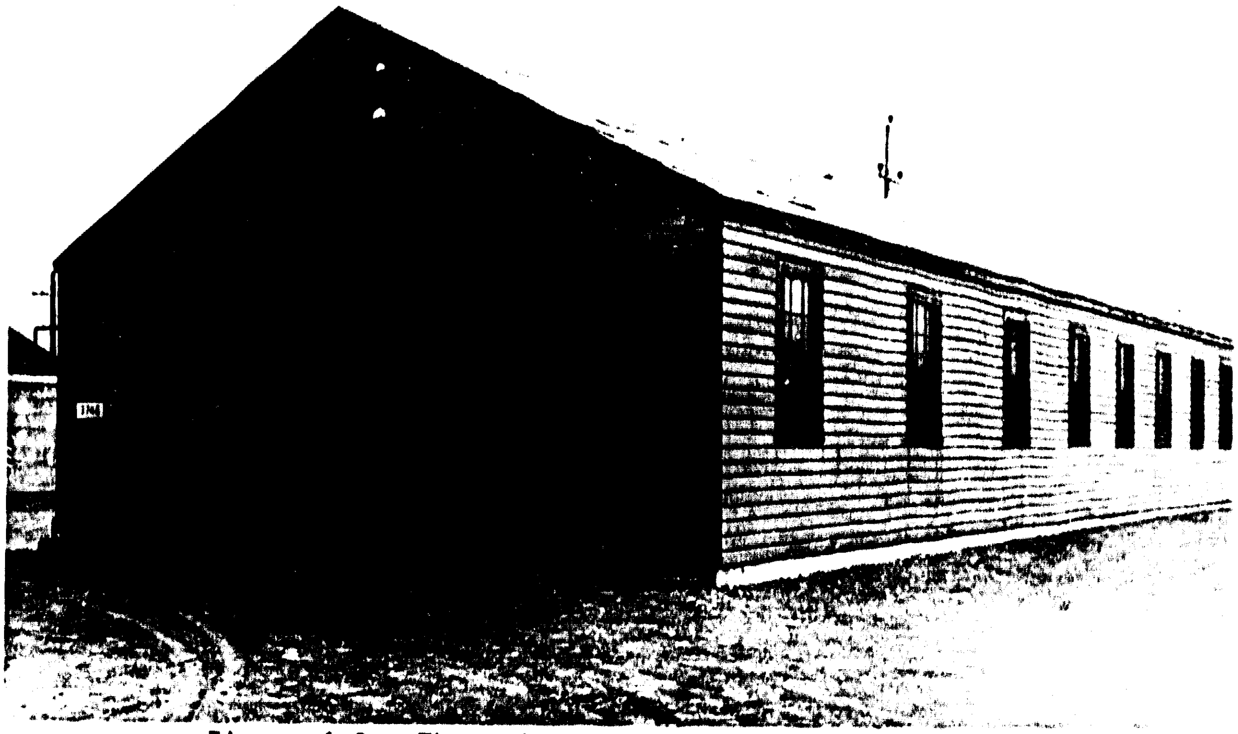

Figure 4-9. The 3746 Control Building, Early 1945.

The 351-B Primary Substation contained a concrete block switch house with switchgear. A fenced area surrounded the block house and contained wooden frame bus structures, three 667-kVa transformers, circuit breakers, and terminal structures. Appendix C contains a physical description of the 351-A and 351-B structures.

<u>Fence and Road Lighting (3501 Structures):</u>

See Section 5.0 for discussion.

<u>Outside Transmission Lines (Including Wooden Poles and Hardware) (3503 Structures):</u>

See Section 5.0 for discussion.

<u>Fire Alarm Systems (3505 Structures):</u>

See Section 5.0 for discussion.

<u>Telephones and Telephone Cable (3506 Structures):</u>

See Section 5.0 for discussion.

<u>Standard Gauge Railroad Tracks (3601 Structures):</u>

See Section 6.0 for discussion.

Roads and Walks (3603 Structures):

See Section 6.0 for discussion.

Fences (Including Guard Towers) (3605 Structures):

Four Guard Towers were emplaced in the 300 Area. See Section 6.0 for discussion.

Underground Septic Tank (3607 Structure):

One such structure was emplaced in the 300 Area. See Section 6.0 for discussion.

Open Drainage Ditch (3612 Structure):

One such ditch was dug in the 300 Area to facilitate sanitary and surface water drainage. It was 500 ft long and 30 in. wide. No further information concerning the 3612 Structure can be found.

Permanent Parking Lots (3613 Structures):

See Section 6.0 for discussion.

General Monitoring Station (3614 Structure):

One such structure was built in the 300 Area. See Section 6.0 for discussion.

Emergency Gasoline Electric Generator Buildings (3621 Structures):

Three of these structures were built in the 300 Area. See Section 6.0 for discussion.

Outside Overhead Pipe Supports (3801 Structures):

See Section 5.0 for discussion.

Outside Overhead Steam Lines (3802 Structures):

See Section 5.0 for discussion.

Outside Overhead Air Lines (3803 Structures):

See Section 8.0 for discussion.

Outside Underground Fire Lines (Including Elevated Storage Tanks) (3902 Structures):

See Section 9.0 for discussion.

Outside Underground Sanitary Sewers (3903 Structures):

See Section 5.0 for discussion.

Outside Underground Process Sewers (3904 Structures):

See Section 5.0 for discussion.

Wells (3905 Structures):

Two wells were dug in the 300 Area. No further information can be found concerning the 3905 Wells.

5.0 500, 800, AND 900 AREAS

The 500 Area at HEW was not a geographical area. It consisted of the outside electrical facilities of the entire site, including the primary, secondary, and distribution substations; the outside power transmission lines, fence, and road lighting; fire alarm systems; and telephones and telephone cables. All electrical power for HEW came from the Grand Coulee-to-Bonneville grid and was supplied to the 100 and 200 areas via the Midway Substation (a pre-HEW structure located at the northwest corner of the Site) (Figure 5-1) and the 151, 152, 153, 251, 252, and 253 Substations (Figure 5-2). (See Sections 2.0 and 3.0.) Additional circuit breakers and transmission banks were added, and other apparatus was rearranged within the Midway Substation by the MED to serve the needs of HEW.

The power supply to the other HEW areas was obtained from the 115-kV Midway-Walla Walla tie-line, and delivery was made through the Pasco Substation and former Hanford Substation of the PP&L. These substations reduced the voltage to 66 kV before final delivery over the PP&L transmission lines. An additional transformer bank was added to the Pasco Substation by the MED to serve the needs of HEW.

Likewise, the 800 Area at HEW was not a geographical area. It consisted of the 184, 284, and 384 power houses (Sections 2.0, 3.0, and 4.0), and the overhead pipe line facilities, specifically all pipe supports, steam lines, air lines, and process lines. All of these systems were separate within each area, with the exception of the 784 Boiler House that served both the 700 and 1100 Areas and the 1187 Steam Distribution Lines that encompassed both the pipe supports and the steam distribution lines for the 700 and 1100 areas.

The 900 Area at HEW also was not a geographical area. It consisted of the underground pipe line facilities, specifically the export water lines and valve houses; raw water and fire protection lines; sanitary sewers; process sewers; and wells and pumps. All of these systems were separate within each area, with no interarea ties.

In the case of the 500, 800, and 900 area structures and facilities, a prefix (and in some cases a suffix) indicated the specific location. For example, a 1501-B structure was a fence or road light in the 100-B Area. A 2902-W Structure was an underground fire line in the 200-W Area. The exceptions to these designations will be noted. (For information on the TCs in the 500, 800, and 900 areas, see TC-10 Structures in Section 9.0.)

500 AREA

Fence and Road Lighting (501 Structures):

Series road and fence lighting was constructed for the main roads in the 100, 200, 300, and 700 areas, and for the respective boundary fences for these areas. Additional fence lighting was provided in the 100 Areas around the 105 exclusion areas and in the 700 Area around the inside of the secondary enclosure fences for the 703 and 702 buildings. Road lighting fixtures were

Figure 5-1. The Midway Substation.
(A PreHanford Site structure that brought electrical power to Hanford Engineer Works from the Grand Coulee Dam-to-Bonneville Dam grid. Looking east, the Riverland Rail Yard and the 100-B Area are barely visible.)

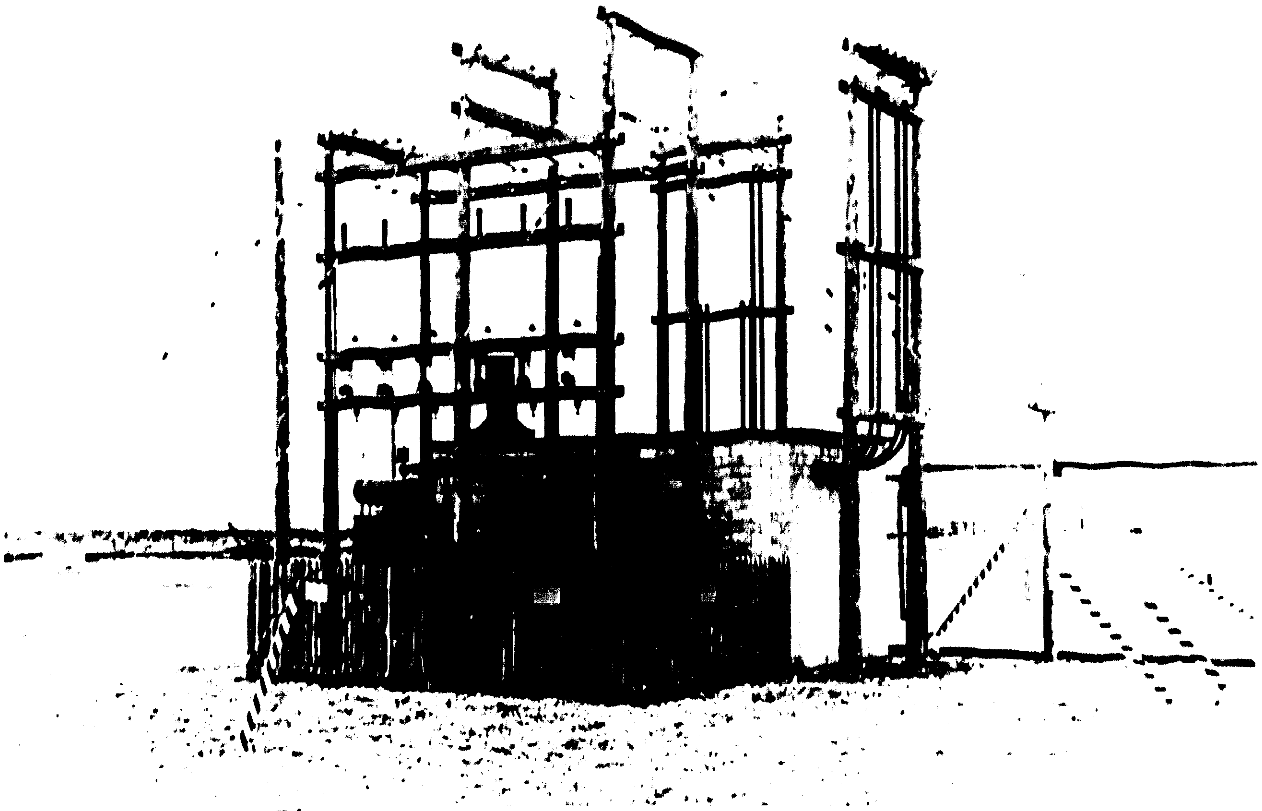

Figure 5-2. The 252-E Secondary Substation.
(This substation was an essential step-down link in the Hanford Engineer Works electrical distribution system.)

provided at all main road intersections, with distances between street lights varying from 400 to 500 ft. Galvanized iron wire and bare copper wire were used for fence circuits, insulated copper wire was used for fixture taps, and galvanized iron wire was used for road lighting circuits. The fence circuits also supplied power to the 1701, 2701, and 3701 guard towers and to the 614 General Monitoring Stations. In most cases road and street lighting was supported on area power distribution poles. Telephone lines were carried on the same poles. Appendix D contains a listing of the 501 Structures.

Electric Transmission Lines (503 Facilities):

The power distribution system for HEW was composed of transmission lines of five different voltage levels, containing separate closed loops with a number of interconnections. The 151 and 251 substations were fed by 230-kV lines with associated loops (Figure 5-3), while the 351, 751, and 1151 substations were supplied by 115-kV and 66-kV transmission lines. Power then was distributed via 13.8-kV and 2.5-kV lines. The transmission lines, poles, wires, and insulation were of ordinary industrial construction: three-wire, cross arm, single-pole design, fir and cedar poles, and insulated and bare stranded copper wire. There were 51.3 miles of 230-kV line, 35 miles of 115-kV line, 53.6 miles of 66-kV line, hundreds of miles of 13.8-kV line, and 5.9 miles of 2.3-kV line. (Note: In the 1100 Area the electrical distribution lines were designated as 1105 Facilities.)

Fire Alarm Systems (505 Facilities):

Fire alarm systems at HEW were constructed in each area. Circuits were galvanized iron wire carried, in most cases, on the same poles as the telephone lines. Fire alarm boxes, mounted on existing power poles, rang as electro-mechanical gong-type devises inside fire stations and as sirens inside and outside other buildings. Ten fire alarm boxes were installed in each of the 100-B and 200-W areas, 11 each in the 100-D and 100-F areas, 9 in the 700 Area, 8 in the 200-E Area, 6 in the 300 Area, and 90 in the 1100 Area. (Note: The 1100 Area fire alarm system was designated as the 1155 Facility.)

Telephone Cable and Instruments (506 Facilities):

The HEW telephone network comprised five types of systems. These systems included an interarea system with a main switchboard in the 702 Central Telephone Exchange Building. This switchboard connected to switchboards in the patrol headquarters buildings and supervisors' office buildings in each area. This system was composed of lead-sheathed aerial cable lines. Within each area, an intraarea telephone system consisted of an aerial cable or a multicircuit line emanating out of each respective area switchboard to each building. Within several of the major buildings themselves (including the 100, 200, and 300 area process buildings), there were individual building teletalk and voice-powered phones, buzzers, and klaxons. Teletalk systems also connected several of the process buildings to each other. A separate power dispatcher system, carried on a single circuit, open iron wire, connected magneto phones in each of the primary substations to the Chief Power Dispatcher in the 251-N Substation. Another single circuit, open iron wire line connected each of the railroad dispatcher stations to the Chief Dispatcher located at the Riverland Rail Classification Yard. A total of 2,067 telephones and 1,384,445 ft of telephone cable were installed at HEW. (Note: The 1100 Area telephone system was designated as the 1156 Facility.)

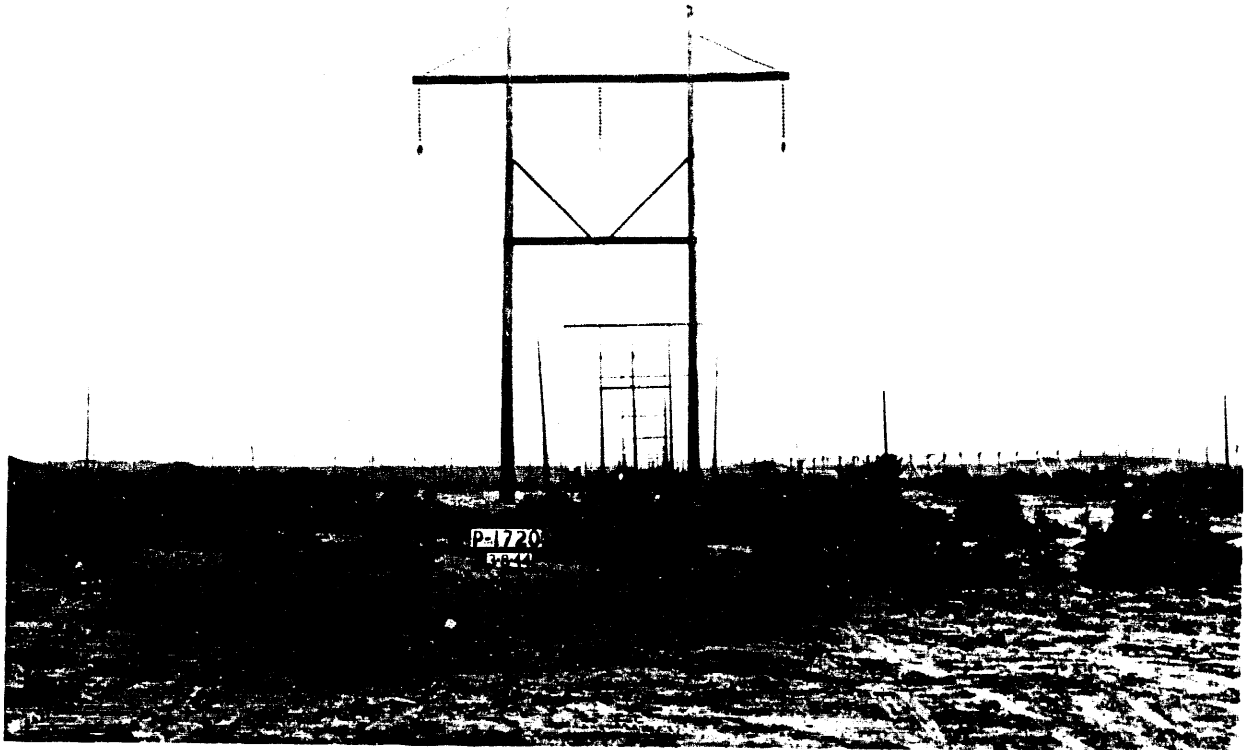

Figure 5-3. A 1503-B Structure, 1945.
(This 230-kV transmission line was located in the southwest corner of 100-B Area.)

800 AREA

Pipe Supports (801 Structures):

Two standard, wooden-type pipe supports were installed at HEW to carry the overhead steam, air, and process lines in the 100, 200, 300, and 700 areas. These supports were used principally for the pipes that carried steam lines from the power houses to the buildings requiring steam for power, processes, or heat. One type of pipe support was a single pole with a double wooden cross arm fastened with strap steel knee braces. The other type was a double wooden pole with a single wooden cross arm bolted in place. The poles were untreated wood set in concrete.

Steam Lines (802 Structures):

Overhead steam lines carried steam to and throughout all HEW areas except the 1100 Area and in the 200-E and 200-W Areas between the 221 Buildings and the 291 Exhaust Stacks. (In those cases, the lines were laid underground.) Overhead steam lines were of welded construction with welded neck flanges installed for necessary valves and at points of connection with building services. Schedule 40 seamless steel pipe was used for pressures up to and including 160-lb lines, and schedule 80 seamless steel pipe was used for the 225-lb pressure lines used for 100 and 200 areas process and auxiliary power needs. (Note: 160-lb lines were used for 700 Area steam-heating distribution, 135-lb lines were used for both process and heating purposes in the 300 Area, and 15-lb lines were used for heating purposes elsewhere.) Steam lines varied in size from 1.5 in. to 18 in. and contained vertical and horizontal expansion joints at distances required by the Uniform Building Code of 1938. Pressure reducing valves also were provided on the pipes that carried steam for building heating purposes. Magnesia (85%) insulation covered all outside steam lines. For weather protection, this insulation then was covered with asphalt rolled roofing (a "felt jacket"). Appendix D contains a tabulation of the various lengths and sizes of steam lines at HEW. (Note: In the 1100 Area the steam distribution lines were located underground and were designated as 1187 Structures.)

Air Lines (803 Structures):

Overhead, noninsulated lines were provided at HEW for the delivery of 125 lbf/in^2 compressed air to 100, 200, 300, and 700 area process areas. Compressed air was used to operate process and laboratory instrumentation, as well as some shop equipment. In the 300 and 700 areas, compressed air lines ran from the 384 and 784 power houses to various buildings. In the 100 and 200 areas, similar lines ran from the 184 and 284 power houses to various buildings, as well as within some large buildings. The 803 Structures were composed of welded, schedule 40 steel pipe varying from 1 in. to 3 in. in diameter.

Process Lines (805 Structures):

Overhead welded process lines, varying from 2 in. to 4 in. in diameter, were provided for limited, specific uses in the 100 and 200 areas. In the 100 Areas, the lines were constructed of mild steel and consisted of a 3-in. sodium dichromate line and a 3-in. sodium silicate line running from each of the 108 Buildings to the 190 Buildings, as well as a 2-in. oxalic acid line running from each 108 Building to each 105 Building. In the 200-E and 200-W Areas, the 805 Structures all ran between the 221 Building and the 224 Buildings. They consisted of a 3-in. stainless steel nitric acid line, a 3-in. stainless steel formic acid line, and a 4-in. mild steel caustic line. Other process lines running between the 221 and 224 buildings were located in an underground pipe trench.

900 AREA

Water and Fire Lines (Including Elevated Water Storage Tanks) (901 and 902 Structures):

The 901 Structures at HEW were located underground and provided water for process, heating, cooling, laboratory, drinking, and sanitary purposes. Lines that carried water from the 100 Areas to the 200-E and 200-W Areas were known specifically as export water lines (901-1 Structures). Piping for fire protection purposes was designated as 902 Facilities (Figure 5-4).

The 1901, 1901-1, and 1902 structures included river water lines running from the 181 Buildings to the 182 Buildings (and to the 189-D and 189-F buildings). Export water lines to supply sanitary and raw water to the 200-E and 200-W Areas ran from the 182 to the 282 Buildings. Raw and

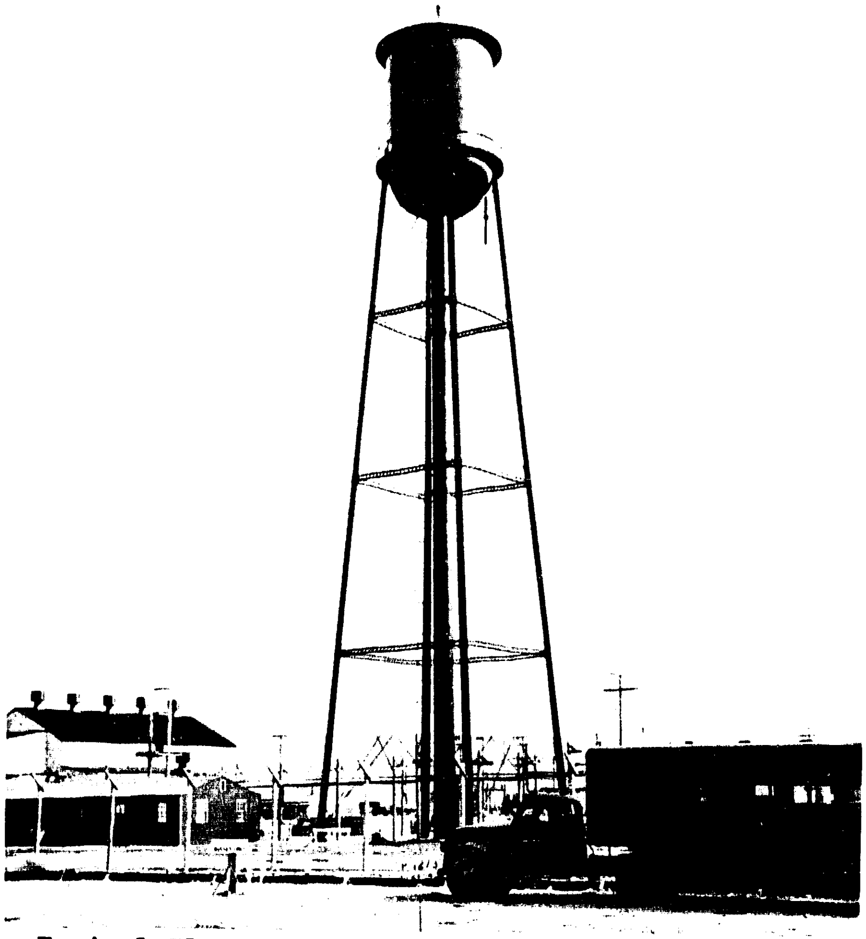

Figure 5-4. Typical Elevated Water Storage Tank at Hanford Engineer Works. (This 3902 Structure held a 75,000-gal reserve for the 3709 Fire Headquarters.)

condensed water lines ran from the 182 to the 190 Buildings, and hot condensed water return lines were provided from the 190 to the 182 Buildings. Filtered water lines ran from the 183 to the 190 Buildings (via the 186 Building in the 100-D Area) and from the 190 to the 105 Buildings. (In the 100-D Area the pipes running from the 186 to the 190 Buildings were known as demineralized water lines.) Elevated storage tanks (187 Structures) held reserves of filtered water in all of the 100 Areas (Section 2.0). Sanitary water lines looped throughout the 100 Areas, and softened water lines connected a 75,000-gal elevated softened water storage tank at each boiler house with equipment within the 184 Structures. Additionally, each 1709 Fire Headquarters had a 100,000-gal elevated water storage tank for use as a fire-fighting reserve.

The 2901 and 2902 structures in the 200-E and 200-W Areas included process water lines that ran from the 282 Buildings to the 221, 224, and 231 buildings and sanitary water lines that ran from the 282 Buildings to all area buildings via the 283 Filter Plants. A 100,000-gal elevated tank was provided near the 2709 Fire Headquarters Buildings; a 50,000-gal fire fighting reserve tank was provided in each of the T, B, and U process group areas; and a 50,000-gal tank for the storage of softened water was provided at each of the 284-E and 284-W buildings.

The 200-N Area had an independent water supply emanating from two wells (2905-N Structures) drilled in the fenced areas surrounding the 212-R Building. From these wells, 2901 and 2902 water lines ran due west to each 212 Building, and an additional line ran from the 212-N Building to the 251-N Substation. Another line ran from the 200-N Area well to the export water lines running to the 200-E and 200-W areas.

The 300 Area water supply also was independent and emanated from two wells in the southeast corner of the area. All of the water was chlorinated and then distributed throughout the area via two main piping loops that ran from the wells to various buildings for process, heating, cooling, laboratory, fire, drinking, and sanitary purposes. A 75,000-gal elevated water tank was connected to this system for fire protection purposes.

The 600 Area water supply came from a well dug at the Riverland Classification Rail Yard. A water treatment plant (6186 Building) for softening and chlorinating the water was built over this well. Sanitary water lines ran from this plant to various area buildings, and softened water lines ran to the 6718 Locomotive House. A 25,000-gal elevated tank for chlorinated water storage was located next to the 6186 Building. Another well in the 600 Area was located in the 661 Rifle and Pistol Range enclosure.

The 700 Area and 1100 Area water supply was based upon wells drilled in the south end of Richland along Wellsian Way. All water from these wells was chlorinated and then distributed via piping for sanitary, fire, laboratory, heating, cooling, and drinking purposes. A 25,000-gal softened water storage tank was provided next to the 784 Boiler House.

All 901 Structures were buried at least 4 ft belowgrade and were surrounded by concrete kicker blocks at connections with sharp bends. All main lines were encased in concrete under road and rail crossings. The piping itself varied widely from 42-in. steel lines between the 181 and 182 buildings and 42-in. concrete export water lines down to 1-in. service piping. All elevated water storage tanks were built of wood. A listing of the materials and quantities used in 901 and 902 piping at HEW is contained in Appendix D. (Note: The sanitary and fire protection water lines in Richland Village were designated as the 1103 Structures.)

Sanitary Sewer Lines (903 Structures):

A total of 53,745 ft of sanitary sewer lines, ranging from 4-in. to 15-in. pipe, was emplaced at HEW. In all areas except the 700 and 1100 areas, these lines were connected to Septic Tanks (607 Structures [Section 6.0]). The sewer lines in the 700 and 1100 areas were connected to the Richland Village Sanitary Sewage Disposal Plant (1124 Structure [Section 8.0]). The 903 Structures were built of concrete or vitrified clay pipe with concrete joints. Piping in congested areas and under roads and railroads was encased in concrete. Brick manholes were provided for access to the piping, and drain fields of field drain tile and vitrified clay piping with open joints were constructed around the septic tanks. (Note: The sewer lines in Richland Village were designated as the 1104 Structures.)

Process Sewer Lines (904 Structures):

The 904 Structures were emplaced in the 100, 200, 300, and 600 areas to carry some process wastes, process waste water, process cooling water, steam condensate, and building floor drainage to various points for disposal in open drainage ditches or in the Columbia River. Some process sewer lines at HEW were constructed of nonacid-proof materials, such as vitrified clay, concrete, and schedule 40 welded steel pipe with plain cement joints. Other process sewer lines were made of "acid-proof" materials, including vitrified clay with cast iron, wrought iron, lead, or asphaltic joints or earthenware, cast iron, wrought iron, reinforced concrete pressure pipe, and stronger varieties of steel (such as schedule 80 or stainless steel). All process sewer lines were encased in concrete under rail and road crossings or where the fill exceeded 12 ft. Additionally, all process sewer systems at HEW operated by gravity flow, with the exception of the 105 Buildings to 107 Basins lines and the lines draining the 115-D and 115-F gas purification buildings.

In each of the 100 Areas, process waste (reactor effluent) from the 105 Buildings was discharged into the Columbia River at a point north of each area. Pressure sewer lines to carry this waste were installed between the 105 and 107 buildings and then from the 107 Basins to the main area sewer outfall piping just before its discharge point into the river. A reinforced concrete chamber was constructed at the terminus of the main sewer and actual discharge into the river occurred through twin, 42-in. spiral steel welded pipes with 3/8-in. walls. These latter pipes extended 900 to 1,800 ft into the river. Regular acid-proof and nonacid-proof piping was used for other process building connections in the 100 Areas.

Many independent process sewer systems existed in the 200-E and 200-W Areas (Figure 5-5). Each process group (T, B, and U) had three process sewer networks. From the 221, 222, 224, and 291 buildings one such system carried process waste to the 241 Storage Tanks; one carried cooling water to the 241 Retention Basins; and one transported chemical waste, building floor drainage, and steam condensate to open drainage ditches (2612 Structures). Other separate process sewer systems served the 200-W Power and Service Area, the 231 Building, the 200-E Power Area, and the 200-E Service Area. The latter system primarily existed to carry waste from the 273 Heat Treating Furnace Structure. Regular acid-proof and nonacid-proof piping was used for other process building connections in the 200-E and 200-W Areas.

In the 200-N Area each 212 Lag Storage Building was provided with a separate outfall process sewer that ran due south and emptied into a main 2912-N open drainage ditch. Two manholes were installed in each line.

In the 300 Area, the process sewer network serving each building was connected to form a single system. The 3904 lines from the 305, 313, 314, 321, 382, 384, 3706, 3709, and 3717 buildings connected through laterals to a main 18-in. vitrified clay pipe that ran eastward through the area to a settling basin about 800 ft east of the boundary fence. This basin, known as the Process Pond, served as a percolation vehicle for wastes to seep through soils and into the Columbia River.

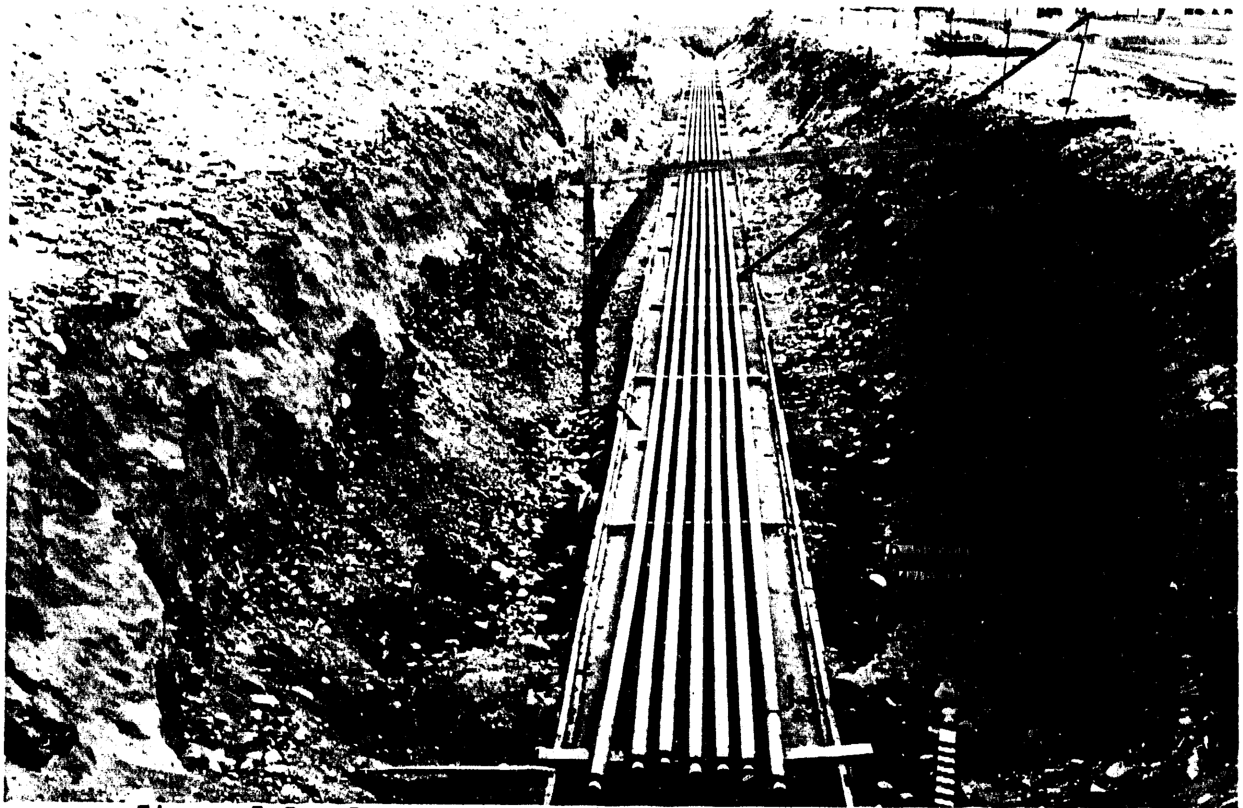

Figure 5-5. Process Sewer Lines (2904 Structures) Newly Laid in the 200-W Area, April 1944.

In the 600 Area, an 8-in. vitrified clay pipe was laid at the Riverland Yard to dispose of waste water from the 6186 Water Treatment Plant. This line emptied into the area's 612 open drainage ditch.

<u>Wells and Pump Houses (905 Structures):</u>

An unknown number of such structures were built at HEW in the 200-N, 300, 600, and 1100 areas. They are described individually (to the extent that information can be found) under headings describing the 901, 901-1, and 902 structures (Section 5.0), the 661 Complex and 6901 Structures (Section 6.0), and 1185 Structures (Section 8.0). Pump Houses varied from very small structures (such as the one at the 661 Complex) to much larger ones in the 1100 Area.

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6.0 600 AREA

The 600 Area at HEW consisted of facilities that served more than one specific area, such as roads and railroads (along with their maintenance structures) and health protection and monitoring facilities. The 600 Area designation soon came to refer to all areas of HEW that were included specifically within some other area. The 600 Area contained 130 buildings and/or structures and 20 facilities. However, portions of 600 Area facilities that were located within other areas were designated with prefixes and suffixes that identified their physical locations. For example, a 607 Septic Tank in the 100-B Area was designated as a 1607-B Structure.

That portion of the 600 Area that contained the most structures in a concentrated location was the Riverland Classification Rail Yard (Figure 6-1). This area was a strip of land, 5,800 ft long and 400 ft wide, located on the Columbia River side of the existing (preSite) track spur of the Chicago, Milwaukee, St. Paul, and Pacific Railroad that ran between Beverly and Hanford, Washington. Riverland Yard was about 3 miles west of the 100-B Area, near the Midway Substation. (Note: All structures in the Riverland Yard have been removed. Remediation alternatives for soil wastes in the area currently are undergoing public comment.)

Some temporary construction structures in the 600 Area, such as the Hot Mix Plant For Road Materials, survived as permanent buildings, and several miles of TC rail track, roads, and walks were converted to permanent operational use. (For more information on temporary buildings and facilities in the 600 Area, see TC-10 Structures in Section 9.0.)

Standard Gauge Railroad Track, Track Scale, and Scale House (601 Structures):

The designation of the 601 Structures applied to the 123.3 miles of standard gauge single-rail track at HEW that wound through all of the areas, as well as to a track scale and scale house that was constructed at Riverland Rail Yard. The 601 track itself functioned to carry supplies and products throughout HEW and was divided (administratively) into process and service tracks. Process tracks were those over which "product" (plutonium, irradiated fuel rods, or uranium) was allowed to move during manufacturing operations. All such tracks were laid with rail weighing not less than 80 lb/yd and sometimes as much as 100 lb and 110 lb/yd. All other tracks constituted service tracks and were expected to remain uncontaminated. The Scale House sat next to the tracks, just west of the 6186 Locomotive House. Next to the Scale House and under the tracks was a concrete scale pit containing a 120-ton track scale connected to a concrete weigh beam pit. Concrete track anchors were located at each end of the scale pit. The Scale House, scale pit, and weight beam pit functioned to weigh and gauge specific rail loads. Appendix E contains a physical description of the 601 Scale House, scale pit, and weigh beam pit.

Standard Gauge Rolling Stock (602 Facilities):

Eighty-nine pieces of standard gauge railroad equipment were listed in the inventory for HEW (Figure 6-2). The 602 Facilities included locomotives,

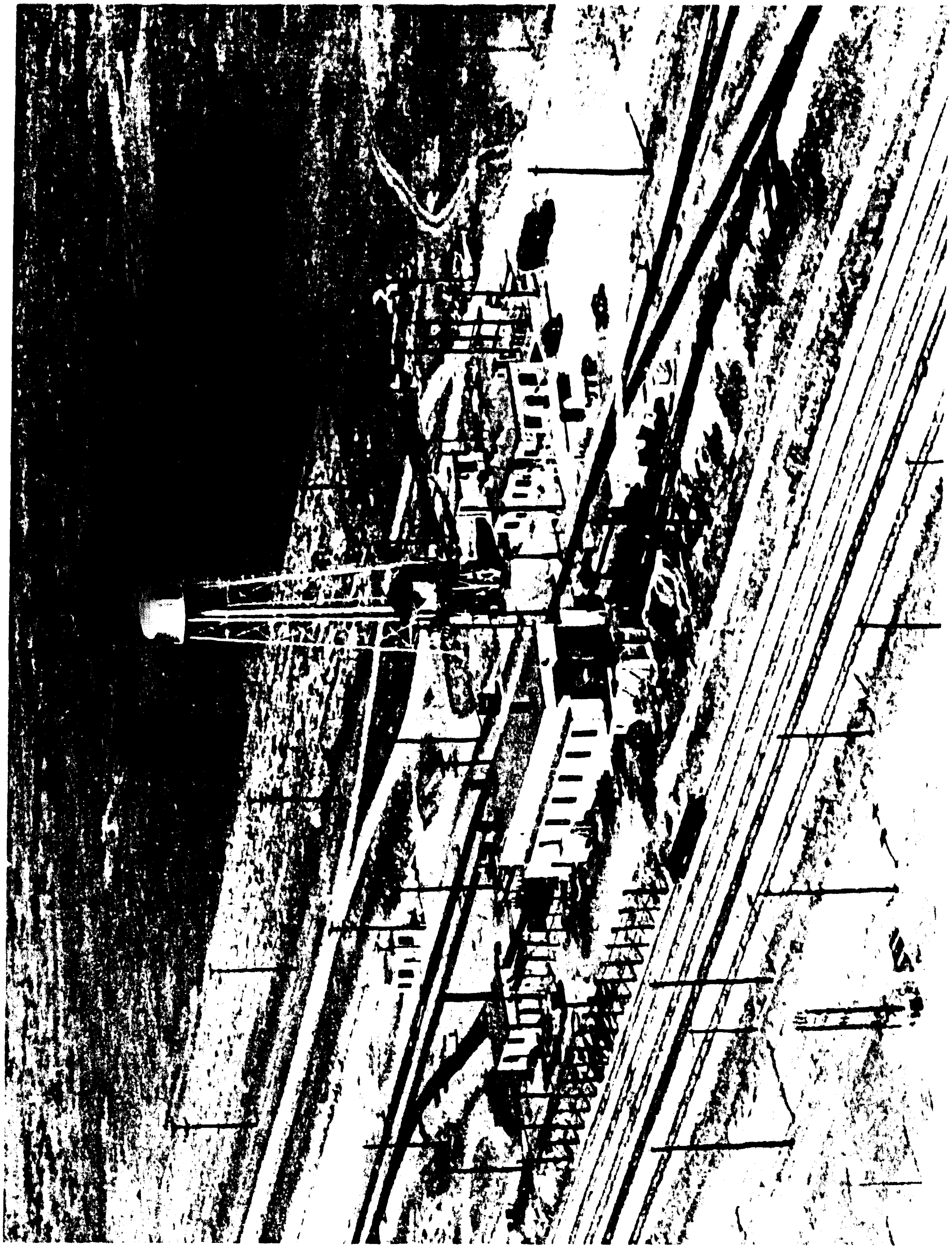

Figure 6-1. Riverland Rail Classification Yard, Looking North.

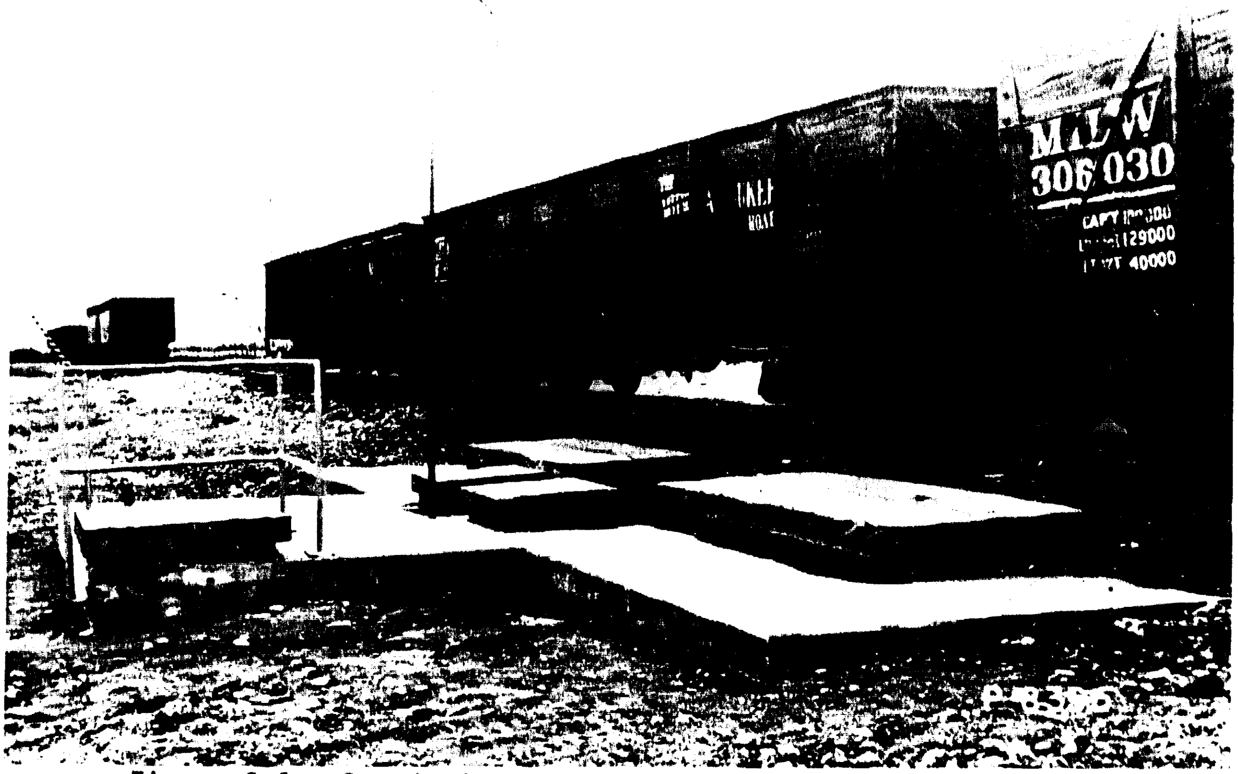

Figure 6-2. Standard 602 Rolling Stock, Halted Near the Salt Dissolving Pit that Served the 284-E Power House, Looking Southeast, 1945.

rail cars of many varieties, trailers, jacks, cranes, and rail drills. All of this material was stored at the Riverland Yard when not in use along the track. Appendix E contains an inventory listing of the 602 equipment.

Roads, Walks, and Traffic Checking Stations (603 Structures):

The designation of 603 Structures applied to the approximately 291 miles of permanent roads (including gravel roads but not including roads and streets in Richland Village), the approximately 7 miles of walks on the HEW Site (excluding walks in Richland Village), and to the four permanent traffic checking stations built at HEW. The function of the roads and walks, of course, was to provide pathways for traffic access around the Site. The function of the traffic checking stations was to stop and inspect traffic moving into, through, and out of HEW, for security purposes.

Most of the HEW roads were built by subcontractors, according to MED specifications. The original specifications were for what was known at the time as "stage construction," roads with a 5-in. gravel base, a leveling course of 3/4-in. aggregate, and then two courses of "shot and cover" bituminous surfacing for the mat. However, after the subcontract was let, the subcontractor offered to use a bituminous road mix mat (a higher grade) if the leveling course of aggregate was omitted. This offer was accepted and became the actual basis for the HEW roads.

After the road mat was laid, it was common practice to wait as long as possible (up to one year) before the final seal was applied, so that any failures could develop and be patched before the final seal was applied. Two types of road seals were used at HEW: a "nonskid" single-seal treatment as specified in the 1941 Manual of the Washington State Highway Department was used for major roads, and a light seal using oil was used for intraarea roads and for access roads leading into the various areas. The three most major roads on the HEW Site were the Richland-to-Hanford Road (Route 4, newly constructed); the Cold Creek Road (a preSite structure that was improved by the MED) running east-west from the Vernita area through the town of White Bluffs to the town of Hanford; and a road known as the "cut-off" leading east from the Midway Substation, turning south between the 200-E and 200-W Areas, and then turning east again and intersecting with the Richland-to-Hanford Road.

There were four permanent traffic checking stations at HEW and four additional ones during the construction phase. The four permanent stations each had a small Sentry House that contained an office, as well as checking lanes for the traffic. These four stations were the Richland-Hanford Barricade on Route 4 at the 300 Area (with six covered checking lanes), the Benton City-Prosser Barricade approximately one mile north of Horn Rapids Dam at the Route 10 entrance to HEW (usually known as the Prosser Barricade, with two covered checking lanes), the Cold Creek Barricade on the Cold Creek Road approximately five miles west of the 200-W Area (with four covered checking lanes), and the Midway Barricade at the Riverland Yard (where there were no covered checking lanes, but the Sentry House was right at the roadway). During the construction phase at HEW, additional traffic checking stations or barricades stood on the Cold Creek Road at the entrance to the Hanford Construction Camp at the intersection of Routes 2 (the "cut-off") and 4; on Route 4 approximately seven miles south of the Hanford Camp; and across the Columbia River at the ferry access road near Connell, Washington (in Franklin County). Appendix E contains a physical description of the four permanent traffic checking barricades at HEW. (Note: The roads and walks in Richland Village were designated as 1102 Structures.)

Autos, Tractors, and Trailers (604 Structures):

The 604 designation applied to all government-owned overland vehicles at HEW, with the exception of rail stock. Each vehicle then was given an additional number to identify it precisely. No description or tabulation of the HEW vehicles can be found.

Fences (Including Guard Towers) (605 Structures):

Just over 80 miles of fencing was emplaced at HEW, with 72 guard towers built along this fencing. The function of the fencing and guard towers was to serve as part of the security system, to observe and guard the region and to prevent any unauthorized entries, and to watch for the outbreak of fires.

Four standard types of fencing were used. Type No. 1, the most formidable, surrounded the 100, 200, 300, and 700 areas individually and also surrounded each 105 Building, the 221, 224, 231, and 241 structures of each process group, and the 661 Rifle and Pistol Range (Figure 6-3) (Section 6.0). These fences were 9 ft, 4 in. high, with 12-ft posts, and consisted of woven wire fabric with three strands of barbed wire. Approximately 37.6 miles of Type No. 1 fencing was built at HEW. Type No. 2 fencing was approximately 4 ft high, consisted of just four strands of barbed wire with no woven wire fabric, and surrounded a large sector that encompassed the 100, 200, and

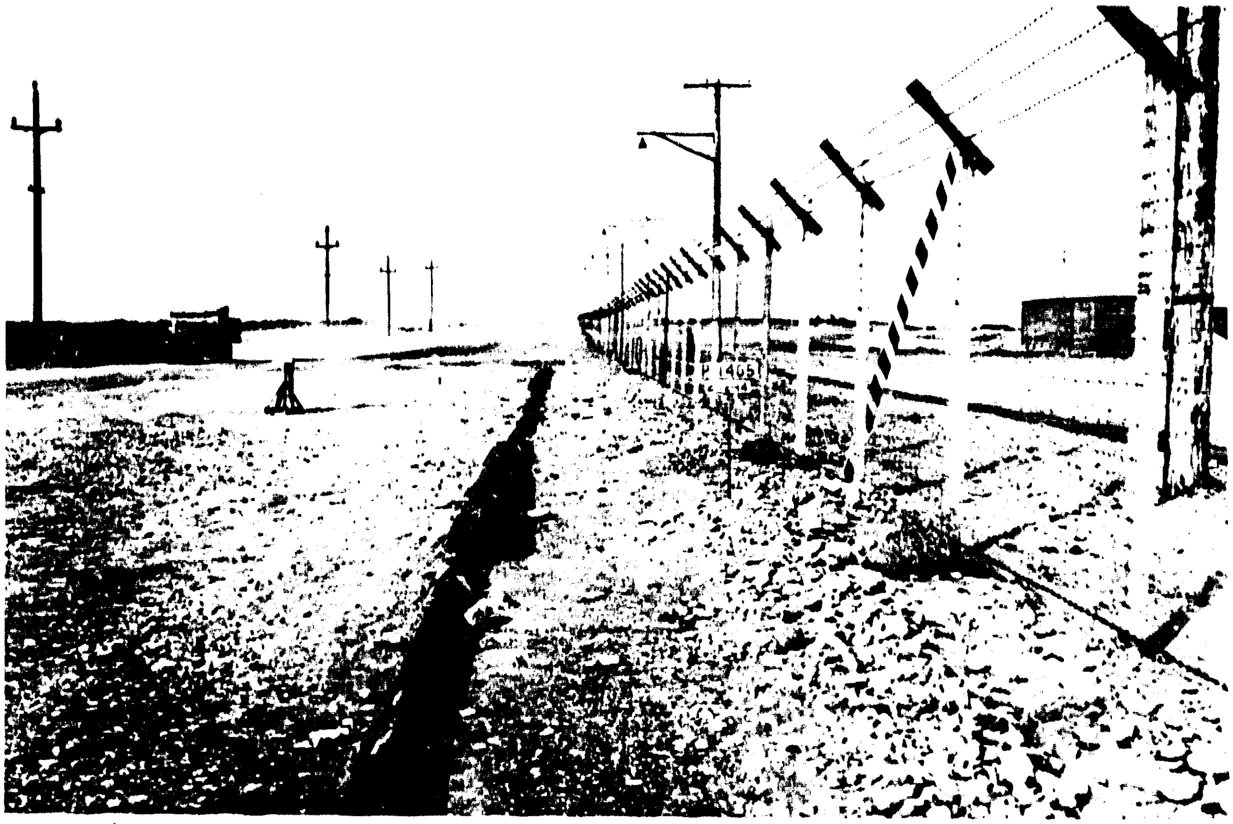

Figure 6-3. The 605 Security Fencing, Type No. 1, Newly Emplaced at Hanford Engineer Works, February 1944.

300 areas as an aggregate. Approximately 40 miles of this fencing ran south from a point just southwest of Riverland Yard to a point west of the Rattlesnake Hills, east to the Columbia River due east of the 300 Area barricade (603 Structure). The third type of fencing used at HEW was standard chain link fencing. Approximately 3.07 miles of this fencing surrounded the 213 J and K Vaults (Section 3.0) and ran along both sides of the 1100 Area Irrigation Ditch. (See 1186 Structure in Section 8.0.) The latter irrigation ditch fence was known as the 1128 Facility. The fourth type of fencing was wooden (usually picket style) and was used to surround electrical substations and sometimes water storage tanks and other structures.

The 72 one-room, flat-topped guard towers were located along the fencing at HEW (Figure 6-4). Constructed of wood, these structures were accessed via a single or double outside wooden staircase. Each contained a hand-operated searchlight that was mounted on the roof. Seventy of the guard towers were constructed along the inside of the Type No. 1 fence lines of the 100, 200, and 300 areas, and two were built along the south HEW boundary line in the vicinity of the Rattlesnake Hills. Appendix E contains a physical description of the 605 fencing and guard towers.

<u>Settling Tanks (606 Structures):</u>

Very little is known about such tanks, except the fact that they existed only in the 200-E and 300 areas. It is speculated that in the 300 Area the 3606 Structures <u>may</u> have been the four large, underground waste tanks built just south of the 321 Building (Section 4.0). No speculation can be made about the 2606 Structures. No definitive function, location, nor physical description for the 3606 nor 2606 structures can be located.

Figure 6-4. The 2605-W-10 Guard Tower, Newly Emplaced East of T Plant, April 1944.

Septic Tanks (607 Structures):

Thirty-three septic tanks and tile fields were emplaced in the 100, 200, 300, and 600 areas for the disposal of sanitary sewage. Many different sizes of tanks were used, but all fell into two types or categories. For tanks having a capacity of 25 persons a day or less, the design was rectangular with 8-in.-thick walls and floor slab and wooden tops and baffles. For tanks having a capacity of more than 25 persons a day, the design was rectangular with 1-ft-thick concrete walls, floors, and tops (pierced by three manholes with wooden covers). The design basis for both types of tanks was 35-gal of sewage per capita with a 24-hour retention period. All of the septic tanks at HEW drained into the surrounding soil via "irrigation fields" or "tile fields" composed of 4-in. vitrified clay or concrete tile. All of the septic tanks and tile fields were surrounded by 4-ft-high wooden fences. Appendix E contains a tabulation of all of the 607 Structures at HEW.

Open Drainage Ditches (612 Structures):

A total of 19,070 ft of such ditches were dug at HEW. Their function was to drain process, waste, sanitary, and surface water away from structures and into the ground. The 612 Structures in the 100, 200, and 300 areas have been described previously (Sections 2.0, 3.0, and 4.0). Three hundred feet of 30-in.-wide ditching also existed in the 600 Area. It is known that this ditching existed for the drainage of surface and sanitary water, not waste or process water. However, no specific location or further details can be located.

Permanent Parking Areas (613 Structures):

Ten 613 Structures, totalling 413,100 ft^2, were built at HEW. Their function was to provide designated space for individual vehicles and for the HEW bus loading lanes. Usually located just outside area fences near the Gate Houses and Clock Alleys, 613 Structures were built for each of the 100 Areas, the 200-E and 200-W Areas, the 300 Area, and the 700 Area. In the 700 Area, 613 Structures also were provided at the 703 Administration Building and at the 705 Employment Building. They were constructed of water-bound sand and gravel and stabilized with a hot mix bituminous gravel surfacing. Most HEW parking lots were approximately 40,000 ft^2. Wooden car stops and railings were emplaced.

General Monitoring Stations (614 Structures):

A total of 29 such structures were built by the MED for HEW. Twenty seven were located on the Site, and two were located offsite in the vicinity of Pasco and Benton City. Their function was to house the environmental monitoring equipment that sampled airborne process wastes at and near HEW. As such, these small, windowless buildings performed a pioneering role in the unique and precedent-setting environmental surveillance program at HEW. Appendix E contains a physical description of the 614 Structures. (Note: The TC General Monitoring Station located near the 145 Building in the Hanford Construction Camp was moved to the Hanford Airport [an 1100 Area location] at the close of the construction period.)

Hot Mix Plant (615 Structure):

One such structure was built at HEW, along the south side of a railroad spur just east of the Hanford aggregate pit (a barrow pit near the Hanford Construction Camp). Its function was to prepare bituminous road surfacing materials for HEW roads. The 615 Structure was a TC plant that continued to operate after the construction phase. It consisted of eight oil storage tanks, a large aggregate hopper and mixer, steam facilities, a wooden access platform, rail loading facilities, and ancillary equipment. Appendix E contains a physical description of the 615 Hot Mix Plant.

Emergency Generator Shelters (621 Structures):

Twenty such structures were built at HEW, in the 100, 200, 300, and 700 areas. Their function was to house the emergency electric generators driven by gasoline motors that stood near many essential process and service buildings. Type B shelters housed 10-kW, 230- and 115-V generators, and were installed only at the 105 Buildings and the 3719 Building. Type A shelters housed smaller 1.5-kW, 115-V generators. A gasoline storage tank for the generators was placed outside each structure on concrete saddles of sufficient height to allow for gravity feed. Appendix E contains a physical description and tabulation of the 621 Structures.

Meteorological Tower (622 Structure):

One such structure was built at HEW, located just north of the connecting road between the 200-E and 200-W Areas on a ridge approximately one-half mile east of the 200-W Area (Figure 6-5). Its function was weather

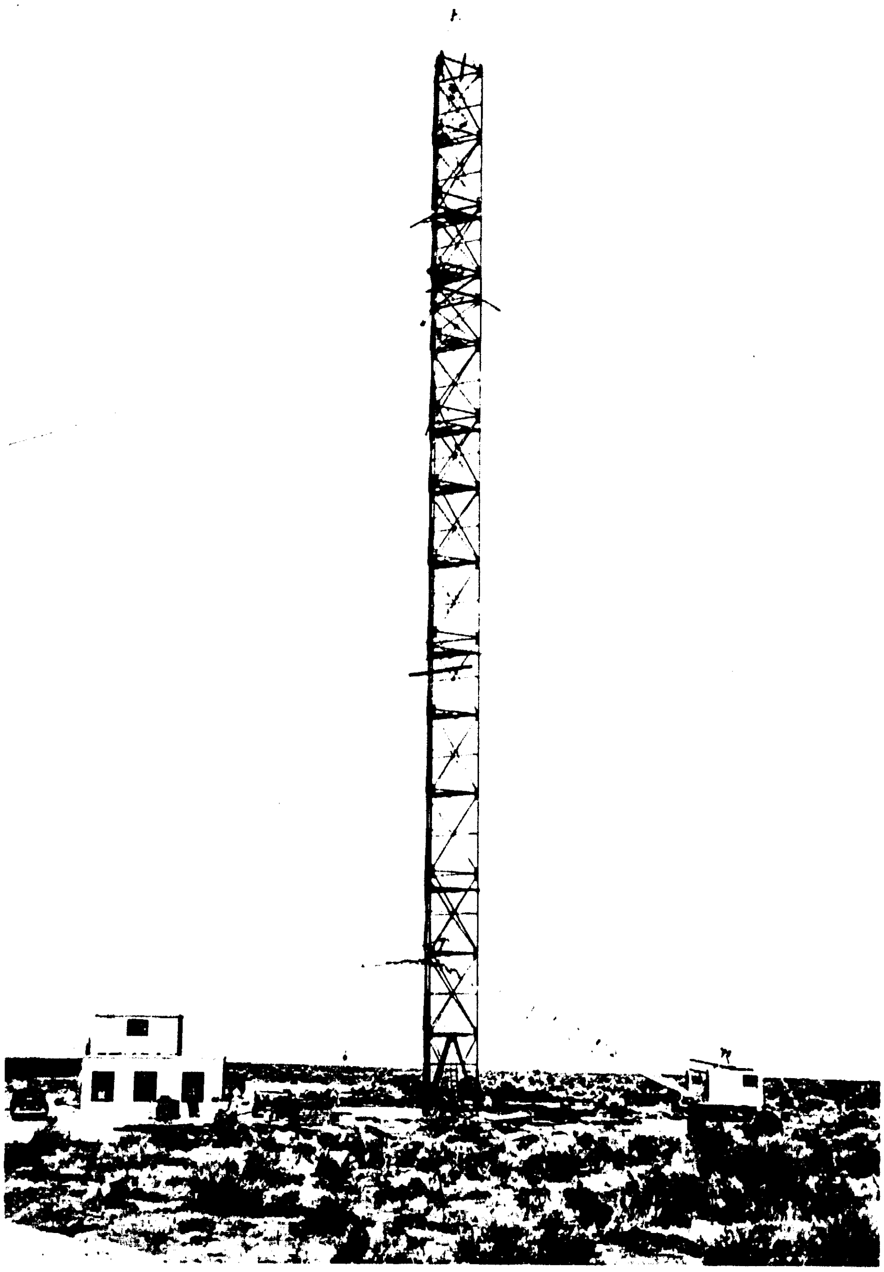

Figure 6-5. The 622 Meteorological Tower With the 622-B Observatory Building, Nearly Completed in Late 1944.

prediction and study, specifically as it related to wind dilution factors for the airborne process wastes generated at HEW. As such, it was a pivotal structure in the pioneering environmental monitoring program at the Site. The scientists of the MED and the builders of HEW established an early and extensive meteorological program aimed at determining and predicting weather conditions that would allow for safe dispersion of process gases (especially from the 221 Buildings) in the surrounding region. They relied on studies of wind factors because they emplaced no filters of any kind in the 291 Exhaust Stacks.

The triangular, structural steel 622 Tower was 406.6 ft high and contained eight platform working levels with boom extensions that supported meteorological equipment. It was anchored by three reinforced concrete guy anchors that were enclosed by fences. The 622 Tower was complete enough for use beginning December 7, 1944, and soon became an official U.S. weather station. Appendix E contains a physical description of the 622 Structure.

Meteorological Building (622-A Structure):

One such structure was built at HEW, approximately 50 ft west of the 622 Tower. Its function was to house the instruments, elevator equipment, and electrical and ventilation equipment associated with the meteorological tower. It contained an instrument room, instrument storage and work room, elevator equipment room, ventilation equipment room, office, and rest room. Cables and electrical and instrument lines ran between the 622 and the 622-A structures via a concrete trench with a sectioned, wooden cover. Appendix E contains a physical description of the 622-A Structure.

Meteorological Observatory Building (622-B Structure):

One such structure was built at HEW, approximately 100 ft southeast of the 622 Tower. Its function was to provide for visual observation in connection with meteorological studies. It contained an observation platform and a roof with a hinged, hip section that could be opened for day or night observation. Appendix E contains a physical description of the 622-B Building.

Radio Transmitter Station and Fire Observation Tower (623 Structure):

One such structure was built at HEW on the east end of Gable Mountain. One of its functions, performed on the first floor, was to house a shortwave radio transmitter set for emergency patrol use, along with the necessary generating equipment. Three feet west of the building was a power pole that supported the transmitting aerial for this station. The second function of the 623 Structure, performed on the second floor, was to search for fires on the HEW site, especially in and near the 100 and 200 areas. The second floor of the building was accessed via an outside wooden stairway and had a similar design to that of the 605 Guard Tower Buildings. The 623 Structure originally was constructed as the TC Radio Transmitter Station, and the fire watch portion was added as the need became evident. Appendix E contains a physical description of the 623 Building.

Rifle and Pistol Range (661 Complex):

One such complex was built at HEW, located at the east end of Gable Mountain. The complex was a TC facility that continued to perform its original function, that of training the HEW patrolmen in weapons use, after the construction period. It consisted of a Range House Building, Well Pump House, and four firing ranges. The entire complex was 1,250 ft by 1,820 ft and was surrounded on three sides by a Type No. 1, three-strand, barbed wire fence. (Gable Mountain formed a natural access barrier on the fourth side.) The ranges were of four different types: a regular Army pistol range, a Federal Bureau of Investigation "killer course" range (also known as the "special range"), a submachine gun range, and a "walk and draw" pistol range. The first two ranges were covered with a 2-in.-thick bituminous road mix, and the latter two ranges were equipped with manually operated, moving targets. The Range House Building was located on the opposite side of the access road from the ranges and contained a conference room, equipment storage room, office, rest room, and three brick chimneys for stove heating purposes. The small Well Pump House pit was constructed of reinforced concrete and contained a hatch in the roof for the maintenance of pumping equipment. Appendix E contains a physical description of the 661 Complex.

Water Treatment Building and Soft Water Storage Tank (6186 Structures):

One such set of facilities was built in the 600 Area. Located at Riverland Yard, just north of the 6718 Locomotive House, the 6186 Building functioned to supply softened water to the HEW steam locomotives. A 25,000-gal elevated soft water storage tank stood next to the 6186 Structure and bore the same designation. A locomotive standpipe with a concrete valve pit was located adjacent to the rail tracks just southeast of the 6186 storage tank, for purposes of transferring the soft water into the locomotives. Appendix E contains a physical description of the 6186 Structures.

Change House (6707 Building):

One such structure was built in the 600 Area. Located just north of the 6718 Locomotive House at Riverland Yard, the 6707 Building functioned to provide changing facilities for railroad personnel who wore protective clothing in their work. The 6707 Building was larger than the 1707, 2707-A, and 3707-B change houses, but smaller than the 2707 and 3707-A change houses. It contained a locker room, shower room, wash room, rest room, office, lunch room, and two vestibules. A lean-to heater room, to contain the electric heating equipment, was attached to the north side of the building. Appendix E contains a physical description of the 6707 Structure.

Locomotive House (6718 Building):

One such structure was built in the 600 Area approximately 800 ft east of the end or border of the Riverland Yard tracks (Figure 6-6). It functioned as a maintenance shop for the HEW locomotives and was oriented on an east-west axis over the tracks themselves, with two sets of tracks running through the building. Below each track at the west end was a concrete maintenance pit, and three smokestacks were located in the building roof for locomotives being serviced. A set of overhead track doors was located at each end of the building, a parts and storeroom was located in the southeast corner, and an office was located in the northeast corner. Approximately 50 ft from the southwest corner of the 6718 Building sat a 12,000-gal underground diesel fuel storage tank and two aboveground transfer pumps. Appendix E contains a physical description of the 6718 Locomotive House.

Locomotive House Cinder Pit (6718-A Structure):

One such structure was built in the 600 Area, approximately 630 ft east of the 6718 Locomotive House. It functioned to receive hot cinders from locomotives traveling through Riverland Yard. Cinders were removed via clam shell buckets to this reinforced concrete pit, which sat partially under the rail tracks. The tracks over the pit were supported on concrete-encased I-beams. Appendix E contains a physical description of the 6718-A Cinder Pit.

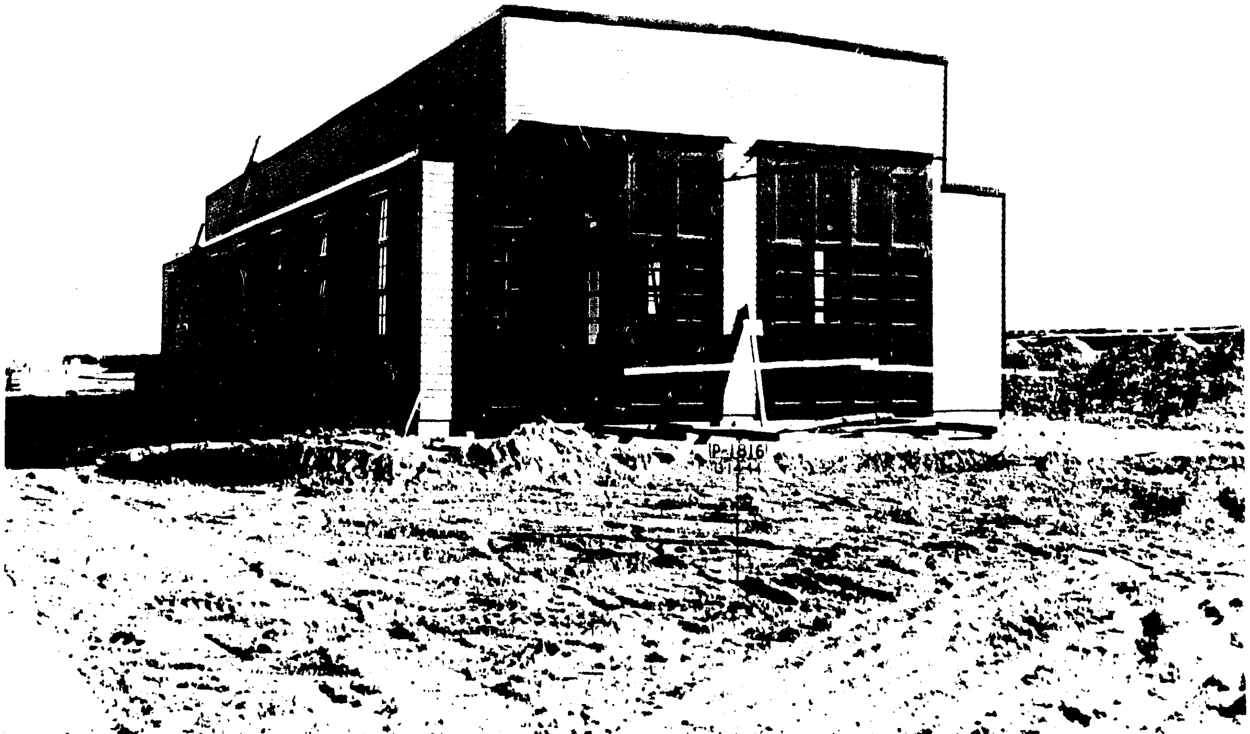

Figure 6-6. The 6718 Locomotive House at Riverland Rail Yard Under Construction, March 1944.

FACILITIES (Generic to Other HEW Areas)

Secondary Substation and Distribution Substation (652 and 653 Structures):

One such combined structure was built in one fenced enclosure in the 600 Area, just northeast of the 6607 Change House at Riverland Yard. The function of the 652 and 653 structures was to serve as steps in the electrical distribution system for Riverland Yard. Power to the 652 Substation was supplied from the 151-B Primary Substation and was transmitted over the 66-kV lines of the former Priest Rapids Irrigation and Power Company. A very small combined structure, the 652/653 Substation consisted of a four-pole, wooden frame bus structure over three transformers supported by a single concrete pad. Lightning arresters, disconnect switches and fuse mountings, and an oil circuit breaker on a separate concrete pad completed the structure. It was surrounded by a wooden fence, and there was no switch house. Appendix E contains a physical description of the 652 Secondary Substation, which serves as a combined description of both the 652 and 653 structures.

Outside Transmission Lines (Including Wooden Poles and Hardware) (6503 Structures):

See Section 5.0 for discussion.

Telephones and Telephone Cable (6506 Structures):

See Section 5.0 for discussion.

Water Lines and Elevated Water Storage Tanks (6901 Structures):

One such structure was built in the 600 Area at Riverland Yard just north of the 6186 Water Treatment Building and Softened Water Storage Tank. The 6901 Tank was distinct and separate from the 6186 Tank. The 6901 Tank was a 25,000-gal structure that held the raw water pumped from a well dug just beneath the tank (at the northwest corner of the area below the tank). A deep-well centrifugal pump extracted the water from this well and transferred it into the 6901 Storage Tank. No further information can be found concerning 6901 Structures.

Outside Underground Sanitary Sewers (6903 Structures):

See Section 5.0 for discussion.

Outside Underground Process Sewers (6904 Structures):

See Section 5.0 for discussion.

Wells (6905 Structures):

It is known that at least two wells were dug in the 600 Area, one at Riverland Yard and one at the 661 Rifle and Pistol Range. See 6901 Structure and 661 Complex for discussion (Section 6.0).

7.0 700 AREA

The 700 Area was the location of the central administrative functions for all of HEW (Figure 7-1). Situated within the "HEW Village" (Richland, Washington), the 700 Area was bounded by Swift Boulevard on the north, Knight Street on the south, Jadwin Avenue on the east, and Stevens Drive on the west. This area was roughly rectangular in shape, with the long portion running east-west. The 700 Area within Richland was distinct and separate from the 1100 Area, which included residences, churches, commercial buildings, schools, and other community living buildings.

All of the 700 Area was fenced with Type No. 1 security fencing (605 Structures in Section 6.0), with the exception of the 720 Patrol Building and the 721 Military Intelligence Building, which were located just outside the southeast corner of the area. Additional Type No. 1 fencing was emplaced around the 744 Brick Storage Yard, the smaller of the two 713-B Storehouses, and (jointly) around the 703 Administration Building, the 705 Employment Building, and the two 712 Permanent Records Storage Hutments.

The 700 Area contained 38 permanent buildings and 13 types of facilities. Nearly all 700 Area buildings were of wood frame construction. However, the 702 Telephone Exchange Building, the 784 Power House, and the 784-A Emergency Generator and Water Softening Building were constructed of concrete, concrete block, and brick. Additionally, 14 sheet metal hutments were provided in the area.

Because most of the construction of the 700 Area was done by subcontractors, very few TC Buildings were emplaced. (For more information, see TC-37 Structures in Section 9.0.) Those cases wherein TC structures were converted for use as permanent buildings will be noted. Additionally, five preSite buildings were standing within the bounds of the 700 Area when it was created. Two of these were converted for HEW use, and the others were demolished. Such buildings will be noted.

PERMANENT BUILDINGS

Gate House and Clock Alley (701 Building):

One such structure was built in the 700 Area. Very small in comparison to the Gate Houses and Clock Alleys in the process areas, the 701 Structure performed the similar functions of providing a pedestrian security check to keep unauthorized persons out of the area and of recording the times actually worked by area employees. The 701 Building was located on the east fence line of the area, just north of the 705 Employment Building. Appendix F contains a physical description of the 701 Gate House and Clock Alley.

Telephone Building (702 Building):

One such structure was built in the 700 Area. Its function was to house all of the central telephone switching equipment and personnel space to provide telephone connections throughout HEW. (See 506 Structures in Section 5.0 for further descriptions of the HEW telephone systems.)

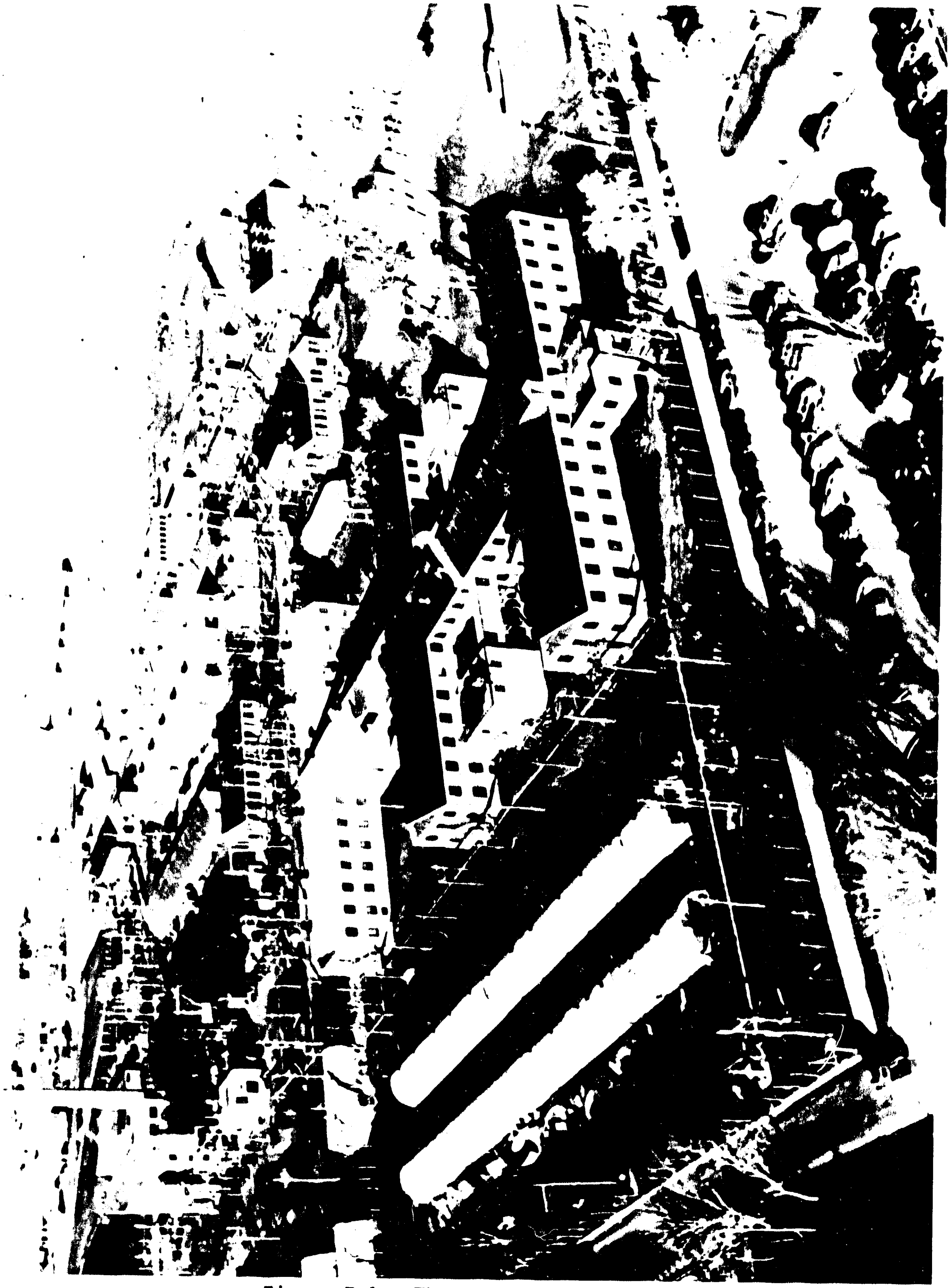

Figure 7-1. The 700 Area, 1945.

The 702 Building was located in the east portion of the 700 Area, just north of the 703 Administration Building and just west of the 705 Employment Building. It contained a large switchboard room, power room, storeroom, engineer's office, and ventilating equipment room in the main section and an office, coat closet, and rest room in a smaller L-shaped east wing. Appendix F contains a physical description of the 702 Building.

Administration Building (703 Structure):

One such building was constructed in the 700 Area. Its function was to house the central administrative offices for HEW. A large building with six wings, the 703 Building was increased in size by approximately 40% during its construction phase. The main wing was extended, and another wing was added so that the final structure, as built by the MED, contained 153 rooms. Most of these rooms were offices, along with stairwells and rest rooms. Two reinforced concrete vaults with 1-ft-thick concrete brick walls were located between the east and center wings and were connected to the main building via passageways. Additionally, two brick fire walls separated the building into three parts. The building also contained 26 roof ventilators and 28 humidifying units. Appendix F contains a physical description of the 703 Administration Building.

Supervisors' Office (704 Building):

One such structure was built in the 700 Area. It functioned to house offices for the supervisors of the engineering groups that built and maintained Richland. Located near the center of the area, it contained seven offices, a drafting room, janitor's closet, a rest room, and a corridor. Appendix F contains a physical description of the 704 Building. (Note: The structure that became the 704 Building originally was intended to be a paint shop and had been scheduled to be designated as the 722-B Building. However, the need for offices for the Village Engineering group became so urgent that the decision was made to change the building's function when only the shell had been constructed. The only design changes needed were those to the interior of the structure.)

Employment Building (705 Building):

One such structure was built in the 700 Area. It functioned to house the personnel recruiting, processing, and termination offices for HEW. Located on the east side of the 700 Area, just north of the 703 Building, the 705 Building was an L-shaped structure containing 22 offices, six rest rooms, two janitor's closets, and a corridor. Appendix F contains a physical description of the 705 Building.

Laboratory (706 Building):

One such structure was built in the 700 Area. It functioned as a control laboratory to perform analysis on samples of the well water, filter backwash, tap water, sewage, air, and other basic elements in Richland. Located in the eastern part of the 700 Area, the 706 Building contained a large laboratory, a small laboratory, an office, fan room, locker room, rest rooms, and two vestibules. Appendix F contains a physical description of the 706 Building.

Change House (707 Building):

One such building was constructed in the 700 Area. Its function was the same as that of the other change houses at HEW in that it provided a place for workers who wore protective clothing to change from work to regular clothes. Larger than any of the HEW change houses except the 2707 Structures and the 3707-A Structure, which also contained the 300 Area Patrol Headquarters, the 707 Building contained 220 wooden lockers, a guard room, lunch room, shower room, wash room, rest room, and two vestibules. A hot water heater room with a cinder floor adjoined the west side of the building. Appendix F contains a physical description of the 707 Building.

Central Receiving Storeroom (713 Building):

One such building was constructed in the 700 Area. Its function was to receive and store large shipments and amounts of bulk materials needed for 700 Area operations. Located in the west central portion of the 700 Area along the main rail tracks that entered Richland from the south, this warehouse received most of its bulk goods by rail. A large storeroom and general receiving room ran the entire 220-ft length of this structure on the south (rail tracks) side. An outdoor concrete loading platform also extended along the east side of the building. The 713 Building also contained a receiving office, general office, two private offices, a rack storage room, goggles fitting room and repair shop, clothes storage room, and rest rooms. Appendix F contains a physical description of the 713 Building.

Laboratory Storeroom (713-A Structure):

One such structure was built in the 700 Area. Its function was to store the solvents, reagents, and other chemicals needed for work in the 706 Laboratory. Located just west of the large 713 Storeroom, the 713-A Building contained a solvent storage room, another storeroom, an office, rest room, and a loading and storage platform along the east side. Appendix F contains a physical description of the 713-A Building.

Storehouses (1713-B Structures):

These two structures were preSite buildings that were converted for HEW use in the 700 Area. They functioned to store materials needed for various Richland functions. They were located on the far west side of the 700 Area, along the north-south rail spur, north and south from each other. Both structures were quite small. The one to the north was a former preSite residence and was the larger of the two. The 713-B Building to the south had been a preSite outbuilding that stored materials for the residence. This structure was fenced by HEW builders. No further physical description or information can be found concerning the 713-B Buildings.

Material Shed (714 Building):

One such building was constructed in the 700 Area. It functioned to store building materials for Richland. Located just south of the 713 Building, it consisted of an office, large shed with the north side open, and a storage loft on the east end. Appendix F contains a physical description of the 714 Building.

Permanent Records Storage Hutments (712 Buildings):

Two such structures were built in the 700 Area next to each other with a connecting passageway in the southeast corner of the area. They functioned to store the permanent records for the entire HEW project. The 712 Buildings were standard prefabricated hutments, semicylindrical in shape (i.e., with curved roofs), and 80 ft long each. No further specific description of these structures can be found, but generic descriptions of such hutments are located in Section 9.0.

Oil and Paint Storage Building (715 Structure):

One such building was constructed in the 700 Area. It functioned to receive and store oil and paint needed in Richland. Located along a rail spur in the southwest portion of the 700 Area, this structure received many of its shipments by rail. The main portion of the building contained a large storage area with a french drain for materials spills in the center of a sloping floor. To the north of the main portion was an open, concrete-paved storage area and then an unloading platform north of that (along the rail spur). Extending from the unloading dock to and through the main building was a monorail mounted on a wooden frame structure. The monorail supported an electric-driven hoist. Appendix F contains a physical description of the 715 Structure.

Automotive Repair Shop (716 Building):

One such structure was built in the 700 Area. Its function was to maintain and repair the vehicles needed in 700 and 1100 Area operations. Located in the center of the 700 Area just north of the main gate road, the 716 Building contained a main garage and repair shop, a tire storage room, vehicle wash room, an open area containing an automotive fit and hydraulic lift, a spare parts storage room, tool room, four offices, locker room, and rest rooms. It had four large vertical rolling doors for vehicle access on the north and south sides. Appendix F contains a physical description of the 716 Building.

Central Fabrication Shop (717 Building):

One such structure was built in the 700 Area. It functioned to fabricate the metallic shapes, tools, parts, and other materials needed for the 700 and 1100 areas. Located in the central part of the 700 Area, just north of the main road, the 717 Building contained a large fabrication shop, assembly room, storeroom, offices, and rest rooms. It also contained many pieces of metal fabricating equipment, including various drills, lathes, saws, grinders, shapers, presses, and shears. Appendix F contains a physical description of the 717 Building.

Fabrication Shop (717-A Building):

One such structure was built in the 700 Area. Slightly larger than the 717 Building, it functioned to perform specialized metal fabrication jobs, to calibrate the specialized tools used in fabrication, and to house classroom instruction in fabrication techniques. Located north and west of the Central Fabrication Shop, the 717-A Building contained a large lecture and demonstration room, a circuit room, calibration room, assembly tube shop, subassembly tube shop, storeroom, offices, ventilation equipment room, and rest rooms. Appendix F contains a physical description of the 717-A Building.

Patrol Headquarters (720 Building):

One such structure was built in the 700 Area. It functioned to house the regular HEW patrol offices for the 700 and 1100 areas. Originally constructed as the TC Richland Construction Office, this structure was converted to the 720 Patrol Building when the Village Engineering Offices were housed in the 704 Building. No physical description of the 720 Building can be located.

Military Intelligence Building (721 Building):

One such structure was built in the 700 Area. It functioned to house the Military Intelligence and Federal Bureau of Investigation offices for all of HEW. Located near the southeast corner of the 700 Area, the 721 Building contained an agents' room, file room, photographic laboratory, 11 offices, and rest rooms. Originally, the 721 Building was designed and built to be the 700 Area Patrol Headquarters (the 720 Building). However, another building was found to be more suitable as the Patrol Headquarters, so the designation of 720 Building was applied to a different structure (see 720 Building above) and the structure described herein became the 721 Building. Appendix F contains a physical description of this structure.

Area Shop (722-A Building):

One such structure was built in the 700 Area. It functioned as a general shop, performing building, fitting, and repair functions for Richland that were not specialized as carpentry, paint work, rotary press work, or electrical work. Much larger than the area shops located in the 100 Areas and in the 200-E and 200-W Areas, and slightly larger than the area shop in the 300 Area, the 722-A Building contained a machine shop, blacksmith shop, riggers' shop, general material shop, miscellaneous repair shop, radio and telephone room, storeroom, office, and rest room. It was located in the east central portion of the 700 Area, south of the main road. Appendix F contains a physical description of the 722-A Building.

Carpenter Shop (722-C Building):

One such structure was built in the 700 Area. It functioned to house the specialized carpentry work that could not be performed directly on job sites in the 700 and 100 areas. Located south and west of the 722-A Building, the 722-C Building contained a large carpenter shop, an office, and a rest room. Appendix F contains a physical description of the 722-C Carpenter Shop.

Paint Shops (722-D and 722-E Buildings):

Two such structures were built in the 700 Area. They functioned to house painting and paint removal activities that could not be performed at job sites in 700 and 1100 area construction and maintenance. Located at the far south end of the 700 Area along Knight Street, these two structures were identical. They were much smaller than the 722-A and 722-C buildings, but no precise physical description can be found.

Pipe Shops (722-F and 722-G Buildings):

Two such structures were built in the 700 Area. They functioned to house pipe fabrication and fitting activities that could not be performed at job sites in 700 and 1100 area construction and maintenance. Located at the far south end of the 700 Area along Knight Street, just east of the 722-D and 722-E buildings, the 722-F and 722-G buildings were identical to the 722-D and 722-E buildings.

Furniture Distribution Office (722-K Building):

One such structure was built in the 700 Area. It functioned to distribute and account for office, home, and public building furniture in the 700 and 1100 areas. Located toward the south end of the 700 Area, the 722-K Building was identical to the 722-D, -E, -F, and -G buildings.

Multilith[2] Office (722-L Building):

One such structure was built in the 700 Area. It functioned to house multilith operations for the 700 and 1100 areas. Located just north of the 722-K Building, the 722-L Building was identical to the 722-D, -E, -F, -G, and -K buildings.

Area General Foreman's Office (722-M Building):

One such structure was built in the 700 Area. It functioned to house the offices of the building and maintenance foreman (and his staff) for the 700 and 1100 areas. Located just north of the 722-L Building, the 722-M Building was identical to the 722-D, -E, -F, -G, -K, and -L buildings.

Electrical Shop (722-N Building):

One such structure was built in the 700 Area. It functioned to house the electrical shop for the 700 and 1100 areas. Located on the south end of the 700 Area along Knight Street, the 722-N Building was identical to the 722-D, -E, -F, -G, -K, -L, and -M buildings.

Orientation Unit (722-P Building):

One such structure was built in the 700 Area. It functioned to provide classroom space for the employee orientation classes that were conducted by the personnel and employment offices at HEW. Located on the far east side of the 700 Area toward the north end, the 722-P Building was identical to the 722-D, -E, -F, -G, -K, -L, -M, and -N buildings.

Transportation Parts and Storage Building (722-R Building):

One such structure was built in the 700 Area. It functioned to store small parts for the transportation department at HEW, including dispatch and manifest forms and other small items not stored in the 716 Automotive Repair

[2] Multilith was a trademark name for a small rotary offset press. It was manufactured by the Security Pacific Business Credit Company of Chicago, IL.

Shop or in the Riverland Yard. Located on the far north end of the 700 Area, the 722-R Building was identical to the 722-D, -E, -F, -G, -K, -L, -M, -N, and -P buildings.

Laundry (723 Building):

One such structure was built in the 700 Area. It functioned to launder work and protective clothing not contaminated with radioactivity that was worn by 700 and 1100 area employees. Located near the center of the 700 Area just north of the main gate road, the 723 Building contained a large general laundry area, a water softener room, two locker rooms, an office, and rest rooms. Appendix F contains a physical description of the 723 Building.

Printing Plant (724 Building):

One such structure was built in the 700 Area. Its function was to print the documents, forms, and plant publications needed at HEW. No physical description or further information can be found regarding the 724 Building.

Spare Machinery Storage Building (729 Building):

One such building was constructed in the 700 Area. Its function was to store heavy machinery parts, most of which were delivered to HEW by rail. Located on the west side of the 700 Area along the north-south rail spur, the large 729 Building consisted of a storage room, office, concrete loading platform along the west side, and hoist suspended from a monorail. Appendix F contains a physical description of the 729 Building.

Central Cylinder Storage Building (734 Structure):

One such building was constructed in the 700 Area. Its function was to store cylinders containing inflammable gas and, in a separate section, noninflammable gas. A third portion of the building stored empty gas cylinders. Located on the far west side of the 700 Area along the north-south rail spur, this building had a reinforced concrete platform along one entire side. Appendix F contains a physical description of the 734 Building.

Brick Storage Building and Yard (744 Structure):

One such structure was built in the 700 Area. Its function was to store bricks for usage in 700 and 1100 area construction and maintenance. Located near the southwest corner of the 700 Area, this earthen-floored building had a gravel-surfaced road extending the full length of the building on the inside. A large, fenced brick yard lay across the rail tracks from the 744 Building on the south side. Appendix F contains a physical description of the 744 Structure.

Boiler House (784 Building):

One such structure was built in the 700 Area (Figure 7-2). Its function was to supply steam heat to the 700 and 1100 areas via four coal-fired boilers. Located in the southcentral portion of the 700 Area along a rail spur, the 784 Plant had boilers on the north side, four elevated coal bunkers on the south side (with an elevated coal conveyor system running from the

Figure 7-2. The 784 Power House and Its Coal Supply, Richland, 1944.

bunkers through spreader-stokers and to the boilers), an office, rest room, and a 200-ft-high exhaust stack. A concrete coal crusher was located below the rail spur tracks just to the north of the building, and a 30-ton/hour coal conveyor system ran from this pit to the coal bunkers within the 784 Building. A second coal handling system ran from the crusher pit to an open coal storage area on the north side of the track. An 8-in. ash pipe line ran beneath the ground floor of the building from the boilers to an elevated, live ash storage silo located outside the east end of the building. The building also contained several reinforced concrete platform, steel gratings, walkways, and a deaerator and flash tank. Appendix F contains a physical description of the 784 Building.

Emergency Generator and Water Softening Building (784-A Building):

One such structure was built in the 700 Area, approximately 75 ft east of the 784 Building. Its function was to supply softened water to the boilers in the 784 Building and to provide emergency diesel generating equipment for backup power for boiler house operations. The 784-A Building contained a water softening room in the east end and a diesel engine and generator room in the west end. A reinforced concrete clearwell ran beneath the floor of the entire west end of the water softening equipment room. This clearwell contained numerous wooden storage tanks for the soft water. Appendix F contains a physical description of the 784-A Building.

FACILITIES

Primary Substation (751 Structure):

One such structure was built in the 700 Area. It functioned to provide 2,300 V electrical power to the 700 Area. Three 1,667-kVa transformers, two current transformers, two potential transformers, and a lightning transformer were located in this gravel surfaced area just outside of the 700 Area main fence at the northwest corner of the intersection of Swift Boulevard and Stevens Drive. The transformers sat on concrete pads and a 37.5-ft wooden pole carried the necessary lines and elevated equipment. The entire 751 Substation was surrounded by a wooden fence. Appendix F contains a physical description of the 751 Structure.

Fence and Road Lighting (7501 Structures):

See Section 5.0 for discussion.

Outside Transmission Lines (Including Wooden Poles and Hardware) (7503 Structures):

See Section 5.0 for discussion.

Fire Alarm Systems (7505 Structures):

See Section 5.0 for discussion.

Telephones and Telephone Cable (7506 Structures):

The 700 Area was served by two types of telephones: Class A was designated Administrative and Official (approved for outside calls), and Class C was designated Emergency, Service, and Administrative (approved for local calls only). A central telephone switchboard located in the 702 Building directed calls in and around the 700 and 1100 Areas. See Section 5.0 for further discussion.

Standard Gauge Railroad Tracks (7601 Structures):

See Section 6.0 for discussion.

Roads and Walks (7603 Structures):

See Section 6.0 for discussion.

Fences (Including Guard Towers) (7605 Structures):

Six thousand feet of Type No. 1 fencing were constructed in the 700 Area with no guard towers. See Section 6.0 for discussion.

Automobile and Bus Parking Areas (7613 Structures):

Three permanent parking areas were constructed in the 700 Area outside the 701, 703, and 705 buildings. See Section 6.0 for discussion.

General Monitoring Stations (7614 Structures):

One such structure was built in the 700 Area. See Section 6.0 for discussion.

Emergency Gasoline Electric Generator Shelters (7621 Buildings):

Two of these structures were built in the 700 Area. See Section 6.0 for discussion.

Outside Overhead Pipe Supports (7801 Structures):

See Section 5.0 for discussion.

Outside Overhead Steam Lines (7802 Structures):

See Section 5.0 for discussion.

Outside Overhead Air Lines (7803 Structures):

See Section 5.0 for discussion.

Outside Underground Water Lines (Including Elevated Storage Tanks) (7901 Structures):

One elevated water storage tank was provided in the 700 Area for the storage of softened water for the 784 Boiler House. See 784 Building in Section 5.0 for discussion.

Outside Underground Fire Lines (Including Elevated Storage Tanks) (7902 Structures):

See Section 5.0 for discussion.

Outside Underground Sanitary Sewers (7903 Structures):

See Section 5.0 for discussion.

8.0 1100 AREA

The 1100 Area at HEW was located in Richland Village and referred to those facilities used for housing, medical care, community recreation, religious services, and other aspects of daily living. Administratively, it did not include 700 Area facilities, although the 700 Area was located physically within Richland Village.

As built, Richland Village contained 4,329 individual housing units (4,304 of which were new) and 25 dormitories (all of which were new or emplaced by the government) (Figure 8-1). There were eight different styles of conventional (not prefabricated) houses, designated A, B, D, E, F, G, H, and L, and three styles of prefabricated houses designated A-1, B-1, and C-1. There were 24 stores, including service stations and the milk depot (all but six of which were new), three churches (two of which were new), and five schools (four of which were new). Also, Richland Village, not counting the 700 Area, contained 46 permanent buildings, all but seven of which were constructed by the government. Among these structures were six TC buildings that were converted for operations use at the end of the construction phase. (For more information on these buildings, see TC-37 Structures in Section 9.0.) In all cases, it will be noted where buildings were either preSite or TC structures. Additionally, Richland Village contained 16 types of facilities.

All of the government-built, conventional houses in Richland had several features in common. The foundations were of 8-in.-thick concrete and concrete block construction. Approximately one/half of each cellar was paved with a 3-in. layer of concrete with a two-ft-high concrete block retaining wall between the paved and unpaved portions. The superstructures of the houses were wood frame, finished on the outside with a combination of vertical siding and wood shakes. Exterior walls had 1-in. blanket-type insulation, while the ceiling of the top floor had 2-in. insulation of the same type. In the first 520 duplexes (Type A and Type B houses) that were built, no insulation was provided in the dividing wall, but 2-in.-thick insulation was provided at that wall in the remaining duplexes. All interior walls were of 0.5-in.-thick gypsum wall board, taped and cemented at the joints.

Floors in the conventional houses were of natural stained wood, except for the kitchens and bathrooms, which were covered with linoleum. Floors were of hard wood, mainly oak, in all houses except the duplexes, where the floors were constructed of soft wood, usually fir. Additionally, all houses had subflooring, except for the duplexes. The roofs were built of wood and composition shingles. The houses were heated by hand-fed, lignite-burning, piped hot air furnaces and had no air conditioning or cooling devices.

The prefabricated houses all arrived at HEW in sections approximately 8 ft wide by 20 ft long. They simply were placed on their foundations, fastened together, and then anchored. Some of the prefabricated housing sections arrived with furniture packed in them. In those cases, the sections simply acted as packing cases for the furniture.

The kitchens in each HEW house contained an electric range, refrigerator, and hot water heater. The living room contained a "daveno"

Figure 8-1. A Neighborhood of Mixed Housing Styles Takes Shape in Richland, February 1944.

(sofa), bookcase, two cabinets, a platform rocker, main rug, throw rugs, lamps, a folding table, and four folding straight chairs. The main bedroom contained a bed, bureau, vanity, cabinet, and chair. The second bedroom, where it existed, contained a double bed, vanity, bureau, cabinet, and chair and the third bedroom, where it existed, contained a three-quarter-size bed, vanity, bureau, cabinet, and chair.

PERMANENT BUILDINGS

Site Residences (1106 Structures):

The designation 1106 Structures was applied to the 25 existing, preSite residences that were preserved and used as government residences in what became the 1100 Area. The HEW builders made "every effort, insofar as it was possible...to save all buildings, facilities and improvements, including orchards, shade trees, roads, streets and all other decorative or utilitarian facilities which would be of benefit to the permanent Village."[3] Each of the 25 residences that were preserved was unique, and no physical descriptions can be located.

Housing Units--Type A and Type B Houses (1109 Structures):

Eight hundred and sixteen Type A Houses and one thousand and forty Type B Houses were built in Richland Village (Figures 8-2 and 8-3). All were new government construction. The Type A Houses were two-family duplexes, two

[3] DuPont, HAN-10970, Vol. III, p. 1226.

Figure 8-2. Typical 1109-A House in Richland, 1945.

Figure 8-3. Typical 1109-B House in Richland, 1945.

stories high with each family having one level. They contained three bedrooms in each section. The Type B Houses were single-story, two-family duplexes having two bedrooms in each section. In each portion, a dining area was formed from the L-shaped end of the living room. Appendix G contains floor plan diagrams and physical descriptions of the A and B Houses.

Staff Residences: Type D, E, G, and L Houses (1107 Structures):

Eight Type D Houses, 84 Type E Houses, eight Type G Houses, and 44 Type L Houses were built in Richland Village (Figures 8-4, 8-5, and 8-6). All were new government construction. The D Houses were single-family units, one and one-half stories high with two bedrooms on each level. The D Houses had larger than average room and were "designed for executive occupancy."[4] The E Houses were one story, single-family units with three bedrooms. The G Houses were single-family units, one and one-half stories high with four bedrooms. They were very similar to the D Houses and were designed for similar "type of occupancy."[5] The L Houses were two-story, four-bedroom units, designed for single-family occupancy. They were slightly larger than the D and G houses. Appendix G contains floor plan diagrams and physical descriptions of the D, E, and G houses. No floor plan nor physical description of the L Houses can be located.

Supervisors' Houses: Type F and H Houses (1108 Structures):

Two hundred and fifty of each of these types of houses were built in Richland Village (Figure 8-7). All were new government construction. The F Houses were two-story, single-family units containing three bedrooms. The H Houses were one-story, single-family units with three bedrooms. Appendix G contains floor plan diagrams and physical descriptions of the F and H houses.

Prefabricated Houses: Type A-1, B-1, and C-1 Houses (1129 Structures):

Four hundred and two Type A-1 Houses, 802 Type B-1 Houses, and 600 Type C-1 Houses were built in Richland Village (Figure 8-8). All were new government issue, all were one story, and all were composed of varying numbers of 8-ft-wide by 20-ft-long standard sections. The Type A-1 Houses were one-bedroom units composed of two standard sections, the Type B-1 Houses contained two bedrooms and were composed of three standard sections, and the Type C-1 Houses were three-bedroom units composed of four standard sections. No further physical descriptions of the prefabricated houses can be located.

Dormitories (1110 Structures):

Twenty-five such structures were built in Richland Village. Eight were known as K Type units (men's dormitories), and 17 were designated as J Type units (women's dormitories). All were two stories high and contained 21 single bedrooms and eight double bedrooms. The two types of dormitories were

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[4] Pehrson, Report on the Hanford Engineer Works Village, p. 32.

[5] Ibid., p. 38.

Figure 8-4. An 1107-D House, World War II.
(Richland's 1107-G houses were nearly identical to the "D" houses.)

Figure 8-5. An 1107-E House, 1945.

Figure 8-6. An 1107-L House Next to an "A" House, Richland, 1945.

Figure 8-7. An 1108-F House, 1945.

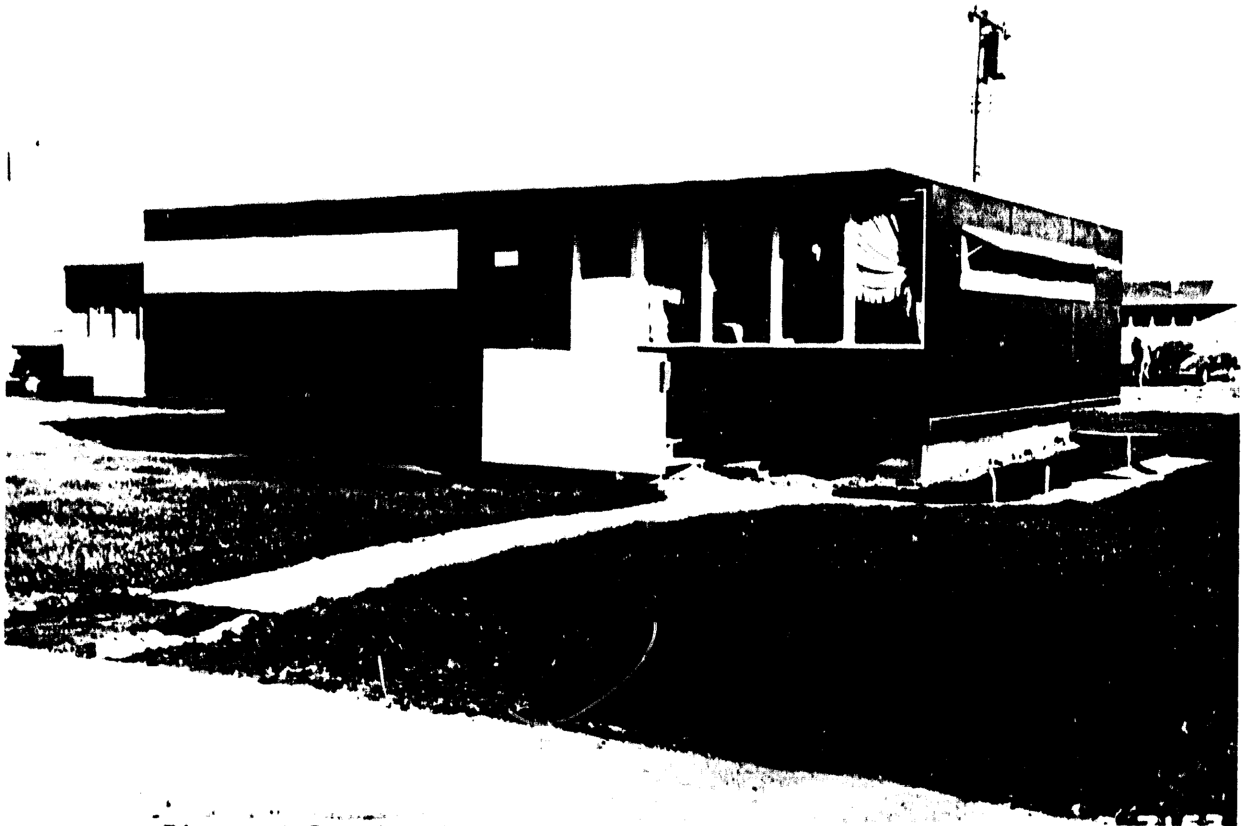

Figure 8-8. An 1129-A-1 One-Bedroom, Prefabricated House in Richland, World War II.

nearly identical, but some of the room designations and usage within them were arranged differently. Appendix G contains a physical description of the J and K dormitories.

Food Stores (1111 Structures):

Five such structures were built in Richland Village, and all were new government construction (Figure 8-9). Their function was to provide and sell food to residents. Identical in size, shape, and design, the 1111 Food Stores were located at the intersections of Symons Street and Goethals Drive, Williams Boulevard and Thayer Drive, Goethals Drive and Jackson Street, Snow Avenue and Jewett Street, and Goethals Drive and Comstock Street. Appendix G contains a physical description of the 1111 Food Stores.

Drug Stores (1111 Structures):

Three such buildings were constructed in Richland Village, designated as A, B, and C Drug Stores. All of new government construction, their function was to sell medicines and everyday toiletry items to residents. Although they had the same number designation as the 1111 Food Stores, the Drug Stores were considerably smaller. They were located at the intersections of Symons Street and Keller Avenue, Williams Boulevard and Thayer Drive, and just west of Theater No. 1 in the center of Richland. Drug Store C was slightly larger than the other two and contained a prescription room. Appendix G contains a physical description of the 1111 Drug Stores.

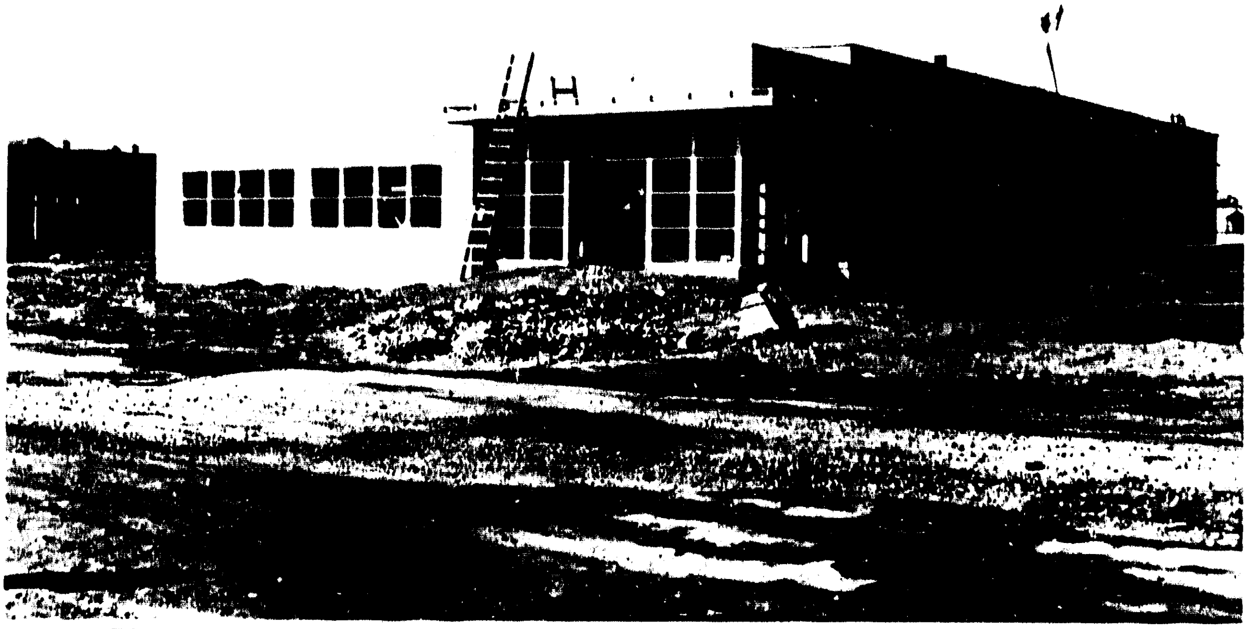

Figure 8-9. The 1111 Food Store No. 1 Under Construction, 1944. (This store was located at the intersection of Symons Street and Goethals Drive. To the left 1111 Drug Store C, the largest of the three drug stores built by the federal government in Richland, can be partially seen.)

General Merchandise Store (1111 Structure):

One such store of new government construction was built in Richland Village. Its function was to sell general household dry goods to residents. Appendix G contains a physical description of this structure, located at the corner of Lee Boulevard and Goethals Drive.

Variety Store (1111 Structure):

One such store of new government construction was built in Richland Village. Its function was to sell generally inexpensive, notion-type goods to residents. Appendix G contains a physical description of this structure, located on the northwest corner of the intersection of Lee Boulevard and Goethals Drive.

Shoe Repair Shop (1111 Structure):

One such store of new government construction was built in Richland Village. Its function was to repair shoes for residents. Appendix G contains a physical description of this structure, located in the central shopping district between George Washington Way and Goethals Drive just north of the Variety Store.

Women's and Children's Apparel Shop (1111 Structure):

One such store of new government construction was built in Richland Village. Its function was to provide and sell women's and children's clothing. Appendix G contains a physical description of this structure, located between George Washington Way and Goethals Drive.

Barber and Beauty Shop (1111 Structure):

One such shop of new government construction was built in Richland Village. Its function was to house barbering and hairdressing services for residents. The 12-chair barber shop portion of the building was to the north, and the 10-booth beauty shop portion was to the south. Appendix G contains a physical description of this structure, located in the central shopping district with the other 1111 Structures.

Milk Depot (1111 Structure):

One such structure of new government construction was built in Richland Village. Its function was to receive and distribute milk to residents. Appendix G contains a physical description of this structure, located at the intersection of Cullum Avenue and Harding Street.

Electrical Shop (1111 Structure):

One such shop was provided for Richland Village, converted from a preSite residence. Its function was to provide electrical repair services to residents. Appendix G contains a physical description of the 1111 Electrical Shop, located on the east side of George Washington Way at its intersection with Knight Street.

Optical Shop (1111 Structure):

One such shop was provided for Richland Village, remodeled from a preSite milk depot and meat market. Its function was to provide optical examinations and eyeglasses services to residents. Appendix G contains a physical description of this building, located on the west side of George Washington Way in the central shopping district.

Hardware Store (1111 Structure):

One such store was provided for Richland Village, remodeled from a preSite grocery store. Its function was to provide and sell hardware items to residents. Appendix G contains a physical description of the 1111 Hardware Store, located one door south of the Optical Shop.

Men's Apparel Shop and Shoe Store (1111 Structure):

One such store was provided for Richland Village, converted from a preSite grocery and variety store. Its function was to provide and sell men's clothing (in the north end of the building) and shoes (in the south end) to residents. Appendix G contains a physical description of this structure, located in the central shopping district on the west side of George Washington Way.

Automotive Garage and Service Station (1111 Structure):

One such structure of new government construction was built in Richland Village. Its function was to provide and sell gasoline, oil, and repair services for private vehicles owned by residents. Appendix G contains a physical description of this structure, located in the central shopping district at the intersection of Goethals Drive and Newton Street.

Service Stations (1111 Structures):

Three such stations, all of new government construction, were built in Richland Village. Their function was to provide and sell gasoline and oil only to residents for their vehicles. The three stations were very small and were located at the intersections of Goethals Drive and Symons Street, Williams Boulevard and Perkins Avenue, and Casey Avenue and Comstock Street. Appendix G contains a physical description of the service stations.

Western Union[6] Building (1111 Structure):

One such structure was located in Richland Village, remodeled from a preSite drug store. Its function was to serve as the telegraph communication center for residents' use. Appendix G contains a physical description of this structure, located on the southwest corner of the intersection of George Washington Way and Lee Boulevard.

Unassigned Store (1111 Structure):

One such structure, a preSite barber shop, was designated in Richland Village. Its function is not known, but it was scheduled for remodeling and was designated as "Unoccupied Store 85X." Appendix G contains a physical description.

Churches (1112 Structures):

Three such structures were provided in Richland Village, two of new government construction and the preSite Redeemer Lutheran Church. Their function was to house religious services and provide for the religious needs and desires of residents. Located at the "Y" intersection of Stevens Drive and Long Avenue, the two new churches built by the government were identical, except that the Catholic one was provided with a steeple and the United Protestant one was not. Appendix G contains a physical description of the two government-built 1112 Churches. No physical description of the Redeemer Lutheran Church can be located.

Schools (1113 Structures):

Five schools were provided in Richland Village. One was Columbia High School (Figure 8-10); three were new grade schools, all of new government construction; and the fifth school was the preSite Richland Grade School that was remodeled to become Lewis and Clark Grade School. The function of the grade schools and the high school was to provide for the educational needs of

[6] Western Union is a trademark service product of Western Union International, Inc., of Fort Lee, New Jersey.

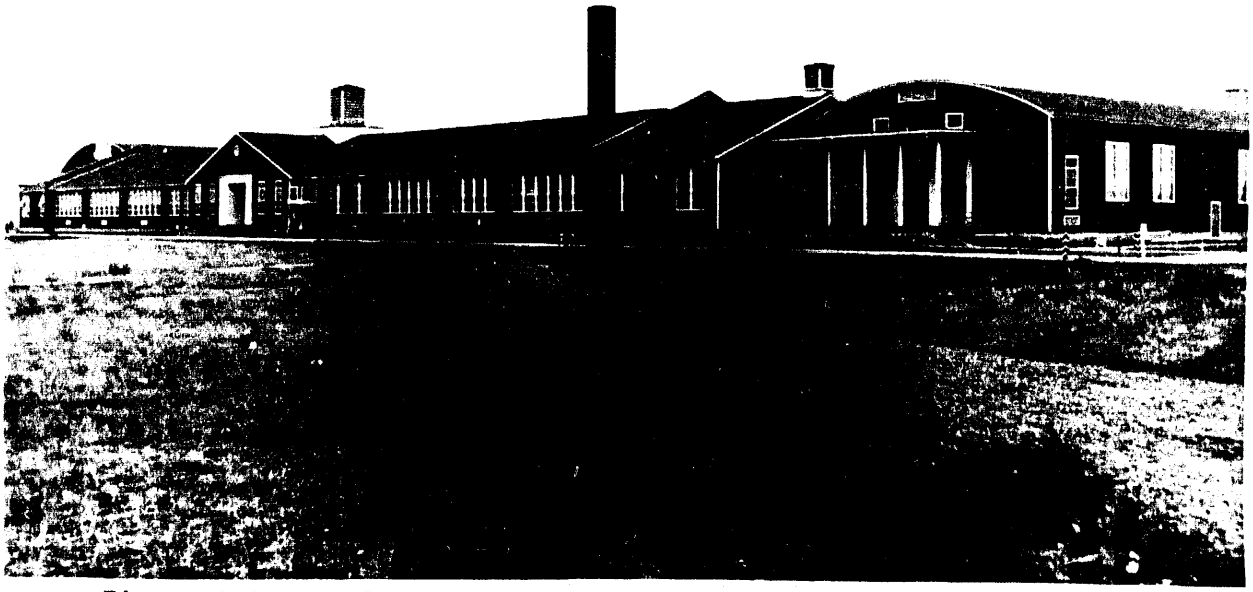

Figure 8-10. Columbia High School, a 1113 Structure, New in 1944.

resident children. One of the few functions in Richland Village that was not administered by the federal government, these schools were formed into School District No. 400 in 1944 and were administered by the state of Washington like all of the other schools in the state. The new grade schools first were designated as Grade Schools No. 1, No. 2, and No. 3 but soon were named as Sacajawea, Marcus Whitman, and Jefferson Schools (Figures 8-11 and 8-12). They were located, respectively, along the south side of Williams Boulevard just west of Stevens Drive, along the south side of Lee Boulevard between Winslow Avenue and Snow Avenue, and along the south side of Van Giesen Street between George Washington Way and Hunt Avenue. The existing grade school was located southwest of the central shopping district on the land bounded by Church Avenue, Gillespie Street, Cullum Avenue, and Davenport Street. The high school was located just south of Long Avenue, approximately 300 ft east of Thayer Drive. Appendix G contains physical descriptions of the five Richland schools.

Nursery (1113 Structure):

One such structure was provided in Richland Village. Its function was to provide day care for resident preschool children. The 1113 Nursery School was remodeled from a preSite residence on the northwest corner of the intersection of Goethals Drive and Lee Boulevard. Two government hutments were added to this structure. Appendix G contains a physical description of the 1113 Nursery.

Theaters (1114 Structures):

Two such structures, both of new government construction, were built in Richland Village. Their function was to entertain residents and maintain and

Figure 8-11. Marcus Whitman (The Winged Structure), January 1945.

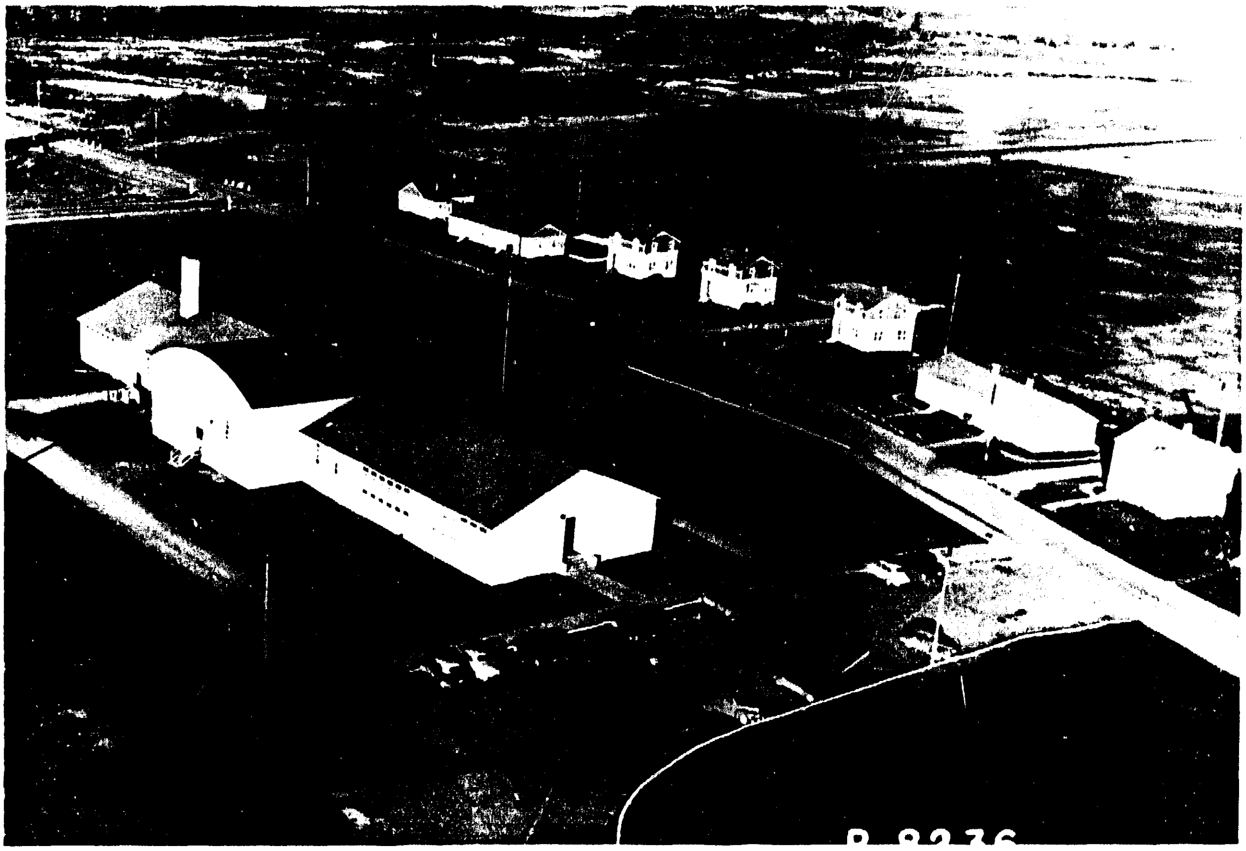

Figure 8-12. Jefferson School, New in Autumn 1944.

build morale. The two 1114 Theaters were identical and seated 526 people each. One was located just west of George Washington Way between Gillespie Street and Lee Boulevard, and the other was located on the east side of George Washington Way between Lee Boulevard and Knight Street. Appendix G contains a physical description of the 1114 Theaters.

Bank (1115 Building):

One such structure of new government construction was built in Richland Village. Its function was to safeguard the money of residents and to provide banking services through a private company that obtained a lease with HEW. Appendix G contains a physical description of the 1115 Bank, located at the intersection of Goethals Drive and Knight Street.

Municipal Building (1116 Building):

One such structure of new government construction was built in Richland Village. It functioned to house four apparatus stalls for 1100 fire trucks, the police chief's office, village magistrate's office, and peacekeeping ordnance. Appendix G contains a physical description of the 1116 Municipal Building, located along Goethals Drive between Newton and MacKenzie Streets.

Patrol Headquarters (1116 Structure):

One such structure was provided in Richland Village, remodeled from a preSite residence. It functioned to house the routine patrol police desk and other patrol offices. A one-vehicle garage attached to the northeast corner also houses a patrol car. Appendix G contains a physical description of the 1116 Patrol Headquarters, located on the north side of Lockwood Street between George Washington Way and Goethals Drive.

Transient Quarters (1117 Structure):

One such structure of new government construction was built in Richland Village (Figure 8-13). It functioned as a hotel, housing guests and visitors to HEW. It contained 162 bedrooms as well as the other accoutrements of a standard hotel, including lobbies, rest rooms, a kitchen, coffee shop, storage and locker rooms, and offices. Appendix G contains a physical description of the 1117 Structure, located on the east side of George Washington Way directly opposite Lockwood Street.

Hospital (1118 Structure):

One such structure of new government construction was built in Richland Village (Figure 8-14). It functioned as the central medical care facility for residents and for all of HEW. It also contained the bacteriological laboratory that screened residents for germ-transmitted diseases and a radiological laboratory that administered and interpreted chest X rays. This large, winged building contained 240 rooms and was named Richland General Hospital when it opened on July 1, 1944. Just a few days later, HEW's deputy commander, Colonel Henry R. Kadlec, became the first patient to die in this hospital, and it was renamed as Kadlec Hospital. Appendix G contains a physical description of this building, located north of Swift Boulevard between Stevens Drive and Guthrie Avenue.

Figure 8-13. The 1117 Transient Quarters, Also Known as the Desert Inn, 1945.

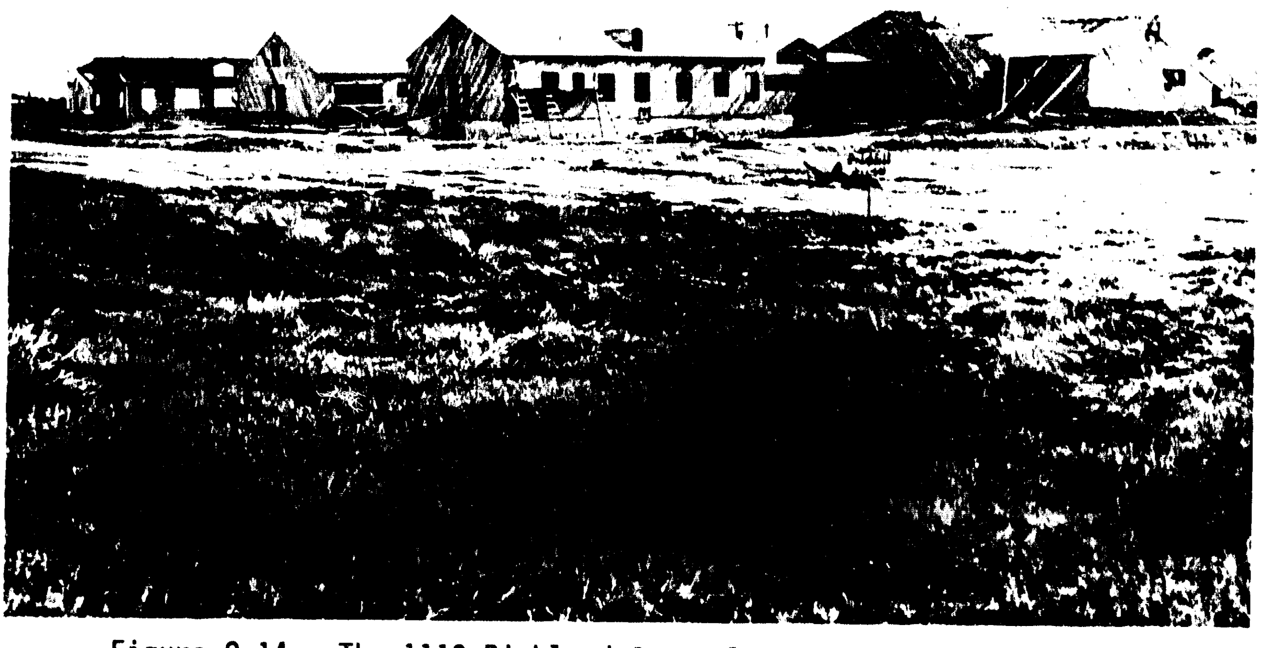

Figure 8-14. The 1118 Richland General Hospital (Later Renamed Kadlec Hospital) Under Construction, February 1944.

Post Office (1119 Building):

One such structure of new government construction was built in Richland Village. It functioned to provide normal postal services (as opposed to secret military deliveries) to and from residents. Appendix G contains a physical description of this building, located on the southwest corner of the intersection of George Washington Way and Knight Street.

Figure 8-15 shows downtown Richland, looking southeast, in 1945. The 1116 Patrol Building, a preHanford Site structure, is in the bottom center. The 1119 Post Office is the square, white building just right of the lower center and the 1115 Bank is the long, narrow building in the lower right. Most of the rest of the buildings shown are 1111 commercial structures.

Laundry (1120 Building):

One such structure of new government construction was built in Richland Village. It functioned as a general purpose laundry, dry cleaning, sewing and mending, and ironing and pressing facility for residents. Appendix G contains a physical description of this building, located on the north side of Harding Street between Cullum and Duane Avenues.

Cafeteria (1121 Building):

One such structure of new government construction was built in Richland Village. It functioned to serve and sell meals and also to house a small canteen that sold cigarettes, ice cream, and other convenience food stuffs and consumer goods to residents. Appendix G contains a physical description of this large building, located on the southwest corner of the intersection of Goethals Drive and Knight Street.

Propane Gas Storage (1122 Structure):

One such structure of new government construction was built in Richland Village. It functioned to store propane gas in tanks and "bottle" containers for use in the 1100 Area. No physical description of the 1122 Building can be located.

Recreation Building (1123 Structure):

One such structure of new government construction was built in Richland Village. It functioned as the virtual center of community life for residents at HEW, housing a bowling alley, tavern, dining room, canteen area, card rooms, large pool room, teen center, and recreation offices. Appendix G contains a physical description of this huge structure, located on the southeast corner of the intersection of George Washington Way and Lee Boulevard.

Sewage Disposal Plant and Lift Station (1124 Building):

One such complex of new government construction was built in Richland Village (Figure 8-16). The sewage disposal plant functioned to filter, settle, clarify, chlorinate, and dry sanitary sewage produced by residents. It consisted of a pump house, scale and chlorinator house, diversion weir and chlorine contact chamber, large biofilter, primary and secondary clarifiers,

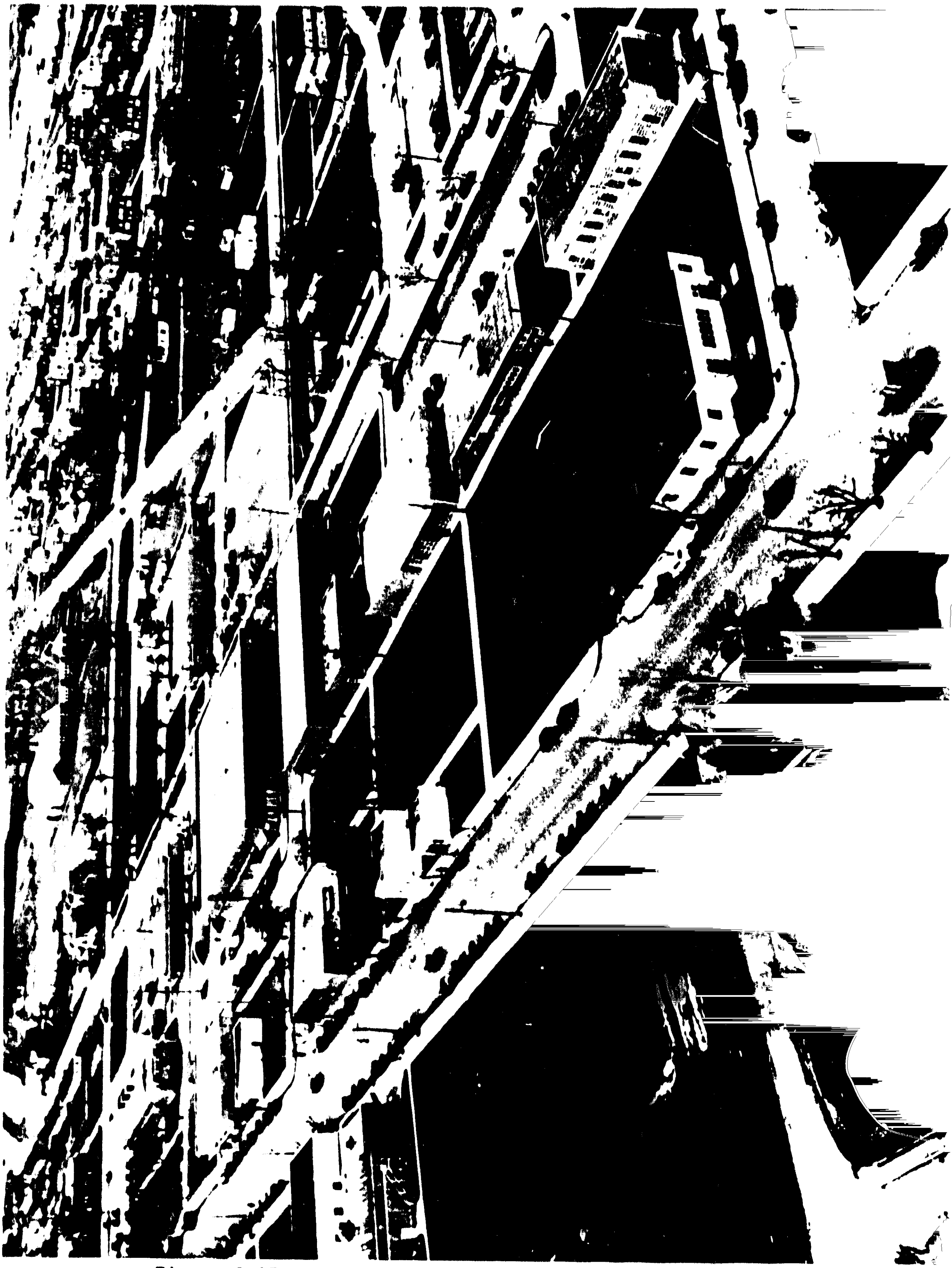

Figure 8-15. Downtown Richland, Looking Southeast, 1945.

Figure 8-16. The 1124 Sewage Treatment Plant Under Construction in Richland, January 1944.

and a sludge drying pit. In the plant, solid and liquid sewage first was separated. Chlorine then was added to the liquid portion to decrease the bacterial levels to the point that discharge into the Columbia River was permissible. The solid portion was dried and then disposed to a refuse pit or distributed as low-grade fertilizer. The treatment plant had a capacity of 1,800,000 gal a day and was located approximately 500 ft southeast of the "outskirts"[7] of Richland Village just east of George Washington Way. The lift station was a collection point for sewage from the northern portion of Richland. Located 1.5 miles from the treatment plant at the corner of George Washington Way and Swift Boulevard, the lift station received sewage by gravity flow and then used three, 15-HP electric pumps to deliver it to the treatment plant. Appendix G contains a physical description of the 1124 Structures.

Warehouses (1125 Buildings):

Eight warehouses were provided in Richland Village, one a preSite storage structure, six TC warehouses, and one constructed specifically for use during village occupancy. They functioned to store supplies, goods, fixtures, and other items necessary to residential life but provided by the federal government. The six TC warehouses were similar in size and design to the one permanent warehouse. Appendix G contains a physical description of these seven warehouses, located along a rail spur just south of the intersection of Lee Boulevard and Stevens Drive. No description of the preSite storage building can be located.

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[7] DuPont, HAN-10970, Volume IV, p. 1309.

Bus Depot (1130 Building):

One such structure of new government construction was built in the 1100 Area. It functioned as a retail transit sales and delivery point for commercial buses traveling to and from HEW. Appendix G contains a physical description of this building, located along the east side of George Washington Way approximately 400 ft south of the Recreation Building.

Bus Transfer Station and Maintenance Garage (1131 Structure):

One such structure was provided in Richland Village, constructed as a TC facility and then carried over into use during the operations/occupancy period. Its function was to house and maintain (service) the buses used to transport HEW employees from Richland Village to their work areas. It was a wood-frame structure with gypsum siding, 110 ft by 150 ft by 25 ft (tall).

Ambulance Garage (1132 Structure):

One such structure was provided in Richland Village, constructed as a TC fire station and then transferred to a different use during the occupancy period. Its function was to house the ambulances that were maintained for the use and needs of residents. No physical description of the 1132 Ambulance Garage can be located.

Village Maintenance Buildings Group (1133 Complex):

One such complex, consisting of 12 buildings, was provided in Richland Village, constructed as TC facilities and then transferred to different uses during the occupancy period. Their function was to provide the maintenance services and supplies that the federal government supplied for residents and residences. The Village Maintenance Group consisted of the following buildings: one Parts and Tire Storage, one Irrigation Supplies and Seed Storage, one Parts Storage, Sign Shop and Road Maintenance Office, one Garden Tools Storage, Baggage Room and Seed Distribution Office, one Safety Office, one Lawn Mower Shop, two Storage Hutments, one Transportation Office Hutment, one Labor office Hutment, and one Comfort Station. These 12 buildings were located within a wire-fenced rectangle, 550 ft by 450 ft, between the west bank of the Columbia River and George Washington Way across from Davenport Street. Some of the buildings were prefabricated, while others were metal hutments in standard 40-ft sections (sometimes joined by a wooden frame section). Appendix G contains a physical description of the 1133 Group.

Red Cross Building (1134 Structure):

One such building was provided in Richland Village, converted from a preSite pool hall with apartments. Its function was to house the Red Cross chapter started in the Hanford Construction Camp but then moved to the 1100 Area in February 1945. One primary function of this chapter was to assist in communications and the conveyance of messages between resident and military areas, and another key function was to provide assistance to Kadlec Hospital. Appendix G contains a physical description of the 1134 Building, located on the northeast corner of the intersection of George Washington Way and Lee Boulevard.

Professional Building (1136 Structure):

One such building of new government construction was provided in Richland Village. Its function was to house the offices of doctors, dentists, well baby care nurses, and other professionals associated with Kadlec Hospital. Appendix G contains a physical description of the 1136 Building, located just southeast of the hospital at the intersection of Swift Boulevard and Guthrie Avenue.

Dog Pound (1138 Building):

One such structure was provided in Richland Village, converted from a preSite residence. It functioned as an animal shelter to house homeless and lost domestic animals. No physical description of the 1138 Dog Pound can be located.

Transportation Garage (1139 Structure):

One such structure was provided in Richland Village, originally constructed as the TC Transportation Garage and then continued in use during the occupancy period. It functioned to house the government vehicles used by Army and other government personnel and official visitors at HEW. It was a wood-frame structure with horizontal wood siding, 25 ft by 50 ft by 15 ft (high), with a taller equipment penthouse section. It was located along George Washington Way, southwest of the Knight Street railroad siding.

Railway Express[8] Building (1140 Structure):

One such structure was provided in Richland Village, converted from a TC warehouse. It functioned to house the railway express office for personal and commercial (nongovernment) shipments to and from the 1100 Area. No physical description of the 1140 Building can be located.

Fire Stations (1142 Structures):

Two such structures were provided in Richland Village, one of new government construction and one converted from a preSite church. The older structure was fitted with four equipment stalls to house fire vehicles, and the newer structure, on Williams Boulevard, was equipped with two such stalls. (Note: Space for four other fire protection vehicles was located in the 1116 Municipal Building.) No physical description of the 1142 Fire Stations can be located.

Ration Office (1148 Structure):

One such building was provided in Richland Village, converted from the preSite Richland Irrigation District Office. It functioned to dispense coupons for, and keep track of, residents' use of goods that were rationed during World War II. Among such goods were tires, gasoline, hosiery and other personal items, meat and other foodstuffs, and various additional items. No physical description of the 1148 Ration Office can be located.

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[8] No registered trademark for Railway Express can be located.

Airport (1165 Installation):

One airport of new government construction was provided for Richland Village. It functioned to provide the facilities needed for air travel to and from HEW during the occupancy period. Located one-half mile northwest of the 1100 boundaries, the airport consisted of two 1,200-ft runways at an 81° angle to each other, as well as a hangar, control tower, and four hutments used for offices, storage space, a weather station, a bedroom, rest room, and shower. Appendix G contains a physical description of the 1165 Airport.

Reservoirs and Reservoir Pump Houses (1182 Structures):

Two ground storage reservoirs and two pump houses of new government construction were provided in Richland Village. They functioned to store water for village drinking needs ("consumer" use) and for fire protection. The two in-ground reservoirs were different dimensions, but each held 1M gal. The Consumer Pump House (capacity 6,000 gal/minute) and the Fire Pump House (capacity 4,000 gal/minute) contained centrifugal pumps for delivering the water and were located next to the two reservoirs just north of Lee Boulevard near the Columbia High School stadium. Appendix G contains physical descriptions of the all of the 1182 Structures.

FACILITIES

Roads and Walks (1102 Structures):

A total of 47.42 miles of streets and roads, 42.89 miles of blacktop sidewalks, and 2.91 miles of concrete sidewalks were built in Richland Village. Their function was to provide avenues for vehicular and pedestrian movement. According to the architect, the roads were located to "make as much use as possible of the old road beds...Also, there was the need for finding the easiest possible circulation of traffic from the outlying areas to the center of the village."[9] At first, the various streets in Richland were designated by alphabetical letters, but in August 1944 they were named for deceased Army officers and engineers. The intended plan was to name north-south roads as "avenues," with the exception of the main arteries, which were named "drives" (with George Washington Way as the exception). The plan also included naming east-west streets as "streets," with the main arteries being called "boulevards." George Washington Way and Goethals Drive were the main north-south arteries, and Lee, Swift, and Williams Boulevards were the main east-west arteries. "From this skeletal plan, the location of the secondary and minor roads followed naturally."[10]

Streets in Richland varied from 14 ft wide to 56 ft wide. Subgrade for them consisted of a mixture of boulder gravel, gravel, sand, and volcanic ash native to the region. Water was added for compaction and, "in view of the dry climate...government representatives insisted that a minimum of funds should be expended for...drainage structures."[11] A 5-in.-thick mixture of pit run,

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[9] Pehrson, Report on Hanford Engineer Works Village, p. 17.

[10] Ibid., p. 18

[11] DuPont, HAN-10970, Volume I, p. 127.

boulder gravel, and sand then was placed over the subgrade, and then a leveling course of crushed stone was added. Three types of bituminous surfacing were used: dust palliative (oiling), light bituminous (shot and cover), and plant mix. The roads near the Columbia River were "redesigned several times to improve the sewer gradient," and the locations of roads in the south end of Richland were "limited by the workable sewer invert levels."[12] A survey made of the streets in the autumn of 1944 indicated the need for better drainage systems and improved surfacing. Later in the MED period, a subcontract was let for these improvements, but it was not considered to be a part of the prime contract work of the DuPont Corporation.

Concrete sidewalks 4 to 6 in. thick were provided on both sides of the streets in the business district of Richland. Bituminous walks 2 in. thick were constructed on one side of the residential streets and leading from the sidewalks and streets to houses. Just over 5 miles of curbing and a total of 274,842 yd^2 of bituminous-surfaced parking lots also were constructed.

Water and Fire Protection Systems (1103 Structures):

The water supply in Richland Village was based on eight wells, designed to supply 1,400,000 gal/day (1185 Structures). The wells pumped into a common raw water collection header and then, in turn, into two in-ground reservoirs that held 1M gal each. A chlorinating station that treated all of the water (both sanitary and fire protection) before it entered the distribution lines was located between the two reservoirs. This water system functioned to supply all of the drinking and fire protection needs of the village. Two pump houses transferred the water from the reservoirs throughout the 1100 Area piping network (1182 Structures). (Note: This system also supplied the 700 Area.) The designation 1103 Structures actually applied to the water piping itself, of which a total of 106.75 miles was laid in Richland, varying from 1 to 24 in. in diameter. Additionally, three elevated metal tanks, with a capacity of 100,000 gal each, were constructed to store fire protection water. A total of 441 fire hydrants were provided in Richland, along with 90 fire alarm boxes in the 1100 Area and 9 in the 700 Area.

Sewer System (1104 Structures):

The sanitary sewer system for Richland Village consisted of all new government construction. It functioned to receive raw sewage from residential, community, and commercial buildings and to transport this waste to the 1124 Sewage Treatment Plant. A total of 501,076 ft (nearly 100 miles) of sewer piping, varying from 4 to 24 in. in diameter, was laid. This piping, located at least 4 ft belowgrade, was accessed by 478 manholes. The system was a combination of gravity and forced flow. Sewage from the northern portion of Richland drained by gravity flow to the 1124 Lift Station and then was pumped to the 1124 Treatment Plant. Sewage from the central and southern portions of Richland drained by direct gravity flow to the Treatment Plant (1124 Structures).

[12] Pehrson, Report on Hanford Engineer Works Village, p. 18.

Electrical Service (1105 and 1151 Structures):

The electrical system in Richland Village consisted of two primary substations (1151A and 1151B), as well as secondary and distribution substations, electrical poles and wires, and street lights. It functioned to receive and distribute electrical power throughout the 1100 Area. Electrical power came to Richland via a 66-kV transmission line that formerly had belonged to the PP&L. This line could be supplied either through the Hanford or the Pasco Substations. Part of the electrical power for Richland Village came through the 751 Primary Substation (Section 7.0) and the remainder came through the 1151A Substation (5,000 kVa) and the 1151B Substation (10,000 kVa). (The 1151B Substation was built when it was decided to heat Richland's prefabricated houses with electricity instead of steam.) The original 66-kV line was moved from its downtown location to just west and north of Thayer Drive. Secondary and distribution transformers were placed on poles throughout the village. There were a total of 533 such transformers in the 1100 Area, ranging from 3 to 100 kVa. A total of 870,331 ft of electrical lines were strung along 1,919 poles throughout the village, running generally down the centers of the blocks behind houses.

Street lights were erected along all main and interconnecting thoroughfares in the village, but they were limited to intersections in the outlying (residential) areas of town. There was a total of 349 street lights.

Coal Storage Yard (1126 Structure):

One such facility was provided in Richland Village. Its function was to store and dispense coal for heating purposes to residents of conventional houses (not prefabricated units) and to the administrators of community and commercial buildings in the 1100 Area. The coal yard was approximately 66.68 ft^2 and designed to hold 10,000 tons of coal (with the coal piled 8 ft high). A small scale house for weighing loads of coal, along with an office, also were provided. No further description of the 1126 Coal Yard, located along a rail track near the south end of Richland, can be located.

Swimming Pool, Comfort Station, and Bath House (1127 Structures):

One such grouping was provided in Richland Village. The Comfort Station and Bath House was a single building that functioned as the service building for the existing concrete swimming pool and play area in the park along the Columbia River adjacent to downtown Richland. The new government 1127 Building contained clothing check rooms, shower rooms, janitor's closet, a porch, rest rooms, and a chlorinator room for the pool. Appendix G contains a physical description of the 1127 Comfort Station and Bath House.

Enclosure Fence for Irrigation Canal (1128 Structure):

Approximately 12,000 ft of standard chain link fencing was emplaced along both sides of the existing, preSite Richland Irrigation Company ditch where it ran through the prefabricated housing section of Richland Village. It functioned to keep children, pets, and others from falling into the open canal.

Miscellaneous Recreation Facilities (1135 Structures):

The 1135 designation was applied to the existing preSite park along the Columbia River just east of Lee Boulevard, along with four new tennis courts emplaced in that park; various smaller neighborhood parks with new baseball and softball diamonds (and one with bleachers for 500 persons); and a larger outdoor athletic complex constructed southeast of Columbia High School. The latter facility contained baseball and softball diamonds, tennis courts, a one-quarter mile track, and a football field with bleachers to seat 2,500 people. While it was designated primarily for high school use, it was made available for public uses when not employed for school activities. (The gymnasiums of the five schools in Richland School District No. 400 likewise were made available.) These facilities functioned to provide recreational outlets to residents in addition to the 1114 Theaters, the 1123 Recreation Building, and the 1127 Swimming Pool and Comfort Station and served, according to the architect, as a "guarantee against tedium."[13]

Salvage Yard (1137 Facility):

One such facility, also known as the Excess Storage Yard, was provided in Richland Village. It functioned to collect, store, and transfer salvage (junk) and excess materials not needed at HEW or similar materials not needed at government installations elsewhere and shipped to HEW for possible use. No physical description nor further information is available regarding the 1137 Facility. (Note: A fenced area near White Bluffs also was established as a salvage yard and functioned to receive 238 rail car loads and 128 truck loads of scrap material from plant construction projects between January 1944 and March 1945.) See TC-10 Structures in Section 9.0.

Burning Ground (1137 Facility):

One such facility was provided for Richland Village. It functioned to dispose of solid garbage from residences, commercial, and community buildings. Such refuse was picked up in government trucks, disposed of in the 1137 Burning Ground, and periodically burned by open air incineration. The 1137 Facility was located approximately one mile northwest of the village.

Trailer Storage Lot (1143 Facility):

No information can be located regarding this singular facility in Richland Village.

Fire Alarm System (1155 Facilities):

Ninety fire alarm boxes (with 145,700 ft of electrical circuits) were provided in Richland Village, all of new government construction. Their function was to provide a means for residents to notify the fire stations quickly when fires were detected. The boxes were mounted on existing power poles and used galvanized iron wire.

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[13] Pehrson, Report on Hanford Engineer Works Village, p. 24.

Telephone System (1156 Facilities):

The 700 and 1100 areas together were served by a single telephone system. By December 1944, this system contained approximately 1970 phones and 312,800 ft of connecting lines. The function of the 1156 System was to provide communication within Richland Village and the 700 Area. The central telephone switchboard for these areas was located in the 702 Building (Section 7.0). Main trunk lines were encased in vitrified clay sewer tiles as far as the first manholes north and south of the 702 Building and then in ducting from those points to manholes No. 5 and No. 12, respectively. From those points, the lines were carried aerially on existing power poles. From these lines, connections were made to individual buildings via twisted pair wire drops into terminal boxes.

The 1156 System contained four types of telephones. Class A phones were Official and Administrative (approved for outside calls paid for by the government) and served the administration buildings of the 700 Area as well as the 1117 Transient Quarters, the 1118 Hospital, the 1119 Post Office, and other such structures. Class B-1 phones served private residences and were installed on a monthly rental plus toll service basis. Class B-2 phones served commercial stores and were installed and paid on the same basis as residential phones. Class C phones were Emergency, Service, and Administrative and were approved for local calls only. These phones were installed in the 1116 Buildings, the 1132 Ambulance Garage, the 1142 Structures, and 18 such phones were installed outdoors on poles in the prefabricated housing section of the village.

Wells and Well Pump Houses (1185 Structures):

The water supply for Richland Village was based on eight wells, with a total capacity of 6,000 gal/minute (Figure 8-17). They were located in a hollow (natural depression) south of Swift Boulevard between east-west coordinates E-12800 and E-13200 (along Wellsian Way). The wells, along with the eight new 1185 Well Pump Houses and the 1103 Water Lines, functioned to provide drinking and fire protection water to Richland. According to DuPont, wells were chosen for the village water supply, rather than a Columbia River-based supply, because wells were "much easier and quicker to construct, and the water from them did not require filtering."[14] No further physical description of the 1185 Wells and Pump Houses can be located.

Irrigation Piping and Pump Houses (1186 Facilities):

The 1136 Facilities functioned to transport Yakima River irrigation water to the treed shelter belt, the parks, individual lawns, and other growing sites needing sustenance in the 1100 Area. The preSite Richland Irrigation Company canal and its wooden stave, steel-bound underground water mains (approximately 25 miles long each), along with the pump house became federal government property in 1943. The concrete delivery pipes located near the schools and the park and the many make-shift delivery pipes that supplied various orchards within Richland also were taken. The main diversion dam, located on the Yakima River about 10 miles northwest of Richland was not appropriated because it also supplied water to the Kennewick Irrigation

[14] DuPont, HAN-10970, Volume I, p. 137.

Figure 8-17. The 1185 Wells and Well Pump Houses in Richland, Looking North, 1945. (The wells and pump houses are prominently shown in the western portion of the village.)

District. The system then was expanded by government installation of 319,520 ft of additional underground piping, as well as five new pump houses. The new piping varied from 1 to 24 in. in diameter and was partly spiral welded black steel pipe and partly wrought iron and black steel pipe. It was laid 1 ft belowgrade and ran down the center of blocks behind houses and buildings, parallel to the electric and telephone lines. Risers reached up to 2,515 hose bibs, located approximately 100 ft apart, that were installed in the village. The preSite pump house was located near the intersection of Thayer Drive and Lee Boulevard. Three of the total number of pump houses each contained three pumps, and the others each contained two pumps. No physical description of the 1186 Pump Houses can be located.

Steam Distribution System (1187 Facilities):

Heat for the commercial buildings and facilities in Richland Village was supplied by steam from the 784 Boiler Plant (Section 7.0). A total of 15,250 ft of steam distribution lines, varying from 1.5 to 16 in. in diameter, was laid underground with a commercial protective coating. (Note: Heat for the prefabricated house was supplied by electricity, and heat for the conventional houses was supplied via individual, lignite-burning furnaces with bowl diameters that varied from 20 to 27 in.)

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9.0 TEMPORARY CONSTRUCTION STRUCTURES

There were four categories of Temporary Construction at HEW. The Hanford Commercial Contracts and Facilities (HC) structures were those in the Hanford Construction Camp that were necessary for housing, eating, shopping, banking, medical care services, and recreation for all employees who lived there. The General Commercial Contracts and Facilities (GC) structures included those leased for cold storage space off the HEW Site, construction of cold storage facilities on the Site, the modification of preSite residences other than those in Richland Village, and the provision of hotel, dormitory, and rooming facilities off the Site. The Commercial Contracts and Facilities for the 3000 Area Camp (XC) structures were those that furnished housing, eating, and recreational facilities for the 3000 Area. The designation TC structure referred to a wide variety of temporary buildings used for services and administration in all plant areas (including the Hanford Camp and the 3000 Area Camp), plant construction buildings, and special equipment used by police, fire, safety, and engineering offices.

Two types of prefabricated huts were purchased for use at HEW. Hobbs "Pacific" huts[15] were used for barracks, commercial facilities, and offices in the Hanford Camp. Butler huts[16] were used as utility craft shops in the Hanford Camp and for special storage warehouses in the 200-E, 200-W, and 1100 areas. The smaller Nisson huts[17] were used as offices, warehouses, or small shops in almost all areas. Other moveable prefabricated buildings were transferred to HEW from other government projects and were used for warehouses and field offices. Early in HEW's history, canvas Army tents also were used for storage, theater performances, church services, and for housing personnel.

However, most of the temporary construction buildings at HEW actually were constructed, not prefabricated. These newly-built structures had several attributes in common. Foundations usually were composed of wooden beams and piers set on mud sills, pads, and stringers laid on stabilized ground. For buildings that were expected to bear heavy loads, regular or reinforced concrete foundations were emplaced. Concrete slabs could be used or concrete piers either with or without spread footings. Wall and pier foundations for temporary structures were carried 3 ft belowgrade or sometimes to just 1 ft in undisturbed soil. Smaller buildings and offices were built without foundations on wooden skids so that they could be moved easily to other locations.

Floors in the temporary buildings at HEW were built either of wood, concrete, cinder, or earth. Wooden floors were either single or double, with subfloors laid diagonally to the floor joists. A layer of building paper insulation was placed between the floor and the subfloor. Double floors were used principally in the Hanford Camp Administration Area and in the 3000 Area Camp barracks. Warehouses bearing heavy loads were given 2-in. solid plank

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[15] Hobbs Pacific huts do not carry a registered trademark.

[16] Butler huts do not carry a registered trademark.

[17] Nisson huts do not carry a registered trademark.

floors. Four-in.-thick concrete floors generally were installed wherever concrete foundations were used, and metal reinforcing was included in some cases. Concrete floor finishes included hard troweled, smear troweled, and float types. Cinder and earth floors were used both in open and closed shop and warehouse buildings that did not require wood or concrete floors. No floor coverings were applied in the majority of the temporary construction buildings.

Four types of framing were used in the temporary buildings constructed at HEW. Post and girder construction was used for large flat shed and gable-roofed buildings and for multistory structures that were scheduled to bear large, dead-weight loads. Column and truss construction was used for buildings having large roof spans and high ceiling clearances. Split-ring timber connectors and bolts were used in all truss construction. Studded and gable-roof construction was used for small-width structures having light dead-weight loads that could be distributed to outside and partition walls. Barracks, bath houses, small offices, and all skidded buildings had this type of framing. Lastly, open storage buildings and field craft shops were given open-shed construction with roofing supported by posts and girders with posts set in the ground. Special semicircular channel steel framing was included by the manufacturer of the large Nisson huts. Structural steel framing was used in only one temporary building at HEW, in the high portion of the 105 Special Metal Fabrication Shop at White Bluffs (TC-10 Structures).

Frame erection for the temporary buildings constructed at HEW began when mud sills or mats made of 2-in. wood blocking supported by knee-braced posts were emplaced. The sills carried floor joists set on 24-in. centers. Outside and inside walls had studs that also were set on 24-in. centers. Column posts set on the floor sills or footing pads supported ceiling beams. Ceiling joists also were set on 24-in. centers. From this basic framework, the rest of the buildings could be constructed easily and quickly.

Four types of roofing were used in the temporary buildings at HEW. Gabled and hipped roofs were pitched at various angles; flat shed roofs could be pitched just one way or sloped two ways from the center; semicircular corrugated, galvanized sheet iron with plywood sections was supplied by some manufacturers of prefabricated roofing; and reinforced concrete roofs were used for vault construction. The gabled and hipped roofs were covered with 55-lb rolled roofing, and the flat or shed roofs were covered with two layers of 15-lb rolled felt base and one layer of 55-lb rolled roofing. Mop coats of tar were placed between the layers and over the top coats.

Exterior siding for the temporary buildings generally was of gypsum board applied horizontally with V-matched top and bottom edges. In larger buildings composed of several wings, fire walls of regular red brick with salt-glazed tile caps were emplaced. Such walls had metal clad fire doors set in steel bucks. Vaults constructed within the temporary buildings also were composed of brick and tile. Inside building walls and partition linings consisted of celotex[18], fir-tex[19], or sheetrock[20], which were applied only

[18] Celotex is a trademark product name of the Celotex Corporation of Tampa, Florida.

on one side of the studs and only in the Hanford Camp, the 3000 Area barracks, and Area Engineers' Offices. These linings, as well as the ceilings, were of common wallboard materials. One-fourth-in. fiberboard and three-eighths-in. asbestos board were used for shower room partitions only. Window sashes and frames in all temporary buildings were constructed of wood.

Ventilation in the temporary structures at HEW was via gable louvers, roof and wall evaporative coolers, sheet metal roof ventilators, wooden roof ventilators, and wall and ceiling exhaust fans. Steam heating was provided for nearly all buildings in the Hanford Camp; the 3000 Area; Central Shops Buildings at White Bluffs, with the exception of hutments; small moveable buildings; and remote structures. Coal or fuel oil stoves were provided for the remaining buildings. Steam was supplied through outside, overhead lines connected to nearby boiler plants. Building drainage systems consisted of sanitary, waste, and floor drain piping. Cast-iron bell and spigot piping was used, with oakum and leaded joints. Aboveground hot and cold water supply lines were constructed of screwed, galvanized pipes and fittings. Open-light wiring, composed of sheathed cable with bare iron wire ground or knob-and-tube parallel wiring, was installed throughout the temporary buildings. Enclosed power wiring in black steel conduit was emplaced between building service heads and equipment. Painting and insulation were minimized for the temporary buildings.

HANFORD CONSTRUCTION CAMP

The Hanford Construction Camp was built to house, feed, and provide for the community recreational, religious, and other needs of the Hanford construction and support service workers (Figure 9-1). It was located approximately 2.5 miles south of the preSite town of Hanford, Washington, on the west side of the Hanford-to-Richland Road. As the camp expanded, it reached further north toward the boundary of the preSite town of Hanford. The north end of the camp, along the river bank and the existing tracks of the Chicago, St. Paul, Milwaukee, and Pacific Railroad, was designated as the unloading and coordinating area for camp construction. It contained 65 craft shops, warehouses, offices, and six facilities, such as water and electrical systems, sewers and septic tanks. (These buildings will be described separately in Section 9.0.) Of these buildings, 12 were preSite residences, fruit packing warehouses, and commercial store buildings that were converted for government use. During the life of the camp, a total of 1,176 other buildings and nine service facilities were built to house, feed, and provide other community services for the Hanford workers. It was these structures that were given the HC designation.

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[19] Fir-tex is a trademark product name of Owens, Corning Fiberglass Corporation of Toledo, Ohio.

[20] Sheetrock is a trademark product name of the U.S. Gypsum Company of Chicago, Illinois.

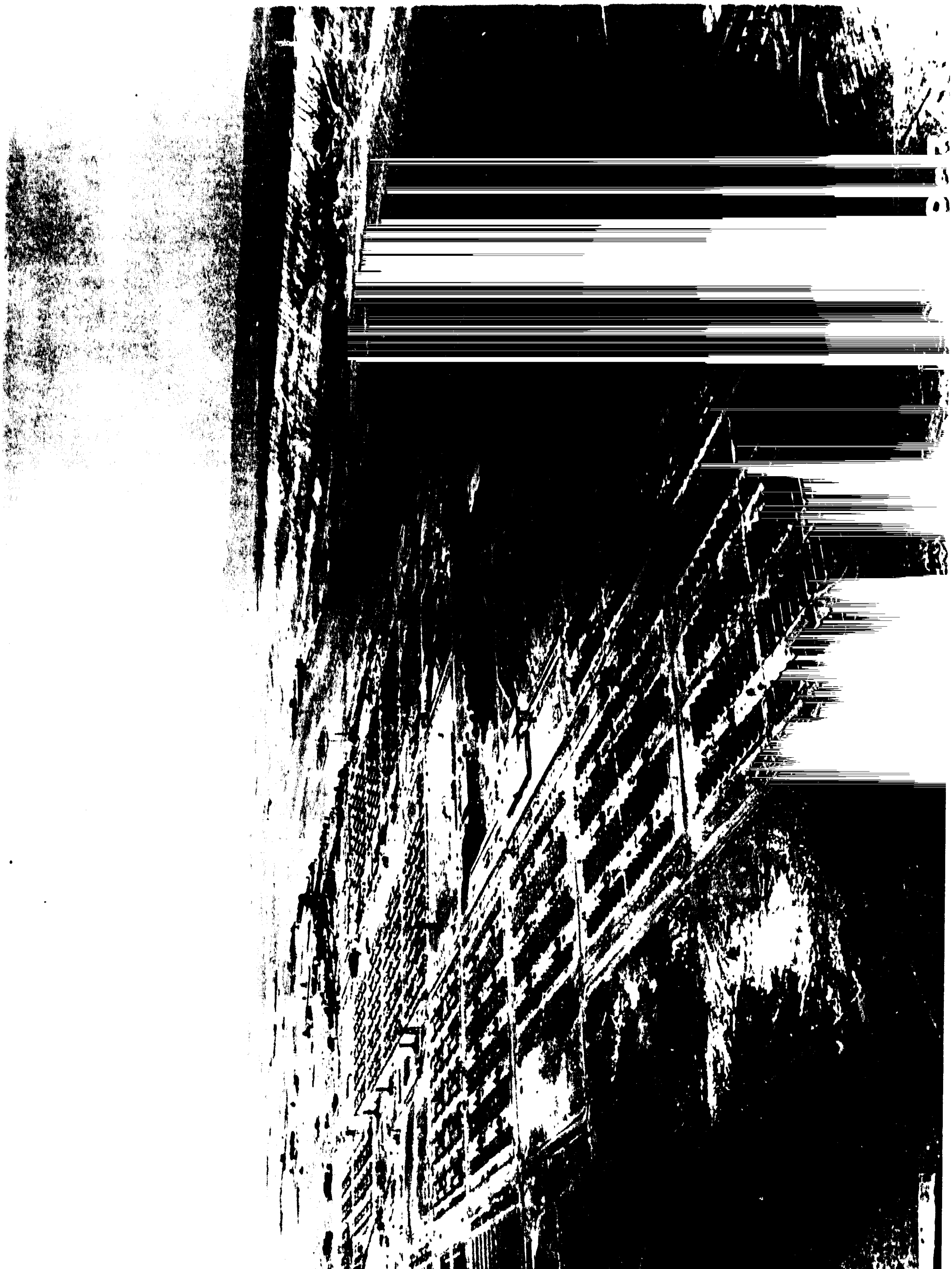

Figure 9-1. Aerial View of the Hanford Construction Camp, 1944.

HC BUILDINGS

Bunkhouses (HC-1 Structures):

A total of 831 or 834 such buildings, all of new government construction, were provided in the Hanford Camp.[21] (Figure 9-2) They functioned to provide sleeping quarters for the workers. Two types of bunkhouses were used: barracks (of which either 171 or 174 were constructed) and 660 much smaller hutments (of which 660 were constructed). Additionally, in the summer of 1943, a peak of 834 workers were housed in 125 Army pyramidal tents, while the bunkhouses were being built. The men's barracks buildings were capable of housing 191 to 199 persons each and were built in an H-shape with four separate wings and a "crossbar" section that contained a utility room and four shower rooms. Each wing contained 22 to 25 double sleeping rooms, an equipment room, and a storage room. In each barrack, one double room was reserved for a single "caretaker." The double rooms were 12 ft by 10 ft, with built-in closets, two 36-in. steel cots with wire springs and felt mattresses, one four-drawer chest, one table, and two straight-backed chairs. The equipment room in each wing housed mechanical equipment for hot and cold air circulation. The women's barracks were smaller, having only two wings and a "crossbar" connection area each. The double sleeping rooms in these barracks were slightly larger at 12 ft by 13 ft each, the beds were maple with box springs and inner springs mattresses, and two mirrors and two pin-up lamps were provided in each room.

Figure 9-2. The HC-2 Hutments in the Hanford Construction Camp, 1944. (More than 10,000 men, but no women, were housed in such units.)

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[21] Note: Two separate figures are given in the same account. See: DuPont, HAN-10970, Vol. II, pp. 351-355.

The hutment buildings were much smaller still. Some were 80 ft long, and some were 40 ft long. All were 16 ft wide and were semicylindrical in shape with curved roofs and self-supporting side walls. The 40-ft units housed 11 people, and the 80-ft units housed twice that number. Hutments were spaced 20 ft apart, ten to a row, with rows 40 ft apart. Separate bathhouse facilities were provided for each group of 20 of the 40-ft hutments. One hut in every block of 40 units was reserved as a linen storage area. Standard equipment in the huts included a steel cot (identical to the men's barracks cots) for each occupant; one table; two straight-backed chairs; and a two-door, wooden wardrobe locker for each occupant. Because of the inconvenience of this arrangement, no women were housed in hutments.

Trailer Camp Buildings (HC-2 Structures):

One hundred and forty eight such structures were provided in Hanford Camp, of which 146 were new government construction and two were existing structures (Figure 9-3). Their function was to provide services to the 3,639 occupants of the seven trailer camps located in the Hanford Camp. Of the 148 buildings, 139 were bathhouses, and the remaining structures were ice houses, coal and lumber storage buildings, a warehouse, trailer camp offices, a dog pound, and a trailer canopy building (for the construction of the wood and paper sunshades placed over the trailers to cool them).

Mess Halls (HC-3 Structures):

Eight mess halls (Figures 9-4, 9-5, and 9-6), eight mess hall warehouses, a sandwich and bake shop, an evisceration building (butchering facility), and a fat rendering building were constructed for the Hanford Camp. All were of new government construction. Their function was to prepare food for and to feed the workers. The mess halls themselves were nearly identical at 176 ft by 370 ft, with two dining halls and a kitchen in each one. One of the mess halls also had a 48-ft extension on one end to house central commissary offices. The mess halls were one-story, wooden structures, and each was connected by a covered walkway to a 60-ft by 120-ft warehouse for short-term food storage. The 96-ft by 192-ft sandwich and bake shop prepared and sold box lunches to workers, the 122-ft by 192 ft evisceration building thawed, butchered, and refrigerated meat and poultry, and the small fat rendering building that was added to the evisceration building rendered usable meat scraps that were used for cooking purposes in the mess halls.

Commercial Buildings:

Eighteen such structures were provided in Hanford Camp, fourteen of new government construction and four converted from preSite store buildings. Their function was to provide retail outlets where camp residents could buy standard consumer goods. There were two grocery stores, a Sears, Roebuck, and Company store[22], a Western Union store, a shoe sales store, two shoe repair stores (Figure 9-7), a women's clothing store, a garment alteration shop, two men's clothing stores, a tire store, a jewelry store, an optometrist shop, a fix-it shop, a toy store, and a root beer hut. Prefabricated huts were used

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[22] Sears, Roebuck and Company is a trade name of the retail sales Sears and Roebuck Corporation of Chicago, Illinois.

Figure 9-3. An HC-2 Building.
(This was a preHanford Site structure that served as the rental office for one of the seven trailer camps in the Hanford Construction Camp.)

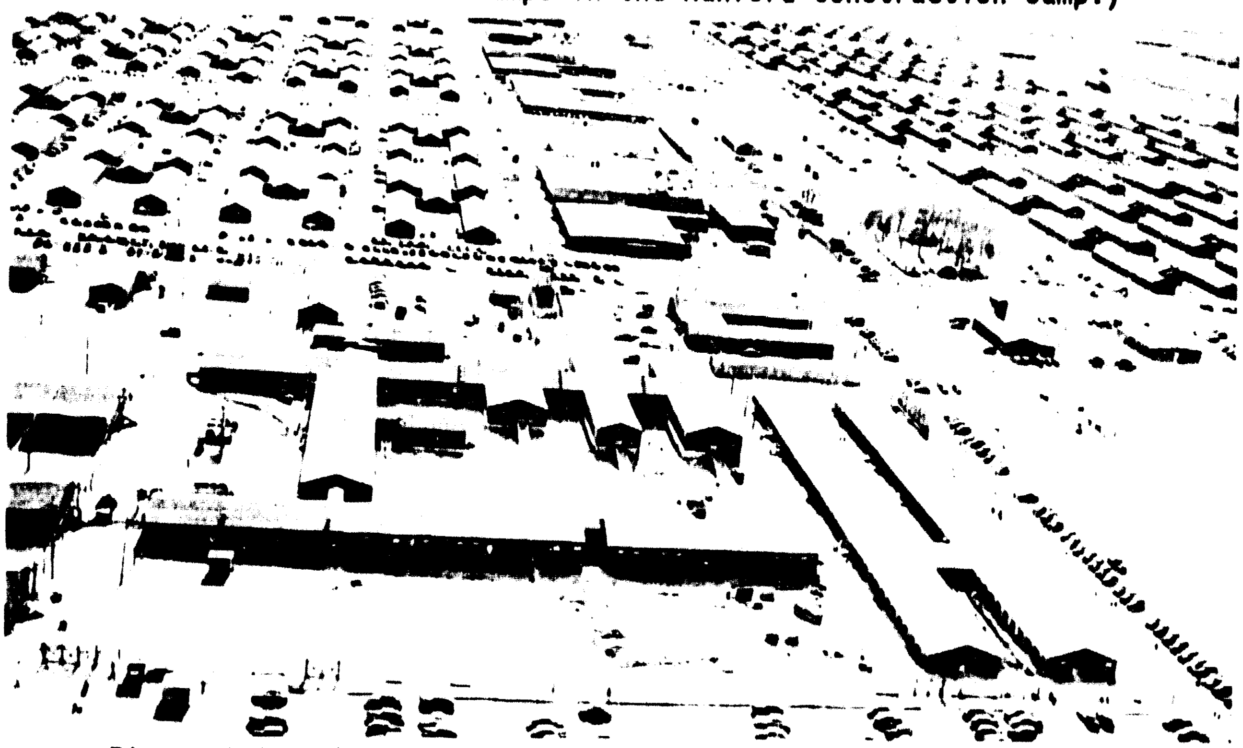

Figure 9-4. The Roofs of the Eight Mess Halls (HC-3 Structures) in the Hanford Construction Camp.
(The Mess Halls are shown in a row proceeding from the center to the top center of this overview. Part of the camp's Administration Area is shown in the foreground.)

Figure 9-5. Hanford Workers Dining in One of the HC-3 Mess Halls, 1944.

Figure 9-6. The HC-3 Evisceration Building (Butchering Facility) in the Hanford Construction Camp, 1944.

Figure 9-7. The Shoe Sales and Repair Store (HC-4), a preHanford Site Structure, in the Hanford Construction Camp.

for the smaller stores, and standard wooden temporary construction was used for the larger stores (such as the Sears, Roebuck, and Company structure).

<u>Theaters (HC-5 Structures):</u>

Two motion picture theaters were provided in the Hanford Camp, both of new government construction. Named the Hanford Theater and the Valley Theater, their function was to provide entertainment for camp residents. The Hanford Theater was 78 ft by 188 ft and could seat 1,500 persons. The Valley Theater was 40 ft by 124 ft and could seat 500 persons. Both were two-story, wooden structures built with standard temporary construction materials and methods.

<u>Commissary Buildings (HC-7 Structures):</u>

Five such structures were provided in the Hanford Camp, four of which were new government construction and one of which was located in the basement of the preSite Grange Hall. The commissaries functioned to provide and sell snacks, soft drinks, beer, tobacco, magazines, sandwiches, and notions to HEW workers and to provide them with recreational activities such as billiards, pin ball machines, and card rooms. All of the newly constructed commissary buildings were large, flat-roofed, wooden structures. Commissary No. 1, the "White Men's Recreational Hall," was 192 ft by 352 ft, and contained 50 rooms. Commissary No. 2, the "Colored Men's Recreational Hall," was 192 ft by 112 ft and had 16 rooms. Commissary No. 3, the "Women's Refreshment Center," was 128 ft by 144 ft and had the capacity to seat 476 people. Commissary No. 4, the "White Men's Tavern," was the same size as Commissary No. 2 and could seat

530 people. Commissary No. 5, the preSite structure, consisted only of a small canteen. Commissary operations at HEW were run by a private subcontractor.

Garages and Service Stations (HC-8 Structures):

Two such structures were provided in the Hanford Camp, one of new government construction and one a combination of two preSite structures. They functioned to sell gasoline and service vehicles of residents. Service Station No. 1 was 22 ft by 38 ft, with an extended canopy covering the driveway and gas pumps area. It contained a sales room, equipment for minor repairs and tire service, rest rooms, and equipment for dispensing gasoline, oil, and grease. Service Station No. 2 was a combination office/display room and a garage repair/tire recap station. The office portion was a one-story, wood-frame structure with a gable roof, and the display area was added by government constructors. The gas pumps and underground storage tanks were located in front of this building. The garage/tire area was 30 ft by 56 ft, with an outdoor, fenced enclosure that contained a propane storage tank for the sale of propane to trailer camp residents for heating and cooking purposes.

Combined Store Buildings (HC-9 Structure):

Two such structures were provided in the Hanford Camp, both of new government construction. Their function was to house jointly a combination of several small commercial ventures. These facilities each contained a drug store, beauty parlor, barber shop, notary public office, and storage space. They were identical one-story, wood-frame, T-shaped structures 145 ft by 250 ft. An additional 30 ft of storage space was added to Store No. 1 in 1944.

Laundry (HC-10 Structures):

Three such structures were provided in the Hanford Camp, two of new government construction and one converted from a preSite store. They functioned to provide laundry and dry cleaning services to camp residents. The two new buildings were prefabricated, 16-ft by 40-ft huts, one of which received an addition of equal size in 1944. The first existing structure to be used as a laundry was a 30-ft by 60-ft, concrete block store. When business increased because of population growth in the camp, the laundry office then moved to another preSite store.

Bank (HC-11 Structure):

One such structure of new government construction was provided in the Hanford Camp (Figure 9-8). It functioned to safeguard the personal funds of residents and to make funds transfers for them. The bank was a 96-ft by 120-ft, one-story, wood-frame structure containing two reinforced concrete vaults. Both sides of the building (lengthwise) were occupied by teller and cashier windows. Accounting, office and banking sections, and one vault occupied the inner areas of the building. The other vault was located in the northwest corner.

Figure 9-8. Hanford Workers in the HC-11 Bank in the Hanford Construction Camp, 1944.

Post Office (HC-12 Building):

One such structure of new government construction was provided in the Hanford Camp. It functioned to provide postal and mail services (including mail boxes) to residents. The first Post Office built by the government was a small one-story, wood-frame structure with a gable roof. By 1944, the size of this building had proven inadequate, and the Post Office was moved to another government building that was 96 ft by 120 ft. By late 1944, it housed the largest general delivery post office operation (by mail volume) in the United States. The Post Office contained a lobby, general delivery room with 12 windows, mail sorting room, incoming and outgoing mail rooms, a C.O.D. room, and rest rooms.

Bowling Alley (HC-14 Structure):

One such structure of new government construction was provided in the Hanford Camp (Figure 9-9). It functioned to provide bowling facilities for the recreational use of residents. The one-story, wood-frame building contained 12 bowling alleys, a soda fountain, a pin boy's coat and storage room, a lobby, rest rooms, and a lean-to that housed ventilation equipment.

Churches and Community Buildings (HC-15 Structures):

Three such structures were provided in the Hanford Camp, two of new government construction and one preSite church. The existing church first was used for various Protestant church services, but soon a United Protestant Church was consolidated at HEW. A one-story, frame annex then was added to the existing church, and it became the United Protestant Church building.

Figure 9-9. The Bowling Alley (HC-14) in the Hanford Construction Camp, 1944.

Catholic Church services first were held in an Army tent, but later were held in the Hanford Camp Auditorium (HC-16 Structures). One wing of a barrack building was used for Colored Church services, and the second floors of the preSite Grange Hall and the Masonic Hall Building were used for church offices and other functions.

Auditorium and Gymnasium (HC-16):

One such combined structure of new government construction was provided in the Hanford Camp (Figure 9-10). It functioned to provide and house recreational activities, shows, dances, and administrative gatherings, such as rallies for HEW residents. This two-story, rectangular, wood-frame building was 140 ft by 206 ft, with an additional 320-ft by 47-ft lean-to wing attached to each end of the stage section. It contained a 140-ft by 160-ft dance floor, projection room, soft drink storage room and refreshment stand, a 23-ft by 36-ft stage, four dressing rooms, shower and rest rooms, locker rooms, and a lobby. A 16-ft by 40-ft hutment was erected just outside the building in late 1944 and was used for chair storage.

Commercial Bus Depot (HC-17 Structure):

One such structure, of new government construction, was provided in the Hanford Camp. It functioned as the Hanford Terminal for commercial bus lines that provided transportation to residents to and from nearby communities. It was a one-story, L-shaped, wood-frame structure with a waiting room, ticket office, and four rest rooms.

Figure 9-10. The Auditorium and Gymnasium Building (HC-14) Being Completed, July 1944.

Other Buildings (TC Structures):

The other buildings that existed in the Hanford Camp will be described in the TC Section because they were constructed and recorded as TC (not HC) structures. These structures were as follows:

-65 Miscellaneous Temporary Construction Shops and Offices (TC-4.9 Structures)
-5 Fire Stations (TC-4.10 Structures)
-8 School Buildings (TC-4.11 Structures)
-1 Locomotive and Boiler Repair Shop (TC-4.12 Structures)
-4 Employees' Recreational Facilities (TC-12 Structures)

FACILITIES

All of the facilities in the Hanford Camp were assigned TC (not HC) numbers. Therefore, they will be described in the TC Section. Such facilities that served the Hanford Camp were as follows:

-317,675 ft of Water Lines (TC-4.5 Facilities)
-321,300 ft of Electric Lines (TC-4.6 Facilities)
-General Grading (TC-4.7 Facilities)
-214,250 ft of Sewers and 9 Septic Tanks (TC-4.8 Facilities)
-Public Address System (TC-4.13 Facility)
-368,300 ft of Roads and 254,400 ft of Walks (TC-5 Facilities)
-112,310 ft of Fences (TC-9 Facilities)
-169,180 ft of Steam Lines and 15 Boiler Houses (TC-15 Facilities)
-152,500 ft of Telephone Lines (TC-16 Facilities)

GENERAL COMMERCIAL CONTRACT AND FACILITIES (GC STRUCTURES)

The GC designation applied to existing structures both on and off the HEW Site that were either acquired directly by the government and remodeled for Plantwide uses or were leased and used to provide services that benefitted the entire Hanford project.

Ice Plant and Cold Storage Facilities (GC-40 Structures):

One such plant was acquired directly and remodeled, and several other plants were leased in the vicinity surrounding HEW. The Priest Rapids Cold Storage and Ice Plant was located in the town of White Bluffs and became government property. It was a three-story, reinforced concrete structure with 10 cold storage rooms having a total capacity of 240,000 ft^3. A three-story, wood-frame, L-shaped addition containing a freight elevator and trucking corridors was made to this plant. Additionally the refrigeration and electrical equipment was overhauled with new compressors, wiring and lighting, new piping was installed, 2-in. cork insulation was added to all storage rooms, and new doors were cut.

Additionally, two cold storage plants in the city of Pasco were leased by the DuPont Corporation for HEW use, as were other such plants in Moses Lake, Kennewick, and Zillah. No remodeling was done to these leased facilities.

Off-Plant Hotel, Dormitory, Rooming Facilities, and Offices (GC-41 Structures):

To house the rapidly growing work force at the beginning of the Hanford project, several facilities in nearby communities were leased and then remodeled or expanded to provide sleeping quarters. One such facility was known as the Little Pasco Camp (Figure 9-11), 2.5 miles northeast of Pasco. At this location, nine existing barracks and two bathhouses of the Army Reconsignment Depot were enlarged and modernized by HEW constructors. Seven barracks were used for sleeping facilities, one was used as a cafeteria, and one was used for linen and baggage storage as well as to provide living quarters for camp caretakers and cafeteria personnel. After adequate living quarters were constructed in the Hanford Camp, the Little Pasco Camp continued to be used to house personnel just arriving at HEW, on a temporary basis. A total of 36,088 men eventually were given temporary accommodations at this location immediately after their arrival by train or bus at Pasco. The Little Pasco camp was discontinued on January 21, 1945.

A building at 125-127 West Lewis Street in Pasco was leased and converted to a bunkhouse for temporary accommodations. It was a one-story, concrete block and brick structure with wooden roof, formerly used as a bowling alley. It became known by HEW as the Duck Pin Inn. It was leased from April 1943 to September 1944 and housed 23,069 HEW recruits on a temporary basis during that period. After that time, the lease was canceled and the structure was returned to its preSite usage.

A one-story brick building located at 116 Tacoma Street in Pasco was leased by HEW from July 1943 to March 1944, remodeled, and used as a Colored Bunkhouse. A total of 3,765 people used this facility on a one-night basis during that period. The structure was remodeled again by the government and

Figure 9-11. The "Little Pasco Camp," a GC-41 Structure, 1943.

used as the DuPont Pasco Baggage Room until December 31, 1944. Two prefabricated 16-ft by 40-ft hutments with a 20-ft^2 connecting wooden frame corner section were erected in a vacant lot next door and used as a Reception and Information Center for incoming personnel. After December 1944, the 116 Tacoma Building was returned to its preSite use and the Reception and Information Center huts were dismantled.

Two rooms on the lower floor of a building at the intersection of Fourth and Lewis Streets in Pasco were leased by HEW and converted to bunkhouse use from October 12 through November 17, 1943. During this period, 418 men were housed on a one-night basis. The rooms were leased again from September 11 to October 16, 1944, and used to house government bus drivers working in and out of Pasco. After the leases expired, the rooms were returned to their original condition.

The 38-room Strand Hotel in Prosser was leased by HEW from April 24 through September 30, 1943; remodeled; and used for the temporary housing of women employees until women's living quarters could be constructed in the Hanford Camp.

Through five separate "campaigns,"[23] rooms to accommodate 2,000 HEW workers were located and rented in Pasco and Kennewick. No remodeling was done to these facilities.

Office space for the Area Engineer, DuPont, and commissary personnel were leased at many locations throughout Pasco, Kennewick, Sunnyside, and

[23] DuPont, HAN-10970, Volume II, p. 445.

Prosser. In some cases, garages, stores, and other off-standard facilities were leased and remodeled until such time as adequate space could be constructed in the Hanford Camp and in Richland. In the case of the DuPont Recruitment Office and some of the commissary offices, these facilities were maintained throughout the HEW construction period.

Rehabilitation Of Plant Site Houses (GC-44 Structures):

At the time that the HEW site was acquired, there were 468 existing houses in the Hanford and White Bluffs towns and on surrounding farms. Most of these were one-story, wood-frame buildings containing two to eight rooms. About one-third of these houses had inside bath and toilet facilities, electric lighting, water, and central heating. Of these, 280 houses were remodeled for the use of HEW personnel, 14 were remodeled as Bachelor Quarters that housed from six to 22 men, and 35 were remodeled and used as field offices and storage warehouses. Most of the remodeling involved cleaning and chlorinating wells and providing indoor sanitary facilities and new wiring and piping. All of the houses west of the preSite town of Hanford were evacuated as of July 1944, because of the imminent startup of B Reactor. Seventy-six houses in the town of Hanford continued to be used by the HEW project until February 1945, when all structures there (including the construction camp) were evacuated because of the startup of F Reactor nearby. After that time, about half of the preSite houses were dismantled by the government, 63 houses were sold and moved, and the remaining ones were boarded up and padlocked.

3000 AREA CAMP (XC STRUCTURES)

The 3000 Area Camp was located along the east side of the Richland-to-Hanford Road, about halfway between Richland and the 300 Area (Figure 9-12). It originally was conceived as a construction housing camp that would exist in addition to the Hanford Camp. However, by July 1943 the decision had been made to erect just one main residential construction camp. At that time, approximately six structures had been erected in the 3000 Area Camp, and it was decided to use these to provide temporary housing to new HEW recruits. From February to March 1944, five more structures were erected to serve as housing units for Hispanic laborers who were being recruited for the first time by the Hanford project. In July 1944, part of the camp was turned over to the Area Engineer (HEW Army commander) to feed and house the project's Military Police. At that time, a garage was erected to service Military Police vehicles. By January 1945, the entire camp had been dedicated to Military Police purposes.

In total, the 3000 Area Camp was a rectangle 800 ft by 2,000 ft long, that contained five men's barracks, one fenced women's barracks, a mess hall with attached warehouse, three hutments for the storage of linens and miscellaneous supplies, a boiler house, a sanitary water and fire protection system dependent on three camp wells, electrical power and telephone lines emanating from Richland, and sanitary sewers with a septic tank and drainage field. Standard barracks, mess hall, and service facilities designs identical to those in the Hanford Camp were adopted.

Temporary Construction--Plant Areas (TC Structures)

The TC designation referred to structures and facilities at various locations all over the HEW site that served the construction needs for

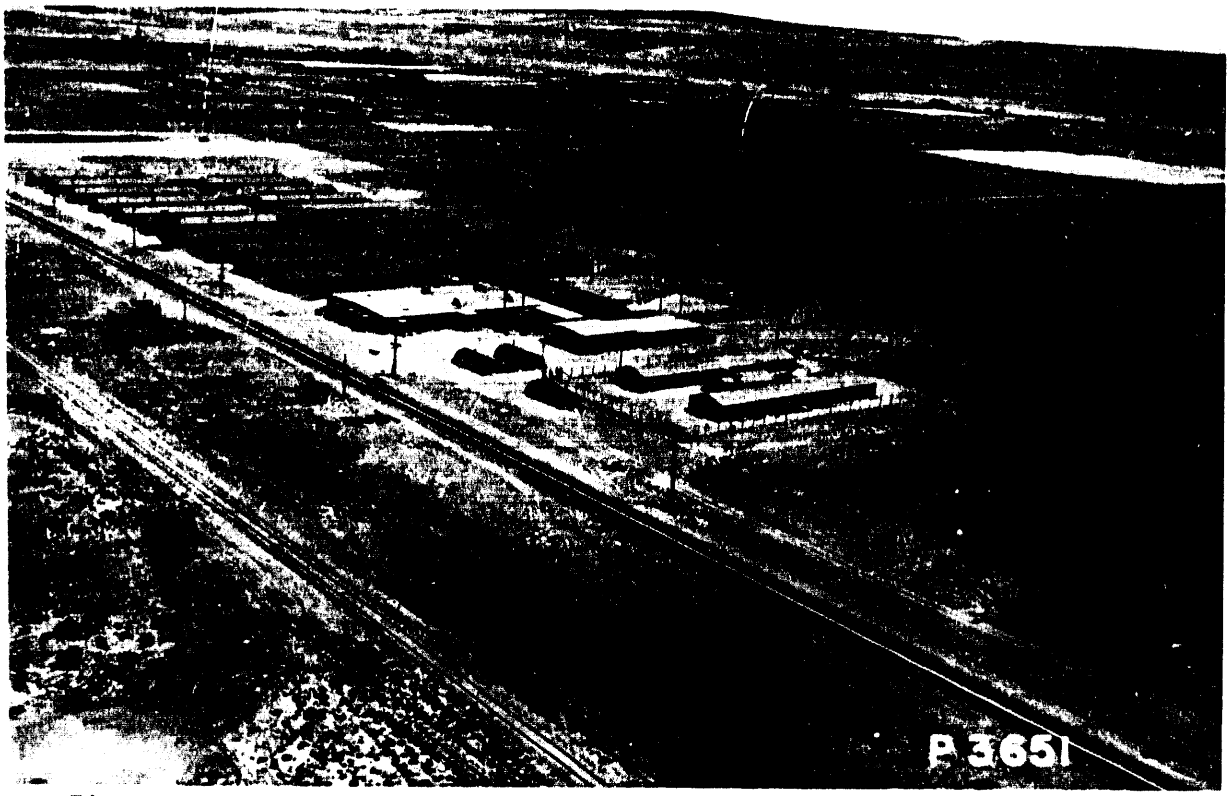

Figure 9-12. The 3000 Area Camp Encompassing Hanford Engineer Works' XC Structures, 1943.

permanent buildings and facilities. Certain sectors in all of the permanent site areas were set aside for the erection of TC structures. The TC buildings and facilities also existed at all of the following locations: Hanford Construction Camp, the preSite town of White Bluffs, the 3000 Area Camp, the Central Shops Area (located halfway between the 200-E and 200-W Areas along the Cold Creek Road), Leazer Spur and the Salvage Yard (located on the west side of the Hanford-White Bluffs Road about halfway between the two towns), the Gondola Repair Shops (located near the Allard Pump House between the 100-B and 100-D areas), the Sanitary Disposal Area (on Route 4 between the 200 and 100 areas), the Riverland Rail Yard (Section 6.0), and at the McGee Well (a preSite structure located to the far west side of the HEW Site). There were hundreds of TC Structures at HEW, and information on them is somewhat sketchy and, in some cases, incomplete. The following is a tabulation of the facts that are known.

Construction Administration and Service Area (TC-1 Structures):

A central TC Administration Area existed in a two-block area near the center of the Hanford Construction Camp (Figure 9-13). (Two exceptions, the Bus Maintenance Garage and the Convalescent-Isolation Ward and Public Health Building, were located in other parts of the camp.) The TC-1 area consisted of 24 structures (of which 23 were new government construction) and eight facilities, including water lines, electric lines, sewer and septic tanks, the public address system, roads and walks, fences, steam lines, and telephones. The function of this area was to house the central coordinating offices for the construction of all of the HEW structures and facilities across the Site. The buildings in the TC-1 area were of standard wood-frame, gable-roofed, temporary construction, and comprised the following:

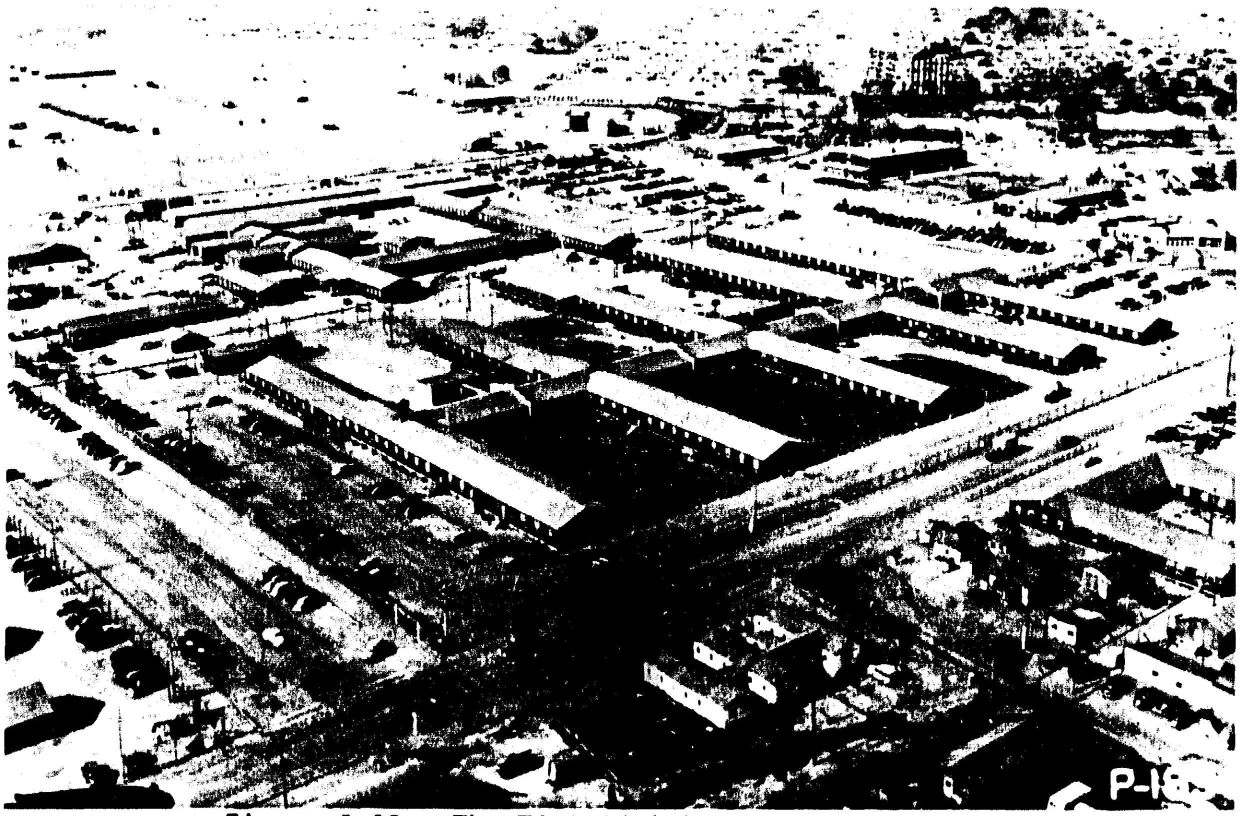

Figure 9-13. The TC-1 Administration Area in the Hanford Construction Camp, 1944.

-Main Construction Office Building (TC-1.1): 109,090 ft^2, with five wings and two vaults
-Employment Building (TC-1.2): 11,600 ft^2
-Employee Training and Relations, Investigation, and Termination Building (TC 1.2): 21,200 ft^2
-Hospital-First Aid and Clinic (TC-1.2): 57,360 ft^2, with five wings, a front section, and two long, connecting corridors
-Guard Headquarters Building (TC-1.3): 11,130 ft^2, along with a 1,600-ft^2 Patrol Training Building, a 3,080 ft^2 Patrol Utility Hut, and a 1,056 ft^2 Radio Repair Hut
-Service Building for Hanford Housing (TC-1.4): 8,800 ft^2
-Telephone Building (TC-1.5): 19,732 ft^2
-Miscellaneous TC in Construction Administration Area (TC-1.6): A collection of eight small buildings consisting of an Auto Wash (768 ft^2), Driver's Education Building (2,400 ft^2), Fumigation Chamber (preSite residence, dimensions unknown), Bedding Storage Hut (640 ft^2), Lunch Hut (640 ft^2), Coca-Cola[24] Hut (640 ft^2), Orientation Building (1,200 ft^2), Ordnance Building (256 ft^2), Guard-Post Building (36 ft^2), and Patrol Storage Building (320 ft^2)
-Time Office and Payroll Building (TC-1.7): 32,000 ft^2
-Piping Subcontractor's Office (TC-1.8): 12,244 ft^2, with three wings, an extension, and a vault
-Bus Maintenance Garage (TC-1.9): 23,050 ft^2
-Military Intelligence Office (TC-1.10): 3,780 ft^2

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[24] Coca-Cola was and is a trademark product of the Coca-Cola Company Incorporated of Atlanta, Georgia.

-Subcontractor's Identification and Badging Office (TC-1.11): 4,400 ft^2
-Convalescent-Isolation Ward an Public Health Building (TC-1.12): 71,000 ft^2 with eight wings and three connecting sections

Roads and Walks (TC-5 Facilities):

Nearly 70 miles of TC roads were built in the Hanford Camp, 40.23 miles of which had a 2- to 3-in. bituminous surface. The remaining roads in the camp had a water-bound gravel surface. The other TC roads at HEW were all constructed of water-bound gravel and included 5,000 ft of Salvage Yard road, 2,000 ft of Gunnery Range road, 4,000 ft of White Bluffs Storage Area road, 2,500 ft of Sanitation Lot road, and the Sanitation Lot itself (160,000 ft^2). Other TC roads were built in the specific process areas, at the Central Shops area, and in Richland Village. Temporary roads at HEW were constructed of compacted sand and gravel, 8 to 12 in. thick (with bituminous surfacing placed only on some of the Hanford Camp roads). They varied from 16 to 50 ft in width and were sprinkled during the summer months to eliminate dust. Pit-run sand and gravel for these roads was obtained from building excavations and from two main barrow pits on the HEW Site (the Haven Barrow Pit, located about 0.5 mile west of the 100-B Area, and the Hanford Barrow Pit, located about 1 mile west of the preSite town of Hanford).

Additionally, approximately 50 miles of bituminous-surfaced TC walkways, varying from 4 to 50 ft wide, were laid in the Hanford Camp. Just over 63 miles of TC walkways were built at HEW, all of which were packed sand and gravel varying from 4 to 6 in. thick and from 4 to 10 ft wide. Thirteen water-bound gravel parking lots also were constructed in the Hanford Camp, three of which were treated with road oil as a dust palliative.

Railroads (TC-6 Facilities):

The TC Railroad construction at HEW consisted of strengthening existing local tracks of the Chicago, Milwaukee, St. Paul, and Seattle Railroad in the north end of the Site and of the Northern Pacific Railroad in the south end. A large number of spurs also were built off of these lines, leading to barrow pits, specific large building excavations, concrete batch plants, coal yards, warehouses, and other key construction locations. Just over 6 miles of track were so strengthened, and 0.5 mile of spurs was built in Richland, and nearly 4 miles of other key spurs were built at the Haven Pit, the Hanford Pit, and at White Bluffs. In the process areas themselves, approximately 1.5 to 5 miles of TC track was emplaced in each area. Sometimes these tracks later became part of the plant operating tracks, but often they were removed as soon as construction of a certain building was completed.

Wells and Water Lines (TC-7 Structures):

The TC water system at HEW was built around four key structures: the McGee Well (a deep and productive preSite artesian well located in the far western portion of the Site), the Allard Pumping Station (Figure 9-14) (located in a preSite pump house about midway between 100-B and 100-D areas), the Hanford township well, and six smaller wells in the town of White Bluffs. When the government acquired these facilities, they built a chlorinator station for the McGee Well and a booster station with six pumps located in the 200-E Area. The McGee water lines that served HEW consisted of 52,000 ft of 12-in. pipe, most of which was wire-wrapped, wood-stave construction. Four

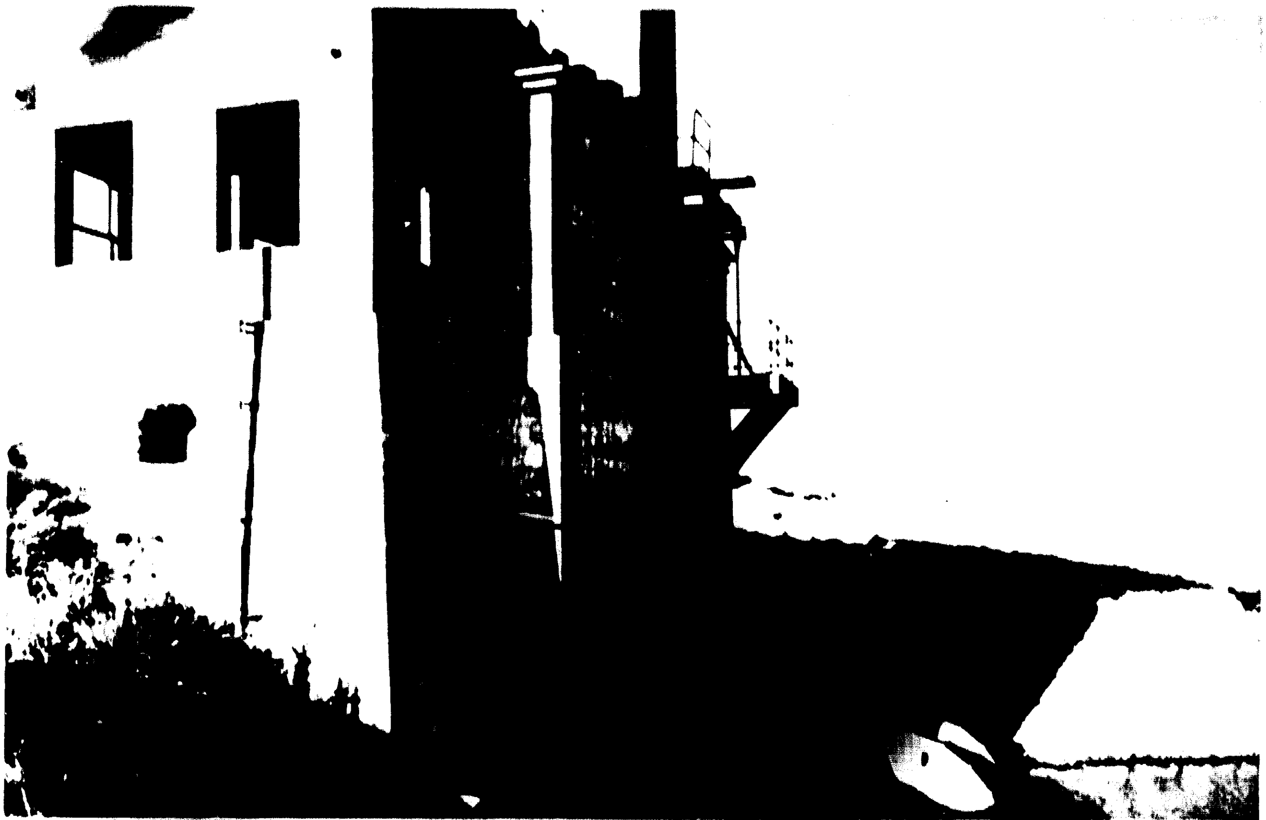

Figure 9-14. The Allard Pump House, a PreHanford Site Structure. (This pump house was located along the Columbia River just east of the 100-B Area. It was acquired by the Manhattan Engineer District in 1943 and served as one of the mainstays of the earliest TC-7 water supply systems used for Hanford Engineer Works construction.)

principal branches were served by this line: the 200-E lateral (7,000 ft of 8-in. pipe); the 200-W lateral (two parallel, 8-in. lines, 5,000 ft each, one wood stave and the other schedule 40 welded steel); the Central Shops main loop (10,000 ft of various types and sizes of pipes, 15 fire hydrants, and 20 building connections); and the Sanitation Lot lateral (600 ft of 6-in. iron pipe). The McGee Line also fed two other laterals leading to two locomotive water stations north of the Hanford Cold Creek Road.

The Allard Line ran south from the pumping station and tied into the McGee Line near the Central Shops area. The Allard pump house was provided by the government with a chlorinator station and two primary pumps and two booster pumps. Approximately 25,000 ft of 12-in., spiral welded steel pipe tied the Allard Line in as an auxiliary supply to the McGee Lines. Five water storage tanks then were provided from the McGee and Allard systems, having a combined total capacity of 530,000 gal. These facilities served the process plant and northern and central construction areas of HEW until permanent water lines could be emplaced.

Because the preSite Hanford township well was small (capacity 500 gal/minute), three additional wells with 500-gal/minute pumps were drilled immediately in the town, and the preSite pump was replaced. Two steel storage tanks with a combined capacity of 335,000 gal also were emplaced. By mid-1944, a total of 13 wells existed in the Hanford Camp area, with 13 well pumps, 11 booster pumps, 18 storage tanks, six chlorinator stations, and 317,765 ft of water distribution piping. The ultimate capacity of this system (designated the TC-4.5 Facilities) was 14,831,200 gal/day.

The government acquired six wells in the White Bluffs area, including the City Well, the High School Well, the Ice Plant Well, and three Ranch Wells. By tying these systems together, improving the piping and pumping facilities, and adding two 100,000-gal storage tanks and a chlorinator station, the HEW builders were able to increase the White Bluffs Area well capacity to 1,500,000 gal.

A temporary well also was drilled at Leazer Spur to provide fire protection for the Excess Yard and Warehouses located there. Two 50,000-gal storage tanks also were emplaced there. The 300 Area water supply came from two TC wells drilled in the southeast portion of that area (see 3905 Structure in Section 4.0) and continued to serve throughout the operating period. The Richland water supply also came from wells dug early in the construction period (see 1103 and 1185 structures in Section 8.0).

Electric Lines (TC-8):

Temporary electric power for construction purposes was obtained from the existing substations at Hanford, Richland, White Bluffs, and Allard. The existing 66-kVa transmission lines of the PP&L and the Priest Rapids Irrigation and Power Company were tapped in five places to acquire power from construction in the 100-B, 100-D, 100-F, 200-E, and 200-W areas, and approximately 19 miles of additional 66-kVa lines were built for this purpose. Additionally, eight 3,000- to 5,000-kVa substations were built to supply TC power. These substations were located in each of the process areas mentioned above, as well as in the Hanford Camp Administration Area, the Hanford Camp barracks area, and in the 3000 Area Camp. The 600-kVa White Bluffs substation and its local distribution system (with some government extension) supplied TC power to project shops, storage buildings, cement block plant, and construction wells locate in the White Bluffs area. The existing 1,800-kVa substation at Coyote Rapids (just west of 100-B Area) supplied the power from the numerous electrical connections made by the government to preSite houses that were used in the construction period.

The two temporary substations and the 321,300 ft of power distribution lines installed to serve the Hanford Camp were designated as TC-4.6 Facilities. In the 300 and 700 areas, TC electrical power was supplied from the permanent substations as they were built in those areas. Temporary construction power to the 1100 Area was supplied by the 66-kVa line of the PP&L that ran from Pasco to Hanford (via Richland) (1105 Structures in Section 8.0).

Temporary Fences (TC-9 Facilities):

Approximately 50 miles of TC fencing was installed at HEW for security purposes (Figure 9-15). Two types of TC fencing were used: Type No. 1 consisted of two courses of woven wire and three strands of two-point barbed wire. This was the most formidable type of fencing and stood 8 to 10 ft high. About 42 miles of this type of fencing was emplaced. Type No. 2 fencing was 4 to 6 ft high and was composed of one course of woven wire with three strands of four-point, zinc-coated, barbed wire. Posts for both types of fencing were wooden, usually Douglas fir.

Figure 9-15. The TC-9 Type No. 1 Security Fencing Being Installed at the Far Western Boundary of the Hanford Construction Camp, 1944. (This view is of the Cold Creek Road, looking west. The fencing was installed to keep workers from making unauthorized visits to the 100 and 200 areas.)

Type No. 1 fencing was used to control the movement of personnel in the 105 Exclusion Areas; the TC-101 Special Fabrication Shop; the Instrument Receiving and Assembly Building at Hanford; the 105 Special Fabrication Shop at White Bluffs; the 272-E and 272-W Shops; the T, B, and U Process Group Buildings in the 200-E and 200-W Areas; and at the west boundary of the Hanford Camp (to keep personnel from unauthorized visits to the 100 and 200 areas). Women's barracks areas at the Hanford Camp, the 3000 Area Camp, and certain parking areas also were so fenced. Type No. 2 fencing was placed around the Hanford Airport, Trailer Camp No. 6, the main shopping area in the Hanford Camp, and the Excess an Storage Yards at leazer Spur, Central Shops, and White Bluffs.

<u>Miscellaneous Temporary Construction Outside Specific Areas (TC-10 Structures):</u>

The TC-10 designation was applied to temporary buildings and facilities built outside of specific areas to support construction needs of the entire HEW project. Some of these buildings were located in clusters at Leazer Spur, the Hanford Camp, White Bluffs, Midway Substation, the Gondola Repair Station, and the Salvage Yard, while others were in scattered, individual locations. The buildings and facilities in the Central Stores Area are listed separately, as they were designated TC-29 Structures (see TC-29 Structures). Most of these buildings were either prefabricated huts or of standard wood-frame construction with gable, flat, or angled shed roofs. The information on these buildings is incomplete, but the following listing is known to have existed.

At Leazer Spur:

-5 warehouses, ranging from 640 to 13,552 ft^2 each
-1 Crane Operator's Loft, 380 ft^2
-1 Rigger's Loft, 450 ft^2
-1 Ice Storage Pit, 100,000 ft^2, lined by 6-in. by 6-in. timbers placed on the floor about 18 in. apart. Sawdust then was used to fill in between the lines, and 300-lb blocks of ice were placed in the pit via chutes from refrigerated rail cars. A double layer of red resin-building paper then was placed over the ice. Ice was delivered in March, April, and May of 1944 for consumption during May through September. A total of 24,318 tons of ice was received from nine commercial vendors in the surrounding region. Thirteen temporary ice storage houses also were constructed in the 100 Areas (3), the Central Shops Area (1), the Hanford Camp (5), the Commissary central warehouse (1), the 300 Area (1), Richland (1), and at Little Pasco (1).

At Hanford Camp:

-17 Warehouses, ranging from small hutments to three furniture warehouses of 7,200 ft^2 each
-1 Furniture Office, 192 ft^2
-1 Carpenter Orientation Building, 2,400 ft^2
-1 Division and Labor Safety Office, 768 ft^2
-1 Patrol and Traffic Hut, 640 ft^2
-1 Train Crew Hut, 640 ft^2
-1 Utility Craft Combined Shop, 12,800 ft^2
-1 Camp Superintendent's Office, 768 ft^2
-1 Fire Inspection Department Building, 640 ft^2
-2 Red Cross Hutments, 1,792 ft^2 each
-1 Radio Transmitter House, 320 ft^2
-1 Instrument Building, 6,270 square feet
-3 Boys' Work Huts, ranging from 640 to 1,696 ft^2 each
-8 Commissary Offices, ranging from 1,024 to 5,120 ft^2 each
-1 Railway Express Office, 1,536 ft^2
-1 Women's Army Corps Post Exchange, 640 ft^2
-2 Coal Tipples, wood-frame bunkers over concrete foundations, 740 ft^2 each
-1 Hanford Ferry for the transport of goods, including two docks, railings, a fence, and a guard post building
-1 Truck Scale and Coal House, 80 ft^2
-1 Latrine, 840 ft^2
-1 Garbage Can Steaming Shed, 900 ft^2
-1 Tin Can Salvage Yard, 6,500 ft^2, with an 840-ft^2 Salvage Shed
-1 Janitor's Hutment, 840 ft^2
-2 Youth Activity Work Huts, 2,112 ft^2 each
-1 Bath House, 4,000 ft^2
-1 Chlorinator House, 144 ft^2
-1 Ration Office, 640 ft^2
-5 Garbage Disposal Platforms, 23,340 ft^2 each
-2 Bus Maintenance Shops

At Midway Substation:

-7 Linemen's Barracks, 7,392 ft^2 each

At the Salvage Yard near White Bluffs:

-9 Storage Hutments, 9,504 ft^2 each
-2 Parts and Miscellaneous Warehouses, one a preSite shed of 2,100 ft^2 and one a 2,400-ft^2 structure of new government construction
-2 Loading Docks
-1 Salvage Office, a preSite residence of 810 ft^2

At White Bluffs:

-1 Main Pipe Fabrication and Blacksmith Shop, 19,992 ft^2
-20 Warehouses, including preSite structures and new government construction, varying from 625 to 20,056 ft^2
-3 Miscellaneous Storage Yards, varying from 15,000 to 60,000 ft^2
-5 Offices, including those for the 800 and 900 Areas Division Engineers and ranging from 400 to 2,448 ft^2
-1 Storage Platform, 6,000 ft^2
-1 White Bluffs Railroad Station, a preSite structure of 2,240 ft^2
-1 Fumigation Building, 400 ft^2
-1 Test Welding Shop, 1,750 ft^2
-4 Pipe Docks, ranging from 400 to 6,300 ft^2
-5 Valve and Fitting Platforms, 40,000 ft^2 each
-1 Fire Station
-Other Structures

At the Gondola Repair Yard:

-1 Line Yard Office, 1,080 ft^2
-2 Storage Warehouses, one a preSite barn of 5,000 ft^2 and a 920-ft^2 structure of new government construction
-1 Repair Shop, 6,284 ft^2

At Miscellaneous Locations:

-1 Radio Transmitter Station
-1 Sanitary Disposal Area
-Pistol and Machine Gun Ranges
-1 Hot Mix Plant for Road Materials

In and For the 500, 600, 800, and 900 Areas:

-81 Construction Field Offices
-10 Clock Alleys
-7 Lavatories
-Other Structures

<u>Sewers and Septic Tanks (TC-11 Structures):</u>

A total of 46.3 miles of TC sewer lines, varying in size from 4 to 30 in., and 80 TC septic tanks were emplaced during the construction of HEW. Building connections and sewer pipes were made of vitrified clay or cement, laid with cement joints. These lines were encased in concrete under roads and rail crossings. Manholes were built of reinforced concrete pipe set on concrete pads. In the 100, 200, and 300 areas, the need for these facilities was negligible, as only the Division Engineer's Office and the Government Field Office were provided with indoor rest rooms. In the case of each of these areas, 500 to 1,500 ft of lines were emplaced, along with underground, single-pass baffle, wooden septic tanks. These tanks each were designed to overflow to a tile field. The Central Shops Area and the 3000 Area Camp structures were provided with gravity flow sanitary sewer systems, wherein individual building drain lines flowed to a main trunk line that emptied to a large septic tank. The Central Shops Area required 6,400 ft of such lines, while the 3000 Area Camp required 3,150 ft. The septic tanks in these areas then emptied to open settling basins. In the White Bluffs area, new and larger septic tanks and tile fields were constructed to supplement the existing structure, and 300 additional ft of underground pipe were laid. The 700 and 1100 areas were served temporarily by two septic tanks, one buried east of Goethals Drive between Williams Boulevard and Jadwin Avenue and one buried east of George Washington Way between Swift and Williams Boulevards. Additionally, 1,600 ft of underground lines leading to these tanks were provided. These facilities served Richland until early April 1944, when the permanent system began operating.

In the Hanford Camp, sewers and septic tanks were designated as TC-4.8 Structures. A total of 214,250 ft of underground pipes and 76 septic tanks were emplaced in the camp by July 1944 to serve the peak population. The septic tanks were three-pass baffle, wooden box types, and these in turn fed to three individual sewage treatment plants located in the camp. These plants consisted of a baffled chlorine mixing chamber, chlorinator house, and a settling basin 80 by 230 ft and 4 ft deep for the settling of solids. The chlorinated liquid sewage was disposed to the Columbia River when the bacterial levels had dropped to a State standard.

Employees' Recreational Facilities (TC-12 Structures):

The TC-12 designation refers to a number of structures, and facilities not listed as HC structures were built and improved for the recreational use of the residents of the Hanford Camp. Among these structures were two baseball diamonds, one with a bleachers that could seat 4,000 persons. At the close of the Hanford Camp, these bleachers were moved to the Richland Athletic Fields. Nine regulation softball diamonds also were provided in the Hanford Camp. Wood-frame, wire backstops were provided for all of the baseball and softball diamonds. Four regulation-size, concrete paved tennis courts with wood-frame, wire backstops also were constructed in the camp, with two badminton and two clay volleyball courts adjacent to them. A total of 144 horseshoe courts were provided at scattered locations throughout the camp, and a nine-acre picnic ground was set aside on the west bank of the Columbia River one mile east of the Hanford Ferry landing. Wood tables, benches, fireplaces, portable rest rooms, and water barrels were provided at the picnic ground.

The other recreational facilities at the Hanford Camp encompassed a 20-ft by 48-ft, wood-frame, gable-roofed, prefabricated library and a barracks converted into a Women's Recreation Hall containing reading and game rooms, lounge, dance hall with a concrete-floored dance pavilion, music rooms, club rooms, and offices. Lastly, a bathing beach was developed on the Columbia River just west of the preSite Hanford Substation. A T-shaped floating walkway with a 100-ft stem and a 150-ft T-bar was constructed out into the river. A diving tower was erected, and diving boards, safety equipment, and floats were installed (Figures 9-16, 9-17, and 9-18). A small chlorination station and bath house also were built.

Hanford Airport (TC-14 Facility):

The first TC airport at HEW was a single 30-ft wide, 2,000-ft long blacktop landing strip that was constructed in the spring of 1943 near the Hanford Camp on the south side of the Hanford Irrigation Ditch just east of the Hanford-to-Richland Road (Figure 9-19). As the project expanded and began to receive daily air express shipments, this strip proved to be inadequate and had to be abandoned. A second airport was constructed approximately one mile west of Hanford, between the Hanford-White Bluffs Road and the south end of Gable Mountain. This facility consisted of two 200-ft-wide landing strips at nearly right angles to each other. The north-south strip was 4,000 ft long and the east-west strip was 2,400 ft long. The strips were constructed of surface sand and gravel mixed in place with road oil and then rolled to 6 to 8 in. thick and surfaced with bituminous. Two wood-frame, open-shed hangars were erected, along with a 16-ft by 40-ft enclosed hut, just east of the intersection of the two airstrips. Gasoline pumps with underground storage tanks were provided for refueling Army planes, and the TC-14 Facility was enclosed with a Type No. 2, TC fence (see TC-9 Structures).

Boiler Houses and Steam Lines (TC-15 Structures):

A total of 24 semipermanent (TC) boiler houses were erected for the construction needs of HEW. Eighteen of these facilities were built in the Hanford Camp, five in the Central Shops Area (TC-29 Structures), and one in the 3000 Area Camp. Additionally, five railroad locomotives were connected in parallel to a single header to furnish steam power during the very earliest operations in the Hanford Camp (Figure 9-20). The standard design for the TC boiler houses was that of one-story, wooden-frame, shed-roofed buildings of post and girder construction. These buildings housed 100-HP, hand-fired, horizontal return tubular boilers, either singly or in batteries. The structures also housed a wood-stave, soft water storage tank and a boiler feed pump. Along one side of the boiler houses that contained six to eight stacks, a wooden ramp was emplaced for the delivery of coal. Along the other side was an open-boxed pit for the sluicing and removal of ashes via a clamshell crane.

In the process areas and at interarea locations, portable single-unit boilers, varying from 12 to 100 HP, were emplaced for the earliest temporary generation of steam. These boilers were relocated around the HEW Site as the work schedule demanded.

Approximately 38.5 miles of TC-15 steam lines, varying from 1 to 12 in. in diameter, were emplaced around the HEW plant for construction purposes. More than 80% of these lines were in the Hanford Camp. The TC steam lines were made of schedule 40 seamless steel pipe, with all joints welded and flanged and were carried overhead with an outside layer of 85% magnesia insulation covered by tar paper weatherproofing. Piping inside the boiler houses and the hot water heaters also were covered with 85% magnesia insulation. Outdoor steam lines were carried on single-pole, wooden-pipe supports, usually Douglas fir, set in concrete. Steam lines less than 3 in.

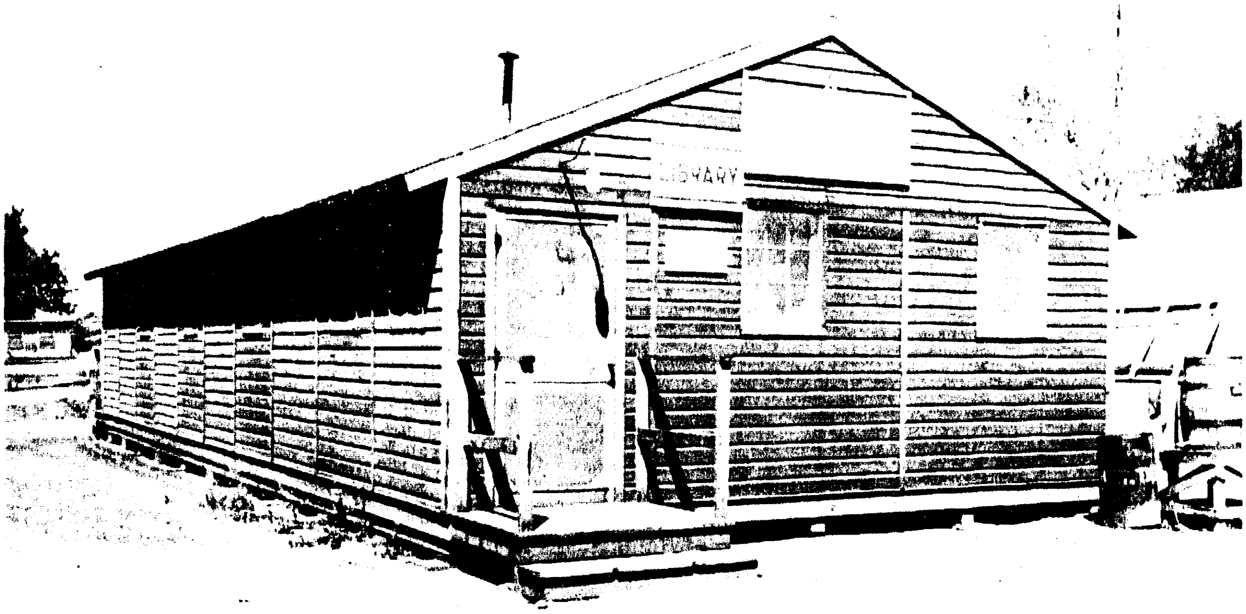

Figure 9-16. The Library (TC-12) in the Hanford Construction Camp, 1944.

Figure 9-17. The Dance Pavilion (TC-12) in the Women's Recreation Hall at the Hanford Construction Camp, 1943.

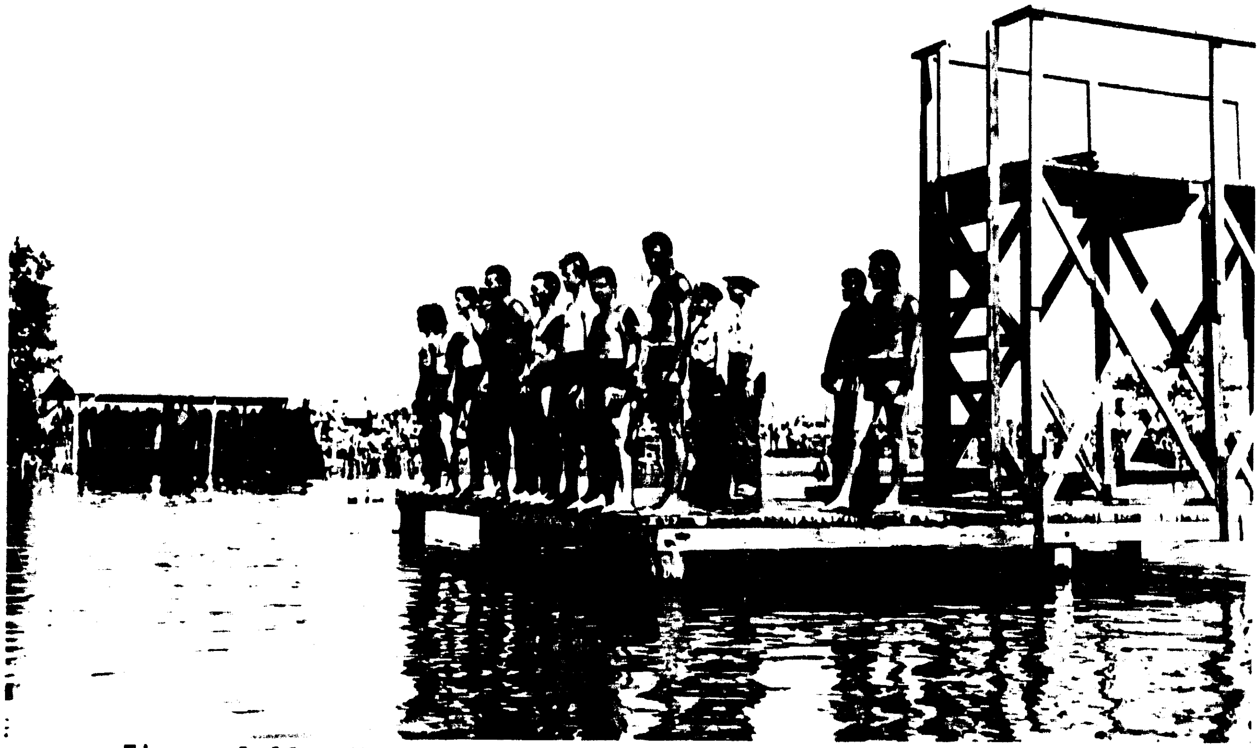

Figure 9-18. Hanford Workers at the Floating Platform (TC-12). (This recreational facility with diving board and tower was built into a sluice of the Columbia River just north of the Hanford Construction Camp.)

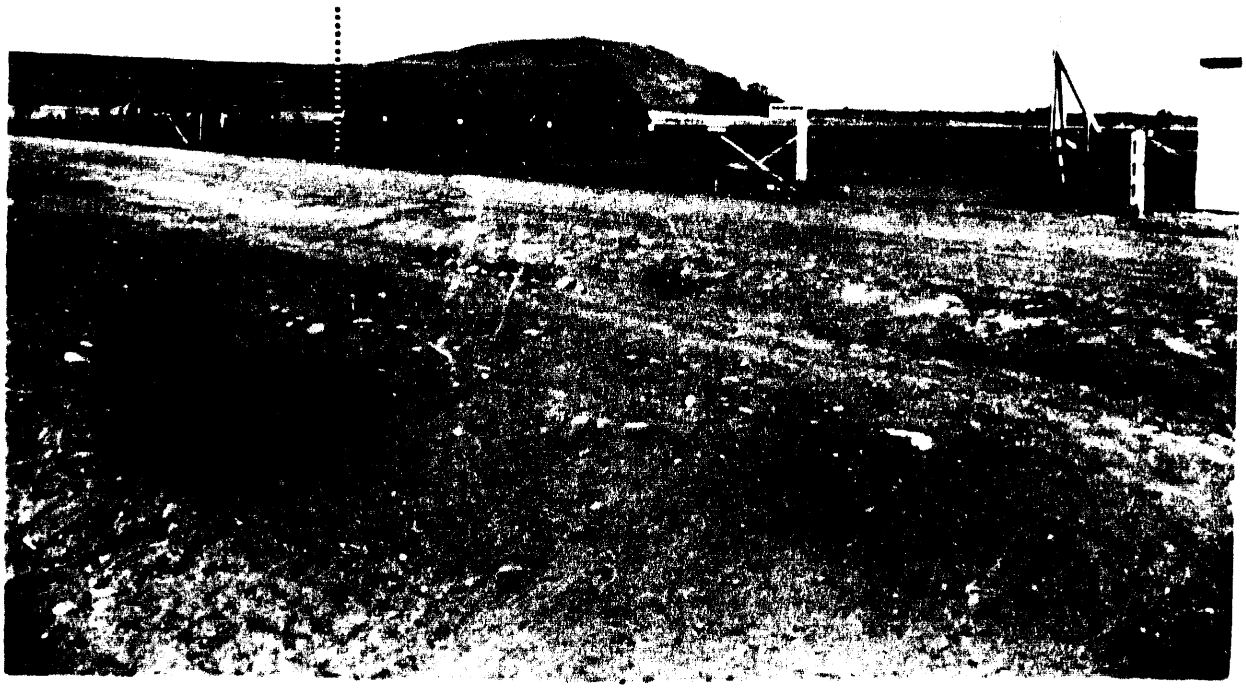

Figure 9-19. The TC-14 Airport, Looking Southwest Toward Gable Mountain. (The airport was built just west of the preSite town of Hanford to provide air express service to the Hanford Construction Camp.)

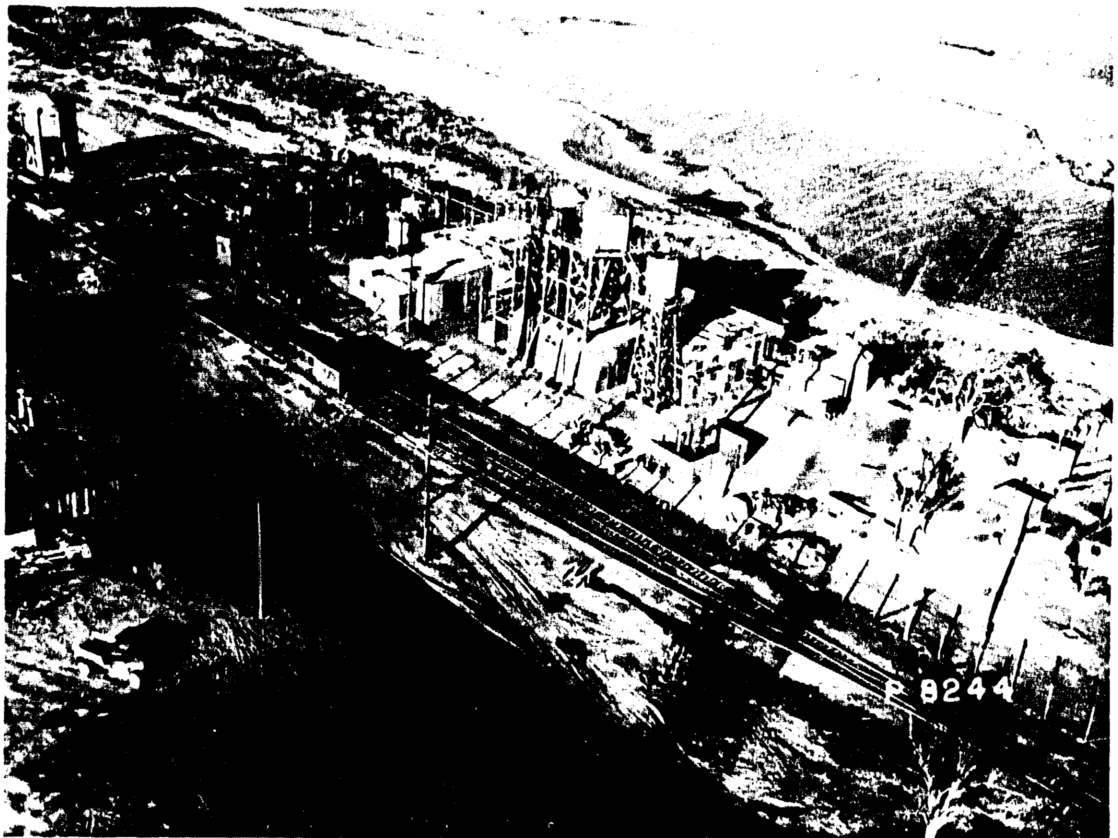

Figure 9-20. Five Locomotive Engines Aligned Just North of the 145 Building.
(These engines provided the very earliest steam heat and power for the Hanford Construction Camp and its facilities.)

in diameter usually were suspended from the poles by J-shaped, metal strap hangers. Lines 3 to 12 in. in diameter were suspended from rod hangers fastened to wooden cross-arms on the support poles.

Temporary Telephone Lines (TC-16 and TC-17 Facilities):

To conserve critical materials and manpower, existing preSite interarea trunk lines with government extensions and additional carriers were used almost exclusively for temporary telephone connections. Temporary switchboards that were established off of these main lines, as well as the filed telephones, were known as TC-16 Facilities. Temporary switchboards were installed in Richland, Hanford, and the Central Shops Area. The Richland Temporary Board contained 11 positions, carrying approximately 975 lines and serving 3,000 telephones. The Hanford Temporary Board carried approximately the same numbers of facilities, and the Central Shops Area Temporary Board (known as the Cold Creek Exchange) was much smaller. It was a two-position, manually operated switchboard located in the Craft Superintendent's Building and servicing approximately 75 lines. An offsite commercial telephone company also installed pay telephones in the Hanford Camp for the use of residents. In the process areas and the 700 and 1100 areas, the permanent area switchboards and local preSite distributing networks were used for temporary service to minimize telephone work. In some of the process areas, field telephone services were among the last construction facilities to be established. Twisted pair and open galvanized iron wire was used for drops into temporary buildings, and approximately 4,000 field telephones were connected in this manner. A concrete and concrete block Telephone Repeater Station (the TC-17 Structure) was built on the main trunk line just north of the 300 Area to improve temporary telephone transmission.

Prison Camp (TC-20 Facility):

A temporary residential camp known as the Columbia Camp (or sometimes the Columbia River Camp) was erected on the north bank of the Yakima River just west of the Horn Rapids Dam (Figure 9-21). Its purpose was to house workers of Federal Prison Industries, a subsidiary entity formed of minimum security prisoners from the McNeill Island Penitentiary near Tacoma, Washington. These men were brought to HEW to help harvest and care for the many preSite orchards inherited by the federal government. By using prisoner labor and allowing Federal Prison Industries to sell the harvest for profits that supported the upkeep of prisoners, the HEW project freed nonprisoner manpower for construction work and also obtained virtually self-supporting labor. The prisoner laborers who worked under this agreement were terminated at HEW in late 1945. No listing of the barracks and other living facilities provided in the Columbia Camp can be located.

Figure 9-21. The TC-20 Columbia Camp, February 1944.
(This camp was a housing facility for minimum security prisoners from McNeill Island Penitentiary who were brought to the Hanford Engineer Works to tend the abundant preHanford Site orchards.)

105 Areas Temporary Construction (TC-28 Structures):

All temporary construction facilities and structures in the 105 (reactors) exclusion areas were designated as TC-28 Structures. Such buildings included Division Engineers' Offices, Layout Offices, Field Craft Services Offices, Labor Offices, Badging and Identification Offices, Air Lock Offices, various shops for Steamfitters, Instruments, Sheet Metal, Bolts, the 105 Special Fabrication Shops, and other necessary items and crafts, guard and laborer shelters, boiler houses and seam lines, water lines, field privies, change houses, warehouses, transformer banks, and other structures and facilities.

Central Shops Area Temporary Construction Buildings and Facilities (TC-29 Structures):

This area, located midway between the 200-E and 200-W Areas, was devoted to fuel storage for heavy construction vehicles, heavy equipment repair, acid-conditioning treatment for construction metals, and a multitude of construction shops and servicing buildings. Most of the structures were prefabricated huts or wood-frame buildings of simple post and girder construction with shed, flat, or gable roofs. The area contained the following structures.

-1 Machine and Sheet Metal Shop, 19,910 ft^2
-1 Crane Repair Shop and Office, 10, 350 ft^2
-14 Offices, ranging from 768 to 3,240 ft^2
-7 Warehouses and Storage Buildings, ranging from 4,800 to 14,400 ft^2
-5 Storage Huts, 5,280 ft^2 each
-17 Shop Buildings for welding, iron cutting, tire storage and repair, electrical repair, automotive and truck repair, small parts repair, painting, valve testing, pumpcrete[25] repair, heavy equipment repair, and other functions, ranging from 360 to 17,340 ft^2
-1 Rigger's Loft, 5,184 ft^2
-1 Pumpcrete Repair Shop, 3,680 ft^2
-1 Road Materials Laboratory, 640 ft^2
-1 Salvage Platform, 4,000 ft^2
-1 Auto Inspection Building, 8,448 ft^2
-1 Set of Grease and Wash Racks, 3,440 ft^2
-1 Tool Room, 800 ft^2
-1 Barrel Rack Platform, 22,500 ft^2
-2 Fuel Storage Yards with Tanks, totalling 76,000 ft^2
-1 Concrete Laboratory, 2,480 ft^2
-1 First Aid Building, 1,107 ft^2
-Other Structures

The Central Shops Area also contained a huge bus parking lot (360,000 ft^2), nearly 5M ft^2 of miscellaneous construction storage lots, five boiler houses, three transformer banks, 29 construction shacks, steam lines,

[25]Pumpcrete now is a registered trademark product of the Morgen Manufacturing Company of Yankton, South Dakota. The MED era trademark owner of the product cannot be located.

sewers and septic tanks, electric lines, and many other facilities. Additionally, over 1.3 miles of fencing surrounded the valuable supply warehouse and lots of the Central Stores area.

Area Temporary Construction (TC-30 through TC-37 Structures):

The designations TC-30 through TC-37 applied to structures and facilities constructed within specific HEW areas. Temporary structures erected in building the 500, 600, 800, and 900 areas all were designated as TC-10 Structures. However, temporary structures erected for the building of the other areas were designated as follows:

-TC-30: All TC in the 100-B Area
-TC-31: All TC in the 100-D Area
-TC-32: All TC in the 100-F Area
-TC-33: All TC in the 200-N Area
-TC-34: All TC in the 200-E Area
-TC-35: All TC in the 200-W Area
-TC-36: All TC in the 300 Area
-TC-37: All TC in the 700 and 1100 Areas.

Most of the TC-30 through TC-37 buildings were either prefabricated huts, or they were of wood-frame construction with gable, flat, or shed roofs. A representative list of such buildings, common to most specific areas, along with some average numbers and sizes of these structures, is as follows:

TC-30 through TC-32 (100 Areas Structures, found in each 100 Area):

-Division Engineer's Office, 4,515 ft^2
-Labor and Concrete Office, 960 ft^2
-Pipe Shop, 5,320 ft^2
-U.S. Engineer's Office, 792 ft^2
-Area Intelligence Office, 240 ft^2
-Layout Office, 1,056 ft^2
-Paint Office, 1.056 ft^2
-Cost and Safety Office, 1,056 ft^2
-Earthworks Office, 1,056 ft^2
-Millwright Shop, 12,180 ft^2
-Miscellaneous Pipe Warehouse and Tool Room, 11,200 ft^2
-Pipe Warehouse Dock, 1,600 ft^2
-Electric Office and Shop, 3,800 ft^2
-Electrical Storage Shed, 3,750 ft^2
-Miscellaneous Warehouse, 16,640 ft^2
-Miscellaneous Warehouse Docks (3), ranging from 400 to 1,568 ft^2
-Transportation Office, 3,600 ft^2
-Transportation Welding Shop, 600 ft^2
-Tire Repair Storage Building, 340 ft^2
-Grease Storage Platform, 256 ft^2
-Oiler's and Dispatcher's Building, 288 ft^2
-Tire Repair Platform, 1,600 ft^2
-Gas Station, 120 ft^2
-Rigger's Office and Loft (2), 1,440 ft^2 each
-Rigger's Dock, 400 ft^2
-Crane Office and Loft, 750 ft^2
-Carpenter Shop, 4,400 ft^2

-Reinforcing Steel Shop, 3,400 ft^2
-Reinforcing Steel Office, 480 ft^2
-Concrete, Labor, and Storage Shed, 576 ft^2
-Warehouse for 184 Building, 3,200 ft^2
-Boiler Shed for 184 Building, 216 ft^2
-Electric Office and Shop for 184 Building, 648 ft^2
-Railroad Lantern Repair Building, 450 ft^2
-Railroad Car Storage Building, 300 ft^2
-Fire Station Barracks, 1,803 ft^2
-Pumpcrete Building for 105 Plant, 1,856 ft^2
-Barrel Platform, 1,500 ft^2
-Clock Alley, 288 ft^2
-Clock Alley Office, 120 ft^2
-Materials Storage Platforms (2), 8,000 and 20,000 ft^2
-Bus Repair Platform and Shelter, 792 ft^2
-Ice House, 1,000 ft^2
-Saw Shelters (2), 432 ft^2 each
-Dispatcher's Shacks (2), 64 ft^2 each
-Warming Shelters (14), 750 ft^2 each
-Check Booths (17), 36 ft^2 each
-Privies (62), 80 ft^2 each
-Guard Houses (9), 36 ft^2 each
-Miscellaneous Shacks (35), 120 ft^2 each
-Roads
-Walks
-Parking Lots
-Miscellaneous Storage Lots (over 5M ft^2 in each area)
-Railroad Lines
-Water Lines
-Transformer Banks
-Fences
-Sewers and Septic Tanks
-Steam Lines
-Telephones
-Other Structures and Facilities.

TC-33 Structures (not listed).

TC-34 through TC-35 Structures (structures listed found in each of the 200-E and 200-W Areas):

-Division Engineer's Offices (2), 1,728 and 2,560 ft^2
-Millwright Shop, 10,920 ft^2
-Rigger's Lofts (2), 352 and 1,440 ft^2
-Transportation Building, 3,600 ft^2
-Electrical Shop and Warehouse, 3,880 ft^2
-Electric Shops (2), 960 ft^2
-Pipe Shops (2), 1,200 and 5,250 ft^2
-Pipe Warehouse, 11,264 ft^2
-Reinforcing Steel Building, 3,360 ft^2
-Reinforcing Steel Office, 432 ft^2
-Miscellaneous Warehouse, 16,640 ft^2
-Labor and Concrete Office, 960 ft^2
-Layout Office, 960 ft^2
-Carpenter Shop, 5,200 ft^2

-Carpenter Fabrication Shop, 3,000 ft^2
-Clock Alley, 500 ft^2
-Ladder Repair Shop, 768 ft^2
-U.S. Engineer's Office, 768 ft^2
-Painter's Hut, 1,056 ft^2
-Crane Operators' Loft and Office, 600 ft^2
-Area Safety Orientation Shed, 1,800 ft^2
-Fire Department Office and Bunkhouse, 1,750 ft^2
-Cost Office, 528 ft^2
-Gas Station, 96 ft^2
-Storage Hut and Office (2), 7,056 ft^2 each
-Tire Repair Platform, 1,200 ft^2
-Welding Shed, 420 ft^2
-Meteorological Building, 450 ft^2
-Equipment Storage Building, 1,500 ft^2
-Safety Office Hut, 528 ft^2
-Area Engineer's Office, 1,056 ft^2
-Chemical Pipe Fabricating Shop, 1,040 ft^2
-Area Carpenter's Office, 625 ft^2
-Bolt Shed, 2,314 ft^2
-Area Tool Shed, 256 ft^2
-Area Concrete Shed, 704 ft^2
-Pumpcrete Building, 2,112 ft^2
-Badge Office, 480 ft^2
-Special Equipment Warehouse, 9,000 ft^2
-Equipment Storage Sheds (2), 4,000 and 34,560 ft^2
-First Aid Waiting Shelter, 388 ft^2
-Blacksmith Shop, 900 ft^2
-Machine Shop, 2,085 ft^2
-Storage Platform, 10,000 ft^2
-Paint Office, 280 ft^2
-Ice House, 224 ft^2
-Saw Sheds (7), 320 ft^2 each
-Check Booths (10), 24 ft^2 each
-Privies (50), 80 ft^2 each
-Roads
-Walks
-Parking Lots
-Miscellaneous Storage Lots (nearly 5M ft^2 in each area)
-Railroad Lines
-Water Lines
-Transformer Banks
-Fences
-Sewers and Septic Tanks
-Steam Lines
-Telephones
-Other Structures and Facilities.

TC-36 Structures (300 Area) not listed.

TC-37 Structures (700 and 1100 areas combined):

-Engineer's Office, 15,750 ft^2
-Construction Warehouse, 8,625 ft^2
-Telephone Exchange, 600 ft^2

-Ration Office, 270 ft^2
-Signal Corps Office, 1,066 ft^2
-Miscellaneous and Signal Corps Warehouse, 7,240 ft^2
-Patrol Office, 1,200 ft^2
-Pipe Shop (2), 2,400 and 7,200 ft^2
-Labor Office, 300 ft^2
-Special Construction Office, 1,350 ft^2
-Special Construction Huts (7), 1,008 ft^2 each
-Plumbing Storage Shed, 1,500 ft^2
-Carpenter Shop and Office, 3,960 ft^2
-Lumber Warehouse, 1,500 ft^2
-Fire Engine House, 1,224 ft^2
-Fire Engine Repair House, 540 ft^2
-Rigger's Loft, 1,250 ft^2
-Storage Building, 42,700 ft^2
-Baggage Office and Storage, 1,440 ft^2
-Sheet Metal Shop, 1,080 ft^2
-Transportation Garage, 1,250 ft^2
-Gas Station and Garage, 2,808 ft^2
-Clock Alleys (2), 150 ft^2 each
-Labor Office and Carpenter Shop, 3,800 ft^2 each
-Labor Office, 1,300 ft^2
-First Aid Station, 1,200 ft^2
-Sheet Metal and Rigger's Hut, 2,835 ft^2
-Electrical Hut, 600 ft^2
-Pipe Office, 1,870 ft^2
-Bus Garage, 16,500 ft^2
-Training and Relations Huts (3), 945 ft^2 each
-Patrolmen's Living Huts (2), 1,876 ft^2 each
-Storage Huts (3), 648, 945, and 6,000 ft^2
-Firemen's Huts (3), two at 1,280 ft^2 each and one at 1,080 ft^2
-Furniture Huts (3), 6,200 ft^2 each
-Furniture Warehouses (2), 17,280 ft^2 each
-Roads
-Walks
-Parking Lots
-Miscellaneous Storage Lots (nearly 5M ft^2 in each area)
-Railroad Lines
-Water Lines
-Transformer Banks
-Fences
-Sewers and Septic Tanks
-Steam Lines
-Telephones
-Other Structures and Facilities.

Special Shops In Hanford For Machining Graphite Bars (TC-101 Structures):

The TC-101 designation refers to two very large buildings located near the Hanford Camp used to machine the graphite that formed the cores of the 305 Test Pile and the three HEW production reactors (105-B, 105-D, and 105-F) (Figure 9-22). Graphite was delivered to HEW by rail, in blocks, and then machined to form the specific, top-secret process channels borings and lattice

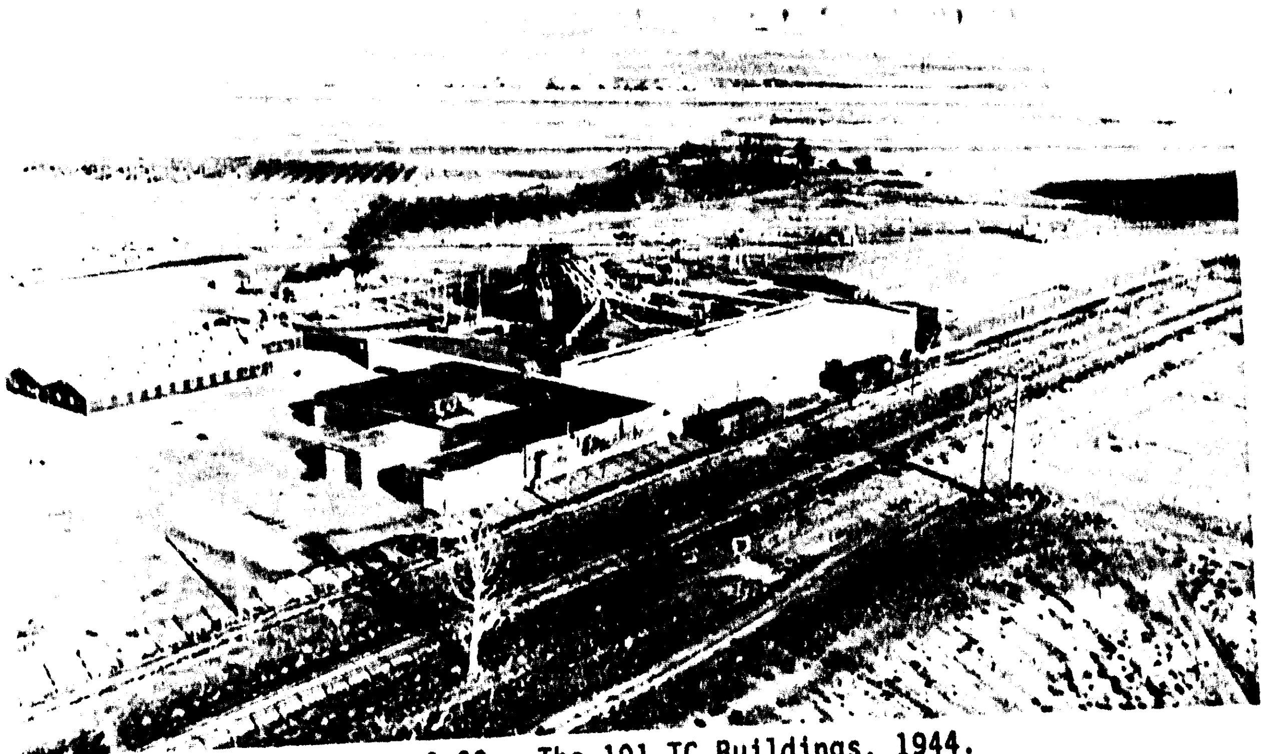

Figure 9-22. The 101-TC Buildings, 1944.

configurations used to hold uranium fuel. The machined graphite blocks then were stacked together to form the reactor cores. No physical descriptions of the TC-101 Structures can be located.

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APPENDIXES

The information in Appendixes A through G is taken from *Construction of Hanford Engineer Works: History of the Project*, Volumes 3 and 4, and *Report on the Hanford Engineer Works Village (Richland, Washington)*. See the Bibliography for complete information on these documents.

In Appendix G the bracketed information in the heading has been added for clarification regarding housing categories. The "??" appearing in the appendixes indicate the text in the original document was illegible.

LIST OF TRADEMARKS

A.C.M. is/was a trademark of the Allis-Chalmers Manufacturing Co.
Allen-Sherman-Hoff is/was a trademark of the Allen-Sherman-Hoff Co.
Allis-Chalmers is/was a trademark of the Allis-Chalmers Manufacturing Co.
Amercoat is/was a trademark of American Paint Corporation.
Anthrafilt is a trademark of Charles G. Zink.
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APPENDIX A

PHYSICAL DESCRIPTION OF 100 AREA FACILITIES

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115 PURIFICATION BUILDINGS

Purification Buildings - one in each of the three 100 Areas are essentially one-story buildings of reinforced concrete identical in size, shape, and design, except for minor details, and are located directly south of the 105 Building in the 100-B and 100-D Areas, and directly west of the 105 Building in the 100-F Area. Each building includes an underground reinforced concrete pipe tunnel connecting with the 105 Building. This tunnel is identical in the D and F Areas, but is longer in the B Area and has two right angle turns. This building contains a Control Room, three Dryer Rooms, two Cooler and Blower Rooms, two Blower Rooms, two Ventilator Rooms, two Purification Rooms, a large Fan Room having an Office and Toilet Room in one corner, a large underground Pipe Room, and 15 outside instrument cubicles.

The building is supported on reinforced concrete piers having spread footings and by reinforced concrete underground pipe room which serves as a support for the center of the structure. Exterior walls of the structure are of reinforced concrete and concrete block. The roof is of reinforced concrete having a tar and gravel surface with the exception of that portion over the large Fan Room where the roof is pre-cast reinforced concrete tile with tar and gravel surface.

The Control Room extends from one end of the building along the central axis to the Fan Room at the other end. Various equipment rooms are located along either side of the Control Room. Under the Control Room is the reinforced concrete pipe room from which the pipe tunnel runs to 105 Building.

Dividing walls and floors of the various equipment rooms are of massive reinforced concrete 1' to 3' in thickness. These equipment rooms are open to the outside through off-set hallways but have no inner connection with each other or with the Control Room. Extending through the walls between the various equipment rooms and the Control Room are sleeve-enclosed control rods for manually controlling the equipment in these rooms. Similar control rods extend through the floor to control the various valves below.

Above the Control Room is a large reinforced concrete ventilation duct which connects with each of the various equipment rooms. Two large 50,000 CFM ventilating supply fans provide heat and ventilation to the building through this duct allowing a complete change of air every two minutes. The exhaust from this system is carried through the pipe tunnel to the 105 Building where it is exhausted out of the 116 Stack.

The outside instrument cubicles have heavy steel sliding doors in front of them. Above the cubicles are trolley beams and hoists to lift these doors. These cubicles contain pressure controls and regulators and special gas analyzer equipment. On the outside of the building is a wooden stairway leading to a water storage tank located on one corner of the roof above the Fan Room.

The overall dimensions of this building are 168' x 98' x 33½', the cross-sectional area is 14,810 Sq.Ft., and the displacement volume is 457,800 Cu.Ft.

The pipe tunnels have the following figures:

	Overall Dimensions	Displacement Volume	Cross-Sectional Area
Pipe Tunnel 115-B	329' x 14' x 11'	50,666 Cu.Ft.	4,606 Sq.Ft.
Pipe Tunnel 115-E	215' x 14' x 11'	33,110 Cu.Ft.	3,010 Sq.Ft.
Pipe Tunnel 115-F	215' x 14' x 11'	33,110 Cu.Ft.	3,010 Sq.Ft.

110 GAS STORAGE TANKS

Gas Storage Tanks - similar in number, size and design, are located in each of the three 100-Areas near the 115 Building. Each Tank Farm consists of two low pressure storage tanks, 33 high pressure storage tanks, unloading platform and car spot. The two low pressure storage tanks are 8' in diameter, 20' in length, supported on concrete foundation piers. Space is provided for a third tank if required. The high pressure storage tanks supported on concrete foundation piers are arranged in two separate groups of 15 and 18 nested tanks respectively. The two groups of tanks are so valved that flexibility of storage, inventorying and handling of gas, and maintenance and repair of tanks can be handled without a shut-down of the entire storage.

A wooden walkway supported on small concrete piers extends along one end of the low pressure and high pressure storage tanks, which are parallel to each other; and a wooden platform with stairways runs above the same end of the two nested groups of low pressure storage tanks. A wooden unloading platform, 6' x 12', supported on small concrete piers is located along the railroad track. Piping runs from these tanks directly to the circulation system and equipment in the 115 Building.

181 RIVER PUMP HOUSE

A River Pump House is provided in each of the three 100-Area. These buildings are similar in design; however, they differ considerably in size, quantity of equipment and in the construction of the river intake channels.

Each building is constructed of reinforced concrete and concrete blocks. Structural steel is used on portions of the exterior of the buildings for the support of equipment and platforms.

The foundations of these buildings are divided by reinforced concrete walls that form the pump wells, which receive water from the river intake channels. There are two pump wells in the 181-B Building and three pump wells each in the 181-D and 181-F Buildings.

Vertical-type pumps located near the bottom of the wells are operated by electric motors and steam turbines located on the operating floor.

There is installed in the entrance flume for each well, a bar steel rack and traveling fish screen.

The operating floor supports the various pump drives, as well as the fish screens and other auxiliary equipment. The equipment is segregated into groups in conformity with the wells below. A tabulation of the pumping capacity of each group follows:

First Section	181-B	181-D	181-F
Electric Driven Pumps	40,000	40,000	40,000
Steam Driven Pumps	7,500	7,500	7,500
Second Section			
Electric Driven Pumps	30,000	40,000	30,000
Steam Driven Pumps	15,000	15,000	15,000
Third Section			
Electric Driven Pumps	--	50,000	40,000
Steam Driven Pumps	--	--	--
Total Installed Pumping Capacity Provided	92,500 CFM	152,500 CFM	132,500 CFM

Space has been provided for the following additional pumping capacity in each section of each building:

First Section	181-B	181-D	181-F
Electric Driven Pumps	--	--	--
Steam Driven Pumps	7,500	7,500	7,500

Second Section	181-B	181-D	181-F
Electric Driven Pumps	10,000	--	10,000
Steam Driven Pumps	--	--	--
Third Section			
Electric Driven Pumps	--	--	10,000
Steam Driven Pumps	--	--	--
Total Provisional Capacity	17,500 CFM	7,500 CFM	27,500 CFM

Outside wooden stairway provide access to the operating floor, office and the roof.

The roof has a tar and gravel covering. It has openings with removable wood covers over the line of pump drives and fish screens. These openings provide for the withdrawal of shafts and screens for maintenance and/or replacement. Installed over the openings above the line of pumps is a wooden frame gantry crane, equipped with two 10-ton hoists, supported on flanged wheels which operate on a track running the entire length of the building. These tracks extend 12 ft. beyond the east end of the 181-B Building and 12 ft. beyond each end of the 181-D and the 181-F Buildings.

Four 10-ton hoists are installed on the roof above the traveling screens in the 181-B Building. Six identical hoists are installed on the roof of each of the 181-D and 181-F Buildings.

There are three overhead barometric condensers for the steam driven pumps supported by structural steel frames, installed above the roof on the river side of each building. The discharge into hot wells located below the operating floor. The water is discharged from the hot wells by 14" welded steel pipe, onto the river bank at a point above the high water level.

Guard towers identical in design to those in all of the areas, have been erected on the roof of the 181-D and 181-F Buildings.

To provide a sufficient quantity of water for each of the river pump houses, channels were constructed, extending from the pump house into the main river channel. Du Pont performed this work for the 181-B and F Buildings. Inasmuch as the channel for the "D" Area was considerably longer and therefore more difficult to construct than Areas B and F, this work was performed by Guy F. Atkinson Company, who had considerable experience in channel excavation work, under subcontract RPG 4337. This company also had adequate equipment and personnel available.

Gravel was placed on the slopes and bottom of the channel adjacent to the pump house in the 181-B Building. For the 181-D Building, the bottom of the channel was rip-rapped in front of the pump house and large boulders and rocks were hand-placed on the slopes. For 181-F Building, the bottom of the channel was rip-rapped and concrete was placed on the slopes.

Each channel was excavated to a depth of approximately 10 ft. below extreme low water level and the bottom of the channel is essentially the same depth as the deepest part of the river channel opposite the pump houses.

The following is a tabulation of the approximate length of width of the three river intake channels:

Building	Width	Length
181-B	70 Ft.	1000 Ft.
181-D	90 Ft.	1560 Ft.
181-F	90 Ft.	210 Ft.

The following are the dimensions of these buildings:

	Dimension	Volume	Area
181-B Overall	130' x 64' x 80'	*412,000 Cu.Ft.	6,100 Sq.Ft.
181-D Overall	170' x 64' x 80'	*572,000 Cu.Ft.	8,350 Sq.Ft.
181-F Overall	170' x 64' x 86'	*606,000 Cu.Ft.	8,350 Sq.Ft.

*From bottom of foundation to top of roof

182 RESERVOIR AND PUMP HOUSE

There is one Reservoir and Pump House in each of the three 100-Areas. These buildings are very similar in design, differing in various details such as the location of pipes, number of pieces of equipment, construction of the water inlet weirs, number of water inlet houses, etc. This building consists of two main structures, a reinforced concrete reservoir, and reinforced concrete and concrete block pump house. These two structures will be discussed separately.

Reservoir: The Reservoir consists of a rectangular, sloped, reinforced concrete basin. The bottom is a poured reinforced concrete slab 6" thick; the sloping sides are of reinforced gunite 4" thick; and the vertical portion of the side walls is of poured reinforced concrete 10" thick. The reservoir is divided into two sections by a 10" reinforced concrete wall (with reinforced gunite sloping sides) running parallel to the short dimension of the structure. The inlet section of the reservoir, known as the reserve section, holds 15 million gallons of water, while the other, or working section, holds 10 million gallons. Top of dividing wall between the two sections is approximately 2-3/4' below the top of side walls and thus acts as a weir between the two sections.

Inlet House No. 1 is located at the northwest corner of the reservoir in 100-B and D Areas and at the northeast corner in the 100-F Area. This Inlet House is a steel-framed, reinforced concrete and concrete block structure, two stories in height. The first story contains the main level control cone valves for the inlet pipes to the reservoir. Water is admitted to the reservoir normally through a 42" steel pipe line from the river pump house. However, a second emergency 30" steel pipe line is also provided. The second floor of the Inlet House contains the chlorinating equipment for chlorinating the incoming water. The two cone valves discharge into two inlet weirs which overflow into the reserve section.

The weirs are approximately 1-1/2 ft. above the normal level of the water and three inches higher than the top of the outside wall of the reservoir which prevents the water from flowing back over the weirs even if the reservoir overflows. Also, if at any time it becomes necessary to perform maintenance work on the valves, piping, or chlorinating equipment, it would not be necessary to drain the reservoir. A one-story reinforced concrete No. 2 Inlet House is located near the northeast corner of the 182-D reservoir and near the northwest corner of the 182-F reservoir. This building houses a 30" float-control cone valve on a 42" concrete line. This line is an emergency supply to the reservoir coming from the river pump which ordinarily supply the refrigeration system in the 189 Building. Space has been provided in the northeast corner of the 182-B reservoir for a No. 2 Inlet House should a 189-B (refrigeration) Building be added to that area at a later date.

Just outside the reservoir near the No. 1 Inlet House is an open, wood frame, canvas-covered structure enclosing six 1-ton chlorinating cylinders which feed the chlorinating equipment. At the northeast corner of the reservoir is a 20,000 GPM overflow weir to handle any overflow.

Pump House: The Pump House runs along the east wall of the reservoir in 182-B and D, and along the north wall in 182-F. The Pump House is an essentially below ground level structure which houses the necessary pumping equipment to transfer the water from the reservoir to other process buildings within the area and also to the 100 and 200 Process Areas. Located next to the reservoir wall are a series of seven reinforced concrete-enclosed suction wells. The water enters each of these wells or compartments through a 4 ft. square, manually-operated sluice gate. Fish screens are provided in front of four of the sluice gates. At the base of the suction wells is a 3 ft. thick reinforced concrete slab which is located approximately 7 ft. below the bottom of the reservoir. The side wall of the wells next to the reservoir tapers in thickness from 2-1/2 ft. at the base to 1 ft. at the top, while the dividing wall between the suction wells and the pump room tapers in thickness from 3 ft. at the base to 1 ft. at the top.

Next to and paralleling the suction wells is the pump room containing the various pieces of pumping equipment. The base of the pump room is 1 ft. thick concrete slab approximately 4 ft. above the base of the suction wells. The pump room is enclosed on one side by the dividing wall between the suction wells and on the other side by a reinforced concrete wall tapering in thickness from 3 ft. at the bottom to 1 ft. at the top. The roof above the pumps is a reinforced concrete slab supporting an electrical switchgear room at one end, and seven overhead barometric condensers at the other end. The pumps in the pump room are located approximately 10 ft. form the suction well wall on a line parallel to this wall. There are four pipe systems which receive their water from the pump room as follows:

(a) The emergency well water steel line to the No. 105 Building.
(b) One 36-inch cast-iron barometric condenser water line.
(c) Two 36-inch (one steel and one cast-iron) lines to the 183 Building.
(d) One 42-inch concrete export line to other areas.

The first of the above systems is supplied by three condensing turbine-driven pumps, the second is supplied by three condensing turbine-driven pumps and one motor-driven pump. The third is supplied by seven motor-driven pumps only (eight motor-driven pump in 182-D). The last of the above systems is supplied by four motor-driven pumps (two motor-driven pumps in 182-F) and one geared condensing steam turbine. Each of the seven suction wells feeding the various pumps is a compartment independent of the other six wells, thus if at any time there is a breakdown, or any piece of equipment needs to be repaired on the suction wells, the well involved can be drained without disturbing the other wells or pumps feeding from these wells. The floor of the pump room slopes slightly toward the suction wells wall, and a drain 3-1/2 ft. wide by 3-1/2 ft. deep is located at the base of this wall which is capable of carrying off 20,000 GPM of water from the Pump Room in an emergency. Above the line of pumps is a monorail hoist. In the roof above each end of the Pump Room is a removable section over which is a steel-framed gantry crane.

The electrical switchgear room above the pumps is an enclosed concrete block structure having a pre-cast cement tile roof. At the north end in B and D, and at the west end in F of the Pump House are the seven barometric condensers supported by structural steel framework. These condensers are located approximately 48 ft. above the slab roof of the Pump Room.

Inlet House No. 3 is located at the southwest corner of the Pump House in B and D, and the southeast corner in F. This Inlet House contains level control cone valve for the 42" reservoir by-pass line from the river pump house. This valve discharges into the nearest suction well rather than into the reservoir.

The following are the dimensions of this building:

	Dimensions	Volume	Area
Reserve Reservoir	432' x 309' x 18'	15,000,000 Gals.	135,488 Sq.Ft.
Working Reservoir	432' x 209' x 18'	10,000,000 Gals.	90,288 Sq.Ft.
Overall Pump House	374' x 49½' x 22½'	*418,750 Cu.Ft.	18,513 Sq.Ft.

*From bottom of foundation to top of roof.

183 FILTER BUILDING

There is one Filter Building in each of the three 100-Areas. These buildings are very similar in design, differing only in the number of sedimentation basins and filters, in the 100-D Area, and in the size and shape of the clear wells in the 100-F Area. This building consists of four structures: the Head House and Chemical Building, the Flocculation and Subsidence Basins, the Filter Building proper, and the Clear Water Reservoir and Pump Room. These four structures will be discussed separately.

Head House and Chemical Building: This building consists of a three-story, steel-framed reinforced concrete and concrete block enclosed structure, including a covered car spot. The car spot is open at both ends and can handle one railroad car at a time. There is a dock for unloading package material directly from the car while bulk shipments can be unloaded by bottom dump cars or by scooping to the side into a bulk conveyor hopper under the track.

The ground floor of the Head House and Chemical Building consists of a series of small, concrete block enclosed rooms as follows: a Chlorine Room, Laboratory, Lavatories, Janitors' Rooms, Electrical Switchgear Room and Locker Room. Underneath the ground floor at the south end in B and D, and the west end in F of the building, is a conveyor which travels from the car dump to an elevator, thence vertically up to a conveyor above the third floor.

The second floor is a chemical room containing eleven Omega Chemical Feeders. The balance of this floor consists of wood pallets for storage of packaged chemicals.

The third floor of this building is principally a storage room and contains eight 625 cu. ft. prefabricated wood storage bins. These bins empty into steel hoppers which extend through the floor down to a point directly above the Omega Feeders. There are three hoppers that have no storage bins above them. Above the hoppers is a belt which operates the length of the building taking chemicals from the elevator and emptying them into the various bins.

Flocculation and Subsidence Bins: This portion of the building consists of a number of open reinforced concrete basins. Paralleling the Head House and Chemical Building, and between it and the Flocculation Chambers, is a reinforced concrete water distribution flume. This flume empties into any one or all twelve 55,000 gallon reinforced concrete Flocculation Chambers. In all of these chambers are double, steel paddle wheel, electrically-operated flocculators or agitators. On the side adjacent to the Head House, and emptying into the distribution flumes, are two double compartment chemical mixing chambers, one on either side of the Chemical Building. Space has been provided for one additional flocculation chamber at each end of the series of chambers.

Next to each Flocculation Chamber is a 500,000 gallon reinforced concrete subsidence basin. Between the Flocculation Chambers and the Subsidence Basins are open, wood baffles. At the opposite end of the Subsidence Basin is a weir over which the water flows into a second distribution flume from which the water flows by gravity through pipes into the Filter Building.

Filter Building: The Filter Building consists of a series of twelve two-section filter beds having a total capacity of 36,000 GPM. In the 183-D Building there are thirteen beds having a total capacity of 39,000 GPM. The filter beds are supported on Wheeler bottoms consisting of pyramidal depressions formed in concrete, with a porcelain thimble outlet at the bottom of each depression, the depressions being filled with porcelain and earthenware spheres. Above these spheres is a 12" layer of gravel, then a 10" layer of sand, and finally a 20" layer of anthrafilt. Above the filter beds is a reinforced concrete frame and concrete block enclosure. Along one side of the row of filter beds is a concrete slab on which are located various metering devices, valves, and controls for the filter beds. Underneath this slab is a pipe gallery and underneath the pipe gallery are two parallel flumes, one for effluent process water and the other for waste water.

Clear Water Reservoir and Pump Room: This portion of the building consists of two 5,000,000 gallon reinforced concrete, completely enclosed, reservoirs between which is a pump room. Due to the drainage conditions in the 100-F Area, the two reservoirs are 5½ ft. shallower, 20 ft. wider, and contain only 4,500,000 gallons each. Each reservoir has a concrete slab roof covered with a tar and gravel surface. The bottom of the suction wells on either side of the Pump Room is approximately 5 ft. lower than the bottom of the reservoir, and thus the water flows by gravity from the reservoir into suction wells. The Pump Room contains nine electric pumps (ten in 183-D), and six steam turbine pumps. Two of these pumps are used for backwashing the filter beds and four pumps are connected to the combined sanitary and fire protection system. The remaining nine pumps, (ten in 1893-D), handle the distribution of filtered water. A monorail and hoist runs in a "U" around the room, above the various pieces of equipment, to the doorway at the end. Overflow trenches of 20,000 GPM run along both walls of the Pump Room below floor level, paralleling the two reservoirs.

Directly above the Pump Room is an electric switchgear room containing the various electric meters and controls for the Pump Room. The Pump Room itself has reinforced concrete side walls, reinforced concrete floor and reinforced concrete slab roof. The electrical switchgear room is reinforced concrete framed and concrete block enclosed with a precast concrete roof covered with tar and gravel.

The following are the dimensions of this building:

	Dimensions	Volume	Area
Head House and Chemical Building (Overall)	133' x 62½' x 52'	213,200 Cu.Ft.	5,230 Sq.Ft.
Flocculation Basins	654' x 30' x 10'	660,000 Gals.	19,620 Sq.Ft.
Subsidence Basins	650' x 100' x 20'	6,000,000 Gals.	65,000 Sq.Ft.
Filter Building (Overall)	648' x 40' x 40'	1,036,800 Cu.Ft.	25,920 Sq.Ft.
Pump Room & Elect. Room	130' x 35' x 34'	117,900 Cu Ft.	4,350 Sq.Ft.
Clear Water Reservoirs - B and D Areas - Two	712' x 130' x 22'	10,000,000 Gals.	92,560 Sq.Ft.
Clear Water Reservoirs - F Area - Two	712' x 150 x 16½'	9,000,000 Gals.	106,800 Sq.Ft.

185 DEAERATION PLANT

There is one Deaeration Plant in each of the three 100-Areas. These buildings are identical in size and very similar in design with the following exceptions: All process water piping is rubber-lined in 185-D, while it is not lined in 185-B or 185-F. Also, no facilities have been provided for an adjacent refrigeration plant in the 185-B as in 185-D and 185-F. The building consists of one main structure with reinforced concrete foundations, structural steel superstructure, concrete block walls, and precast concrete roof slabs, with built-up roofing, and tar and gravel surface above. The structure is entirely above ground level except for a reinforced concrete underground pipe tunnel and reinforced concrete acid trench which run the entire length of the building.

The long axis of the building runs in a north-south direction in the 100-B and D Areas and in an east-west direction in the 100-F Area. One wall of the 185 Building forms part of the adjacent wall of the 190 Building. Ten 4-stage, rubber-lined deaeration units are mounted vertically on steel structures above the building near the 190 Building. The deaeration units extend from a height of 100 ft. to 174 ft. above the building floor elevation. The piping from these units extends down through the roof of the main structure into the adjacent 190 Building. This piping also runs into the 189 Building in the D and F Areas. The towers are approximately 20 ft. square of steel beam construction with numerous platform levels with stairways and connecting runways of steel grating. At the top of each tower above the deaerator, is located a steel monorail beam.

Ten control panel boards are located on the ground floor of the 185 Building proper, 20 ft. from the center line of each deaerator, while a central control room is located along the wall opposite the 190 Building near the center of the structure.

Two acid storage tanks are located 40 ft. south of the south end of the building in 100-B and D Areas, and 40 ft. west of the west end of the building in the 100-F Area and supply acid to the building through two acid feed systems to the water inlets and water outlets of each deaerator. In the 100-B and F Areas, a length of stainless steel pipe is provided in the inlet and outlet lines to each deaerator.

A large instrument room is located at one end of the building. On the reinforced concrete roof of the instrument room are located two sodium silicate storage tanks; a small storage room and lavatory are located along the wall opposite the 190 Building near the other end of the building; and two sodium dichromate storage tanks are located adjacent to the 190 Building in the same end of the structure. A reinforced, poured slab of concrete forms a valve operation and chemical handling platform 14 ft. above floor level at this end of the building. A transfer monorail and hoist is located above this platform for transferring material and equipment in and out of the building. Two overhead rolling steel doors at two levels are located at this end of the building, while one overhead rolling steel door is located at the other end of the building on the ground floor.

The overall dimensions of this building are 306' in length by 48' in width by 182' in height. The displacement volume is 796,800 cubic feet, and the cross-sectional area is 14,688 square feet.

186 DEMINERALIZING PLANT

There is only one Demineralizing Plant and it is located in the 100-D Area between the 183 Building and the 189 - 185 - 190 Buildings group. Space has been provided, however, in the same location in the 100-B and 100-F Areas for the possible future construction of a 186 Building in those Areas.

The 186 Building consists of two major parts - the Demineralizing Plant proper, and the Clearwell Reservoir. There are also a number of various type tanks located outside the building. These will be discussed separately.

Demineralizing Plant: This portion of the 186 Building is a two-story structure having reinforced concrete foundations, reinforced concrete slab floor, steel framing, concrete block superstructure, and built-up roofing over pre-cast concrete tile slabs. The main axis of the building extends in a north-south direction, paralleling the 198 - 185 - 190 Buildings group.

The ground floor of this building consists principally of twelve wooden Deacidite tanks supported on reinforced concrete and wooden foundations. These tanks are located along the east side of the building in two banks of six each. Between the two banks of Deacidite tanks in the center of the building are four wooden acid-reclaiming tanks and two steel soda-reclaiming tanks. At the south end of the building are two steel soda-dissolving tanks.

Along the west wall is an acidproof brick trench approximately 4' deep by 6' wide, and running almost the entire length of the building.

Maintenance platforms of reinforced concrete parallel the Deacidite tanks 12 ft. above floor level. At 23-1/2 ft. above floor level is the Deacidite operating floor of reinforced concrete on which is located an operating table approximately 2-1/2 ft. square, for each Deacidite tank.

The second floor of this building is approximately 35' above the ground floor elevation and is also of reinforced concrete. This floor supports 24 wooden Zeo-Karb tanks along the east wall of the building. Four layers of anthrafilt have been provided in the bottom of both the Deacidite and the Zeo-Karb tanks.

Clearwell Reservoir: Along the east side and parallel to the Demineralizing Plant proper is the Clearwell. This section is mostly below ground level, extending to a depth of 21 ft. The Clearwell consists of a reinforced concrete slab floor, reinforced concrete walls tapering in thickness from 12" at the base to 22" at the top, and a reinforced concrete arched roof with a tar and gravel covering. This structure houses 12 wooden Clearwell tanks which are supported by reinforced concrete and wooden foundations. A catwalk, level with the base of the tanks, extends along the west wall of this area; another catwalk 10 ft. above the first extends along the east wall of the building. The tops of the tanks are approximately level with ground elevation.

Adjacent to and east of the center portion of the Clearwell is a pump house containing seven stainless steel corrosive water pumps. This pump house is located entirely below ground level at the same elevation as the Clearwell floor. Directly above the pump room is electrical room "A", electrical room "B" extends from electrical room "A" over the roof of the Clearwell to the Demineralizing Plant. These two electrical rooms house the necessary electrical switchgear equipment for the operation of the pumps.

Miscellaneous: Approximately 10 ft. west of the Demineralizing Plant at the south end of the building are six, outside, horizontal sulphuric acid steel tanks with an overhead wooden stairway and platform and a safety shower. Approximately 70 ft. and 95 ft. west of the southwest corner of the Demineralizing Plant respectively, are located two acid neutralizing gunite tanks which are approximately 26 ft. in height and extend some 23 ft. below ground level. These tanks have a 3-1/4 ft. square manhole at the top with a wooden ladder extending down to a deck located approximately 11 ft. below ground level. Directly beneath this deck is a smaller sized lead-lined concrete tank, the top of which acts as a weir, discharging into the outer chamber.

Directly to the south of these two acid neutralizing tanks is a hydrolime storage gunite silo 64 ft. high. Approximately 6 ft. south of the Demineralizing Plant are two pre-cast concrete soda-ash storage silos 47 ft. in height.

Approximately 20 ft. west of the Demineralizing Plant is a 92 ft. square, 14 ft. deep, acid-proof brick waste acid reservoir. The waste acid trench on the ground floor of the Demineralizing Plant empties into this reservoir. A railroad spur extending along the south end of the building contains a car spot and unloading platform for acid, as well as two 10 ft. square track hoppers, one for each of the soda-ash storage silos, and a 10 ft. square track hopper for the lime storage silo. Redler conveyors transmit the soda-ash from the hoppers to the silos and also from the silos into the building proper. A similar conveyor carries the lime from the lime track hopper to the storage silo.

General: Practically all of the equipment in this building was designed by, purchased from, and erected under the supervision of the Permutit Company. The system is completely automatic. Due to the corrosive action of the water after demineralizing, many of the valves and a portion of the piping are lined with Buna-S rubber, as is the main line from the 186 Building to the 185 Building. Also any steel, such as the horizontal rods surrounding the wooden tanks and the I beams supporting these tanks which might come in contact with the demineralized water is protected with lead stripping.

In connection with the start-up of this building, it is worth noting that most of the chemicals used in the processes were lowered into the building through the openings provided for the roof ventilators with construction equipment cranes. This operation saved considerable time and expense.

The following are the dimensions of this building:

	Dimensions	Volume	Area
Building Overall	670' x 128' x 87'	2,819,460 Cu.Ft.	69,424 Sq.Ft.

189 REFRIGERATION BUILDING

There are two Refrigeration Buildings - one in the 100-D Area and one in the 100-F Area. These two buildings are similar in design and construction, differing principally in size. The 189-D Building is approximately 50 percent larger than the 189-F Building both in equipment and in the size of building structure.

The building consists of a large refrigeration room, electric control room, Freon tank pit, and two ventilating rooms. The structure is one story in height, having reinforced concrete foundations, steel framing, concrete block superstructure, and a pre-cast concrete slab roof covered by a built-up roof of tar and gravel. The long axis of the building parallels that of the 185 Building, and in addition, there is a common wall between the 189 and the 185 Buildings.

The refrigeration room extends the entire length of the building. In the 189-D Building it houses six York Refrigeration Machines, having a total capacity of 14,000 tons of refrigeration, and in the 189-F Building, it houses four York Refrigeration Machines having a total capacity of 10,000 tons. Although the individual units in each building are identical, the difference in the refrigeration capacity is due to the fact that the temperature range in the 189-D Building is 22½°F, while in the 189-F Building, it is 16.3°F, both for 15,000 GPM of water. Along one side of the refrigeration room, adjacent to the common wall between the 189 and 185 Building, are two concrete pipe trenches covered with steel grating at floor level. One trench houses the 42" raw water inlet pipe. The other trench carries the effluent waste water. The process water flows from the 185 Building into the refrigeration room of the 189 Building where it is chilled and pumped into either or both of the two center storage tanks in the 190 Building.

In the center of the refrigeration room is a reinforced concrete Freon storage tank pit extending some 13 ft. below floor level. This pit contains two horizontal Freon storage tanks with space and foundations provided for a third tank if necessary. Adjacent to this pit at floor level are six chilled water pumps which maintain the proper water pressure throughout the system.

Along the wall opposite the 185 Building are two ventilating rooms which house the evaporator cooling units. In the 189-D Building each ventilating room houses three evaporator cooling units, whereas the 189-F Building ventilating room houses two evaporator cooling units, with additional foundation space provided for a third unit in each room, if necessary.

Along this same wall and adjacent to the south ventilating room in the 189-D Building and the east ventilating room in the 189-F Building, is the electric control room which houses the electric switchgear and the motor generator sets used in the operation of this building. A one-ton monorail hoist is located in this room above the equipment.

Above the refrigeration equipment in the refrigeration room is a 25-ton electric-operated crane running the entire length of the building. One large overhead steel door is located at each end of the crane track. There are also several wooden doors at ground level providing access from the outside. Horizontal wooden louvres are located near the roof in the two ventilating rooms.

The following are the dimensions of this building:

	Dimensions	Volume	Area
189-D Building (Overall)	307' x 76' x 53'	723,960 Cu.Ft	20,181 Sq.Ft
189-F Building (Overall)	229' x 76' x 53'	552,360 Cu.Ft	15,891 Sq.Ft

190 PROCESS PUMP HOUSE

There is one Process Pump House in each of the three 100-Areas. These buildings are identical in design, size, and installed equipment, except that in the 190-D Building, the four Process Water Storage Tanks are lined with Buna-S rubber and most of the process piping is either stainless steel or rubber lined while there is little stainless steel or lined piping in the 190-B and 190-F Building. The building consists of a large Tank Room, housing four process Water Storage Tanks, a Process Pump Room, Control Room, Office, Ventilating Equipment Rooms, Electric Switchgear Rooms, Battery Room, Air Lock Chambers, Basement Conduit Room, two Pipe Tunnels, Re-use Pump Room, Re-use Water Reservoir, Lunch Room, Locker Room, and Lavatories.

The structure is a one-story reinforced concrete foundation, steel frame, concrete block superstructure windowless building with concrete pre-cast roof, covered with a built-up roofing of felt, tar and gravel. In the 100-B and 100-D Areas, the long axis of the building runs in a north-south direction, while in the 100-F Area, the long axis runs in an east-west direction. One wall of the 190 Building forms one wall of the 185 Building which is adjacent to and parallel to it.

The main section of the building houses four large steel Process Water Storage Tanks. Water flows by gravity from Deaerators in the adjacent 185 Building to all four tanks in the 190-B Building, while chilled water is pumped into the two center tanks from the 189 Building in the 100-D and 100-F Areas. The tank contains a steel pontoon floating roof which is sealed against air infiltration and leakage by a continuous neoprene impregnated curtain with one side attached to the shell of the tank and the other to the pontoon. A water inlet control valve worked by an automatic mechanism holds the level of the pontoon within small limits. A 36" overflow standpipe with the top end covered by a stainless steel valve weighted with concrete is also provided and can handle an overflow of 33,000 gallons per minute. A bleeder vent is provided in the top of the pontoon and 4-1/2 ft. high supporting legs are located in the floor of the tank for supporting the pontoon roof when the tank is drained for repairs. A 12" rubber-lined valve is located in the bottom of the tank and is piped to waste to enable batch dumping if the process water fails to meet required specifications. An Allis-Chalmers close-coupled pump is mounted on the pontoon roof to maintain the correct water level in the curtain seal.

Steel grating platforms, runways and stairways afford access to the top of the storage tanks. A walkway hinged at the upper end and with two wheels at its base extends downward onto two tracks on top of the pontoon roof in each tank. An open below-floor level, 6 ft. wide by 5 ft. deep, reinforced concrete overflow channel, carrying a 36" steel pipe from the base of the four tanks and from the 12 Process Water Pumps in the adjoining room in the overflow sewer. This trench is covered with steel grating at floor level. Five electric-motored and two steam-driven air compressors are located in this room and supply compressed air to equipment and instruments located in both the 185 and 190 Buildings.

Paralleling the Tank Room is a smaller room running the entire length of the building and housing 12 electrically-driven Process Water Pumps in series with 12 steam-driven Process Water Pumps. In case of power failure, 12 large flywheels on the motor-driven pumps maintain adequate water pressure until the turbine-driven pumps can come up to speed. Between and above the Tank and Pump Rooms are the 12 Barometric Condensers and hot wells.

The Control Room is located along the east wall in B and D, and along the south wall in F, within the Pump Room at the center of the building. At the northeast corner in B and D, and the southeast corner in F, of the building, leading out from the Pump Room, is a group of rooms consisting of Lunch Room, Shower Room, Locker Room and Lavatory. Outside of the Pump Room are six Ventilating Equipment Rooms, four Electric Switchgear Rooms, one Battery Room and Office. The office connects with the Control Room. Outside wooden louvres with metal screening are located in the wall of each Ventilating Equipment Room. A Shaw Box Crane runs on rails the entire length of the building above the process pumps.

Re-use Water Reservoir of reinforced concrete is located at the southeast corner in B and D, and the southwest corner in F, of the building approximately 12 ft. below ground level. Three Re-use Water Pumps are located below the Main Pump Room floor within the building adjacent to the reservoir. Waste water from the steam jet condensers is collected in this reservoir and is pumped back to the main reservoir (Building 182) during the winter months to maintain the temperature of the process water at slightly above 35°F. A reinforced concrete room housing the Process Water Piping is located beneath the Main Pump Room floor. This room extends practically the entire length of the building. Two completely enclosed reinforced concrete pipe tunnels run from this room in an easterly direction in B and D, and in a southerly direction in F, to the 105 Building, some 300 ft. away. These pipe tunnels house the process Water Pipes.

The Main Pump Room is provided with filtered air under pressure slightly above atmospheric to keep dust out of the machinery. Nine air-lock chambers provide access from this room to both the outside and to the adjacent Process Water Tank Room.

The following are the dimensions of this building:

	Dimensions	Volume	Area
Process Pump House - (Overall)	456' x 184' x 67'	4,473,760 Cu.Ft.	100,610 Sq.Ft.
Pipe Tunnels (2)	305' x 12' x 10'	73,200 Cu.Ft.	7,320 Sq.Ft.
Re-use Water Reservoir	47' x 34' x 15'	23,970 Cu.Ft.	1,600 Sq.Ft.

107 RETENTION BASINS

Retention Basins - one in each of the three 100-Areas, are identical in size, shape and design, and are located near the Columbia River in the north portion of B and D Areas and east portion of F Area. The long axes of the 107-B and 107-D Basins run in an east-west direction with the discharge end of 107-B Basin on the east, and the discharge end of 107-D Basin on the west. The long axis of the 107-F Basin runs in a north-south direction with the discharge end of the basin on the north. Each structure consists of a large rectangular basin with intake chamber and shelter at one end and pump house and water-sampling laboratory at the other.

The Retention Basin has reinforced concrete retaining walls which slope in thickness from 1 ft. at the top to 5 ft. to 8 ft. at the base. Above certain portions of this retaining wall, where the terrain of the ground requires it, is a vertical concrete block wall with 3" concrete top slab. The interior sides of the basin are 4" reinforced gunite on a 2 to 1 slope and the floor of the basin is a reinforced concrete slab 6" in thickness. At the intake end of the basin is a waste water pipe from the 105 Building, 48" in diameter in the B Area, 60" diameter in the D Area, and 42" diameter in the F Area, which discharges into a 12 ft. long by 8 ft. wide by 20 ft. high reinforced concrete intake chamber lined with 2" thick spruce planking. Opposite the intake pipe is a reinforced concrete weir approximately 15-1/2 ft. above the bottom of the chamber which discharges into a reinforced concrete overflow flume running along the center line of the basin to the discharge end, and dividing the basin into two equal parts. One 4 ft. square sluice gate is located near the bottom on either side of the intake chamber and opens into the Retention Basin. A vertical concrete block wall with open holes throughout parallels the intake wall of the basin at a distance of 12-1/2 ft. Four vertical spruce baffle fences made of 2" x 12" boards are located in each of the two sides of the Retention Basin also paralleling the intake wall and 96 ft. apart.

The operating levers and controls of the two sluice gates, located above the intake chamber, are protected by a wooden frame shelter. The sluice gate controls are operated at ground level outside the basin.

At the discharge end of the basin is the discharge pipe and a one-story Pump House which houses the Retention Basin pumping equipment. This structure has a reinforced concrete slab floor, drop-siding walls over 1" sheathing, and a smooth surface, sloping roof of built-up asphalt felt. Adjacent to this structure, but approximately 10 ft. above it, is the discharge water-sampling laboratory which contains three water-sampling pumps, laboratory testing table and small diameter water-sampling piping. This one-story building has a wooden floor, walls of drop-siding over 1" sheathing and smooth surface sloping roof of built-up asphalt felt. A wooden stairway provides access to this building.

The overall dimensions of this building are 496' x 240' x 20', the cross-sectional area is 115,100 square feet, and the displacement volume is 1,153,500 cubic feet. Each side of the basin is capable of holding 6,000,000 gallons of process waste water.

187 ELEVATED PROCESS WATER STORAGE TANK

There are six Elevated Process Water Storage Tanks in the three 100-Areas. The two tanks in each Area are located near and on opposite sides of the 105 Building. These tanks are identical in size, capacity, and design, and consist of an elevated tank supported by six columns, a standpipe, and a valve pit.

This structure consists of an ellipsoidal 1/2" to 3/8" steel plate tank elevated 120 ft. above ground level. The tank is supported by six 14" wide flange steel columns anchored to large reinforced concrete foundations. These columns are cross-braced at five different elevations with 9" steel channels. Two channels welded together at right angles to their axis form the cross-bracing; 1-1/2" steel rods form the diagonal bracing for these columns.

A reinforced concrete valve pit with 3-1/2 ft. thick floor slab, 1 ft. to 1-1/2 ft. thick side walls and 2-1/2 ft. thick roof, is located below ground directly underneath the elevated tank. A 5 ft. diameter standpipe or riser of 1/4" thick steel plate runs vertically from the roof of the valve pit to the base of the storage tank. This standpipe contains two 12" process water pipes, the inlet pipe extending to the bottom of the elevated tank above, the outlet pipe rising to a height of 5 ft., a 6" steam pipe which is required to prevent freezing during cold weather, and a 4" steel pipe running to the float valve mechanism. A small manhole, approximately 3 ft. above the valve pit roof, affords access into the standpipe and a 14" steel ladder with steel safety cage runs from the base of one of the steel columns to a 24" wide balcony with 3-1/2 ft. steel railing which runs around the elevated tank 130 ft. above ground level. A 21" wide revolving steel ladder curved to fit the shape of the tank, with 3 ft. high hand rails, affords access from the floor of the balcony to the top of the storage tank at an elevation approximately 160 ft. above ground level. A vertical steel indicator board, with movable target connected to a stainless steel float within, is fastened outside the tank and balcony to indict the water level within the tank.

The ellipsoidal elevated tank is 41 ft. in diameter, 39 ft. in height, and has a capacity of 300,000 gallons.

184 POWER HOUSE

There is one Power House in each of the three 100-Areas. These buildings are identical in design, size and equipment. The building is called the Power House, but is primarily a Boiler House, containing only a small turbine generator for emergencies, capable of supplying building lights and motors that must be maintained in continuous service. The building consists of the following structures: Main Power House, two 300' reinforced concrete smoke stacks, coal handling conveyor system, including crusher house, two transfer houses and track hoppers, an open coal storage pit, salt dissolving pit and brine pump house.

The main Power House consists of a three-story, steel frame, windowless building with reinforced concrete foundation, concrete block superstructure and concrete pre-cast roof, covered with built-up roofing consisting of felt, tar and gravel. The building is entirely above ground-level, with the exception of sluice trenches and piping.

The ground floor of the Power House contains four steel ash pits divided into five wind box sections each. Sluice trenches running beneath these pits carry the ashes from the building through an 8" ashcolite pipe to the ash disposal basin (Building 188). A turbo-generator is located in the southwest corner in B and D, and in the northwest corner in F, while three water softeners, a stage of small chemical pumps and four boiler feed pumps are located along the south wall of the ground floor in B and D, and along the west wall of the ground floor in F. Two air compressors are located in one corner of the buildings. Ash and sluice water pumps are located along the north wall in B and D, and along the east wall in F.

The operating floor, 14 ft. above the ground floor, is a reinforced concrete slab surrounding four steam boilers. Each boiler is fired by a spreader-type stoker with dumping grates. The 23-1/2 ft. wide by 16 ft. deep grate is divided into five sections, each having its own fuel distributor or feeder. Although the boiler is designed for natural draft, to improve reliability a forced draft fan aids combustion on the fire bed. The operating controls and gauges of the boilers are located on panel boards along the wall of the building facing the firing doors of the boilers. Above the operating floor are the intermediate and top platforms consisting of structural steel supports and steel grating stairways and walkways which afford access to the upper regions of the boilers and the stoking equipment.

At the west end in B and D, and the north end in F, on the ground floor are a locker room, shower room, lavatory, electrical switchgear cabinets and an open area. On the operating floor above are offices, lavatory, conference room, and battery room. A small laboratory is located on the ground floor in the northwest corner in B and D, and the northeast corner of F. The building has numerous roof ventilators enclosing motor-driven fans. Adjustable wooden louvres run along the side walls and three steel rolling overhead doors are located at each end of the building.

The four boilers are connected to two reinforced concrete-lined stacks by means of four outside steel breechings, two breechings running to each stack. The stacks are 300 ft. tall and are 23 ft. at the base, tapering to 12 ft. at the top. They are located approximately 20 ft. from the Power House proper. In the base of each stack is an ash disposal system which connects with the main system under the Power House.

Within the building, approximately 67 ft. above the ground floor level, is the conveyor platform which consists of a reinforced concrete floor with steel gratings supported by structural steel beams. In this section of the building is a Link Belt Conveyor which discharges by means of a belt tripper running the entire length of the building on steel rails, to four steel bunkers of 260 ton capacity. A 15-ton per hour coal belt conveyor is installed above the stoker hoppers under the bunkers so that coal can be transferred from any bunker to any stoker.

A Link Belt Conveyor system consisting of two underground track hoppers, a crusher house, two transfer houses and connecting housing elevates the coal from beneath the tracks to the coal pit and to the 67 ft. high platform above the coal bunkers some 800 ft. distant. The track hoppers are constructed of reinforced concrete and are large enough to accommodate side dumping cars. The transfer houses and belt housing are constructed of steel framing with corrugated transite walls and roof and wooden plank flooring. They are supported by structural steel piers embedded in concrete foundations.

The crusher house is a three-story reinforced concrete base, structural steel frame, corrugated transite walls and roof building with one story below ground level. This building houses two double-roll crushers with receiving hoppers and sizers on the top floor, the crushers on the ground floor and conveyor belt mechanism beneath. A small coal testing laboratory is located on one end of the crusher house.

The coal storage area located by the crusher house is roughly rectangular in shape with its base 6 ft. below grade. The area is enclosed by an earthen dike and reinforced concrete wall to a height of 9 ft. above ground level. A reclaiming coal hopper is located beneath the pit adjacent to the crusher house and coal is carried back into the conveyor system by an apron conveyor which runs into the crusher house.

Approximately 300 ft. north in B and D, and east in F, of the Power House is a reinforced concrete Salt Dissolving Pit located beside the railroad track. The pit is divided into two sections each, holding 26 tons of crushed rock salt. A reinforced concrete, brine pump house is located beside the pit and houses the brine pumping equipment.

The following are the dimensions of this building:

	Dimensions	Volume	Area
Power House (Overall)	212' x 78' x 80'	862,700 Cu.Ft.	15,966 Sq.Ft.
Stacks (2)	23' Diam. x 300'	144,200 Cu.Ft.	832 Sq.Ft.
Coal Conveyor System	800' long	136,200 Cu.Ft.	8,800 Sq.Ft.
Coal Storage Pit	500' x 260' x 15'	1,950,000 Cu.Ft.	130,000 Sq.Ft.

ASH DISPOSAL BASINS

188 B, D, & F and 288 E & W

Open rectangular-shaped pits and dyke-type basins were dug or constructed in the 100 and 200 Power Areas for the disposal of ashes from the 184 and 284 Power House Buildings. Each Power House is equipped with an Allen-Sherman-Hoff Ash Disposal System which eliminates the removal of ashes manually. By this system ashes are pumped directly form the sluice pit in the Power House to the Ash Disposal Basin by means of an 8" cast-iron underground pipe line.

Basins 188 B & D lie to the north of Building 184 B and D; Basin 188-F lies south of Building 184-F; Basin 288-E lies east of Building 284-E and Basin 288-W lies southeast of Building 284-W. Basins 188-F and 288-W were formerly construction barrow pits which were later converted for ash disposal purposes eliminating additional excavation.

Size and depth of basins vary in each area but all have inside slopes of 3 on 1 outside dyke slopes of 1¼ on 1 with a 4' wide top section. Each basin is provided with a 12" overflow pipe so set as to allow a 1' free-board and connects to the area process sewer system.

	Dimensions	Volume	Area
188-E	320' x 340' x 11'-6"	1,018,700 Cu.Ft.	108,800 Sq.Ft.
188-D	260' x 290' x 13'-6"	1,003,100 Cu.Ft.	75,400 Sq.Ft.
188-F	Irregular Shaped		
288-E	335' x 335' x 7'-6"	841,875 Cu.Ft.	112,225 Sq.Ft.
288-W	Irregular Shaped		

103 FRESH METAL STORAGE

Fresh Metal Storage Buildings - one in each of the three 100-Areas, are one-story buildings identical in size, shape, and design, and are located just north of the 105 Buildings in the B and D Areas, and just east of the 105 Building in the F Area. This rectangular-shaped building consists of one storage room and a loading platform.

The building contains a 5" reinforced concrete slab floor, 4 ft. above ground level, which is supported on reinforced concrete walls and spread footings. The walls of the building are of concrete block to a height of 7-1/2 ft. above floor level and reinforced concrete to the roof which is a reinforced concrete beam and slab roof with a tar and gravel surface. This roof has a cantilever overhang of 5 ft. at one end of the building above a reinforced concrete, floor level, platform with concrete approach stairs and wooden bumper. A concrete loading runway is provided below the platform at ground level. Two metal-covered doors provide access to the platform from within the building, while at the other end, one metal-covered door opens out onto a small wooden platform with a ramp. There are no windows of any type in the structure, but two small louvres are provided at each end of the building.

The overall dimensions of this building are 58' x 27' x 17', the cross-sectional area is 1,566 square feet, and the displacement volume is 26,622 cubic feet.

108 CHEMICAL PUMP HOUSE

Chemical Pump Houses - one in each of the three 100-Areas, are three-story buildings identical in size, shape and design, and are located east of the 105 Buildings in the B and D Areas, and north of the 105 Building in the F Area. Inasmuch as the 108-F Building is laid out 90° counter-clockwise from the 108-B and D buildings in relation to the other buildings in the areas, all three 108 Buildings lie in a north-south direction. This building contains a chemical storage area on the third floor, chemical mixing and pumping equipment on the second and ground floors, a loading platform and covered car spot for unloading bulk shipments, and two car spots for unloading sulphuric acid and sodium silicate.

This building consists of a reinforced concrete and structural steel framework with reinforced concrete slab floors and reinforced concrete foundations and footings. The walls and room partitions are of concrete blocks. The roof consists of precast concrete roof tile, with tar and gravel surface. Numerous large roof ventilators and ventilating ducts are located in the roof. The ground floor contains a large fan room at one end, a conference room near the center of the building and an office, a toilet, and locker room with shower at the other end. The fan room houses an 18,000 c.f.m. Buffalo Forge fan that provides heating for the entire building. Numerous chemical tanks and pumps are also located on this floor. The second floor contains chemical mixing tanks, feeders and hoppers, with a chemical control room near the center of the building. The third floor is given over to floor, tank and bin storage space for chemicals.

Beneath the covered car spot is a track and car hopper capable of handling bottom and side dumping cars. From this car spot, a "Redler" conveyor system handles bulk chemicals to all floors of the building. A vertical bag and barrel elevator is located near the car spot within the building for handling unit shipments.

Two additional car spots are located alongside the building, one for unloading and pumping sulphuric acid to two elevated, horizontal storage tanks and the other for unloading and pumping sodium silicate to two large vertical storage tanks.

This building contains the following overall dimensions, cross-sectional areas and displacement volumes:

	Dimensions	Area	Volume
Building	150½' x 32' x 58'	4,816 Sq.Ft.	232,400 Cu.Ft.
Loading Platform and Car Spot	37' x 31½' x 30'	1,166 Sq.Ft.	34,980 Cu.Ft.

111 TEST BUILDING

The 111 Building is located in the 100-B Area Adjacent to the southeast corner of the 115 Building. This building is a wooden frame structure laid out in the shape of a lower case "h". The legs and cross-bar of the "h" have concrete wall foundation and concrete flooring. The walls consist of drop-siding, building paper and 1" sheathing with no interior lining. The roof is 2" T & G sheathing covered with tar and gravel. Beneath the roof is a 1" layer of blanket insulation. The upper portion of the "h" has a cinder floor; otherwise the building is the same as just described.

Extending across the two legs of the "h" are three steel tanks approximately 26' long by 5' in diameter. Located above one end of these tanks, inside the building, is a 1½ ton monorail hoist.

The extreme dimensions of this building are 80' long by 61' wide by 14½' in height. It has a cross-sectional area of 2,081 square feet, and a displacement volume of 30,175 cubic feet.

GATE HOUSES

1701-B, 1701-D, 1701-F, 2701-E, 2701-W, and 3701

Gate Houses - one in each of the three 100-Areas, one in the 200-E Area, one in the 200-W Area, and one in the 300 Area, are two-story buildings identical in size, shape, and design, and are located along the outer fence line at the main entrance gate. Each building consists of a Guard Room, Equipment Room, and Clock Alley on the first floor; and a Laboratory, two Storage Rooms, Office, Lavatory, and hallway on the second floor.

The building has a 4" reinforced concrete slab floor resting on concrete foundations. The exterior walls are of 1" sheathing covered with building paper and drop siding. The flat roof consists of built-up roofing with tar and gravel surface over 1" insulation and T & G sheathing. The first floor interior walls are not lined, but the second floor walls and partitions are lined both sides with hard board. The building is sealed with gypsum board and insulation board. Access to the second story is provided by an outside wooden stairway and platform resting on a concrete base.

The building has a six ground level access doors, two located at either end, one door entering the small Guard Room, located between the two front Clock Alley doors, and a sixth door entering the Equipment Room. The Equipment Room attached to one side of the building has a shed roof and houses a small air compressor and receiver to furnish compressed air to the Laboratory, and for the operation of instruments, and a Carrier Air Conditioning unit to provide air conditioning to the second floor. Double windows are provided on the second floor for better insulation. The larger storeroom, which has no outside windows, is being used as a dark room in the 300 Area.

The overall dimensions of this building are 41' x 23' x 23', the cross-sectional area is 654 square feet, and the displacement volume is 15,300 cubic feet.

SUPERVISORS' OFFICE AND LABORATORY

1704-B, 1704-D, and 1704-F

Supervisors' Office and Laboratory Buildings, one in each of the three 100-Areas, are one-story buildings identical in size, shape and design and are located along the main Gate House Road within the Service Building group. The building is T-shaped with the top of the "T" next to the road and the long leg running perpendicular to the roadway. Each building includes 28 offices, a special concrete-enclosed laboratory, regular laboratory, locker room, air conditioning equipment, lavatories and hallways.

The foundations are concrete blocks and concrete piers. The outside walls are of drop siding and the roof is built-up asphalt felt. The floors are of wooden construction, with linoleum floor covering added in the laboratories and lavatories. The wall linings are a combination of presdwood, celotex and gypsum board.

In the front right corner of the building is a laboratory with vestibule opening to the outside. This laboratory and vestibule is a reinforced concrete cell with 2' thick walls and ceiling, and 6" concrete floor slab 9" above finished grade. The laboratory walls and ceilings are lined with 1" thick Fibracoustic, while the floor is covered with linoleum. There is no inside connection between this laboratory and the rest of the building. To the left of the concrete-enclosed laboratory is a room housing the air conditioning equipment which serves the two laboratories. Across the hall from the air conditioning equipment is the second laboratory with 2" blanket-type insulation on walls and ceiling. On the left of the main entrance is the locker room, lavatories, janitor's closet, and women's rest room. The rest of the building consists of twenty-eight normal size offices located on either side of the central hallways.

The overall dimensions of this building are 147½' x 116' x 26', the displacement volume is 215,000 cubic feet, and the cross-sectional area is 8,120 square feet.

CHANGE HOUSE

1707-B, 1707-BA, 1707-D, 1707-DA, 1707-F and 1707-FA

Change Houses - two in each of the three 100-Areas, are one-story buildings identical in size, shape and design and are located along the main gate house road within the Service Building group. This building includes a Locker Room, Lunch Room, Wash Room, Shower Room, Hot Water Heater Room, Toilet, and three vestibules.

The foundations are concrete blocks and concrete piers. The floor is a 4" reinforced concrete slab. The outside walls are drop siding and the flat roof is a wooden deck, built-up roof with tar and gravel surface. Several wooden roof ventilators extend 3 feet above the roof.

The walls and partitions are a combination of Presdwood, gypsum board and asbestos board. No ceilings are provided. A small vestibule at either end of the structure enters into the lunch room at one end and the locker room at the other. A third vestibule in the center of the building affords access from the gate house road to the wash room.

The overall dimensions of this building are 66½' x 30' x 16', the cross-sectional area is 1,995 sq. ft. and the displacement volume is 31,920 cu. ft.

FIRE HEADQUARTERS

1709-B, 1709-D, 1709-F, 2709-E, 2709-W, 3709

Fire Headquarters - one in each of the three 100-Areas, one in the 200-E Area, and one in the 200-W Area, are buildings identical in size, shape, and design and are located along the main gate house road near the main entrance to each area. Each building consists of a permanently constructed Truck Storage Building and an addition of temporary construction design to furnish living quarters for the firemen. In the 300 Area is a correspondingly located Fire Headquarters which consists of only the Truck Storage Building. The two sections of the building will be discussed separately.

Truck Storage: The truck storage section contains garage space for three fire trucks, a fire extinguisher filling room, a hose room, and a 30 ft hose tower. The 4" reinforced concrete slab floor with 6" curbing is supported on concrete foundations. The exterior walls are drop siding. The roof over the main portion of the building is a flat wooden deck built-up roof with tar and gravel surface, while the gable roof of the hose tower is covered with 1" sheathing and roll roofing. The tower is framed with 3" x 4" studs and bracing, two wooden louvres near the top provide ventilation. No lining or ceiling is provided except in the hose storage room at the rear of the building which is lined one side with asbestos board. Three overhead wooden doors provide access to the garage.

Living Quarters: This addition is identical in all areas, and includes a connecting hallway, class room, two offices, firemen's dormitory, squad room, locker room, kitchen, and toilet. The structure is of typical temporary construction design and was taken over by Operations as a permanent building after it was determined that firemen could be housed within a Process Area during operation.

The wooden flooring is supported by a 6" x 6" wooden posts on 10' centers. The exterior walls are composed of 3/8" gypsum board while the interior walls are of celotex. The ceilings consist of sheet rock boarding and the gable roof is of T & G sheathing covered with roll roofing. A narrow connecting hallway connects the truck storage room with the class room which is located in the front left corner of the addition.

The following are the dimensions, volume, and area of this building:

	Overall Dimensions	Displacement Volume	Cross-Sectional Area
Truck Storage	47' x 38½' x 34'	28,300 Cu.Ft.	1,810 Sq.Ft.
Living Quarters	70' x 25' x 15½'	23,600 Cu.Ft.	1,750 Sq.Ft.

STOREROOMS

1713-B, 1713-D, 1713-F, 2713-E, 2713-W

Storerooms - one in each of the three 100 Areas, one in the 200-E Area and one in the 200-W Area, are one-story buildings identical in size, shape, and design, and are located approximately in the center of each area within the Service Building group. Each rectangular building contains a large storage space, and in one corner of the building, an office, a janitor's supply room, and two toilets.

The 4" reinforced concrete slab floor is supported on concrete blocks and concrete piers. The walls are 1" sheathing covered with drop-siding and the flat wooden deck built-up roof has a tar and gravel surface. The rooms are lined with one side Presdwood and the janitor's closet also has a Presdwood ceiling. The remainder of the structure consists of unfinished walls and ceiling. A gasoline pump is located 10 feet from the building and 25 feet beyond the gasoline pump is an underground 1,000 gallon gasoline storage tank.

The overall dimensions of the building are 77' x 54' x 16½', the displacement volume is 68,600 cubic feet, and the cross-sectional area is 4,158 square feet.

OIL AND PAINT STORAGE BUILDING

1715-B, 1715-D, 1715-F, 2715-E, 2715-W

Oil and Paint Storage Buildings - one in each of the three 100-Areas, one in the 200-E Area and one in the 200-W Area, are one-story buildings identical in size, shape, and design, and are located in the central part of each area within the Service Building group. Each small one-story rectangular building includes two rooms - one for paint storage and one for oil storage.

The 4" reinforced concrete slab floor is supported on an 8" concrete block foundation wall. The walls are of 1" sheathing covered with drop-siding and the flat wooden deck built-up roof has a tar and gravel surface. A concrete block wall divides the building into two almost equal rooms which are not interconnected. A metal duct runs from 6" above the floor in each room to two roof ventilators.

The overall dimensions of the building are 42' x 14' x 18', the displacement volume is 10,584 cubic feet, and the cross-sectional area is 588 square feet.

AUTOMOTIVE REPAIR SHOP

1716-B, 1716-D, 1716-F

Automotive Repair Shops - one in each of the three 100-Areas are one-story buildings identical in size, shape and design in the B and D Areas, but include an addition in the F Area, and are located in the central portion of the area within the Service Building group. The "L" shaped building in the B and D Areas contains one large rectangular room and a small adjoining room. In the F Area, a small office with shed roof is attached to the opposite side of the building, making it "T" shaped. The foundations are concrete block and concrete piers. The cinder floor in the B and D Areas is at ground level with a concrete curbing extending 8" above grade. In the F Area, the floor is a 4" reinforced concrete slab. The exterior walls are of drop-siding over 7/8" sheathing and the roof supported on wooden posts is a flat wooden deck built-up roof with tar and gravel surface. Two 12' x 12', and one 8' x 8' wooden overhead doors are located along the front of the building.

The following are the dimensions, areas and volumes of these buildings:

	Overall Dimensions	Displacement Volume	Cross-Sectional Area
1716-B and 1716-D	53½' x 40' x 18'	30,400 Cu.Ft.	1,762 Sq.Ft.
1716-F	53½' x 48' x 18'	31,440 Cu.Ft.	1,842 Sq.Ft.

COMBINED SHOPS

1717-B, 1717-D, 1717-F

Combined Shops - one in each of the three 100 Areas, are one-story buildings identical in size, shape, and design, and are located along the Main Gate House Road within the Service Building group with the long axis of the building running parallel to the roadway. The building contains a large machine shop, carpenter shop, pipe shop, sheetmetal shop, electric shop, forge shop, tool room, six offices, and a toilet. Building 1717-B, however, houses considerably more installed major equipment than the other two buildings.

The 4" reinforced concrete slab floor is supported by concrete block walls and concrete piers. Exterior walls are 1" sheathing covered with drop-siding and the flat wooden deck built-up roof supported by wooden columns has a tar and gravel surface. The interior is neither lined nor sealed; partitions are lined one side with presdwood or asbestos board.

A large machine shop, a pipe shop, and a forge shop take up one end of the building while the carpenter shop, electric shop and sheetmetal shop occupy the other end to the building. Offices and a tool room are located in the central part of the structure. Horizontal sliding wooden doors afford access to the various shops. A two-ton monorail crane and hoist runs the entire length of the building between the shops, while a second monorail perpendicular to the first extends above the electric shop equipment. Several 30" diameter ventilators are located in the roof.

The overall dimensions of this building are 150' x 80' x 25', the cross-sectional area is 12,000 sq. ft., and the displacement volume is 288,000 cu. ft.

FIRST AID BUILDINGS

1719-B, 1719-D, 1719-F, 2719-E, 2719-W & 3719

First Aid Buildings - one in each of the three 100-Areas, one in the 200-E Area, one in the 200-W Area, and one in the 300 Area are one-story buildings identical in size, shape and design, and are located near the center of each process area within the Service Building group. Each rectangular building contains a First Aid Room, Cot Room, Office, Laboratory, two Toilets, janitor's Closet and Corridor.

A shed roof, rectangular waiting room has been added to this building in all of the process areas. This addition is not directly connected to the First Aid Building.

A 4" reinforced concrete slab floor is supported on concrete blocks and concrete footing. The exterior walls are of drop siding over 1" diagonal sheathing and the gable roof is covered with asphalt felt. The rooms are lined one side with presdwood and the ceilings are of gypsum board. A central corridor runs from one end of the building to the other with rooms located on either side. Humidifying equipment is installed at one end of the building under the gable roof.

The waiting room has a T & G wood floor supported on wooden braces and skids, drop siding walls and roll roofing over wooden rafters and sheathing. The walls and ceiling are lined with sheet rock. Two windows are located on either side and a door is located at each end of the addition.

The following are the dimensions, areas and volume of this building:

	Overall Dimensions	Displacement Volume	Cross-Sectional Area
First Aid Bldg.	82' x 25½' x 19½	13,260 Cu.Ft.	816 Sq.F.t
Waiting Room	24' x 16' x 12'	4,416 Cu.Ft.	384 Sq.Ft.

PATROL HEADQUARTERS

1720-B, 1720-D, 1720-F, 2720-E, 2720-W

Patrol Headquarters - one in each of the three 100-Areas, are one-story buildings identical in size, shape, and design, and are located along the Main Gate House Road near the Gate House. The Patrol Headquarters similarly located in the 200-E and 200-W Areas are identical in design but somewhat smaller in size. The building includes a Locker Room, Assembly Room, Two Offices, Shower Room, Wash Room, Hot Water Heater Room, Toilet, and in the 100-Areas, in addition, a Telephone Room and second Toilet with Rest Room.

The 4" reinforced concrete slab floor with 6" concrete curbing is supported on concrete blocks and piers. The exterior walls are of drop-siding over 1" sheathing and the flat wooden deck built-up roof has a tar and gravel surface. The interior of the structure is unfinished while the partitions are lined one side with presdwood and asbestos board. The Locker Room comprises the one end of the building while the Assembly Room which runs the entire width of the building is separated from the Locker Room by the Men's Toilet, Wash Room, Shower Room and Hot Water Heater Room. Two offices are located at the other end of the building and in the 100-Areas, a Telephone Room, second Toilet and Rest Room extend beyond these offices. One small outside vestibule is located at each end of the building and a third vestibule is located at the front of the building along the Main Gate House Road.

The following are the dimensions, areas and volumes of these buildings:

	Overall Dimensions	Displacement Volume	Cross-Sectional Area
100 Area Buildings	79' x 32' x 15'	37,920 Cu.Ft.	2,528 Sq.Ft.
200 Area Buildings	67' x 32' x 15'	32,160 Cu.Ft.	2,144 Sq.Ft.

AREA SHOPS

1722-B, 1722-D, 1722-F, 2722-E, 2722-W

Area Shops - one in each of the three 100-Areas, one in the 200-E Area and one in the 200-W Area, are one-story buildings identical in size, shape, and design, and are located along the Main Gate House road within the Service Building group. Each rectangular building consists of a Riggers' Loft and a Paint Storage Room.

The 4" reinforcing concrete slab floor is supported on 8" concrete block walls and footings. The exterior walls are drop-siding over 1" sheathing and the flat wooden deck built-up roof has a tar and gravel surface. The interior of the building is unfinished and an 8" concrete block dividing wall separates the building into two equal rooms. Double swing wooden doors provide access to the building.

The overall dimensions of this building are 40' x 30' x 15', the cross-sectional area is 1,200 square feet, and the displacement volume is 18,000 cubic feet.

GAS CYLINDER STORAGE BUILDINGS

1734-B, D, F, 2734-E, W, & 3734

Gas Cylinder Storage Buildings - one in each of the three 100-Areas, one in the 200-E Area, one in the 200-W Area, and one in the 300 Area are one-story buildings identical in size, shape and design, and are located in the 100 and 200 Areas within the Service Building group and in the 300 Area near the 3713 Building. Each rectangular building contains four small cylinder storage spaces; one for live oxygen storage, one for live hydrogen and acetylene storage, and two for dead cylinder storage.

The 4" reinforced concrete slab flooring with 8" concrete curtain walls rests upon well-tamped earth. The walls which are open at both the bottom and top of the structure, are vertical 7/8" T & G sheathing. The flat, built-up roof which overhangs the sides and ends of the building has a tar and gravel surface. Four doors along the front of the building provide access to the four storage areas. Within each storage area are wooden storage racks, cylinder-shaped to fit the curvature of the cylinders.

The overall dimensions of this building are 24' x 10' x 12', the cross-sectional area is 240 square feet, and the displacement volume is 2,880 cubic feet.

2730 SLAB YARD

In the 200 West Area between Building 221-W and 241-U are located six reinforced concrete paved aprons, 8" thick, 20' wide, and varying from 540' to 645' in length. These were formerly used by construction for the fabrication of concrete cell cover blocks. The concrete was poured in 15' sections with mastic joints between sections and these strips were separated by three parallel standard gauge railroad tracks serving these areas. There are also two open end, wood frame, gable roof buildings over the passing tracks east of the slab area and two concrete pits adjacent to these buildings which were used by construction for painting cell cover blocks.

The paint spray buildings have 8" concrete block foundation walls and contain a concrete paved pit section 4' below the top of the rail. These buildings are covered overall with 1" T & G sheathing and roll roofing. The outside pits are reinforced concrete throughout with structural steel framework supporting the rail over the pit sections. The above facilities were taken over by Operations at the close of Construction and are to be used for the storage of salvage material and equipment in the 200 West Area.

	Dimensions	Volume	Area
Overall	300' x 1,200'		
Labs - (6)	(2) 20' x 540' x 8"	14,400	21,600
	(2) 20' x 600' x 8"	16,000	24,000
	(2) 20' x 645' x 8"	17,200	25,800
Paint Building (2)	62' x 16' x 18'	35,712	1,680
Pits (2)	82' x 12' x 4'	7,872	1,640
	Total	91,184 Cu.Ft.	74,720 Sq.Ft.

151 PRIMARY SUBSTATION

One open frame Primary Substation was constructed in each of the three 100-Areas; along the south side of the area in 100-B and 100-D and along the west side of the area in 100-F, to provide the area with 13.8 KV power. This substation is composed of a wooden fenced, gravel surfaced area 450' x 303'. A reinforced concrete and concrete block switch house is located midway on the north fence line in B and D and midway on the east fence in F.

Fenced Area: This area contains wooden frame bus structures, two main transformers, circuit breakers, and terminal structures. A railroad spur directly serves the area. Underground concrete-encased "Korduct" ducts connect the switch house with oil circuit breakers, the main transformers and the terminal structures. Two types of foundations were used for outside equipment; reinforced concrete slab, and reinforced concrete piers with spread footings.

Switch House: The Switch House is essentially a one-story building, having a sub-level cable pit equipped with a sump pump. All duct lines terminate at this Switch House. The main floor is comprised of a Switch Room, with a Fan Room, Battery Room, and Toilet at one end. The cable pit is a completely enclosed reinforced concrete pit with floor slab, varying from 1 ft. to 1-1/2 ft. in thickness, and with the walls 1 ft. thick. Concrete block walls and concrete brick pilasters support structural steel roof framing overlaid with concrete tile covered with a tar and gravel surface. Floors are reinforced concrete 1 ft. thick over the cable pit and 6" thick over the backfill section and are supported by concrete wing walls. The partitions are constructed of concrete blocks 4" in thickness. Air is discharged into the Switch Room by a wall louvre, after being filtered and preheated by an electric unit heater. Switchgear is located on the main floor directly above the cable pit.

The overall dimensions of the Switch House are 83' x 30½' x 28½', the cross-sectional area is 2,532 sq. ft., and the displacement volume is 64,600 cu. ft. The fenced gravel area is 450' x 303' with cross-sectional area of 136,350 sq. ft.

152 SECONDARY SUBSTATIONS

A total of 33 Secondary Substations have been provided in the three 100-Areas - 10 in 100-B, 12 in 100-D, and 11 in 100-F. These substations are very similar in design and construction, differing in the number and size of the transformers in each. The No. 152 Substations all have a primary voltage of 13.8 KV and a secondary voltage ranging from 110 V to 2300 V.

These substations are open wooden pole structures surrounded by picket fences. The transformers are located at, or near, ground level and are set on individual concrete pads.

On the following page is a tabulation listing each No. 152 Substation, the number of transformers, and the phase, capacity, and primary and secondary voltages of each transformer.

153 DISTRIBUTION SUBSTATIONS

A total of 20 Distribution Substations have been provided in the three 100-Areas - 8 in 100-B, 6 in 100-D, and 6 in 100-F. These substations are very similar in design and construction, differing in the number and size of transformers in each. The No. 153 Substation all have a primary voltage of 2.4 KV, and a secondary voltage ranging from 110 V. to 480 V.

These substations are, with one exception, open wooden pole structures surrounded by picket fences. The transformers are located at, or near, ground elevation and are set on individual concrete pads. The one exception is the substation adjacent to the 107 Building in which the transformers are located on an elevated wood platform suspended between two wooden poles.

On the page immediately following the No. 152 Substation Tabulation, is the No. 153 Substation Tabulation, listing the number of transformers in each substation and the size, phase, and primary and secondary voltages of each.

All other distribution transformers have been charged to the individual buildings or to the outside electric lines, No. 1503.

152 SUBSTATIONS TRANSFORMER TABULATION

Substation Number	Adjacent to Bldg. No.	AREA 100-B	100-D	100-F	VOLTAGE Primary	Secondary	Phase	No. of Trans.	KVA Capacity Each Trans.
152-A1	190	X	X	X	13.8 KV	230 V	3	1	2500
152-A2	190	X	X	X	13.8 KV	2.3 KV	3	1	2500
152-A3	190	X	X	X	13.8 KV	2.3 KV	3	1	2500
152-A4	190	X	X	X	13.8 KV	2.3 KV	3	1	2500
152-B1	189		X	X	13.8 KV	2.3 KV	1	6	200
			X	X	2.3 KV	240/120 V	1	1	150
			X	X	2.3 KV	480 V	1	3	37.5
			X	X	2.3 KV	240/120 V	1	1	50
152-C1	[illegible]33	X	X	X	13.8 KV	2.3 KV	3	2	3000
152-D1	182	X	X		13.8 KV	2.3 KV	3	1	3000
				X	13.8 KV	2.4 KV	1	4	1500
152-E1	181	X			13.8 KV	2.3 KV	1	4	1500
			X	X	13.8 KV	2.3 KV	3	1	3000
			X	X	13.8 KV	2.3 KV	3	1	4000
			X	X	2.3 KV	230 V	1	4	3
152-F1	184	X	X	X	13.8 KV	2.3 KV	1	3	333
152-G1	190	X	X	X	13.8 KV	2.3 KV	3	1	3000
		X	X	X	2.3 KV	230/115 V	1	2	100
		X	X	X	2.3 KV	480 V	3	2	200
152-H1	186		X		13.8 KV	2.3 KV	3	2	2000
			X		2.3 KV	480 V	3	2	300
			X		2.3 KV	240/120 V	1	2	75
152-J1	105	X	X	X	13.8 KV	480 V	1	3	50
		X	X	X	2.3 KV	230/115 V	1	1	150
		X	X	X	2.3 KV	460 V	1	3	50

X Located in indicated Area.

153 SUBSTATION TRANSFORMER TABULATION

Substation Number	Adjacent to Bldg. No.	AREA 100-B	AREA 100-D	AREA 100-F	VOLTAGE Primary	VOLTAGE Secondary	Phase	No. of Trans.	KVA Capacity Each Trans.
(1) 153	107	X	X	X	2.4 KV	480/240 V	1	3	25
(2) 153	108	X	X	X	2.4 KV	240/120 V	1	1	25
		X	X	X	2.4 KV	240/120 V	1	3	100
(3) 153	115	X	X	X	2.4 KV	480/240 V	1	3	25
		X	X	X	2.4 KV	240/120 V	1	1	75
(4) 153	183	X	X	X	2.4 KV	480 V	1	3	75
		X	X	X	2.4 KV	240/120 V	1	3	75
(5) 153	185	X			2.4 KV	480/240 V	1	3	25
		X			2.4 KV	240/120 V	1	1	75
(6) 153	185	X			2.4 KV	480/240 V	1	3	25
		X			2.4 KV	240/120 V	1	1	75
(7) 153	1717	X	X	X	2.4 KV	240/120 V	1	1	50
		X	X	X	2.4 KV	480/240 V	1	3	75
(8) 153	1720	X	X	X	2.4 KV	240/120 V	1	1	25
		X	X	X	2.4 KV	240/120 V	1	3	75

X Located in indicated Area.

1608 PROCESS LIFT STATION

Due to the topography, one Process Lift Station has been provided for the 100-D Area and one for the 100-F Area. These stations are located adjacent to the 105 Building over the 1904 Process Sewer between the 105 and 107 Buildings.

Although these two structures are very similar in design and construction, they differ in size and pumping capacity. The 1608-D Building is a rectangular-shaped, two-story, reinforced concrete structure having a flat, tar and gravel roof. The 1608-F Building is a T-shaped, three-story, reinforced concrete structure also having a flat, tar and gravel roof.

In the 1608-D Building, the pump drives are located on the intermediate concrete floor with the shafts extending down some fifteen feet to the pumps which are located on the sump beneath this floor. In the 1608-F Building, the pumps and pump drives are both located on the second floor with the intake pipe extending to the bottom of the sump.

Over one-half of each structure is below ground elevation. In the case of the 1608-F Building, the sumps are divided into three separate compartments for the three pumps by concrete walls. In the 1608-D Building, the pumps all feed from a common sump.

The 1608-D Building is 20' square by 26' high, having a cross-sectional area of 400 square feet and a displacement volume of 10,400 cubic feet. The 1608-F Building is 36½' long by 34' wide by 45' in height, having a cross-sectional area of 1,241 square feet and a displacement volume of 55,850 cubic feet.

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APPENDIX B

PHYSICAL DESCRIPTION OF 200 NORTH, EAST, AND WEST AREAS FACILITIES

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212 LAG STORAGE BUILDING

Three identical buildings, known as Plants N, P, and R, were built in the 200 North Area for storage of partially processed material enroute from the 100 Process Areas to the 200 East and West Process Areas. All buildings are oriented north and south. These buildings are essentially one-story, steel frame with 8" concrete block walls and pre-cast tile roof covered with built-up felt, graveled surface roofing. Each building is divided into three parts: Transfer Room, Storage Room, and Fan Room.

Transfer Room: This is the high east portion of the building containing two transfer pits, and accommodations for one special railroad car. An electrically operated overhead steel roller door covers the railroad entrance. This room is served by a 30-ton overhead bridge crane operated with a pendant cord control to handle casks from the car to the transfer pit and vice-versa. The transfer pits are equipped with manually-operated hydraulic systems for the handling of storage bucket. Inside surfaces of the transfer pit were painted with "Amercoat" to provide a non-porous surface.

Storage Room: This west portion of the building houses a sub-level 20'-9" deep, water-filled concrete pool. A monorail system runs from the transfer pits to the Storage Room from the trolleys of which are suspended 180 galvanized dipped yokes and buckets. Buckets are weighed and counted by an automatic, printing, monorail scale located near the doorway leading to the Storage Room. The operating floor is made up of movable wooden sections supported by T-shaped concrete piers and are slotted to allow yokes to pass.

Fan Room: This room is attached to the east side of the building, housing a selective forced draft heating and ventilating system. Air is discharged by wall ducts into the Storage Room after having been filtered and pre-heated by an electric unit heater. A separate unit heater is located in the Transfer Room.

Two types of foundations were used - reinforced concrete slab with a 4 ft. spread footing for the Storage and Transfer Pit Sections; and reinforced concrete piers with spread footing for the west and south walls of the Transfer Pit Section, and east wall of the Fan Room. Storage Pit walls are tapered inside from 2'-3" to 1' at the top, and the balance of the building walls are 16" and 8" reinforced concrete curtain walls. Concrete floors vary in thickness from 4" to 18" with the Fan Room floor being supported by reinforced concrete beams.

These buildings contain no windows; three louvres and five pedestrian doors with outside concrete platforms and steps, one at each corner of the building and one for access to the Fan Room.

	Dimensions	Volume	Area
Overall	74' x 89'-8" x 37'-6"	169,090 Cu.Ft.	6,150 Sq.Ft.

213 J & E MAGAZINE STORAGE BUILDINGS

A reinforced concrete, earth-covered, magazine building, containing two parallel vaults, was constructed in the easternmost portion of the 200 North Area for the storage of the product. The south end of each vault forms a continuous reinforced concrete wing-shaped retaining wall which has an attached reinforced concrete loading platform for each vault section. The structure is oriented north and south, having its center line identical with the center line of its access road. Distance between vault sections is 44'-6" face to face. Each section contains three rooms, namely, Magazine, Vestibule, and Instrument. The latter two have outside, steel-hinged doors opening out onto the loading platform.

The type of foundations used are as follows: Vault Section - reinforced concrete slab 1' thick with 4' spread footing; Loading Platform - 12" square reinforced concrete piers with 8" spread footings; Retaining Wall - 10'-6" reinforced concrete spread footing, 1'-6" thick. Side walls, end walls, and roof slabs are reinforced concrete 1' thick with the bulkhead wall between the Vestibule Room and the Magazine Room being 2' thick. An 8' ceiling is maintained in all rooms. The Retaining Wall is reinforced concrete extending 2' above backfill and tapers from 1'-8" to 1' at the top. Roofs have membrane waterproofing, 2-ply, with 1" Celotex protective covering. Exterior surface of the rear and side walls is treated with "Carbozite" waterproofing.

Ventilation is provided by four 12" diameter A.C.M. ventilators in each unit, equipped with dampers and bird screens. These extend approximately 4 ft. above the backfill which averages 6' to 10' above the roof slab. Six-hour fire-resistive, double combination lock, steel doors are installed in the bulkhead wall. Reinforced concrete shelving with concrete brick partitions line each side of the Magazine Sections. The floor is built-up an additional 6' under the shelving portion.

	Dimensions	Volume	Area
Overall	47' x 147' x 21'	14,477 Cu.Ft.	1,155 Sq.Ft.

2743 GATE HOUSE & GUARD TOWER BUILDING

Four wood frame, two-story, flat roof, penthouse-type buildings were built in the 200 North Area; one each at the vehicle and pedestrian gate entrance to Plants N, P, R, and J & K. These buildings served as combination Gate House and Guard Tower Buildings and are located 20' north of the fence line and 33' east of the center line of the main entrance road. The ground floor room contains a 4' x 5' toilet room in the northwest corner except in Building 2743-J, where it is omitted. Access to the second floor tower room is by an outside wooden stairway attached to the north side of the building.

Building foundations are 8" concrete curtain walls supporting a 4" reinforced concrete floor at ground level. The structure is covered on the outside with a 1" drop siding and lined and sealed on the inside with 1/4" asbestos board. These buildings are covered with built-up type roofing having a gravel finish.

	Dimensions	Volume	Area
Overall	13'-9" x 19'-2" x 21'	3,170 Cu.Ft.	264 Sq.Ft.

252 SECONDARY SUBSTATION

One open frame Secondary Substation was erected just east of the 212-R Building in the North Area, to supply Plants N, P, R, and J & K with 2300 Volt power.

The Substation is a four-pole, wood frame structure with the lower portion supporting a bus over the 13.8/2.3 KV transformer with the upper half supporting four pole-type oil circuit breaks, disconnect switches, lightning arrestors, fuse mountings, etc. A 5' x 24' wood frame elevated catwalk provides access to the oil circuit breakers. A 3'-6" x 6'-4" x 2'-0" concrete pad supports the transformer. The entire structure is surrounded by a 20' x 23' x 7' wood picket fence.

	Dimensions	Volume	Area
Overall	20'-0" x 23'-0" x 38'-6"	17,710 Cu.Ft.	460 Sq.Ft.

253 & 653 DISTRIBUTING SUBSTATION

A total of 40 Distributing Substations have been provided in the 200 and 600 Areas - thirteen in 200-E, twenty-one in 200-W, four in 200-N, one at Riverland Yards, and one in the vicinity of the Meteorological Tower. These Substations are of similar design and construction differing only in the number and size of transformers in each bank. The 253 Substations all have primary voltages of 2.4 KV with secondary voltages ranging from 120 V to 140 V for lighting and 240 V to 280 V for heating and power. All lighting transformers are single phase and most of the power transformers are likewise single phase except the transformer installations at the 221, 622, and the 6707, which are three phase.

These Substations are of open frame construction using wooden pole structures surrounded by picket fences. Two types of installations were used: ground installation with transformers resting on a concrete pad, and elevated installations with the transformers resting on an elevated wooden platform suspended between two poles. Installations of the latter type were made at the 213, 241, 291, and 622 Buildings.

On the following page is a tabulation of the 253 and 643 Distributing Substations giving their locations, the primary - secondary voltages, phase, number of transformers, and the KVA capacity of each transformer. All other transformer installations in the 200 and 600 Areas for lighting, heating, and power are either charged directly to the building it serves or to 2503 & 6503 Outside Overhead Electric Lines.

2905 DEEP WELL PUMP HOUSES

Two reinforced concrete and concrete block, one-story, flat roof buildings are built in the 212-R fenced portion in the 200 North Area to house deep well pumping equipment. Both buildings are constructed at an angle of 90° to the well water mains, one structure covering No. 1 Well and the other No. 2 Well.

Building walls are 9" reinforced concrete with 4" spread footings with the wall adjacent to the 12" discharge header forming a kicker block. The floor is reinforced concrete 6" thick with a floor trench from the pump base to the east wall carrying a 6" blow-off pipe. Walls are 8" concrete block supporting a reinforced concrete beam and slab roof 14" thick covered with waterproofing. The roof contains a 4'-0" x 3'-4" hatch opening for the removal of pump equipment. Each building contains one door and window.

	Dimensions	Volume	Area
Pump Room	12'-6" x 15' x 17'	3,179 Cu.Ft.	187 Sq.Ft.

221 CELL BUILDINGS

T, U, & B

In each Process Plant, T, U, & B, is a long, flat, rectangular-shaped mass concrete structure of which approximately one-quarter is below finished grade. These buildings are designated as Cell Buildings due to their design, and are identical in all respects except Building 221-T, which is 65' longer, containing a Head-End Addition. These buildings are of extremely unusual design due to process requirements. In other words, once the equipment in any of the cells is placed in operation, it will not be possible to approach it for maintenance or to manually remove or fit up piping. Each process group is symmetrically laid out, paralleling and supporting the 221 Building. In addition to it, the group is composed of the following: 211 Tank Farm, Building 222 - Sample Preparation Laboratory, 224 - Bulk Reduction Building, 241 - Process Waste Storage and Disposal System, 271 - Chemical Preparation and Service, 291 - Exhauster Building and Stack, and 292 - Exhaust Gas Laboratory.

The 221 Building structure is separated into two main portions - Galleries and Canyon, with the inside of the building being divided into twenty sections, each encompassing two cells. Sections are 40' long with the exception of Sections 1, 2, and 20 which are 44', 43', and 43½' respectively.

Galleries: Building 221 is so designed that the control panel boards, chemical and service distribution, are located in three galleries, one above the other along the front side of the building. The first gallery is called the basement gallery and is used principally for electrical distribution and control cabinets. The first floor gallery consists principally of a piping loft containing steam, water, air, and chemical headers as well as piping connections between the panel boards and weigh tanks on the second floor and through-wall cell piping. The second floor gallery is the control center for the cell equipment. Each 40' building section constitutes a separate unit and the gauge board and weigh tank arrangements are designed accordingly. The gauge board panels are installed in a row along the barricade wall between the canyon and the galleries with weigh tanks along both front and back walls of the gallery.

Canyon: The lower portion of the canyon below the deck level contains 40 individual concrete cells having removable concrete cell-block covers. A 10'-6" x 10'-6" exhaust duct runs along the back wall of the building paralleling the bottom of the cells and is connected by an underground concrete duct to the 291 Exhauster Building and Stack for the removal of cell fumes. Immediately above this duct is a pipe trench which also parallels the cells containing inter-connecting cell piping. The pipe trench is like-wise covered with removable, sectional concrete block covers. The construction of the cells has been standardized as much as possible. The standard design section numbers are 4 to 6 through 19. Section 3 differs in that the pipe trench ends opposite cell #5. Section 5 differs in that cell #10 is much deeper affording drainage to the sewer section. Section 20 differs in that the pipe trench terminates opposite Cell #40 in a manner that will allow for future extension of the building. Section 1 constitutes a large cell with two long openings for the immediate storage of partially precessed material. Section 2 contains two long openings of the same size, one of which centers over the railroad track and the other houses initial cell equipment. A reinforced concrete railroad tunnel, extending 150' from the front side of the building, provides rail service to this section.

The equipment installed in the cells consists mainly of centrifuges and vessels with and without agitators, and connecting piping between cell walls and equipment. Around the periphery of each cell are 42 flanged piping connections serving the cell equipment. Special piping connectors were used allowing pipes, conduits, and instrument leads to be connected by tightening a single nut. Vertical connectors are used for electrical connections only and horizontal connectors for piping, instruments, etc.

The Canyon portion is principally served by an overhead bridge crane equipped with 75 and 10-ton hooks as well as four independent monorail hoists of 1 and 1/2-ton capacities. The crane cab is of special design and contains special controls, observation and communication facilities in order to remove cell blocks, cell equipment and cell piping by remote control. Each building also contains a second overhead bridge crane, 10-ton capacity for maintenance use only, when the building is completely shut down.

Head-End Addition: A testing laboratory is attached to the Head-End of Building 221-T having the same general characteristics as the rest of the 221 Buildings. The addition consists essentially of two equipment cells, A and B, having the same length as cells 1, 2, 3, and 4. The essential difference between the testing laboratory and a standard section of Building 221 is that each testing laboratory cell contains the equipment corresponding to that in two standard cell sections. The 75-ton crane rails are extended to permit the crane to travel to the extreme end of Building 221. The addition also includes a continuation of the basement, first and second floor galleries. These galleries turn at the head-end and continue across to the rear wall of the building.

Stair Towers: Seven four-story reinforced concrete stair towers were constructed along the front side of the 221 Building to provide access to the three gallery levels and the crane-cab runway. These stair towers also house heating and ventilating equipment and toilet rooms for the galleries. Nine reinforced concrete labyrinthed stair towers are built along the rear side of Building 221 which provide access to the Canyon portion of the building at the deck level. Building 221-T contains an additional rear and front stair tower for the Head-End Addition.

General Type of Construction: The foundation for the main building structure is a reinforced concrete pad varying from 6' to 8' in thickness with a spread footing. Outside building walls are likewise reinforced concrete 3' and 5' thick. The barricade wall between the cells and canyon and the galleries is 7' thick. The building has a suspended flat concrete roof varying from 3' to 4' in thickness. Construction joints are provided between each section and expansion joints at required intervals. The inside surfaces of the cells and pipe trench, removable cover blocks, the deck floor level in the canyon, and the second floor control gallery are painted with "Amercoat" to obtain non-porous surfaces. For any additional information in regard to the installation of cell equipment, See: Section 6 - Expediences, sub-heading (b) "Special Construction Methods".

	Dimensions	Volume	Area
221-T Overall	85'-2" x 875'-6" x 102'	5,485,220 Cu.Ft.	66,319 Sq.Ft.
221-U & B Overall	85'-2" x 810'-6" x 102'	5,098,464 Cu.Ft.	61,582 Sq.Ft.

224 BULK REDUCTION BUILDINGS

T, U, & B

Three reinforced concrete, three-story frame structures with concrete and concrete block exterior and interior walls were constructed - one for each of the 200 Process Groups, T, U, and B. The front of these buildings is 150' from the back of Building 221, and is in line with the front of Building 222. Each building contains a total of 21 rooms not including two stair towers, one closet, one janitor's closet, and an elevator penthouse.

The back side of the main structure has 1' thick concrete walls with a balcony running around three sides. This portion of the building is separated into Cells A to E inclusive, with Cells A, B, D, and E having a walled platform for supporting 40" centrifuges. These cells are served by a hand-operated overhead crane. In Cell C, the right-hand portion is a pit which connects with an underground pipe tunnel that runs from the center line of Sections 13 and 14 in Building 221 to the 224 Building. The floors in the cells are sloped to a trench along the wall in a manner similar to cell bottoms in Building 221. The equipment is designed to rest upon the floor. Bolted flange connections were used for cell vessels and equipment instead of the special piping connectors used in Building 221.

The front side of the main structure is reinforced concrete frame with 8" concrete block panels and 8" and 4" concrete block partitions. An elevator identical in all respects to Building 271 is installed adjacent to the No. 1 stair tower and is provided with an outside concrete loading platform to facilitate the movement of chemicals to and from trucks. The first floor contains two Offices, Chemical Storage Room, a central Ventilation Room, which provides filtered and tapered air with humidification, Lunch Room, Wash Room, Shower Room, two Toilet Rooms, and two Locker Rooms. The second floor is principally a Pipe Loft containing five concrete vestibules opposite each centrifuge platform. All chemical and service lines enter the building on this level at the end of the building facing Building 222. The third floor is the Operating Gallery containing gauge boards and with tanks, etc. The bare panel boards are identical in size with those in Building 221 and in most instances, the arrangement of instruments and piping is the same.

The right-hand portion of the building is two stories high, having outside concrete walls 1' thick. This section of the building contains Cell F which is L-shaped due to the inclusion of an office in one corner. A mezzanine floor extends across the side facing Building 221 upon which are mounted gauge boards and weigh tanks used in connection with Cell F. A glass enclosure is located in Cell F against the office wall where the partially finished product is collected for transfer to the 231-W Concentration Building.

Building foundations are comprised on reinforced concrete walls with spread footings, reinforced concrete piers and beams, and concrete pads. Floor slabs are reinforced concrete 4" to 12" thick. Roofs are flat reinforced concrete 5" to 12" thick, covered with built-up felt, gravel surfaced roofing, and containing 8 wood frame ventilators with meters. Each building contains 11 single and one double-swing pedestrian doors, 2 freight doors, and no windows. The walls and floors in Cells A through E, and walls, floors, and ceilings in the Cell and Office are painted with "Amercoat" to produce a smooth, impervious surface.

	Dimensions	Volume	Area
Overall	60'-1" x 197' x 60'-5"	507,445 Cu.Ft.	11,982 Sq.Ft.

231-W CONCENTRATION BUILDING

In the western portion of the 200-W Area, midway between Building 241-T and Building 241-U, is located a two-story, flat roof, reinforced concrete, frame building with 8" concrete block panels and 4" and 8" concrete block partitions. In this building the plant end product reaches its final process stage. The structure is of fireproof construction throughout having most of the rooms completely air conditioned. For the latter reason, windows have been omitted.

The building contains a total of 57 rooms including approximately twenty Laboratories for various purposes, several Process and Chemical Receiving and Storage Rooms, Offices, Change Room facilities for 190 employees, air conditioning equipment, distilled water system, ventilation and exhaust systems, and a compressed air system. All of these facilities except one toilet room are located on the first floor with the second floor serving as a pipe and service loft containing duct work and filters for the ventilation and exhaust systems. For further reference, a list of all rooms giving names and room numbers is included at the end of this section.

The central roof portion of the building is 4'-10" higher than the east end of the building and 17'-2" above the one-story Ventilation and Equipment Room which runs along the west end of the building. The west side of the Ventilation and Equipment Room contains fixed louvres which are protected by an 8" concrete barricade wall that is approximately 4' from the face of the louvres and extends 4' above the roof. Two 8' north and south corridors, A and B, are provided, one on each side of the Cell Laboratories with emergency exits to the outside of the building. Corridors C and D run east and west connecting with corridor B and have emergency exits on the east end of the building. Corridors E and F run north and south separating laboratories and intersect corridors C and D. Two concrete stairways are provided for access to the second floor, one at the inside northeast corner of the building, and the other at the south end of the Ventilation and Equipment Room.

Building foundations are composed of reinforced concrete piers with spread footings and concrete walls with spread footings. Floors are reinforced concrete varying from 4" to 12" in thickness. The walls and ceilings of the Cell Laboratories and Vaults A and B are reinforced concrete 1' thick. Roofs are likewise reinforced concrete 4" thick and are covered with built-up felt, gravel surface roofing containing numerous openings for intake and exhaust ducts. The interior surface of all exterior concrete block walls on the first floor, except in the Ventilation and Equipment Room, is plastered having a white finish coat. All interior partitions are likewise plastered except the Sample Test Room, Instrument Room, and one Office which are lined and sealed with 1" Acoustic tile board. The Lunch Room is also sealed with tile board. The walls, floors, ceilings, and equipment in rooms 1 to 6, 8, 27, 31 to 45, Vaults A and B, and corridors A, B, C, D, E, and F are painted with "Amercoat" to obtain non-porous surfaces. Rooms 7 and 18 to 26 are painted with standard inside wall paint. The building contains 12 single swing, outside pedestrian doors and five double-swing freight doors, three of which are on the second floor and provided with extended monorails for the removal of equipment.

A reinforced concrete sump pit 17' x 17' x 17-6" deep is located approximately 115' east of Building 231-W. This pit extends approximately 4' above grade and contains a 9' x 9' (25-12-S-Cb) sump tank with agitator. The top of the sump pit is covered with removable slabs of cement tile supported by structural steel I beams. Process waste water from Building 231-W is collected in this tank prior to discharge into an open drainage ditch.

Number	Name	Room Number
6	Cell Laboratories	1, 2, 3, 4, 5, 6
2	Control Laboratories	34, 35
13	Laboratories	6-A, 6-B, 6-C, 31, 32, 33, 38 40, 41, 42, 43, 44, 45
1	Process Receiving Room	8
2	Vaults	A, B
1	Solution Preparation Room	46
1	Instrument Room	27
1	Balance Room	37
1	Sample Test Room	36
8	Offices	9, 10, 15, 16, 17, 29, 30, 39
1	Receiving Room	49
1	Receiving Office	48
1	Store Room	47
1	Shop	50
3	Locker Rooms	13, 23, 26
2	Shower Rooms	14, 24
3	Toilet Rooms	12, 22, 51
1	Clean Linen Storage Room	25
1	Women's Rest Room	11
1	Lunch Room	20
1	Lunch Box Storage Room	19
1	Entry Room	18
3	Janitor's Closets	13-A, 21, 28
1	Ventilation Equipment Room	7

	Dimensions	Volume	Area
Overall	147' x 189'-10" x 34'	803,240 Cu.Ft.	27,964 Sq.Ft.

211 TANK FARMS

T, U, and B

Tank Farms were constructed for each 200 Process Group - T, U, and B, for the handling and storage of liquid chemicals and are located at the rear of the 221 Buildings in the angle between the 271 Building and the railroad tunnel to Building 221. Two car spots are provided along one of the railroad spurs adjacent to the 271 Building. One car unloading pump for each kind of chemical is provided at one or the other of these car spots. The Tank Farm is more of less divided into two parts; vertical storage tanks and horizontal storage tanks.

Vertical Storage Tanks: Nine 18-8-S-Cb vertical storage tanks 10 ft. diameter by 14 ft. high are arranged adjacent to the car spots in two rows on concrete octagon-shaped foundations with wood frame access stairways and platforms. Tanks #211-101 to #211-105 are for 70% nitric acid, and tanks #211-121 to #211-125 are for 75% phosphoric acid. A pump is located adjacent to these tanks for transferring acids to Building 271. Tank #211-201 is for formic acid. A pump is located near this tank for transfers to Building 221.

Horizontal Storage Tanks: Six horizontal storage tanks adjoin the vertical storage tanks on reinforced concrete cradles and are provided with wood frame access stairways and platforms. These tanks are used as follows: #211-108 is a 9' x 36' of 18-8-S-Cb for the storage of concentrated nitric acid directly from the tank cars. Adjacent to this tank is an 18-8-S-Cb trombone cooler and pump for circulating the acid during the process of water dilution. After dilution to 70%, the acid is discharged into one of the five tanks previously mentioned and then is distributed to the 221 and 271 Buildings by two transfer pumps.

Three 9' x 36' steel tanks #211-141 to #211-143 are provided for the storage of 50% caustic acid which is pumped directly into Building 221. Steam coils are provided in these tanks to keep the caustic in liquid form during cold weather. An 8' x 30' steel tank #211-161 provides storage for concentrated sulphuric acid and a pump is located adjacent to it for transferring acid to Building 221. A second tank #211-181 of similar size is suspended on scales for the storage of anhydrous hydroflouric acid. A small expansion tank with necessary safety head gauges, pop valves, etc, is provided to prevent rupturing of the main tank. A pump is installed nearby for transferring acid to #221.

Building 211-T only is equipped with drum filling facilities for handling sulphuric, formic, nitric, and phosphoric acids.

	Dimensions	Volume	Area
Overall	120' x 188' x 35'	534,024 Cu.Ft.	19,832 Sq.Ft.

216 & 316 PROCESS WASTE DISPOSAL TRENCHES

Two identical, open trench, fence enclosed, process waste burial grounds were constructed, one each in the 200 east and 300 Areas. Unit 216 in the 200 East Area is located on the south side of "E" Street approximately 2600 feet east of the Power House. Unit 316 is located at the northeast inside corner of the 300 Area.

Each burial ground is enclosed by Type #1 fencing, 150' x 250' having a 20' vehicle gate at both ends and contains a 16' V-bottom ditch 8' deep and 200' long. Ditches were dug parallel to the 20' area service road with space provided along the other side for a similar size future trench.

Fifteen feet from each end of the trench is located a concrete bench mark containing a stainless steel plate stamped "DANGER - Do not dig between markers".

	Dimensions	Volume	Area
Overall	150' x 250'	--	37,500 Sq.Ft.

SAMPLE PREPARATION LABORATORIES

222 T, U, & B

Three one-story, reinforced concrete frame structures, with concrete block exterior and interior walls, were constructed - one for each of the 200 Process Groups. These buildings are located between Building 224 and 292 paralleling Building 221. Each building contains a total of 22 rooms, two outside and two inside vestibules, and an L-shaped corridor. The rooms are used for the following purposes:

No. 1	Receiving Room
No. 2 & 3	Offices
No. 6	Chemical Preparation Laboratory
No. 7	Sample Preparation Laboratory
No. 8	Balance Room
No. 9	Sample Measuring Room
No. 10	Instrument Repair Room
No. 11 & 19	Equipment and Machinery Rooms
No. 12	Conference Room
No. 13	Storeroom
No. 14, 16, 17, 18, 20, 21, 22, 23, 24	Shower, Toilet, Locker and Lounge Rooms
No. 15	Janitor's Closet

The Main Equipment Room is attached to the rear of the building and houses mechanical equipment such as is required for air conditioning, ventilation, water distillation, water heating and steam vacuum jet. A separate hot water heater and ventilation system is housed in rooms No. 19 and 24 which are in the end of the building opposite Building 292. A separate fume exhaust system is provided for the hoods in the Laboratory Rooms. The Sample Measuring Room and Instrument Repair Room are in the end of the building adjacent to Building 224 and are of explosion-proof construction having walls and roof of reinforced concrete 2' thick with a 4" concrete block wall between rooms. An emergency exit is provided for the Sample Measuring Room. The floors in rooms No. 9 and 10 are covered with 1/8" linoleum and have a 2" layer of cork insulation between 4" layers of concrete. Ceilings and walls above 6'-6" in these rooms are covered with 1" fibracoustic tile board.

Floors in rooms No. 1, 3, 2, 6, 7, 8 and 12 are covered with 3/16" tile, including a 6" base. Rooms No. 6, 7, and 8 are plastered, having a white finish coat. Inside partition walls are 4" concrete block. Roofs are reinforced concrete 4" thick, supported by reinforced concrete beams, and covered with 1" insulation board built-up, gravel surfaced roofing. The building contains four outside door entrances, no windows, and louvres for air circulation.

Solvent Storage Shelter: Each 222 Building is provided with an open side, steel frame lean-to, which houses a sheet metal box for the storage of solvents. These are located approximately 25' from the front side of the buildings between the two outside vestibule entrances.

	Dimensions	Volume	Area
Building Overall	64' x 160'-6"x 15'-2"	111,562 Cu.Ft.	7,336 Sq.Ft.

241 PROCESS WASTE STORAGE AND DISPOSAL SYSTEMS

T, U, B, & C

A separate Process Waste Storage and Disposal System was constructed for each 200 Operating Plant, T, U, and B, whereby the process and cooling water waste originating in Building 221, 222, 224, 271, 291, and 292 is either stored in underground storage tanks or held up in reservoirs until it can be disposed of into the ground. Upon cancellation of Plant C, it was necessary to provide an additional diversion box at 241-B, Eq.Pc. #241-B-145 as 241-C was retained with the exception of settling tank Eq.Pc. #241-C-361, and retention basins Eq.Pc. #241-C-351, and 352.

These systems require a considerable area with the ground elevation below the invert elevation of the cooling and process waste water lines at the process buildings. These systems were located approximately 2000' to the rear of the 221-Buildings.

Process Waste Storage System -

Each disposal system is comprised of twelve 75' diameter and four 20' diameter underground composite storage tanks, designed and constructed by Morrison-Bechtel-McCone Company under sub-contract RPG 1451½; one 20' diameter underground catch tank, designed and constructed by National Gunite Contracting Company, under sub-contract RPG 3564½; and four diversion boxes of varying dimensions.

1. Composite Storage Tanks - The twelve 75' tanks are spaced 100' on centers, four to a row and are numbered 241-101 to 241-112. The four 20' tanks are spaced 50' on centers in a single row 100' from the center line of the last row of the 75' tanks and are numbered 241-201 to 241-204. The bottom of the large and small tanks are 40' to 42' below the backfill level with a minimum coverage of 9' above the dome of the 75' tanks.

These tanks are reinforced concrete, having a 1/4" welded steel plate lining with spherical bottom to reduce the possibility of leakage. The steel shell is 18' high in the 75' tanks and 25' high in the 20' tanks. The liquid storage level is 2' below the top of the rim in the 75' tanks and 1' below the rim in the 20' tanks. The outside surface of the steel lining is covered with a 3/4" layer of 3-ply waterproofing membrane and "Gunite" protection. Foundations for both size tanks are reinforced concrete having a minimum thickness of 8" with a 3-ply asphaltic membrane waterproofing between the 2" grout surface directly supporting the tank bottoms and the concrete foundation pad. The larger tanks have an enlarged section 2' x 4'-3", including a 2' spread footing around the entire circumference in order to support the tank walls. The smaller tanks are of the same construction, having a 1'-6" x 3'-3" pad which includes a 1' spread footing.

Tank walls for both size tanks are 1'-1" thick, including the steel lining and waterproofing. The 75' tanks have arched domes 15" thick, not including a 3/4" top layer of 3-ply membrane waterproofing. Six of the larger tanks have single trunk concrete hatchways extending from the dome to 1' above the top of backfill. Each of the smaller tanks have double trunk concrete hatchways that extend from the top of the flat roof slab covering these tanks. Air-cooled, finned tube condensers are installed over each hatchway opening to condense fumes and keep them from escaping to the atmosphere.

All exposed interior surfaces of the steel tank linings were sandblasted and given two coats of "Du Lux Seacrome Primer". The ceilings of the 20' tanks and the underside of the domes for the 75' tanks were given three or more applications of magnesium zinc-fluosilicate in order to saturate all exposed concrete surfaces.

2. Catch Tank - On the same center line as the last row of the 75' composite storage tanks offset approximately 112' from tank 241-112 is a 20' diameter "Gunite" Sump Tank Eq.Pc. #241 - # 301, to receive drainage from the diversion boxes. This tank is 20'-3" from the bottom of the floor slab to the top of the dome and has a 6' minimum backfill covering. A 6" thick reinforced concrete foundation was furnished by Du Pont, having an additional 1' x 2'-6" section with 6" spread footing around the circumference. Tank walls are 6" thick, supporting a suspended dome of the same thickness. The interior surface is painted with two coats of "Amercoat" to obtain a non-porous surface.

3. Diversion Boxes - Four reinforced concrete diversion boxes are located in the immediate vicinity of the composite storage tanks in order to divert the process wastes from certain buildings to especially assigned storage tanks and to provide future flexibility in storage. Foundations and end walls are 2' thick and side walls are 18" thick. Each box is equipped with water spray nozzles for flushing and has removable overlapping concrete covers three layers deep. Cover blocks and the inside surfaces of the diversion boxes are painted two coats with "Amercoat".

Within the diversion boxes, the pipe connectors and piping arrangement is similar to those in Building 221, including steel supports, kick plates, templates, impact wrench assembly, etc. Piping from the diversion boxes to the underground tanks and overflow piping between tanks is carried on concrete pads and supported by concrete piers and beams in the backfill area.

Cooling Water Disposal System -

Uphill from the process waste storage facilities is a cooling water disposal system consisting principally of two retention basins of 500,000 gallon capacity each, #241-352 and 353. The 24" cooling water drain installed on haunches along the rear of Building 221 discharges into either retention basin by means of shut-off valves installed to permit change-over from basin to basin and for discharge into open earthen drainage ditches. The cooling water and third floor wastes from Building 271 are connected into this 24" drain mentioned above for Building 221. The process waste from Building 224 is connected into the same 24" drain. The cooling water drain from Building 224 is also connected into the 24" drain. A process drain from Building 224 is connected to a "Gunite" settling tank Eq.Pc. #241-351, buried uphill from the retention basins.

1. Settling Tank - This tank is the same size and identical to the Catch Tank previously mentioned. The discharge from the settling tank is by means of a manhole into the 24" main cooling water line. Cooling water drains from Buildings 221, 222, 224, 271, and 291 are earthenware to points varying from 5' to 30' away from the building, and are terra cotta pipe thereafter.

2. Retention Basins - These basins are reinforced concrete dyke-shaped, having 10" outside walls supported by 1' x 3'-10" floor pads with 6" spread footings. The remainder of the retention basin bottom is 6" thick.

Observation Wells -

Seven observation wells within a 500' radius, approximately 150' deep, and 8" to 12" in diameter were drilled in each Composite Storage Tank Area and one approximately 300' deep and 8" to 12" in diameter was drilled adjacent to the Settling Tanks in order to detect leakage from the Composite Storage Tanks. These wells were cased with Sch. 40 steel pipe and perforated near the bottom of the wells. Drilling was done by the cable-tool percussion method.

	Dimensions	Volume	Area
Composite Storage Area (Fenced Area)	500' x 500'		
Composite Storage Tank Area	300' x 400' x 37')	4,440,000	120,000
(Overall)	75' x 190' x 37')	527,250	14,250
** Cooling & Retention Area (Fenced Area)	350' x 400'		
Retention Basins (2)	123'-6" x 124'8"x 7'-1"	227,930	30,138
** Settling Tank Area (Fenced Area)	100' x 100'		
Settling Tank (Overall)	21' O.D. x 28'	9,688	315
	Total	5,204,869 Cubic Ft.	164,703 Sq. Ft.

** Omitted for 241-C

271 CHEMICAL PREPARATION AND SERVICE BUILDINGS

T, U, & B

A four-story reinforced concrete frame structure with concrete block exterior and interior walls is attached approximately midway to the back side of each 221 Cell Building, and houses such service items as Chemical Preparation with Laboratory, Offices, Communication Center, Change Room Facilities, Medical Examination laboratory, Small Shops, Air Treatment, and Compressed Air Supply. Each building contains a total of 44 rooms, not including two stair towers, two pipe shafts, two air shafts, one elevator shaft, three vestibules, two janitor's closets, and seven corridors, in order to accommodate these services.

The buildings are constructed independently of Buildings 221 but they abut the side of the building adjacent to Sections 10, 11, 12, and 13. The first floor is 4' above grade with two concrete loading platforms, one adjacent to the railroad spur and the other at right angles for handling Chemicals to and from railroad cars and trucks. A freight elevator, 8000# capacity, is located at the end of the building adjacent to the railroad spur and serves all four floors and permits passage of small items of equipment to Building 221.

An air intake and air supply shaft, four-stories high, is attached to the front side of each building adjacent to the Fan Room. The air supply shaft is lined with 2" cork insulation and the air intake shaft is equipped with louvres at the top of the shaft.

Building foundation and basement walls are a combination of reinforced concrete piers and walls with spread footings. Floor slabs are reinforced concrete varying from 4" to 12" in thickness and are covered with Mastic Tile only in the Toilet Rooms, Chemical Laboratory, Battery Room and Mezzanine floor. Roofs are reinforced concrete slab varying from 4" to 6" in thickness and are covered with built-up felt, gravel surfaced roofing. The penthouse section for the elevator shaft and No. 1 stair tower extends above the main roof section.

Basement Floor - At the left hand end of the basement floor is a large storage room for supplies in addition to two large solution tanks which are supported from the floor and project upward to an opening in the first floor. Two pumps are located nearby for distributing solution from these tanks. The back and middle front side of the basement contains an Instrument Repair room, shop, Pool Crib, and Office. At the right-hand outside corner of the basement is located a Compressor Room which supplies compressed air, both process and instrument, to the 211, 222, 224, 271, and 291 Buildings. Four air receivers are located just outside the right-hand end of the building. On the front side of the building, a pit is arranged to permit movement of large pieces of equipment into or out of the basement. A Fan Room is located between the Compressor Room and the Shop which, in addition to supplying air for this building, also directs an air supply to the basement gallery of Building 221. A small Electrical Control Room is located back of the #2 stair tower and houses controls for the Fan and Compressor Rooms.

First Floor - At the left-hand end of the first floor is a large room for storage of solid and liquid chemicals in crates and dissolving facilities previously mentioned in connection with the basement. A pipe shaft is located to the rear of the two dissolving tanks to permit ready access to all piping between floors and Building 221. A second pipe shaft starts 7' above the first floor at the right end of the building and extends likewise through the third floor. The central portion of the first floor contains two Locker and Wash Rooms, a Shower Room, Toilet Room, Water Heater Room, and Clean Laundry Room. The right-hand end of this same floor contains a Doctor's Office, Medical Laboratory, Waiting Room, two Toilet Rooms and a Battery Room.

Second Floor - This floor contains eight offices, a File Room and Fire Resistant Vault, a Dispatcher Room with two small adjacent communication rooms, a Lunch Room, two Toilet Rooms, and two Heater Rooms located between the stair towers and Building 221. The Heater Rooms supply filtered and tempered air to the second floor gallery of Building 221. In one of the small communication rooms is installed a 100-circuit switchboard and equipment for handling an independent inter-communication system serving Buildings 211, 221, [2]22, and 224. The second room contains communication, signal and control equipment for door inter-locks.

Third Floor - The top floor consists mainly of a chemical preparation room containing a number of 25-12-S-Cb weighing, mixing, storage tanks, and distributing pumps several of which are located on a concrete mezzanine floor 10' above the third floor level. For this work a Chemical Control Laboratory is provided. Two Heater Rooms are also provided behind the stair towers similar to the second floor arrangement. Two labyrinthed access ways to the crane-cab runways of Building 221 are provided. The #1 stair tower provides access to the roof. A portion of the roof has been designed to support a 10,000-gallon tank for demineralized water in the event that it becomes necessary to use it for process.

	Dimensions	Volume	Area
Building Overall	58' x 170' x 67'-10"	496,792 Cu.Ft.	9,280 Sq.Ft.

272 AREA SHOPS

An Area Shop was constructed in each of the 200 East and West Service Areas adjacent to the other maintenance buildings and facilities, and was especially equipped for assembling and fitting-up the operating equipment for the Cells in Building 221. The architectural features of these buildings and facilities are similar. Building 272-E houses a Machine Shop with lathes, milling machines, shapers, shears, punches, drills, grinders, etc.; Electrical Shop with a special drying oven; Pipe Shop with pipe cutting and threading equipment and special facing machine for truing-up flanges after heat treating; Forge and Welding Shop; Carpenter Shop with saws, band saw, jointer, etc.; Tool Room with Crib; six Offices; and a Toilet Room. Building 272-W Contains in addition a Sheet Metal Shop with sheer rolls, crimper, break, etc.; and a Sand Blasting Room.

The main structure of both buildings consists of a four-story structural steel frame. A one-story frame truss supported lean-to is attached to one side. Building 272-E contains ten bays with the high structural steel frame portion extending the full length of the structure. In Building 272-W, the high portion extends only six bays with the balance of the building a one-story wood frame lean-to of typical post and girder construction. Building foundations are reinforced concrete piers with spread footing having 9" concrete curtain walls between piers. Both buildings are covered with 1" T & G sheathing and 1", pattern 105, drop-siding with building paper insulation between, fastened to the structural steel frame portion by wood purlins belted to clips extending from the framework. Roofs are decked with 2" T & G sheathing covered with built-up felt roofing. Each building contains eight 42" and two 18" A.C.M. ventilators with meters. Partitions for the Tool Room, Offices, Electrical Shop, and Toilet Room are 1/4" "Masonite" and the Forge Shop and Sand Blasting Room are lined with 1/4" "transite" board. The Tool Room, Offices, Sand Blasting Room, Electrical Shop are sealed with 3/8" "Gypsum" board. Building 272-E contains 83 single and double frame, double and triple hung windows; 5 outside pedestrian single and double doors; 3 overhead roller railroad doors and 1 sliding freight door. Building 272-E contains 69 single and double frame, double and triple hung windows; 5 outside pedestrian single and double doors; 2 overhead roller railroad doors; and 3 freight doors, sliding and double swing.

The south end of Building 272-E and the north end of Building 272-W is served by a railroad spur extending through the building in order to facilitate the handling of large tanks and heavy equipment to and from railroad cars. A furnace car truck also runs from the north end of Building 272-E to the 273-E Heat Treating Furnace.

The high portion of Building 272-E is equipped with two 10-ton overhead bridge cranes 49' above the ground floor level, and Building 272-W is equipped with one such crane. The space underneath the cranes is fitted with three sets of steel framework simulating the arrangement of piping connections within the Cells of Building 221. These dummy cells are oriented with respect to the crane and cab in a manner identical to the actual cells in Building 221. Platform space has been arranged on two levels above the floor to facilitate fitting-up work. The dummy cells are consequently designed with the slope of the floor, height of wall connections from the floor, and spacing dimensions of connectors and of equipment guides. Air, Steam, Water and Electrical facilities are arranged at each cell for the purpose of testing equipment.

	Dimensions	Volume	Area
272-E Building (Overall)	85'-5" x 201'-9" x 68'-6"	907,509 Cu.Ft.	16,111 Sq.Ft.
272-W Building (Overall)	85'-5" x 201'-9" x 68'-6"	718,276 Cu.Ft.	16,651 Sq.Ft.

273 HEAT TREATING FURNACE

One Heat Treating Furnace with necessary facilities was constructed in the 200 East Area adjacent to Building 272-E, the Area Shop, for the purpose of heat treating and pickling 25-12-S-Cb piping and equipment. The excessive corrosion met with in the process requires all items of process equipment to be fabricated of 25-12-S-Cb, which in turn must be heat treated in accordance with Specifications G19-R-1. Since a considerable amount of fit-up work and some fabricated would be required in the field by both maintenance and construction, it was considered advisable to provide adequate heat treating facilities at the plant site.

Heat Treating Furnace - This furnace was purchased from and erected by the Tate-Jones Company under purchase order RPG 170½ on foundations furnished by Du Pont. The maximum inside dimensions of the furnace are 13'-1" x 25'-1½" x 15'-10" high which handles a 12 x 24' wide gauge rail car. It has a single overhead sliding door facing Building 272. Some of the features of this furnace are: three zone control, eight pound recorders with thermocouple heads in the furnace walls and others extending up through the bottom of the car, dual oil pumps, constant pressure blower with a safety oil cut-off switch, 24 dual fuel oil burners, and a car-puller to the rear of the furnace door.

The furnace and heat control equipment is housed in a structural steel frame building covered with corrugated asbestos siding and roofing. This building is oriented east and west with a transfer track running directly from the furnace building to Building 272-E. The Furnace Building has a gabled roof with louvered ventilator running the entire length of the ridge and has a lean-to Control and Equipment Room attached to the east end of the building. An enclosed door shaft section is attached to the opposite end of the structure housing the overhead sliding furnace door. Six sheet metal furnace stacks extend 2' above the high point of the roof in the furnace section for draft purposes and the Control and Equipment Room is provided with a 24" A.C.M. roof ventilator. Access catwalks run along the sides of the furnace and across the upper face of the door shaft section. This building contains two windows in the control room and four doors for pedestrians.

Building foundations are a combination of reinforced concrete piers with spread footings and concrete curtain walls. The ground floor is a reinforced concrete slab varying from 4" to 18" in thickness.

Quenching Station - Water spray quenching facilities supported by an overhead steel framework are located approximately 15' from the door of the Furnace Room. This spray utilized 1,200 GPM and can be turned on prior to the removal of the car form the furnace house or after the car is in place.

Transfer, Pickling and Wash Area - A transfer track is located southwest of the Quenching Station to permit switching of cars to and from the Spray Quench, Building 272-E, and the Pickling Tank.

Pickling facilities consist of a reinforced concrete tank, carbon and acidproof brick lined, 13'-10" wide by 23'-11" long with an average depth of 13'-9". The top of the tank is 4'-5" above grade. This tank is equipped with two 25-12-S-Cb steam heating coils and a steam jet syphon for emptying and for adding heated water, HNO_3, HF, and NaOH. Beside the Pickling Tank is a concrete paved surface provided with hose connections and drains for cleaning equipment after pickling. An overhead hand-operated bridge crane supported by a steel framework serves the Wash Area, Pickling Tank, Transfer Truck, and a portion of the track which runs from the Heat Treating Furnace and Spray Quench area to Building 272-E.

Chemical and Oil Storage Tank Farm - South and east of the Wash Area is a car unloading spot and chemical storage tanks as follows: One 10' x 14' 18-8-S-Cb vertical storage tank for HNO_3 with a distributing pump and line to the Pickling Tank; one 8' x 30' horizontal steel storage tank equipped with an expansion tank for HF set on a 60-ton scale and a distributing pump and line to the Pickling Tank; one 9' x 36' horizontal steel storage tank for NaOH, including a heating coil and distributing pump to the Pickling Tank for neutralizing purposes; and one 9' x 36' horizontal steel storage tank for fuel oil with a gravity feed line to the fuel pumps in the furnace building. The latter tank is surrounded by an earth dyke. Wood frame access stairs and walkways are provided for the other storage tanks. The stationary horizontal storage tanks rest on reinforced concrete cradles with spread footings. A separate car unloading pump is provided for each chemical tank adjacent to the car spot.

	Dimensions	Volume	Area
Overall	162' x 225' x 13'-8" to 52'-9"	368,334 Cu.Ft.	13,015 Sq.Ft.

MACHINERY STOREHOUSES & CHEMICAL STOREHOUSES

274-E & W; 275-E & W

In the service plants for the 200-East and 200 West Areas are located two identical wood frame, shed roof buildings for the storage of extra machinery and chemicals. These buildings are approximately 100' feet apart and lay alongside the same railroad spur. Building foundations are 8" thick reinforced concrete curtain walls with tapered concrete piers supporting the center columns. Floor slabs are reinforced concrete 6" thick and built 4' above grade to facilitate the movement of equipment and supplies to and from railroad cars and trucks.

From the floor upward, the buildings are of wood frame, post and girder construction having 1" T & G sheathing and decking throughout. Side walls are covered with 1" drop siding with building paper insulation between the siding and sheathing. Roofs containing two 30" x 30" wooden roof ventilators, are sloped two ways and are covered with built-up felt, gravel surfaced roofing. Each building has four 10' x 10' double sliding doors, two single swing pedestrian doors with outside wooden steps and platform, and fourteen single frame, double hung windows.

	Dimensions	Volume	Area
Building Overall	39'-6" x 96' x 20'-7"	78,141 Cu.Ft.	3,792 Sq.Ft.

282 RESERVOIR & PUMP HOUSE BUILDING

In the 200-E and 200-W Power Areas, a Reservoir and Pump House Building is located which furnishes raw water to the Filter Plant Building #283, having a branch line to the Power House Building #284 for an emergency supply, and cooling water supply lines to the Process Areas. Each system consists of an open reservoir with an Inlet Water structure on one side and a Pump House building and a Chlorine Storage structure on the other. The layout of the 282 Building in the 200-E and W Areas is identical except for a 90° difference in orientation between the respective Power Areas. That is, in the East Area, the Inlet House is on the west side of the reservoir and in the West Area it is on the north side of the reservoir.

Inlet House: Water is supplied to the reservoir by the 24" concrete export line which is changed to a 24" steel pipe just outside of the water Inlet House. This building houses a 12" level controlled cone valve which automatically controls the flow from the export line and allows the water to be discharged into a small concrete weir chamber. The construction of the Inlet House is as follows: one-story concrete and concrete block building one-half below grade, 9" reinforced concrete foundation walls with spread footings, flat concrete tile roof covered with built-up felt, gravel surfaced roofing supported by structural steel framing.

Reservoir: The concrete reservoir has inside dimensions of 172' x 172' with a maximum storage depth of 18'-6", capacity 3,000,000 gallons, and is provided with an overflow weir designed for 7,000 GPM. Outside reservoir walls are tapered one side 10" to 12" thick, 8'-9" high and extend 4'-8" above grade. A spread footing pad 4'-6" wide and 1' thick supports the outside walls. From the footing pad to the bottom of the reservoir, the side slopes are on 12 and are of Gunite construction 8" thick. This portion of the work was performed by the National Gunite Contracting Company under subcontract RPG 4335. The side of the reservoir adjacent to the Pump House contains a single compartment pump suction well 5' deep and 5' wide.

Pump House: The Pump House building is a two-story structure having a basement or pump section built entirely below grade adjacent to the reservoir pump section pit previously mentioned. An outside concrete covered basement stairway is provided alongside the building for access to the Pump Room. This section contains three 3,000 GPM, 250' head, raw water pumps, one of which has a steam turbine drive in case of power failures. The concrete block superstructure portion is divided into two rooms - one housing electrical control equipment and the other chlorination equipment. This portion of the structure has a sloped concrete tile roof covered with built-up felt, gravel-surfaced roofing supported by structural steel roof framing. The roof section of the Pump Room opposite the entrance to the Control and Chlorinator Room contains a hatch-covered opening for the removal of pumping equipment, and is served by an overhead wood frame monorail system which extends from the Chlorine Storage structure to the top of the Pump House.

Chlorine Storage Structure: As previously mentioned, a covered pit is provided adjacent to the Pump House for the storage of chlorine cylinders. The pit section is built entirely above grade having a concrete slab floor and 8" concrete block walls approximately 3'-6" high with removable asbestos board and wood frame covers. Each pit is capable of storing four 30" x 72" chlorine cylinders.

	Dimensions	Volume	Area
Overall	174' x 205' x 35'-2"	299,286 Cu.Ft.	32,469 Sq.Ft.

283 FILTER PLANT BUILDINGS

The 200 East and the 200 West Power Areas each have an identical four-story concrete and structural steel frame building in which all water is filtered except for Process Cooling and raw water for the Power House. Each plant consists of a Head House for Chemical Feeding, Chemical Mixing and Contact Chambers, two Sedimentation Basins, one Clearwell Reservoir and Filtered Water Pump Room. The filter plants are designed so that they can be expanded to three basins and filters if necessary. Building 283-E is oriented east and west and lays due west of Building 284-E. Building 283-W is oriented north and south and lays due north of Building 284-W.

Sedimentation Basins - Contact Chambers - On the front side of the Head House are located two open, reinforced concrete, Settling Basins each having inside dimensions of 17' x 51' with an average storage depth of 12', each totaling 80,000 gallons. Raw water entering the filter plant is controlled by a Bailey Water Company, filter level recorder-controller, air-operated, connected through a standardizing relay to the 8" diaphragm-operated, double-seated, V-port valve in the 8" raw water line. Each subsidence basin can be drained and flushed out by admitting settled water at the discharge end of the empty basin which will flush out the sludge to the sewer. On the right side of No. 1 Settling Basin and across the front of both basins are constructed Baffle Mixing and Contact Chambers. The Mixing Chamber is designed for a retention period of 20 minutes with a rate of flow of 800 GPM and a Baffle Contact Chamber for each subsidence basin is designed for a retention period of 15 minutes with a rate of flow of 400 GPM. A chlorine solution is applied to the raw water inlet at the rate of 4 ppm by means of two automatic solution feed, visible vacuum Wallace & Tiernan chlorinators which are located adjacently in the Chlorination Room. The foundation for the above structures is a reinforced concrete pad 18" thick having a spread footing. Basin and Chamber walls are likewise reinforced concrete averaging 1' in thickness.

Head House - This portion of the plant is an L-shaped building with the main portion three-stories high and the short section two-stories high. The first story is reinforced concrete frame; the second story is likewise reinforced concrete frame for the Chemical Mixing Room but structural steel frame for the Filter portion; and the third floor is structural steel frame throughout. Roofs for the structural steel portion are concrete tile sloped one way, covered with built-up felt, gravel surfaced roofing. Roofs for the concrete frame portion are flat covered with built-up felt, gravel surfaced roofing and contain one 30" and one 20" A.C.M. roof ventilator with motor. Outside building walls are 8" concrete block and partitions are 4" concrete block. The third floor is used for dry chemical storage and will accommodate a 60-day supply of Alum, Lime and Carbon. Bags and barrels of chemicals are raised from the ground level to the storage floor and transported to the respective bins by means of a 1-ton electric and a 1-ton manually-operated monorail hoist. Steel extension hoppers are provided for each of the two Alum and the two Lime feeders, each hopper having a capacity of 900# sufficient for 24-hour operation. Hoppers are serviced by a gravimetric feeder on the floor below. These feeders are automatically controlled by the raw water influent motor. In addition to the Alum and Mixing Feeders, the second floor contains a manually-controlled Carbon Feeder. The first and second floors adjacent to the Settling Basins house two 14' and 16' Roberts Filters rated at 400 GPM each which corresponds to 1.8 GPM per square foot. Each filter can be back-washed at the rate of 4200 GPM by means of a back-wash pump installed below in the ground floor. The filter beds are supported on

"Wheeler Bottoms" covered with gravel, sand, and "Anthafilt". The ground floor level contains a sub-level pipe gallery adjacent to the base of the filters and an Office and Laboratory and Chlorine Room at right angles to the filters. This floor is also provided with Toilet and Wash Room.

Clearwell and Pump Room - Along the back side of the Head House is located a sub-level reinforced concrete covered Clearwell Reservoir and Filtered Water Pump Room built entirely below grade. The Clearwell Reservoir has a storage capacity of 200,000 gallons; the Pump Room contains three 600 GPM filtered water pumps and one 600 GPM sanitary and fire pump. The latter pump and one of the filtered water pumps are driven by 55 HP non-condensing steam turbins as insurance against power failures. The Pump Room has been provided with force ventilation and a hatched opening with an overhead monorail for the removal of pumping equipment. The walls for this section of the plant are reinforced concrete 1' thick with spread footings having an 18" wall between the Pump Room and the Clearwell. The floor in the Clearwell is sloped on three sides similar to Building 282 and contains a 5' x 5' suction well adjacent to the Pump Room. The roof is reinforced concrete 4" thick covered with built-up felt, gravel surfaced roofing extending approximately 6" above grade.

	Dimensions	Volume	Area
Overall	75'-3" x 138' x 55'	205,892 Cu.Ft.	8,670 Sq.Ft.

284 POWER HOUSES

There is one 284 Power House in each of the 200 East and West Power Areas. Both of these buildings are identical in design, size, and equipment except for a few minor changes. These buildings are designated as Power Houses but are primarily Boiler Houses with each containing only a 750 KW Turbo-Generator for emergency service such as building lights and motors that must be maintained in case of power failures.

Each Power Plant consists of the following structures: Main Power House Building; two reinforced concrete Stacks partically lined; Coal Handling Conveyor System, including two Track Hoppers, Crusher House, and two Transfer Houses; an Open Coal Storage Pit; and Salt Dissolving Pit, including a Brine Pump House. The layout of the 284 Buildings in the 200 East and West Areas is identical except for a 90° difference in orientation between the respective Power Areas; that is, in the East Area the Power House is oriented north and south, east of the Reservoir and Filter Plant Buildings, and in the West Area it is oriented east and west, south of these Buildings.

The type of construction and floor plan arrangement of these buildings is the same as for the 184 Power Houses with the exception that Buildings 184 are 5' wider and 56' longer, housing an additional 100,000# per hour boiler. The Stacks for the 184 and 284 Buildings are of similar design and were built by the Rust Engineering Company with the Stacks for the 284 Building being constructed under subcontract RPG 587¼. The latter Stacks are 9' I.D. at the top and 250' high which is 2' less in diameter at the top and 50' lower than the Stacks for the 184 Building. Coal Handling Conveyor Systems for all buildings are of the same design and capacity with variable length conveyors and variable size Coal Storage Pits. For further details in the construction of Building 284, see "Building Description 184 B, D, & F - Power Houses".

	Dimensions	Volume	Area
Power House (Overall)	73' x 156' x 80'	639,542	21,144
Coal Handling System (284-E - Overall)	71' x 513' x 88'	90,000	5,780
Coal Handling System (284-W - Overall)	71' x 483' x 88'	86,500	6,090
Coal Storage Pit (284-E - Overall)	310' x 350' x 11'	1,138,500	103,500
Coal Storage Pit (284-W - Overall)	2Ɛ0' x 390' x 11'	1,138,500	103,500
Salt Storage Pit (Overall)	18' x 32' x 12'	4,704	416
	Total - 284-E	1,869,246	130,840
	Total - 284-W	1,872,746	131,150

291 EXHAUSTER BUILDING AND STACKS

T, U, & B

Three exhaust systems were constructed, one for each of the 221 Buildings, to provide adequate ventilation for the "canyon" portions of these buildings. Building 291 consists of a stack, three blowers, control house, and an underground inlet and exhaust duct system.

Stack: The stacks are reinforced concrete shells, 200' tall, having an independent acid-proof brick lining 5' inside diameter at the top, and were erected by the Rust Engineering Company on purchase order RPG 173¼. Stack foundations are reinforced concrete, octagon-shaped, 7' thick, and were built having the top of the stack foundations, in all cases, 19' below the deck level of the 221 Building and 187' from the head face of these buildings, with the exception of the 221-T, in which case the stack was located 252' from the head face. The stack foundation is so oriented that the breeching opening is on the axis parallel to the 221 Building, with the opening facing in the head end direction. An access door was provided opposite the breech opening, as well as ladder rungs, lightning protection, and stainless steel breeching. A stainless steel pan was installed in the bottom of the stack and connected to a 4" chemical-ware drain encased in the stack base to carry off condensate or flushing water. The top 50' exterior surface of the stack is painted with an acid-resisting paint. Three 3" 18-8 Cb lines run underground from a point outside Building 221 (opposite Cells 5, 6 and 7) to a pit adjacent to the stack, in which area is located an arrangement of three stainless steel steam-jet syphons which discharge to the stack breeching by special nozzles. This area is partially enclosed by reinforced concrete curtain walls and roof slab to protect the piping in this section.

Exhaust Fans: Three stainless steel fans are mounted on concrete foundations which are adjacent to the inlet and outlet air ducts, with the latter fan being steam-powered and enclosed in the control house. These fans are in line with the stack breeching parallel to the 221 Building. Exhaust gas is removed from the inlet duct by means of metal duct work between the concrete inlet duct and the fan and from the fan to the outlet concrete duct, then it is exhausted to the stack.

Control House: This building houses the third fan furthermost from the stack, steam engine, and controls. The structure is reinforced concrete and concrete block having a 9" curtain wall foundation, 8" thick floor slab, 8" thick concrete block walls, and a 6" thick concrete flat roof slab covered with built-up felt, gravel surfaced roofing. It contains two doors, one double and one single door, and one window. The building is steam heated.

Inlet and Outlet Ducts: The inlet duct consists of an L-shaped underground concrete passageway with the main part 4' wide by 7' high, which runs at right angles to the line of the fans and the 221 Building and directly connects with the center line of Section 3, that is, between Cells 5 and 6 of Building 221. The latter section of the inlet duct parallels the outlet duct and is separated only by a concrete wall. Walls are, in most cases, 12" thick reinforced concrete, having the inside surfaces painted with bitumastic.

	Dimensions		Volume	Area
Control House (Overall)	17'-6" x 18'-10" x 17'-8"		5,830	330
Fan Bases (2)	7'-3" x 10'-8" x 6'-9"		978	145
Stack Base (1)	23'-0" x 23'-0" x 7'-0"		2,580	529
Stack (1) I.D.	11'-10-3/8" I.D. 6'-6"	200' High		
O.D.	13'-10-3/8" O.D. 7'-6"			
Pit Section (1)	13'-10" x 13'-10" x 8'-0"		1,520	190
		Total	10,908 Cu.Ft.	1,089 Sq.Ft.

INLET DUCT

Height		Width			
O.D.	I.D.	O.D.	I.D.	Length	Volume
9'-0"	7'-0"	6'-0"	4'-0"	204'-6"	70,330
9'-0" to 6'-6"	7'-0" to 4'-6"	7'-10"	6'-6"	49'-0"	2,156

OUTLET DUCT

?'-0" to 10'-9"	4'-0" to 8'-9"	5'-0"	3'-0"	47'-0"	1,551

292 EXHAUST GAS LABORATORIES

T, U, & B

Three reinforced concrete and concrete block, one-story buildings were constructed, one adjacent to each 291 Exhauster Building and Stack for the purpose of testing exhaust gases for toxic fumes. These buildings lie approximately 40' from the center line of the exhaust stack in the direction of the 222 Buildings. A two-inch 18-8 Cb overhead sampling line runs from the stack to each building.

The type of construction used was as follows: 9" reinforced concrete curtain wall foundation; 4" reinforced concrete floor; 8" concrete block walls; and 4" reinforced concrete flat roof slab, supported by concrete beams, and covered with built-up felt, gravel surfaced roofing. Each building contains two outside doors, no windows, and two roof ventilators. An overhead wooden catwalk along one side of the building provides access to the upper building equipment.

	Dimensions	Volume	Area
Building (Overall)	16' x 21' x 19'-7"	6,621 Cu.Ft.	336 Sq.Ft.

2701-WA GATE HOUSE BUILDING

One wood frame, one-story, flat-roof, gate house building was constructed adjacent to the access gate serving the 231 enclosure. Building foundations are plain concrete curtain walls 8" thick supporting a 4" floor slab. The structure is covered on the outside with 1" drop siding and is lined and sealed with 3/16" asbestos board. Roofing is built-up felt over 1" T & G sheathing. The building contains seven single frame, double hung windows and one single door.

	Dimensions	Volume	Area
Overall	9'-2" x 10'-6" x 13'-7"	1,304 Cu.Ft.	97 Sq.Ft.

2704 SUPERVISORS' OFFICE BUILDINGS

An identical, one-story, L-shaped, wood frame, gable roof, office building was constructed in each Service Area to house the Supervisors' Offices for the 200 East and West Areas. Building 2704-E lays north of the Area Shop and west of the First Aid Building, and Building 2704-W lays south of the Area Shop and east of the First Aid Building in the respective areas. Each building contains a total of 27 rooms including two Toilet Rooms and a Telephone Exchange Room which houses the telephone switchboard.

Outside building foundation walls are 8" concrete block laid on plain concrete spread footings and intermediate supports are reinforced concrete piers with spread footing covering the center girders and columns. Buildings are floored throughout with 1" T & G end-matched flooring laid 3' above finished grade except the Toilet and Janitor's Closet which is also covered with 1/8" "Jaspe" linoleum. Outside building walls are covered with 1" T & G sheathing and drop siding with building paper insulation between. Exterior walls, room sides of corridors and one side of cross partitions are lined with 3/16" asbestos board except for the walls of the Toilet Room which are lined with 1/4" tempered Presdwood. Buildings are sealed throughout with 3/8" Gypsum board. Roofs are gabled and hipped with a 6 on 12 pitch and are covered with built-up felt roofing over 1" T & G sheathing. Each building contains a 6' L-shaped corridor connecting with four single outside pedestrian doors; and 33 single frame, double hung windows. Wooden louvres are provided in the gable end of each building for attic ventilation. The hot water heater for each building is mounted in the attic over the Toilet Room.

	Dimensions	Volume	Area
Overall	95'-3" 119'-4" x 25'	165,866 Cu.Ft.	6,518 Sq.Ft.

CHANGE HOUSES

2707 EA, WA & 3707 B

Three identical, one-story, wood frame, Change House Buildings were constructed adjacent to the Power House in the 200-E, 200-W, and 300 Areas to serve the personnel working in the power areas. Each building contains five rooms; namely, Locker Room having a capacity of 22 individual lockers, Lunch Room, Toilet Room with lavatory, Heater Room and Vestibule.

Building foundations are comprised of 8" concrete block walls laid on plain concrete spread footings. Floor slabs are 4" plain concrete haunched under partitions. The outside of the building is covered with 1" T & G sheathing and 1" drop siding with building paper insulation between. The inside of all rooms, except the Heater Room, is lined with 3/16" asbestos wall board. Roofs are sloped one way and are covered with built-up felt, gravel surfaced roofing over 1" T & G sheathing, and contain one 12" and one 18" A.C.M. roof ventilators. Each structure contains one outside pedestrian door and nine single frame, double hung windows.

	Dimensions	Volume	Area
Overall Building	16' x 43'-10" x 15'	10,515 Cu.Ft.	701 Sq.Ft.

2707 CHANGE HOUSES

Two identical, wood frame, one-story Change House Buildings were constructed in the 200 East and 200 West Areas adjacent to the 272 Area Shop in order to serve the personnel working in the Service Areas. These buildings are rectangular in shape with a lean-to Heater Room attached to the side of the building opposite the Shower Room, and have an outside vestibule at each of the three pedestrian doorways. Each building contains a total of six rooms; namely, Locker Room having a capacity of 209 individual lockers, Lunch Room, Wash Room, Shower Room, Toilet Room and Heater Room.

Building foundations are comprised of 8" concrete block walls laid on plain concrete spread footings. Floors are 4" plain concrete haunched under partitions with the exception of the Heater Room which has a cinder floor. The outside of each building is covered with 1" T & G sheathing and 1" drop siding with building paper insulation between. The inside of the exterior walls of the Locker Room are lined with 1/4" presdwood to the ceiling. All walls of the Lunch Room are lined with the same 8' high, having a drop ceiling of 3/8" Gypsum board. Wash Rooms and Toilet Rooms are lined with 1/4" tempered presdwood to the ceiling. The Shower Room walls are lined with 1/4" asbestos board. Roofs are sloped one way and covered with built-up felt, gravel surfaced roofing over 1" T & G sheathing and are provided with two 18" and three 24" square wood frame roof ventilators. Each building contains three outside pedestrian doors; a double outside door to the Heater Room; sixteen single frame, double hung windows; one double frame pivot window; and two double frame, double hung windows.

	Dimensions	Volume	Area
Overall	37'-6" x 88'-2" x 15'-10"	38,810 Cu.Ft.	2,551 Sq.Ft.

ESSENTIAL MATERIAL STOREHOUSES

1713 BA, DA, FA, & 2713 EA, WA

The one-story, wood frame, shed roof Division Warehouses built in the 100-B, D, F and 200-E and W TC Areas formerly used for construction purposes were taken over by Operations at the close of construction and assigned permanent building numbers - 1713-BA, DA, FA and 2713-EA, WA. Buildings 1713-BA and 1713-DA are both oriented east and west, north and west of Buildings 184 and 188; Building 1713-FA is oriented east and west, south of Building 190-F; Building 2713-EA is oriented east and west at the southwest corner of "D" and 5th Streets, and Building 2713-WA is oriented north and south on 3rd Street between "C" and "D" Avenues. A railroad spur runs along one side of each building and wooden unloading platforms 4' high have been provided along each side of the warehouses to facilitate the movement of material and equipment to and from railroad cars and trucks. Inclined ramps extend inside the warehouses as the floor level of these buildings is set on natural grade.

Each building is sixteen bays long, five bays wide, set on 16' centers and is divided as follows: Bays 1 and 2 Tool Room; Bays 3, 4, 5 and 6 Miscellaneous Storage, including a Cash Sales Office; Bays 7, 8, and 9 Receiving Portion, including four Offices; Bays 10, 11, 12 and 13 Equipment Storage.

The type of construction used for these buildings is as follows: Post and girder construction with column posts set on wood mats; 2" plank floor laid on 2 x 6 sleepers; 4' on centers; outside building walls covered with 1/2" exterior Gypsum board except for Building 2713-WA which has 1" T & G sheathing covered with roll roofing; shed roof sloped two ways and covered with roll roofing over 1" T & G sheathing; inside partitions are 1" T & G sheathing. Each building is provided with one single outside pedestrian door, five 7' x 8' sliding doors, and 33 single frame, double hung windows.

	Dimensions	Volume	Area
Overall	92' x 208' x 16'	228,616 Cu.Ft.	19,714 Sq.Ft.

2713-WB MISCELLANEOUS STOREHOUSE

The "Butler" sheet metal, igloo-type hut erected in the 200-W TC Area and formerly used for the storage of process equipment was taken over by Operations at the close of Construction and assigned permanent building number 2713-WB.

Building 2713-WB is oriented east and west on "C" Avenue between 3rd and 4th Streets. This building is semi-cylindrical having a 2" plank floor laid on 4" x 4" sleepers, 6" channel bow-truss framing covered with No. 12 gauge corrugated sheet iron. Each end contains a double-hinged vehicle door and two six-light barn sash windows.

	Dimensions	Volume	Area
Overall	41' x 150' x 20'-6"	99,000 Cu.Ft.	6,350 Sq.Ft.

2716 AUTOMOTIVE REPAIR GARAGES

The wood frame, one-story, gable roof Transportation Repair Shops built in the 200 East and 200 West TC Areas for construction purposes were taken over by Operations at the close of Construction and assigned permanent building numbers - 2716-E and 2716-W. Building 2716-E is oriented north and south at the southwest corner of "C" and 7th Streets. Building 2716-W is oriented north and south at the northwest corner of "C" and 6th Street. Adjacent to each building are located two electrically driven gasoline pumps and two underground fuel oil storage tanks.

These buildings are of the following construction: 6" plain concrete floor slab foundation haunched around the perimeter and under intermediate column supports; post and girder construction; outside walls covered with 1/2" exterior Gypsum board; inside partitions and ceilings for office, Spare Parts Storage and Tire Storage Rooms, 1" T & G sheathing; gabled roof 4 on 12 pitch-covered with rolled roofing over 1" T & G sheathing.

Each building contains 6 bays, 5 of which are provided with 12' x 12' double-swing, hinged doors. Bay No. 1 contains a 3' x 32' x 5' deep concrete grease pit. Bay No. 2 is equipped for tire repair. Bay No. 3 is divided into 3 rooms; an Office, Small Parts Storage Room, and Tire Storage Room. Bays No. 4, 5 and 6 are for Automotive Repair. A concrete apron 6' wide extends along the front side of each building. In addition to the vehicle doors, each building is provided with two single outside pedestrian doors and 15 single frame, double hung windows.

	Dimensions	Volume	Area
Overall	46' x 90' x 24'-6"	72,800 Cu.Ft.	3,600 Sq.Ft.

2723-W LAUNDRY

In the 200-W Service Area, southwest of the 272-W Area Shop, is located a one-story, wood frame, gabled roof building. This building houses Laundry and Shoe Repair Equipment serving both the 100 and 200 Areas, and contains a total of 12 rooms; namely, Wash Room, Pressing Room, Laundry Storage and Receiving Room, Sorting Room, two Testing Rooms, Glove Washing Room, Shoe Repair Room, Store Room, Office, Toilet, Shower and Locker Room, and Rest Room. The Locker Room has a capacity of 20 individual lockers.

The type of construction used for this building is as follows: 8" plain concrete curtain walls and concrete piers with spread footings for intermediate column supports; 4" concrete floor slab throughout, outside walls 1" T & G sheathing and drop siding with building paper insulation between; gable roof 6 on 12 pitch covered with built-up felt roofing over 1" T & G sheathing. The inside face of all exterior walls, all partitions, low partitions and ceilings over the Office, Testing Rooms, Glove Washing Room, Women's Toilet-Locker Room and Rest Room are lined and sealed with 3/16" asbestos board. Low partitions are used between the Wash Room, Pressing Room, and Sorting Room, Across the west end of the building is a 4' point roof extension 8'-4" above the high point of the floor protecting the Receiving and Delivery Room doors. A hot water heater is suspended in the attic above the Testing Room and Office. Three 24" A.C.M. motor-driven ventilators are provided in the ridge for ventilation. This building contains: four single outside pedestrian doors, one sliding outside door, and 24 single frame, double hung windows.

	Dimensions	Volume	Area
Overall	40'-2" x 110'-8" x 23'-3"	78,183 Cu.Ft.	4,283 Sq.Ft.

2730 SLAB YARD

In the 200 West Area between Building 221-W and 241-U are located six reinforced concrete paved aprons, 8" thick, 20' wide, and varying from 540' to 645' in length. These were formerly used by construction for the fabrication of concrete cell cover blocks. The concrete was poured in 15' sections with mastic joints between sections and these strips were separated by three parallel standard gauge railroad tracks serving these areas. There are also two open end, wood frame, gable roof buildings over the passing tracks east of the slab area and two concrete pits adjacent to these buildings which were used by construction for painting cell cover blocks.

The paint spray buildings have 8" concrete block foundation walls and contain a concrete paved pit section 4' below the top of the rail. These buildings are covered overall with 1" T & G sheathing and roll roofing. The outside pits are reinforced concrete throughout with structural steel framework supporting the rail over the pit sections. The above facilities were taken over by Operations at the close of Construction and are to be used for the storage of salvage material and equipment in the 200 West Area.

			Dimensions	Volume	Area
Overall			300' x 1,200'		
Labs - (6)		(2)	20' x 540' x 8"	14,400	21,600
		(2)	20' x 600' x 8"	16,000	24,000
		(2)	20' x 645' x 8"	17,200	25,800
Paint Building	(2)		62' x 16' x 18'	35,712	1,680
Pits	(2)		82' x 12' x 4'	7,872	1,640
			Total	91,184 Cu.Ft.	74,720 Sq.Ft.

2731 BURNING PIT

An open pit approximately 90' x 90' x 10' deep having 1 on 1 side slopes and a 10' wide ramped access road was dug and formerly used by construction for burning scrap lumber and waste materials. This pit is located at the southwest corner of the intersection of Third and "B" Streets in the 200-W Area.

It was originally constructed on Cost Code TC-35, and was taken over by Operations at the close of Construction for similar usage. It has been assigned permanent building number 2731.

	Dimensions	Volume	Area
Overall	90' x 90' x 10'	837,000 Cu.Ft.	8,100 Sq.Ft.

252 SECONDARY SUBSTATION

Two frame, partially open Secondary Substations with attached concrete and concrete block switch houses were constructed. One provides the 200 East Area and the other the 200 West Area with 2300 volt power. Both are located in respective Power Areas as follows: 252-E is north of the 283-E Filter Plant, and 252-W is east of the 283-W Filter Plant.

Fenced Area: The outside area is enclosed by a 7' picket fence and contains a six-pole, wood frame, bus structure over the two main 13.8/2.3 KV transformers supported by separate 4' x 7' x 3' concrete pads. This structure also supports two small, low-voltage transformers providing 240/120 V power for the transformer fans.

Switch House: This building houses 2300 V switchgear and test rack equipment. The walls are supported by a 1' thick concrete floor slab haunched around the perimeter for additional strength. Walls are concrete block 8" thick. Roof consists of pre-cast concrete tile, supported by steel roof framing, and covered with built-up felt, gravel surfaced roofing. A 24" A.C.M. roof ventilator provides ventilation. This building has one single and one double door, but no windows.

	Dimensions	Volume	Area
Overall	27'-4" x 34'-0" x 35'-7"	24,600 Cu.Ft.	930 Sq.Ft.

253 & 653 DISTRIBUTING SUBSTATIONS

A total of 40 Distributing Substations have been provided in the 200 and 600 Areas - thirteen in 200-E, twenty-one in 200-W, four in 200-N, one at Riverland Yards, and one in the vicinity of the Meteorological Tower. These Substations are of similar design and construction differing only in the number and size of transformers in each bank. The 253 Substations all have primary voltages of 2.4 KV with secondary voltages ranging from 120 V to 140 V for lighting and 240 V to 280 V for heating and power. All lighting transformers are single phase and most of the power transformers are likewise single phase except the transformer installations at the 221, 622, and the 6707, which are three phase.

These Substations are of open frame construction using wooden pole structures surrounded by picket fences. Two types of installations were used: ground installation with transformers resting on a concrete pad, and elevated installations with the transformers resting on an elevated wooden platform suspended between two poles. Installations of the latter type were made at the 213, 241, 291, and 622 Buildings.

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APPENDIX C

PHYSICAL DESCRIPTION OF 300 AREA FACILITIES

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305 PILE BUILDING

This building is located in the northwest corner of the 300 Area, and consists principally of a large oblong, steel-framed, concrete block, gable-roofed structure. The main axis of the building is on an east-west line. At the west end of the main structure are two small storage rooms spanning the width of the building, with a fan room above. Along the south side of the building at the west end are an Instrument Room, Supervisors' Office, Locker and Toilet Room, General Storage Room, and an Apparatus Room.

The building is steel-framed throughout; walls are of 8" concrete block construction on the outside and 4" between rooms. The roof consists of two-ply, 44#, and one-ply 15# felt applied with hot asphalt on a pre-cast tile deck. The air entering the building is washed and circulated, and a pressure of approximately 1" of water is maintained. The Instrument Room itself is air-conditioned and the air-conditioning equipment is contained in the General Storage Room. There are five 36" ventilators on the roof of the main structure, one 30" ventilator on the roof of the Equipment Room, and two 30" ventilators on the roofs of the Storage Rooms. There are no outside windows in the building and all outside doors except two pedestrian doors are 8' square, metal-sheathed sliding doors. Floors of the building are of 8" reinforced concrete throughout, set on concrete wall foundations and concrete piers with spread footings.

The Instrument Room has a 4" concrete floor on 1" Celotex. It has a suspended ceiling on 1" Acoustic Tile, 1" Celotex and 2" blanket-type insulation. Walls consist of 1" Acoustic Tile inside of 1" Celotex on 8" concrete blocks. The wall facing the main structure contains seven windows, each 4½' wide by 7' in height.

The main structure of the building is unobstructed and is 120' long by 55' wide by approximately 38½' high. Half-way between the east and west ends of the main structure, and 8' from the south side is a concrete-enclosed barricade or Pile, 28'-3" long by 28'-2" wide by 24'-6" above the floor level. On the west side of the Pile is a charging machine consisting of a roller conveyor 31'-10" long by 2'-3" wide. Running on this conveyor is a chain-drive electric-powered pusher. On the east side of the Pile, is a receiving machine identical in design to the charging machine, except that there is no pusher. Along the north side of the Pile, and paralleling both the charging and receiving machines, are two roller conveyors. Each conveyor is 86'-3" long by 1'-9" wide. Above the charging machine is a 4,000# capacity, electric lift hoist. A second identical hoist is located above the receiving machine.

The Pile itself consists of fifty-one layers of graphite block fully enclosed by concrete approximately 5' in thickness. The graphite section is approximately an 18' cube. On the top, charging face, and south side, the Pile consists principally of a number of staggered concrete blocks which can be removed if necessary. The enclosure is completed by poured concrete. Through the graphite portion of the Pile, from the charging to the discharge face, are 519 circular holes. In addition, there are 20 rectangular holes extending through the graphite and concrete from the charging face to the discharge face.

Above the Pile is one solid vertical metal safety rod which can be dropped through a hole into the Pile. In addition, there is a second, cable-operated, metal safety rod on the top of the Pile for lowering small metal pallets or shot down another hole in the Pile. On the south side of the Pile, are three electrically-operated, solid metal horizontal control rods which enter the Pile through holes in the side. These rods are approximately 32' in length.

This building is approximately 163' long by 87' wide x 51' in height. It has an area of 7,000 square feet, and a displacement volume of 247,000 cubic feet.

313 METAL FABRICATION BUILDING

One Metal Fabrication Building has been provided for the 300 Area. This one-story, thick-set, T-shaped structure is located in the center of the area approximately 100 feet east of the 314 Building. In the central portion, the building contains space for numerous electric furnaces and metal presses, canning process #1, canning process #2, recovery process, a welding area, a car washing area, a can washing area, two offices, and a toilet. The protruding western portion of the building contains a control room, a tool room and shop, a storeroom, women's rest room and toilet. The protruding eastern portion of the building houses canning process #3.

This structure consists of a 4" reinforced concrete slab floor supported on reinforced concrete foundation, structural steel framing, concrete block walls and a pre-cast concrete slab roof with tar and gravel surface. The interior partitions are of concrete block and concrete brick.

The overall dimensions of this building are 199½' x 182½' x 20'. The cross-sectional area is 33,020 square feet, and the displacement volume is 609,700 cubic feet.

314 PRESS BUILDING

One Press Building has been provided for the 300 Area. This one-story, gable roof building is located in the center of the area approximately 150' east of the 313 Building. This building is rectangular is shape with the long axis running east and west. A wing is located along the north side of the building at the east end. The structure has a reinforced concrete floor supported on reinforced concrete foundation walls and piers, structural steel framework, concrete block walls and corrugated asbestos roof. A 36" continuous roof ventilator with operable dampers extends along the gable roof for almost the entire length of the building.

Located within the main portion of the building are the major pieces of equipment, such as the 1,000 ton extrusion press, electric furnaces, straightening machine, etc. A 7½-ton traveling crane runs the entire length of the building on elevated rails extending along either side wall of the building 16' above floor level. At the east end of the building is located an autoclave platform and crane repair platform. Four unit heaters with air-intake openings are located, one at either end and two along the south side of the structure. A Control Room, Office, Toilet, and the pumping units for the 1,000-ton extrusion press are located in the small wing. The walls of the office and toilet are of concrete block, while the ceilings are of concrete. The walls of the control room are 7' high frame partitions of 3/16" asbestos board, one side only. No ceiling is provided. Outside the north side of the building just west of the wing is located a concrete and steel platform 12' wide by 18' long, while along the north wall of the building are located numerous gas cylinders. Fume exhaust ducts are located on either side of the structure.

The overall dimensions of this building are 199½ x 90½ x 40', and the cross-sectional area is 14,842 square feet. The displacement volume is 475,650 cubic feet.

321 SEPARATION BUILDING

One Separation Building was constructed in the south portion of the 300 Area approximately 100 feet south of the 3706 Building. It is a two-story partially below grade, reinforced concrete frame, windowless structure, with concrete and concrete block exterior and interior walls. The building contains 14 rooms, not including stairwells and closets. The building foundations are composed of reinforced concrete walls with spread footings and support reinforced concrete slab floors varying from 4" to 12" in thickness.

The south half of the structure is one-story high, having outside walls of concrete 1' in thickness. This section of the building contains a 12' below ground level cell area which extends the entire width of the building and contains numerous tanks or cells. A Mezzanine floor runs along the south wall of this building on which are mounted gauge boards and weight tanks. The 38' span roof over this portion of the building is of reinforced concrete diminishing in thickness from 1' 8" at the walls to 10" at the center and has a tar and gravel surface. A 3-ton rail crane with 35' span runs the length of this area just below the roof above the numerous cell units.

The north half of the structure contains on the below ground level floor, a large chemical storage room in the northwest half, a process air conditioning, heating, and ventilating equipment room in the northeast half, with #1 sample room in the northeast corner. At this level a pipe gallery runs the entire width of the building between the cell area on the south and the equipment and chemical storage area on the north. A large chemical preparation room is located on the second floor above the chemical storage room. This area also contains on this floor, an office, large locker room with toilet, cleaning room, receiving room, lunch room, laboratory, and sample room #2.

Along the center of the building above the pipe gallery is located the control gallery. Above the north half of the building is a 6" reinforced concrete slab roof with tar and gravel surface. Numerous 16" and 20" roof ventilators are located in the roof. A large reinforced concrete platform runs along the west portion of the north wall and a smaller reinforced concrete platform is located at the southeast corner of the building.

Four large underground steel tanks encased with two-ply membrane waterproofing and completely enclosed in poured concrete are located 120 feet south of this building. The tops of these tanks are 3½ feet below grade. Numerous 4" diameter piping outlets protrude above the surface of the ground. Stainless Steel piping, buried at least 2 feet below grade, slopes down from the 321 cell area to these tanks. An area 96 feet square above the tanks is enclosed by an 8 foot metal link fence.

The overall dimensions of this building are 122' x 87½' x 33'. The cross-sectional area is 10,675 square feet, and the displacement volume is 323,300 cubic feet.

3706 LABORATORY

3706-A AIR CONDITIONING EQUIPMENT BUILDING

One Laboratory and its adjacent Air Conditioning Equipment Building have been provided for the 300 Area. The Laboratory is a large, one-story building roughly rectangular in shape with a center court at one end and an open court at the other end. It is located in the south-central portion of the area just south of the main gate road, with its long axis running east and west. The Air Conditioning Equipment Building is located just a few feet south of and parallel to the Laboratory Building.

Laboratory - This building has a concrete floor with mastic tile covering supported by concrete foundation walls. Exterior walls are of drop siding over 1" T & G sheathing except for the southeast portion of the building where the walls are of concrete blocks. The gable roof which is supported by wooden rafters and 1" T & G sheathing is a built-up roof of asphalt felt. The inner side of the exterior walls and both sides of partitions are of asbestos board, while ceilings are of 3/8" gypsum board. Two fire walls of brick are located near the center of the structure and divide the building roughly in half.

The building contains 90 rooms with central corridors. There are 57 Laboratories, 19 Offices, 4 Toilets, 2 Rest Rooms, 2 Storerooms, 2 Shops, Lunch Room, Locker Room, Dark Room, and Ventilating Equipment Room. Along the south side of the structure, near the center, is located a large Laboratory of concrete. It has a concrete floor covered with linoleum and concrete walls and roof 2' in thickness. Walls of this Laboratory are lined with acoustic tile insulation and the roof is covered with a tar and gravel surface. Two offset concrete entrances provide access to this Laboratory, one opening to the outside and one opening to the central corridor within. The Laboratory Building has seven ventilating systems which provide air conditioning, ventilation and Laboratory exhaust facilities for the numerous rooms and laboratories. Dormers are provided in the gable roof for ventilating louvres.

Air Conditioning Equipment Building - The Air Conditioning Equipment Building which is in the shape of a thick-set "L" contains the air conditioning equipment in the west portion of the building and a small electrical room at the east end.

This building has a 4" concrete slab floor not reinforced which is supported by concrete foundation walls. Exterior walls and the one partition are of concrete block, while the flat roof supported by wooden rafters and 2" T & G planking is a built-up roof with tar and gravel surface. Two large wooden louvres are located in the section housing the air conditioning equipment unit.

Dimensions - The overall dimensions of the Laboratory Building are 327½' x 140'x 22', the cross-sectional area is 30,100 square feet, and the displacement volume is 511,700 cubic feet. The overall dimensions of the Air Conditioning Equipment Building are 75½' x 24½' x 22', the cross-sectional area is 1,500 square feet, and the displacement volume is 27,000 cubic feet.

301 STORAGE AND FABRICATION BUILDING

One Storage and Fabrication Building has been provided for the 300 Area. This one-story, one-room frame building is located in the northwest corner of the area facing a north-south roadway and is situated about equi-distance between the 305 Building to the north and the 314 Building to the south.

It has a 5" reinforced concrete floor supported by reinforced concrete walls, piers and well-tamped earth. The walls are of drop-siding and the roof supported by wooden rafters is of 1" T & G sheathing covered with built-up roofing with tar and gravel surface. Two double swing doorways are located along the east side of the building opening to the roadway.

The overall dimensions of this building are 40½' x 30½' x 17½', the cross-sectional area is 1,235 square feet, and the displacement volume is 21,612 cubic feet.

FRESH METAL STORAGE

303-A, B, C, D, E, F, G, and K

Eight Fresh Metal Storage Buildings identical in size, shape, and design have been provided in the 300 Area. A ninth Fresh Metal Storage Building has also been provided, but this building is different in size, shape, and design and will be described later.

These one-story, one-room, rectangular-shaped buildings are located in the central portion of the 300 Area, near the 313 Building, on either side of a road running in an east-west direction across the area. The long axes of these buildings run in a north-south direction with Buildings 303-A, B, C, D, and E, facing to the north and Buildings G, F, and K, facing to the south.

This structure consists of a 5" reinforced concrete slab floor, 6 inches above grade, supported by well-tamped earth and reinforced concrete foundation walls. The walls are of concrete block to a height of 7½' above floor level. The upper portion of the walls and the roof are of reinforced concrete. The roof which is supported by two 14" x 30" reinforced concrete beams is covered with a tar and gravel surface. At the front of the building are two metal-covered doors that open on a concrete ramp that slopes slightly down to the roadway. At the rear of the building is one metal-covered door. Metal vent bricks are located at either end of the structure to provide ventilation.

The overall dimensions of this building are 48' x 27' x 13½', the cross-sectional area is 1,296 square feet, and the displacement volume is 17,500 cubic feet.

303-J FRESH METAL STORAGE

One frame, gable roof, Fresh Metal Storage Building has been provided for the 300 Area. Eight other Fresh Metal Storage Buildings of reinforced concrete and concrete block construction have also been provided, but have been previously described.

This one-story, one-room building, is located midway in the area near the east fence, with its long axis running north and south, and the east side of the structure facing a north-south roadway.

This building has a 5" reinforced concrete floor slab, 6" above grade, supported by well-tamped earth, and reinforced concrete foundation walls with spread footings. The walls are of drop siding over building paper and 1" T & G sheathing, while the gable roof supported by wooden trusses has a smooth built-up felt surface. Two wooden vents are located in the roof. Along the front side of the building are two sliding wooden doors with gravel ramps running down to the roadway. At the rear of the building are two small doors.

The overall dimensions of this building are 64' x 41½' x 27'; the cross-sectional area is 2,656 square feet, and the displacement volume is 55,776 cubic feet.

216 & 316 PROCESS WASTE DISPOSAL TRENCHES

Two identical, open trench, fence enclosed, process waste burial grounds were constructed, one each in the 200 East and 300 Areas. Unit 216 in the 200 East Area is located on the south side of "E" Street approximately 2600 feet east of the Power House. Unit 316 is located at the northeast inside corner of the 300 Area.

Each burial ground is enclosed by Type #1 fencing, 150' x 250' having a 20' vehicle gate at both ends and contains a 16' V-bottom ditch 8' deep and 200' long. Ditches were dug parallel to the 20' area service road with space provided along the other side for a similar size future trench.

Fifteen feet from each end of the trench is located a concrete bench mark containing a stainless steel plate stamped "DANGER - Do not dig between markers".

	Dimensions	Volume	Area
Overall	150' x 250'	--	37,500 Sq.Ft.

363 TRANSFER PLATFORM

One Transfer Platform has been provided for the 300 Area and is located near the center of the area on a side and between the Fresh Metal Storage Buildings, 303-C and 303-D.

This structure consists only of a 6 ft. deep reinforced concrete wall with wing walls. The top of the wall is flush with the roadway on the north side. On the south side, the road has been cut away to a depth of 3'-9". A wooden fence consisting of two vertical posts and horizontal removable rail protects the platform.

The overall dimensions of this structure are 23' x 8' x 6', the cross-sectional area is 84 square feet, and the displacement volume is 504 cubic feet. The structure contains 4.5 cubic yards of concrete.

382 RESERVOIR AND PUMP HOUSE

One Reservoir and Pump House has been provided for the 300 Area and is located near the center of the area just across the road and south of the 384 Heating Plant. The long axis of the Pump House runs in a north-south direction. This building consists of a one-story concrete and concrete block pump house and a large pre-stressed, reinforced concrete tank with a dome-shaped roof.

Pump House: This one-story, two-room building has a 4" reinforced concrete slab floor supported by concrete foundation walls, concrete block walls and flat 5½" reinforced concrete slab roof covered with tar and gravel surface. The major portion of the building consists of the pump room, which includes a 1000 GPM fire pump driven by a 100 HP electric motor and an Allis-Chalmers gasoline engine and a 75 KW Diesel-driven generator. These two units located along the center portion of the room are supported on 3½' thick reinforced concrete foundations. At the south end of the building is the chlorinating room which houses the chlorinating equipment. Two doors are located along the west side of the building and one door is located on the east side. Two 18" roof ventilators are provided for the pump room and one 12" roof ventilator is provided for the chlorination room.

Reservoir: The Reservoir consists of a large pre-stressed concrete circular tank whose 4" thick base is located 2' below grade. The roof of the tank which is 2" in thickness is also of pre-stressed concrete and has a curvature with a 52' radius. The side of the reservoir is 6" in thickness, while the thickness of the perimeter at base and roof level increases abruptly to more than 1' to provide additional strength. A hatch is located in the roof to provide access. The normal water level maintained in the tank is 14' above the bottom and approximately 6' below the top of the dome.

The overall dimensions of the pump house are 51' x 13½' x 14', the cross-section area is 688 square feet, and the displacement volume is 9,650 cubic feet. The overall dimensions of the reservoir are 49½' diameter by 22' in height, the cross-sectional area is 1920 square feet, and the displacement volume is 35,000 cubic feet. The reservoir is capable of holding 200,000 gallons.

384 HEATING PLANT

One structural steel-framed, reinforced concrete and concrete block heating plant is provided for the 300 Area. This rectangular-shaped building is located near the center of the area north of the main gate road approximately 250' northeast of the 3706 Building. The foundation is of reinforced concrete extending some 4' to 5' below ground level and supports a 6" reinforced concrete floor. The walls are concrete block and the roof which is composed of pre-cast concrete slabs covered with tar and gravel is supported by structural steel framing. At the west end of the structure a room has been added of similar construction for housing water softening equipment. Just west of this addition is located an outside wooden tank which contains the treated water for use in the boilers. At the same end of the building is located a 150' high brick stack with base diameter of 15' and top diameter of approximately 7'. This stack is supported on an octangular-shaped, reinforced concrete base.

Within the building proper are located two 300 HP cross-drum boilers with horizontal stationary grates. Space has been provided for a third boiler if required. Large double-swing doors are located opposite each boiler, and in the east end of the building, so that coal may be hauled in two-wheel buggies, capable of carrying 750# to 1000#, to the boilers within. Coal is piled between the east end of the Heating Plant and the adjacent railroad siding. Along the front of the boilers is a monorail with hoist which raises these buggies to the dual coal stoking unit above each boiler. The fire box is divided into two sections so that one section may be burned out and the ashes pulled and dumped into waiting wheelbarrows beneath, while the other section continues to provide heat. A steel breeching located above the roof runs from the two boilers to the brick stack at the end of the building. A concrete platform with grating walkways surrounds the boilers at 16' elevation above floor level and supports a deaerator and flash tank at the west end of the building. Beneath this platform on the ground floor are located various service and boiler feed pumps.

The overall dimensions of this building are 104½' x 41½' x 32½'. The cross-sectional area is 3,796 square feet, and the displacement volume is 116,120 cubic feet.

3707-A CHANGE HOUSE AND PATROL HEADQUARTERS

One Change House and Patrol Headquarters has been provided for the 300 Area. This long rectangular, one-story building is located in the western half of the area just north of the main gate road across the street from the 3706 Building.

The building contains at the west end, a Patrolmen's Office, Locker Room, and Storage Room. The central portion of the building contains a large General Locker Room, Shower Room, Toilet and Wash Room, while in the east end of the building is located a Lunch Room. Along the south side of the building is a small projecting room for the hot water heater.

This building has a 4" reinforced concrete slab floor supported by concrete block foundation walls with spread footings. Exterior walls are of drop siding over 1" sheathing and the interior linings are a combination of presdwood, asbestos board and gypsum board. The rooms are not sealed. The flat roof supported by wooden rafters and T & G sheathing is a built-up roof with tar and gravel surface. Several wooden ventilators are located on the roof.

The overall dimensions of this building are 121' x 38' x 15½', the cross-sectional area is 3,750 square feet, and the displacement volume is 57,300 cubic feet.

3713 RECEIVING STOREROOM

One Receiving Storeroom Building has been provided for the 300 Area. This one-story, rectangular-shaped, wooden frame building is located in the western portion of the area just south of the 314 Building. The long axis runs in a north-south direction and the building faces a north-south roadway that parallels the west fence line. This building is divided into three equal parts - one for salvage, one for spare machinery, and the third part for miscellaneous stores. In the northwest corner of the stores section is a small office.

This building has a 4" reinforced concrete slab floor supported by concrete block foundation walls with concrete spread footings. The walls are of drop siding over 1" T & G sheathing, while the flat roof supported by wooden beams and interior wooden posts is a built-up roof with tar and gravel surface. The interior partitions are lined one side with presdwood. Three double-swing, wooden doors are located along the west side of the building and wooden roof ventilators are located above the spare machinery and salvage material storage areas.

The overall dimensions of this building are 120' x 40' x 17'. The cross-sectional area is 4,800 square feet, and the displacement volume is 76,800 cubic feet.

3717 INSTRUMENT SHOP

One Instrument Shop has been provided for the 300 Area. This building is located in the central portion of the area just north of the main gate road and approximately 100 feet north of the 3706 Building. The long axis of this one-story, gable roof building runs in an east-west direction. The end of the building on the east side contains a large area which includes a general repair and test shop, and a valve repair assembly and test shop. Three offices and a storeroom are located along the south side of the building and an assembly test room and two toilets are situated along the north side of the building. A corridor runs from the west end of the building to the general repair and test shop area at the east end.

This wooden frame structure has a 4" reinforced concrete slab floor, with 6" concrete curbing, supported by concrete foundation walls. The exterior walls are of drop siding over 1" T & G sheathing and the gable roof supported by wooden trusses and 1" T & G sheathing is a built-up roof with felt surface. Interior partitions are lined one side with presdwood, while the rooms with the exception of the shop area at the east end are sealed with gypsum board. One Plenum Chamber is located beneath the gable at either end of the structure.

A 2-ton monorail and hoist runs along the center axis of the building from the general repair and test shop area to the east end of the structure. A large, double-swing door is located at either end of the building.

The overall dimensions of this building are 105' x 41½' x 29'. The cross-sectional area is 4,360 square feet, and the displacement volume is 105,000 cubic feet.

3722 AREA SHOP

Two Area Shops have been provided for the 300 Area. Area Shop #3722-A is of temporary construction design and was formerly the Receiving Warehouse and is located at the northeast corner of the area along the railroad spur.... Area Shop #3722 is located in the central portion of the area approximately 100 feet south of Building 314.

This one-story, wooden frame, gable roof structure, with long axis running in a north-south direction, contains at the north end a rigging and portable equipment storage area; in the center, a general storage space, tool room, and a general shop area; in the southeast corner, a woodworking shop; and in the southwest corner, an office and toilet.

This structure has a 4" reinforced concrete slab floor supported by concrete foundation walls and well-tamped earth. The walls are of drop siding over 7/8" T & G sheathing and the gable roof supported by wooden trusses is a built-up roof with felt surface. The interior partitions and ceilings are presdwood and asbestos board. Several double-swing, wooden doors located on either side and on the south end provide access to the building. A 2-ton monorail and hoist runs from the center of the general shop area to the south end of the building. Four 24" metal ventilators are located on the roof.

The overall dimensions of this building are 120' x 41½' x 29'. The cross-sectional area is 4,980 square feet, and the displacement volume is 117,000 cubic feet.

3726 PROPANE STORAGE BUILDING

One Propane Storage Building has been provided for the 300 Area and is located in the center of the area approximately 50 feet northeast of Building 3717. This wooden frame, open side, gable roof structure is supported by six wooden posts resting on concrete piers. The roof is three-ply roll roofing over 1" T & G sheathing. Drop siding extends down from the roof to a point 7 feet above ground level.

A 2,600 gallon capacity metal tank supported by two concrete piers with spread footings is located in the center of the structure for propane gas storage.

The overall dimensions of this building are 30' x 13½' x 14½'; the cross-sectional area is 405 square feet, and the displacement volume is 5,260 cubic feet.

3734-A CYLINDER STORAGE WAREHOUSE

One Cylinder Storage Warehouse of the following size and shape has been provided for the 300 Area. A second Cylinder Storage Warehouse #3734, smaller in size but identical to Cylinder Storage Warehouses in the 100 and 200 Areas, has also been provided and is described in the 100-Area section.

Cylinder Storage Warehouse #3734-A is located in the western part of the area directly west of the 3713 Building. This one-room, one-story, rectangular building with its long axis running east and west, has a concrete loading platform at the west end. The building has a 4" reinforced concrete slab floor 3'-4" above grade which is supported by concrete foundation walls with spread footings and a well-tamped gravel fill. The walls, open at both top and bottom, are of vertical 7/8" T & G siding. The flat roof supported by wooden posts, wooden rafters and 1" T & G sheathing is a built-up roof with felt surface. This roof projects 1½' beyond the sides of the structure. A wooden door is located at either end of the building. Within the structure are numerous horizontal rails 3'-3" above floor level, containing grab hook pins.

The overall dimensions of this building are 30' x 26' x 14', the cross-sectional area is 780 square feet, and the displacement volume is 10,920 cubic feet.

3741 BOX STORAGE BUILDING

One Box Storage Building has been provided for the 300 Area and is located near the east fence approximately 200 feet due east of the boiler plant. The long axis of this one-story, one-room, wooden frame, flat roof building runs in a north-south direction.

This building has a 4" reinforced concrete slab floor supported by concrete foundation walls with spread footings and well-tamped earth. Exterior walls are of drop siding over 1" T & G sheathing and the built-up roof is supported by 1" T & G sheathing and wooden rafters and has a tar and gravel surface. One 8' sliding, wooden door is located on the east side of the building and one wooden roof ventilator has been provided.

The overall dimensions of this building are 30' x 14' x 16½', the cross-sectional area is 430 square feet, and the displacement volume is 7,095 cubic feet.

3745 STANDARDS BUILDING

One Standards Building has been provided for the 300 Area and is located in the southwestern corner of the area approximately 100 feet south of the 3706 Building. The long axis of this building runs in a north-south direction. This two-story, wooden frame, multiple gable roof, roughly rectangular building contains in the north half, two Laboratories and Central Room with stairway on the first floor and one Laboratory extending the entire width of the building on the second floor. In the center of the structure is located a large Calibration Room with surrounding wooden frame balcony at 13 feet above floor level. A passageway along the west wall connects the Calibration Room with the Laboratory at the north end of the building. In the southeast corner of the building is a ventilating equipment room and in the southwest corner of the building is a reinforced concrete vault.

The floor of this structure is of reinforced concrete supported by concrete foundation walls and well-tamped earth. Exterior walls for the most part are of drop siding over 1" T & G sheathing, however, the north end of the building is walled with Robertson's insulated "Q" panel board and small portions of the wall beneath some of the gables are of barn board. Reinforced concrete walls separate the Laboratories and the Calibration Room and form a part of the exterior wall. The gable roofing is of built-up felt over 1" sheathing except for the gable roof at the north end which is of Robertson's "Q" Deck roofing. Above the vault is a flat, reinforced concrete roof with tar and gravel surface. Interior partitions, except around the Laboratories and vault, are of asbestos board. The structure contains only two windows for the second story Laboratory, otherwise it is windowless. Three 30" ventilators are located on the roof.

The overall dimensions of this building are 97' x 36' x 40', the cross-sectional area is 3,370 sq. ft., and the displacement volume is 86,400 cu. ft.

3746 CONTROL BUILDING

One Control Building has been provided for the 300 Area. This one-story, wooden frame building with gable roof is located in the southwestern portion of the area approximately 200 feet southwest of the 3706 Building.

This ten-room building contains a Laboratory, Shop, Dark Room, four Offices, Storage Room, and two Toilets.

A 4" reinforced concrete slab floor with mastic tile covering is supported by reinforced concrete foundation walls and well-tamped earth. The walls are of drop siding over building paper and 7/8" sheathing. The gable roof, supported by wooden rafters, is a built-up felt roof. A corridor runs from one end of the building to the other along the center axis. A wooden louvre is located at either end of the building and a ventilation duct runs above the corridor.

The overall dimensions of this building are 72½' x 30½' x 21½', the cross-sectional area is 2,211 square feet, and the displacement volume is 37,600 cubic feet.

351-A PRIMARY SUBSTATION

One open frame Primary Substation was constructed in the south central part of the 300 Area just south of the Main Gate Road.

This Substation consists of a wooden fenced, gravel surfaced area 70' long by 37½' wide, containing wooden frame bus structures, three power transformers, circuit breakers, and terminal structures. No switch house building is provided.

The area contains open-framed, wooden poles extending to a height of 37½'. A wooden ladder and walkway of 2" planking provides access to the upper sections of the pole structure where the Oil Circuit Breakers and insulators are located. Concrete foundation pads are provided for the three transformers. The transformer bases contain 1.6 cu. yds. of concrete.

351-B PRIMARY SUBSTATION

One Primary Substation was constructed in the north central portion of the 300 Area, just southeast of the 305 Building, to principally supply power to this building. This Substation is composed of a wooden fenced, gravel surfaced area 63' x 58'. A reinforced concrete and concrete block switch house is located midway along the south fence line.

Fenced Area - This area contains open wooden frame bus structures, three main power transformers, circuit breakers and terminal structures. The three transformers are supported on reinforced concrete slabs. The area is surrounded by a 7' high wooden picket fence. There are numerous open wooden framed pole structures which extend to a height of 37½' above ground level. A wooden ladder provides access to an elevated walkway and wooden platform.

Switch House - The Switch House is one-story concrete and concrete block, one-room building that houses the switchgear for the Substation. This building has a 6" reinforced concrete slab floor supported on concrete foundation walls, and a concrete slab roof with tar and gravel surface. One double swing door is located on the east side of the building and a single swing door is located at the north end of the building to provide access to the fenced area. The switchgear is located along the center of the building near the west wall.

Electrical steel conduits run from nearby poles to the switchgear within, through openings in the south wall of the building near the roof.

The overall dimensions of the Switch House are 23½' x 11' x 17', the cross-sectional area is 258 square feet, and the displacement volume is 4,386 cubic feet.

APPENDIX D

PHYSICAL DESCRIPTION OF 500, 600, AND 800 AREAS FACILITIES

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501 ROAD AND FENCE LIGHTING

Area	Distance Road	Distance Fence	Road Lights	Fence Lights	Transformers Road	Transformers Fence	Total No. Poles	Total Length Single Strand Wire
100-B	18,150'	25,300'	43	203	1-20 KW C.C. - 2300 V/6.6. Amps	3-25 KW C.C. & 1-15 KW C.C. - 2300 V/6.6. Amps	196	157,700'
100-D	20,700'	24,800'	46	201	1-20 KW C.C. - 2300 V/6.6. Amps	3-25 KW C.C. & 1-15 KW C.C. - 2300 V/6.6. Amps	199	169,000'
100-F	14,700'	23,725'	36	192	1-20 KW C.C.- 2300 V/6.6. Amps	3-25 KW C.C. & 1-15 KW C.C. - 2300 V/6.6. Amps	184	154,800'
200-E	35,500'	38,350'	87	311	2-20 KW C.C. - 2300 V/6.6. Amps	5-25 KW C.C. - 2300 V/5.6. Amps	351	292,000'
200-W	32,750'	36,750'	100	298	2-20 KW C.C. - 2300 V/6.6. Amps	5-25 KW C.C. - 2300 V/6.6. Amps	328	280,600'
200-N	2,300'	13,900'	11	112		3-15 KW C.C. & 2-10 KW C.C. - 2300 V/6.6. Amps	124	20,000'
300	10,850'	6,150'	20	50		1-25 KW C.C. & 1-15 KW C.C. - 2300 V/6.6. Amps	60	30,000'
700	5,000'	14,500'	7	57		1-25 KW C.C. & 1-10 KW C.C. - 2300 V/6.6. Amps	70	32,000'

NOTE: Total number of light poles is less than the combined total of Road & Fence Lighting Fixtures, as part of them are supported by power distribution poles chargeable to Building Code No. 503.

802 STEAM LINES

Area	16"	14"	12"	10"	8"	6"	5"	4"	3½"	3"	2½"	2"	1½"	Total: (ft)
100-B	2,057	1,844	–	2,078	1,989	2,684	–	213	–	1,737	–	–	–	12,602
100-D	1,683	1,177	568	1,381	3,572	603	–	298	–	1,676	–	–	–	11,558
100-F	2,377	1,600	1,018	1,215	2,606	372	–	834	–	1,510	–	106	–	11,638
200-E	–	–	4,063	1,560	3,890	180	–	4,490	–	1,631	–	275	275	16,364
200-W	–	–	1,246	6,948	2,748	7,857	–	2,510	–	7,460	–	208	500	29,477
300	–	–	–	–	150	560	–	1,940	–	1,050	–	800	–	4,500
700	–	–	25	–	1,890	2,190	–	1,610	250	850	–	1,825	–	8,640
1100	–	–	–	–	650	1,025	1,225	4,000	250	2,900	725	3,925	550	15,250
TOTAL	6,117	5,221	6,920	13,182	17,495	15,471	1,225	15,895	500	18,814	725	7,139	1,325	110,029

Material Quantities

901 & 902 SANITARY WATER & FIRE PROTECTION LINES

Area	42"	36"	30"	24"	20"	16"	14"	12"
100-B	3,820	4,580	4,520	320	5,220	230	500	810
100-D	4,650	5,215	3,630	2,470	2,780	230	520	1,260
100-F	8,070	5,600	3,075	430	4,550	360	500	1,160
200-E	--	--	--	--	140	830	1,980	5,110
200-W	--	--	--	--	140	820	--	12,680
200-N	--	--	--	--	--	--	--	6,310
300	--	--	--	--	--	--	--	--
600	--	--	--	--	--	--	--	--
700	--	--	--	--	--	--	--	--
TOTAL	16,540	15,395	11,225	3,220	12,830	2,470	3,500	27,330

Area	10"	8"	6"	4"	3"	2"	1½"	1"
100-B	7,270	950	5,020	1,350	4,380	1,460	350	460
100-D	7,310	1,240	4,830	1,740	3,470	1,600	360	300
100-F	7,350	410	4,610	1,240	2,150	1,700	350	??
200-E	3,310	3,140	9,500	3,150	820	800	460	--
200-W	1,420	9,890	7,520	5,855	360	700	360	--
200-N	150	--	--	--	--	6,145	--	--
300	30	4,857	1,525	1,062	692	172	31	??
600	--	140	--	120	--	240	00	120
700	4,075	6,338	3,600	600	795	25	550	--
TOTAL	30,915	26,965	36,605	15,117	12,667	12,842	3,261	2,865

GRAND TOTAL 233,747

NOTE: The above totals do not include Export Water Lines, Building NO. 901-1.

	901	902	901-1
Concrete	16,105 cu.yds.	679 cu.yds.	2,858 cu.yds

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APPENDIX E

PHYSICAL DESCRIPTION OF 600 AREA FACILITIES

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601 RAILROAD TRACK SCALE

A 120-ton Railroad Track Scale and one-story, wood frame Scale House is located west of the 6186 Locomotive House at Riverland Yards. The Scale House parallels the Scale Pit and has a bay section extending over the connecting weigh beam pit. The Scale Pit and the weigh beam pit are reinforced concrete with floor slabs 18" thick and walls 16" and 12" thick. The floors drain to a sump located in the weigh pit. A concrete track anchor is constructed at each end of the Scale Pit.

The type of construction used for the Scale House is as follows: 8" concrete curtain wall foundations, 4" concrete floor in the main building portion and partial concrete floor slab in the weigh beam bay, 1" T & G sheathing and 1" drop siding with building paper insulation between; shed roof covered with built-up felt roofing having 1" insulation board between the roofing and decking; and 1/4" Presdwood lining. The building contains two single, outside pedestrian doors, and eight single frame, double-hung windows. Electric space heaters are provided for building heating.

	Dimensions	Volume	Area
Overall	32'-9" x 97' x 20'-6"		
Scale House	12' x 25' x 15' and	7,500	300
	9'-5" x 12'-8" x 12'	1,440	120
Scale Pit	11'-4" x 97' x 11'-4" and	12,478	1,100
	9'-5" x 12'-8" x 8'-6"	1,020	120
		22,438 Cu.Ft.	1,640 Sq.Ft.

602 STANDARD GAUGE ROLLING STOCK

Item Number	Quantity	Description
1	1	Dummy Train (used as Snow Plow)
2	2	120-ton Diesel Locomotives
3	10	90-ton Underslung Cars with Tanks and 20 Covers
4	4	Railroad Undercarriage Water Tank Cars
5	2	Tractor Cranes - 1/2 Cubic Yard Cap.
6	4	50-ton Railroad Jacks
7	2	80-ton Diesel Locomotives
8	5	30-ton Gasoline Locomotives
9	17	Flat Cars
10	10	Hopper Cars
11	5	Flat Bottom Gondolas
12	1	Buda Inspection Car
13	6	Push Cars
14	5	Motor Cars
15	3	N - W Trailers
16	3	Cabooses
17	1	Power Rail Drill
18	2	Railroad Tank Cars
19	5	Acid Tank Cars
20	1	130-ton Transformer Car

603 TRAFFIC CHECKING STATIONS

Four Traffic Checking Stations were provided for plant protection on the access roads to Area "A". These stations are located at the following points: on the Hanford-Richland Road at the 300 Area; at the west end of the Cold Creek Road; on the Benton City-Prosser Road, approximately one mile north of the Horn Dam; and at the Riverland Classification Yards.

The barricades at the first three locations are comprised of a multiple lane, partially open wood frame shed with a 12' x 20' x 9' high wood frame, gable roof office building opposite one end of the checking shelter. These facilities are constructed at right angles to the road at an enlarged road section which extends at least 500' each way. Additional passing lanes are provided on each side for trucks and busses as the shed has only a maximum clearance of 9'-8".

The Richland-Hanford Checking Station has six covered lanes; the Cold Creek Checking Station has four covered lanes; the Benton City-Prosser Checking Station has two covered lanes; and the Traffic Checking Station at the Riverland Classification Yards consists only of a 6' x 6' x 8' high Sentry House.

Concrete islands separate the traffic lanes. Every other island is 8' wide which supports a 5' x 11' inclosed Sentry House. The Sentry House and office buildings are sided with 1" T & G sheathing and are lined and sealed with 1/2" sheet rock. Roofs are covered with 55# rolled roofing. The office building houses short-wave radio set and is provided with an emergency generator set in case of power failures or where permanent power is not available. Electrical service for the Richland-Hanford and the Cold Creek barricades is obtained from nearby area distribution lines.

	Dimensions	Volume	Area
Richland-Hanford	14' x 100' x 12'	16,800 Cu.Ft.	1,400 Sq.Ft.
Cold Creek	14' x 72' x 12'	10,368 Cu.Ft.	864 Sq.Ft.
Prosser	14' x 40' x 12'	5,700 Cu.Ft.	480 Sq.Ft.
Riverland Yard	6' x 6' x 8'	288 Cu.Ft.	36 Sq.Ft.
Office Buildings (3)	12' x 20' x 9'	Ea. 2,160 Cu.Ft.	Ea. 240 Sq.Ft.
Generator Shelters (5)	5' x 8' x 5'	Ea. 200 Cu.Ft.	Ea. 40 Sq.Ft.

605 FENCES (INCLUDING GUARD TOWERS)

Three types of permanent fence were used on this project: Type No. 1, Type No. 2, and standard "Chain Link Fencing".

Type No. 1: Approximately 37.6 miles of this type were used to enclose the 100, 200, 300, 600 and 700 Areas, as well as for intra-area fencing in the 200 Areas about the 221, 224, 231, and 241 Buildings, and the 105 Plants in the 100 Areas. These fences are 9'-4" high using a bottom course of 55" and a top course of 29" woven wire fabric, and three strands of 2-point barbed wire. Woven wire fabric consisted of 10-gauge tops and bottoms with 12½-gauge fillers. Fence posts 4" x 4" x 12'-0" Douglas Fir or equal, were set 10' C. to C. a minimum of 2'-0" deep and carried a 2" x 4" overhanging bracket to support the barbed wire. The butts of all posts were painted with "Carbosite" to prevent rotting.

Type No. 2: Approximately 40 miles of this type were used as a boundary line fence around the 100, 200, and 300 Process Areas starting on the Columbia River bank just south of Riverland Classification Yard and running west to the Cold Creek Road Barricade. Then it more or less follows Area "A" boundary to the foot of Rattlesnake Hills. From there it runs to the Benton City Road Barricade, thence east to Richland Road Barricade and terminates approximately one mile further east at the river. Fence posts 4" x 4" square, 4'-5" high, set 15' C. to C. carried four strands of 4-point barbed wire, zinc-coated. Posts were buried approximately 2' deep.

Chain Link Fencing: Approximately 3.07 miles of this type of fencing were used to enclose Plant 213 J & K in the 200 North Area, and along both sides of the irrigation ditch flowing through the pre-fabricated housing area 1100 - Richland Village.

Guard Towers: Seventy elevated, one-room, wood frame, flat roof, buildings were built inside the fence lines of the 100, 200, 300 Areas and two along the south project boundary line fence, in the vicinity of Rattlesnake Hills. These towers are to be used by the plant patrol to observe the fence boundaries in those areas for attempts of sabotage or fires. The observation room is mounted on a four-post wood frame tower 10' and 15' above the ground, having a 3' suspended walkway level around the entire tower. Two towers were built on top of the 181-D and 181-F River Pump Houses in order to gain a more complete view of the river bank. Access to the observation room is obtained by a single or double flight open wooden stairway. Each tower is equipped with a hand-operated searchlight mounted on the roof. Heating is provided by an electric space heater in all tower rooms except the two towers along the Area "A" boundary fence. Tower Rooms are covered on the outside with 1" drop siding, lined and sealed with 1/4" fibre board, and roofed with built-up felt, graveled surface roofing.

	Dimensions	Volume	Area
Overall	* 13'-5½" x 13'-5½" x 22'	2,700 Cu.Ft.	182 Sq.Ft.

* NOTE: Except for Towers 1605-B-5 and 2605-K which are 5' higher.

SEPTIC TANKS

Area	Tank No.	Dimensions	Total Tanks	Cap. Persons	Total Persons	Cap. Gallons	Total Gallons	Serving Buildings
100-B	1607 B-1	7' x 19' x 11'		125		4,375		1701, 1709, 1720
	1607 B-2	11'-6" x 33' x 13'		450		15,750		1704, 1707A-B, 1713, 1717, 1719, 1722, 105, 108, 115, 185, 189, 190
	1607 B-3	4'-7" x 7'-6" x 10'-6"		48		1,680		184
	1607 B-4	3' x 6'-3" x 8'-6"		10		350		151
	1607 B-5	2' x 4'-2" x 8'-6"		6		210		181
	1607 B-6	4' x 8' x 8'-6"		25		875		182, 183
	1607 B-7	3' x 6'-3" x 8'-6"	7	12	676	420	23,660	182
100-D	1607 D-1	7' x 19' x 11'		125		4,375		1701, 1709, 1720
	1607 D-2	12' x 36' x 13'-6"		553		19,355		1704, 1707A-B, 1713 1717, 1719, 1722, 105 108, 182, 183, 185 186, 189, 190
	1607 D-3	3' x 6' x 10'		10		350		151
	1607 D-4 D-5	2' x 4' x 8'	5	6	694	420	24,290	115, 181
100-F	1607 F-1	7' x 19' x 11'		125		4,375		1701, 1709, 1720
	1607 F-2	11'-6" x 36' x 13'-6"		522		18,270		1704, 1707A-B, 1713, 1717, 1719, 1722, 105, 108, 184, 185, 189, 190
	1607 F-3	4'-6" x 9'-6" x 11'		41		1,435		151, 182, 183
	1607 F-4 F-5	2' x 4' x 8'-4"	5	12	700	210	24,500	115, 181
100-E	2607 E-1	12'-2" x 35'-4" x 14'-5"		400		14,000		272, 283, 284, 2704, 2707A-B, 2713, 2719, 2722
	2607 E-2	8'-8" x 21'-4" x 12'-5"		125		4,375		2701, 2709, 2720
	2607 E-3	10'-8" x 30'-4" x 13'-11"		300		10,220		B 221, 222, 224, 271
	2607 E-4	3'-4" x 4'-4" x 7'-8"	4	8	833	280	29,155	B 221

SEPTIC TANKS

Area	Tank No.	Dimensions	Total Tanks	Cap. Persons	Total Persons	Cap. Gallons	Total Gallons	Serving Buildings
200-W	2607 W-1	12'-2" x 35'-4" x 14'-5"		400		14,000		272, 283, 284, 2704, 2707A-B, 2713, 2719, 2722, 2723
	2607 W-2 2607 W-3)	8'-8" x 21'-4" x 12'-5		125		4,375		2701, 2709, 2720
	2607 W-5) 2607 W-4)	10'-8" x 30'-4" x 13'-11"		584		20,440		221 T-U, 22 T-U, 224 T-U, 271 T-U
	2607 W-7)	3'-4" x 5'-4" x 7'-8"		16		560		221 T-U
	2607 W-8	7'-8" x 19'-4" x 12'-11"	7	100	1,225	3,500	42,875	231-W
200-E	2607 N, P & R	3'-4" x 5'-4" x 9'	3	18	18	630	630	212-N, P, & R
300	3607	11'-6" x 25' x 13'	1	460	460	16,100	16,100	305, 313, 314, 321, 384, 3701, 3704, 3706, 3707A-B, 3709, 3717, 3719, 3745, 3746
600	6607	7'-8" x 19'-4" x 12'-11"	1	100	100	3,500	3,500	6707
		GRAND TOTAL	33		47,706		161,210	

614 GENERAL MONITORING STATIONS

A total of twenty-nine, one-room, wood frame buildings, housing special analyzing equipment for health purposes, were constructed at advantageous project locations. In the Process Areas, in most cases, these structures were erected at the inside area fence corners and at main entrance gates. Two of these stations were built off the Project in the vicinity of Pasco and Benton City, Washington, to safeguard the health of the people living in those localities. These installations were made on properties leased by the Government. The Monitoring Station originally constructed inside the 145 Building inclosure at Hanford was moved at the close of the Camp to the Hanford Airport.

The type of construction used for these buildings is as follows: 8" concrete curtain wall foundations, 4" concrete floor slab, 1" T & G sheathing and 1" drop siding with building paper insulation between. The shed roof has built-up felt roofing, containing a wood frame roof louvre-type ventilator; 3/16" asbestos board ceiling and lining, and 2" blanket-type wall insulation between the studding and rafters. Each building contains one pedestrian door and no windows, with heating provided by an electric space heater. Stations located outside of non-restricted areas were inclosed by a 50' x 50' Type #1 fence.

Tabulated below is the number of 614-Monitoring Stations located in each area:

	Area	Numbering of Stations
	100-B	3
	100-D	3
	100-F	3
	200-E	6
	200-W	6
*	200-N	1
	300	1
**	600	3
	700	1
***	Off Project	2

* At the northwest inside corner of the 212-P fence inclosure.

** At Riverland Yards, and Hanford Airport.

*** One at the U.S. Engineers Supply Depot at Pasco, Washington, and one adjacent to east side of main Benton City - Hanford Road about three miles north of R.R. Crossing in Benton City.

	Dimensions	Volume	Area
Overall	6'-9" x 6'-9" x 11'-4"	465 Cu.Ft.	41 Sq.Ft.

615 HOT MIX PLANT FOR ROAD MATERIALS

A Hot Mix Plant for the preparation of bituminous road surfacing materials was originally erected for temporary and permanent plant road construction. This Plant is located along the south side of a railroad spur just east of the former Hanford Aggregate Pit. The Plant is rated at 3/4 to 1-1/4 cubic yards per minute and consists mainly of 8 horizontal oil storage tanks; a Barber-Greene, Model #842, Central Mixer for single aggregate, and a Model #833 Single Drum Dryer; and Steam Facilities. At the close of construction, the above facilities were transferred to the Operating Department and assigned permanent building number 615.

The horizontal oil storage tanks are arranged in a single row at the foot of the railroad fill to provide a gravity flow for unloading operations. The six tanks, 5' diam. x 24', are supported by reinforced concrete cradles and the two tanks, 10' diam. x 24', rest on the ground surrounded by an earthen dyke. All tanks are provided with wooden frame access platforms and stairways. The mixing plant is located adjacent to an aggregate bin of wood which has an inclined ramp section for the delivery of aggregate to the mixing equipment.

621 EMERGENCY GENERATOR SHELTERS

A total of 20 wood frame, one-room buildings were constructed at various locations in the 100, 200, 300, and 700 Areas to house the emergency electric generator sets, gasoline-motor-driven. These sets were provided for buildings requiring continuous lighting service and were equipped for automatic starting in case of power failures.

Two different size shelters and generator sets were used - Type A which houses 1.5 KW, 115 V sets, and Type B which houses 10 KW, 230/115 V sets. The latter type was installed only at the 105 and 3719 Buildings. The fuel storage tank for the gasoline engine was placed outside of the building on concrete saddles of sufficient height to provide a gravity feed. All shelters were built with a minimum clearance of 25 feet from the nearest building structure.

The type of construction used is as follows: 8" concrete curtain wall foundations; concrete pad equipment foundations; 6" cinder floor, 1" drop siding; and shed roof covered with built-up felt roofing with a lean-to sun visor over the fuel storage tank. Each building is provided with one single, outside pedestrian door and one single frame, double-hung window.

Listed below by Areas are the number of generator shelters, size of generator sets, and buildings served by these units:

Area	Building Number	Location	K.W. Capacity
100-B	1621 - BA	1719-B	1.5
100-B	1621 - BB	1720-B	1.5
100-B	1621 - BC	105-B	10
100-D	1621 - DA	1719-D	1.5
100-D	1621 - DB	1720-D	1.5
100-D	1621 - DC	105-D	10
100-F	1621 - FA	1719-F	1.5
100-F	1621 - FB	1720-F	1.5
100-F	1621 - FC	105-F	10
200-E	2621 - EA	2704-E	1.5
200-E	2621 - EB	2719-E	1.5
200-E	2621 - DC	2720-E	1.5
200-W	2621 - WA	2704-W	1.5
200-W	2621 - WB	2719-W	1.5
200-W	2621 - WC	2720-W	1.5
300	3621 - A	3706	1.5
300	3621 - B	3719	10
300	3621 - C	3707-A	1.5
700	7621 - A	702	1.5
700	7621 - B	700	1.5

	Dimensions	Volume	Area
Type A	5' x 9'-6" x 11'-2"	474 Cu.Ft.	50 Sq.Ft.
Type B	10' x 15' x 11'-2"	1,410 Cu.Ft.	135 Sq.Ft.

622 METEOROLOGICAL TOWER

A triangular-shaped, structural steel tower 408'-6" high was erected approximately one-half mile east of the 200 West Area on the high point of the ridge between the 200 East and West Areas. The tower was fabricated and erected by the Clinton Bridge Works under subcontract RPG 4336½.

It contains eight platform working levels and boom extensions which support meteorological equipment. The tower is supported by a triangular-shaped reinforced concrete pad, and is equipped with a 24" x 36", 150# dead load, tool and instrument hoist which was furnished and erected by the Haughton Elevator Company under subcontract RPG 4754½. The hoisting equipment for the elevator is housed in the adjoining 622-A Meteorological Building. Aircraft obstruction lights were installed in accordance with Civil Aeronautics Authority regulations.

The tower is of field bolted construction and is provided with safety ladders for access to the working platforms. The structure is guyed to three equally spaced reinforced concrete guy anchors placed 367' from the base of the tower. Three 1-3/4" (6 x 19) galvanized bridge cables are fastened to the tower 184' above the ground and three 1-1/2" (6 x 19) galvanized bridge cables are fastened to the tower 367' above the ground. Each guy anchor is inclosed by a 30' x 50' - Type #1 fence.

	Dimensions
Overall	397' Radius
Tower	3 (12'-6" sides) - 408'-6" high
Tower Base	3 (16'-4" sides) - 5' thick
Tower Anchors (3)	9' x 24' x 13'-6"

622-A METEOROLOGICAL BUILDING

Approximately 50 feet west of the 622 Meteorological Tower is an L-shaped, partial two-story, wood frame building. This building contains five rooms; namely, Instrument Room, Office, Instrument Storage and Work Room, Elevator Equipment Room, Ventilation Equipment Room, and Toilet Room.

The Ventilation Equipment Room is located in the second floor penthouse section directly above the Instrument Room. Access to this room is by means of an outside, open frame stairway which runs along the front side of the building. The Elevator Equipment Room forms the short leg of the "L" and directly faces the 622 Meteorological Tower. An Elevator cable trench of reinforced concrete with removable, sectional wooden covers runs between this room and the Tower. Electrical and instrument lines are incased in concrete and run underground from the bottom of the Tower and terminate in the Instrument Room.

The type of construction used for this building is as follows: 8" concrete curtain wall foundation; 4" reinforced concrete slab for the ground floor; 1" T & G sheathing and 1" drop siding with building paper insulation between; flat and shed roofs covered with built-up felt, gravel-surfaced roofing; 1/4" asbestos board ceiling and lining in the Instrument Room, Office, and Toilet Rooms; and the partition between the Instrument Storage and Elevator Equipment Rooms. The building contains four single, outside doors for pedestrians; three single frame, double-hung windows; three double frame, double-hung windows; and one single pivot window. Building heating is provided by an electrical unit heater installed in the force draft ventilation duct and by wall-mounted space heaters. The Toilet Room is equipped with a chemical type toilet.

	Dimensions	Volume	Area
Overall	26'-6" x 40' x 23'	11,860 Cu.Ft.	759 Sq.Ft.

622-B METEOROLOGICAL OBSERVATORY BUILDING

Approximately 100 feet southeast of the Meteorological Tower is located a one-story, wood frame building used for visual observation in connection with meteorological studies. The only unusual feature of building design is that the roof section over the observation platform is hinged forming a hip section, allowing this portion of the roof to be laid back for day or night observation.

The type of construction used is as follows: 6" concrete curtain wall foundations, partial 4" concrete floor, 1" T & G sheathing and 1" drop siding with building paper insulation between, and shed and hip roof covered with 55# roll roofing. The building contains one single pedestrian door.

	Dimensions	Volume	Area
Overall	7'-8" x 13'-8" x 14'-2"	1,248 Cu.Ft.	104 Sq.Ft.

623 RADIO TRANSMITTER STATION

A two-story, wood frame, combination Radio Transmitter Station and Fire Observation Tower was constructed on top of the east end of Gable Mountain overlooking the 100 and 200 Areas.

The first floor room houses a "Motorola" short wave radio transmitter set for emergency plant patrol usage. A 1.5 KW, 115 V emergency generator, gasoline motor driven with automatic starting in case of power failure is provided. Three feet west of the building is a 65' class #2 power pole which supports the transmitting aerial for this station and is equipped with red beacon lights in accordance with Civil Aeronautical Administration Regulations.

The second floor room is similar to the construction of #605 Guard Tower Buildings, having windows on all four sides and a wood frame, outside access stairway. This building was constructed under temporary Cost Code TC-10 but was later assigned permanent building number 623 when it was taken over by the Operating Department at the close of construction.

The type of construction used for this building is as follows: concrete building anchors and concrete stair foundations, post and girder building foundations set on mud sills, 1" T & G double flooring with building paper insulation between, 1/2" exterior Gypsum board siding, shed roof covered with 55# roll roofing, 1/2" Celotex lining and ceiling. The building contains two outside, single doors and 13 single frame, double-hung windows.

	Dimensions	Volume	Area
Overall	9' x 12' x 22'	2,376 Cu.Ft.	108 Sq.Ft.

661 RIFLE AND PISTOL RANGE

During the construction of the Project, firing ranges and necessary facilities were built at the east end of Gable Mountain for training patrolmen. Four ranges were constructed, all facing the foot of Gable Mountain; namely, Army Type "L" Pistol Range, Thompson Sub-machine Gun Range, "Walk and Draw" Pistol Range, and an FBI Killer Course Range. The first and last mentioned ranges are covered with 2" thick bituminous road mix. The Sub-machine Gun Range and "Walk and Draw" Pistol Range are equipped with manually-operated moving targets.

A wood frame, gable roof Range House Building, containing a Conference Room, Equipment Storage Room, Office, and Toilet Room, is located on the opposite side of the access road from the firing ranges. This building is provided with sanitary sewers and a septic tank, and a concrete and wood frame Well Pump House.

The area is inclosed on three sides by a 1250' x 1820' three-strand barb wire fence, the mountain forming the forth side.

When the Operating Department took over Plant Patrol, the above facilities were transferred from Cost Code TC-10 to Permanent Building No. 661.

The type of construction used for the Range House is as follows: post and girder foundations set on wood mats; double 1" T & G flooring with building paper insulation between; 1/2 exterior Gypsum board siding; gable roof, 4 on 12 pitch covered with 55# roll roofing; and 1/2" sheet rock lining, partitions and ceiling. The building is provided with 3 single, outside pedestrian doors; one double swing, outside freight door; and 13 single frame, double-hung windows. This building has 3 concrete brick chimneys lined with flue tile, for stove heating purposes.

Construction of the Well House is as follows: 6" reinforced concrete pit walls and floor slab; 1/2" Gypsum board siding; and gable roof covered with 55" roll roofing. A hatch-covered opening is provided in the roof for the removal of pumping equipment.

	Dimensions	Volume	Area
Overall	1250' x 1820'	--	2,880
Range House	40' x 72' x 20'-	48,960	63,750
Pistol Range	6"	--	127,500
Sub-machine Gun Range	255' x 250'	--	132,600
Walk and Draw Pistol Range	255' x 500'	--	40,800
Special Range	255' x 520'	976	63
Pump House	170' x 240'	84	28
Septic Tank	7' x 9' x 15'-6"	--	31,417
Parking Area	4' x 7' x 3'		
	100' radius		
	Total	50,020 Cu.Ft.	399,038 Sq.Ft.

6186 WATER TREATMENT BUILDING

A one-story, concrete and concrete block, Water Treatment Building, and a 25,000 gallon elevated, soft water, wooden storage tank are located north of the 6718 Locomotive House at Riverland Yards. This plant supplies softened water for plant steam locomotives. For transfer purposes, a locomotive standpipe with a concrete valve pit is provided adjacent to the tracks southeast of the soft water storage tank. Just north of the Water Treatment Building is an additional 25,000 gallon, elevated, wooden, well water storage tank, Building No. 6901. In the northwest corner of the building is a drilled well, equipped with a deep well centrifugal pump, that supplies raw water for this plant.

Water softening equipment consists principally of a single Permutit "Zeolite" Softener, 25 GPM capacity, 12,000 gallons between regenerations. An impulse type chemical feed chlorinator is also provided.

The type of construction used for this Water Treatment Building is as follows: 9" plain concrete foundations with spread footings; 8" to 12" thick reinforced concrete slab floor; 8" concrete block walls; and 6" reinforced concrete slab roof covered with built-up felt, gravel surfaced roofing. The roof contains a hatch-covered opening over the well section to permit the removal of pump equipment. The building contains one double-swing, outside door; three single-frame, double-hung windows; and one double-frame, single pivot window.

The overall dimensions of this building are 14'-6" x 20' x 14'-8". The cross-sectional area is 290 square feet, and the displacement volume is 4,254 cubic feet.

6707 CHANGE HOUSE

A one-story, wood frame, Change House Building was constructed just north of the 6718 Locomotive House at Riverland to serve the employees in that area. This building is rectangular in shape with a lean-to Heater Room attached to the north side, and two vestibules, one to the east side and one to the south side of the structure. The building contains a total of seven rooms; namely, Office, Lunch Room, Locker Room, Shower Room, Wash Room, Toilet Room, and Heater Room.

Building foundations are comprised of 8" concrete block walls laid on plain concrete spread footings. Floors are 4" plain concrete, haunched under partitions, except the Heater Room which has a cinder floor. Outside building walls are covered with 1" T & G sheathing and 1" drop siding with building paper insulation between. Roofs are sloped one way, covered with built-up gravel-surfaced roofing. The main section of the roof contains three 24" square wooden roof ventilators. The inside of all exterior walls and one side of room partitions are covered with 1/4" Presdwood. The shower room is lined with 1/4" asbestos board. The building contains six outside single doors for pedestrians; fifteen single frame, double-hung windows; and two single frame pivot windows. The hot water heater is electric.

	Dimensions	Volume	Area
Overall	36'-8" x 72' x 16'	34,715 Cu.Ft.	2,095 Sq.Ft.

6718 LOCOMOTIVE HOUSE

A one-story, wood frame, Locomotive Maintenance Shop is located at Riverland Yards approximately 800 feet east from the end of the Classification Yard Tracks. The building is oriented east and west, having two sets of tracks running lengthwise through the building. The portion of the structure over the tracks is higher than the rest of the building and is of post and girder construction for clearance. This section of the roof contains three 36" in diameter smokestacks for shopped locomotives. This building has an office at the northeast inside corner and a Parts and Storeroom at the southeast inside corner. Concrete pits 4' x 41' x 3' deep are provided under the railroad tracks in the west end of the building. Approximately 50' from the southwest corner of the structure a 12,000 gallon underground fuel oil storage tank and two transfer pumps are located for fueling Diesel Locomotives.

The type of construction used for this building is as follows: 8" reinforced concrete curtain wall foundations; 5" and 8" reinforced concrete floor slabs; 1" T & G sheathing, and 1" drop siding with building paper insulation between; 2" T & G roof decking for the high section and 1" T & G sheathing for the low sections, both covered with built-up felt, gravel surfaced roofing; and 1/4" Presdwood partitions and ceilings for the Office and Parts Storage Rooms. The building contains four overhead track doors, two at each end; two single outside pedestrian doors; and thirteen single frame, triple hung windows.

	Dimensions	Volume	Area
Overall	41'-8" x 107'-1" x 29'	120,158 Cu.Ft.	4,360 Sq.Ft.

6718-A LOCOMOTIVE HOUSE CINDER PIT

A reinforced concrete cinder pit is located underneath the coal track approximately 630 feet east of the Locomotive House at Riverland Yards. The railroad tracks pass over the west side of the pit and are carried on concrete encased I-beams. This allows for the removal of cinders by means of a clam shell bucket. The portion of the pit underneath the tracks is sloped on a 35° angle toward the deep section of the pit. The bottom of the pit is reinforced concrete 1' thick. Side walls are likewise 1' thick and end walls are 1'-6" thick.

	Dimensions	Volume	Area
Overall	17' x 18'-11" x 14'-6"	4,683 Cu.Ft.	323 Sq.Ft.

652 SECONDARY SUBSTATION

One open frame Secondary Substation was erected northeast of the 6607-Change House at Riverland Yards to supply that area with 2300 V power. 13.8 KV power is supplied to this substation from the 151-B Primary Substation and is transmitted over the original 66 KV transmission line of the Priest Rapids Drainage District.

The substation is a 4-pole, wood frame structure, with lightning arrestors fastened to the upper portion of the structure and disconnect switches and fuse mountings to the lower portion. A 2'-6" x 12'-6" x 2'-6" thick concrete pad supports the transformers, and a 3'-8" x 3'-2" x 2'-6" thick concrete pad supports the oil circuit breaker. The entire structure is surrounded by a 20' x 28' x 7' wood picket fence.

	Dimensions	Volume	Area
Overall	20' x 28' x 34'	--	560 Sq.Ft.

253 & 653 DISTRIBUTING SUBSTATIONS

A total of 40 Distributing Substations have been provided in the 200 and 600 Areas - thirteen in 200-E, twenty-one in 200-W, four in 200-N, one at Riverland Yards, and one in the vicinity of the Meteorological Tower. These Substations are of similar design and construction differing only in the number and size of transformers in each bank. The 253 Substations all have primary voltages of 2.4 KV with secondary voltages ranging from 120 V to 140 V for lighting and 240 V to 280 V for heating and power. All lighting transformers are single phase and most of the power transformers are likewise single phase except the transformer installations at the 221, 622, and the 6707, which are three phase.

These Substations are of open frame construction using wooden pole structures surrounded by picket fences. Two types of installations were used: ground installation with transformers resting on a concrete pad, and elevated installations with the transformers resting on an elevated wooden platform suspended between two poles. Installations of the latter type were made at the 213, 241, 291, and 622 Buildings.

APPENDIX F

PHYSICAL DESCRIPTION OF 700 AREA FACILITIES

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701 GATE HOUSE

The Gate House located on the east fence line north of the 705 Building consists of a Guard Room and Clock Alley. It is a one-story, wood frame, shed roof structure with concrete floor and foundation walls. The walls are of sheathing, building paper and drop siding. It has a smooth surface, built-up roof over T & G sheathing.

The Guard Room is located at the front between the two Clock Alley entrance doors, and has Masonite ceilings and Gypsum board wall lining.

Overall dimensions are 17' x 41' x 14', the displacement volume is 9,240 cubic feet, and the cross-sectional area is 660 square feet.

702 TELEPHONE BUILDING

One Telephone Building has been provided for the 700 Area. This one-story, concrete block, "L" shaped building is located in the eastern part of the area approximately 100 feet north of the 703 Building and 75 feet west of the 705 Building. This structure contains a large Switchboard Room, Power Room, Storeroom, Engineer's Office, and Ventilating Equipment Room, in the main section; and a Corridor, Office, Coat Room, Rest Room, and Toilet in the east wing.

This building has a 4" reinforced concrete slab floor supported by reinforced concrete foundation walls. The walls are of concrete block 12" thick and the flat roof is of precast reinforced concrete slabs covered with 1" insulation board and built-up roofing with tar and gravel surface. Floors are of concrete except in the Switchboard Room where linoleum is added. The ceiling of the Switchboard Room is lined with Fibracoustic. A reinforced concrete cable pit is located beneath the Power Room. The building is windowless except for three windows in the rest room. Three roof ventilators are provided.

The overall dimensions of this building are 85' x 62' x 18', the cross-sectional area is 4,145 square feet, and the displacement volume is 74,600 cubic feet.

703 ADMINISTRATION BUILDING

The Administration Building located on the east side of the area is a large, two-story, wooden frame, gable roof structure with six wings. The long axis of this building runs in an east-west direction. The building contains central corridors, stairways, and 153 rooms consisting chiefly of offices, rest rooms and toilets. One two-story concrete and concrete block vault is located on either side of the building between the east and center wings.

The foundations are concrete block walls with concrete footings and concrete piers. The outside walls are drop siding over building paper and 1" T & G sheathing, and the roof is built-up asphalt felt with smooth surface over 7/8" T & G sheathing. Wall linings are of presdwood and ceilings are of gypsum board. The flooring is 3/4" T & G pine with linoleum added in the toilets. The two vaults have reinforced concrete slab floors and concrete foundations, 1' thick cement brick walls and a reinforced concrete slab roof with tar and gravel surface. These vaults are connected with the main building by means of ground level passageways to the center wings and second story passageways to the central portion of the building. Two brick fire walls separate the building into three equal parts. Large louvers are provided at the end of each wing beneath the gable and a dormer with louvre is located at each end of the structure. In addition, 26 roof ventilators are also provided for the 28 humidifying units within the building.

The overall dimensions of this building are 359' x 205' x 37', the cross-sectional area is 36,600 square feet, and the displacement volume is 1,170,000 cubic feet.

704 SUPERVISORS' OFFICE

The Supervisors' Office is a one-story building located south of the 722-A Building and contains seven Offices, a Drafting Room, Lavatories, Janitor's Closet, and Corridor.

The foundation walls and floor are concrete. Outside walls are drop siding over 7/8" T & G sheathing and building paper. The wall linings are a combination of asbestos wallboard and gypsum board. The roof is built-up asphalt felt with a gravel surfacing over 7/8" T & G sheathing. Two ACM ventilators are installed on the roof.

Overall dimensions of this building are 34'-6" x 61'-5" x 16'-6", the cross-sectional area is 2,122 square feet, and the displacement volume is 35,013 cubic feet.

705 EMPLOYMENT BUILDING

The Employment Building - located on the east side of the area, north of the 703 Building, is an "L" shaped, one-story, wood frame, gable roof structure, consisting of twenty-two rooms, six toilets, two janitor's closets, and a corridor.

The foundations are concrete blocks and concrete piers. The outside walls are drop siding over building paper and 7/8" sheathing; the roof is built-up asphalt felt with smooth surface applied over 7/8" T & G sheathing. The ceiling and wall linings are a combination of sheet rock and plaster. Floors are of 7/8" T & G pine with linoleum added in the toilets.

Four standard type humidifying units of 6,000 C.F.M. capacity each, equipped with 3/4 HP motors and two-way directional registers with dampers, are installed in the attic. Four 30" diameter and one 12" diameter ventilators equipped with dampers are installed on the roof.

Overall dimensions of this building are 33' x 10' x 26', 33' x 95' x 26' and 36'-5" x 103'-9" x 26'; the displacement volume is 158, 400 cubic feet; and the cross-sectional area is 7,200 square feet.

706 LABORATORY

One Laboratory has been provided for the 700 Area and is located in the eastern part of the area just north of the Main Gate Road and approximately 75 feet west of the 721 Building. This one-story, wooden frame, gable and shed roof building contains a large Laboratory, a small Laboratory, Office, Fan Room, Locker Room, Rest Room, two Toilets, and two Vestibules.

The 4" reinforced concrete floor is supported by reinforced concrete foundation walls and the exterior walls are of drop siding over building paper and 7/8" sheathing. The gable roof supported by wooden rafters and sheathing is a built-up felt roof, while the shed roof which covers the west portion of the structure, also supported by wooden rafters and sheathing, is built-up roof with tar and gravel surface. The interior linings are of masonite and the ceilings are of gypsum board. Blanket insulation is provided beneath the roof. A wooden louvre is located beneath the gable at either end of the structure.

The overall dimensions of this building are 48' x 48' x 25', the cross-sectional area is 2,158 square feet, and the displacement volume is 44,360 cubic feet.

707 CHANGE HOUSE

One Change House is provided for the 700 Area. It is located north of the 722-C Building and south of the 725 Building. It consists of a Guard Room, Locker Room, Lunch Room, Shower Room, Wash Room, Toilet, and Hot Water Heater Room. There is a vestibule at the north end and another at the west side, and a Guard Room at the south end of the structure.

The building is a wooden frame, one-story structure with a 4" reinforced concrete slab floor and 4" concrete curbs resting upon 8" foundation walls extending 6¼' below the floor level. The exterior walls are of 1" sheathing covered with building paper and drop siding. The roof slopes slightly from one side to the other and consists of 1" T & G sheathing covered with built-up gravel-surfaced roofing. Six A.C.M. ventilators are installed on the roof.

The walls of the Lunch Room are 1/4" Masonite, while the Wash Room, Toilet and Shower Room walls are of asbestos board. Exposed rafters form the ceiling throughout the building.

This building is rectangular in shape with the Lunch Room occupying the north end of the building. The Locker Room extends along the east side from the Lunch Room and across the south end of the building. The space from the Lunch Room to the Locker Room on the west side of the building is occupied by a Wash Room, Toilet and Shower Room. The building has three access doors, one located at each end and on the west side of the structure. Wooden steps and platforms provide access to these entrances.

A Hot Water Heater Room adjoins the west side of the building. A cinder floor has been provided for this room.

The overall dimensions of this building are 30' x 79' x 20', the cross-sectional area is 2,486 square feet, and the displacement volume is 48,620 cubic feet.

Two hundred and twenty wooden lockers, and a water heater with capacity of heating 800 GPM, are installed in this building.

713 CENTRAL RECEIVING STOREROOM

One Central Receiving Storeroom is provided for the 700 Area. It is located directly north of the 714 Building. A Storage Receiving Room and General Storage Room occupies the south side of the building. The Receiving Office, General Office, two Private Offices, Women's Rest Room, two Toilets, Rack Storage Service Room, Fitting Room and Goggle Repair Shop, and Clothes Storage Room occupies the north side of the building.

The building is a one-story, wood frame structure with a 4" reinforced concrete slab floor on concrete foundation walls. A concrete leading platform is located at the east end of the building.

The roof slopes slightly from the center to each side and consists of 7/8" T & G sheathing covered with built-up roofing. Installed on the roof are two A.C.M. ventilators equipped with dampers.

All exterior walls are covered with 1" sheathing, building paper, and drop siding. The interior walls and partitions of the receiving office, general office, two private offices, rack storage service room, fitting room and goggle repair shop, clothes storage room, and the ceilings of the toilets are lined with Masonite. The toilet walls are lined with asbestos wallboard. The ceilings of the two private offices and the women's rest room are of gypsum board. A glazed glass, fixed sash window partition 6' x 17' divides the receiving and general offices. There are seven two-section, horizontal, sliding wooden doors; two at each end and three on the south side of the building.

The overall dimensions of this building are 80' x 220' x 25', the cross-sectional area is 17,600 square feet, and the displacement volume is 422,400 cubic feet.

713-A LABORATORY STOREROOM

One Laboratory Storeroom has been provided for the 700 Area. This building is located west of the 713 Building and east of the 729 Building. It consists of a Storeroom, Office, Solvent Storage Room, Toilet, and Storage Platform.

The building is a one-story, wooden frame structure, with a 4" reinforced concrete slab floor over well-tamped earth, resting upon an 8" foundation wall. A 6" concrete curb is constructed above all foundation walls. The center of the structure is supported by 6" x 6" wooden posts resting upon concrete piers. The roof is gable-type consisting of 7/8" T & G sheathing covered with built-up roofing. Wooden louvers are installed at each end of the attic.

Exterior walls are of 7/8" sheathing, building paper and drop siding, while the interior walls are lined with 3/16" asbestos wallboard. Ceilings are of 3/8" gypsum board above which is two inches of blanket insulation.

The Solvent Storage Room located at the northeast corner of the building has a 5" reinforced concrete slab ceiling supported by 8" concrete block walls.

A Leading and Storage Platform extends the full width of the east end of the building. The storage portion of this platform has drop siding walls at the end and east side with a sloping roof. A 4" x 8" wooden bumper is installed on the east edge of the Loading Platform. Interior equipment includes wooden shelving, cases and lead trays.

A water heater is installed in the attic.

The overall dimensions of this building are 40' x 104' x 30', the cross-sectional area is 4,160 square feet, and the displacement volume is 10,400 cubic feet.

714 MATERIAL SHED

One Material Shed is provided for the 700 Area. It is located south of the 713 Building and consists of an Office, Shed, and Storage Loft.

The building is a wood frame, post and girder structure on concrete foundation walls, footings and frost walls.

The roof is gable-type consisting of 7/8" sheathing covered with built-up roofing. The roof extends 5 feet beyond the building edge on the north side.

An Office is located at the west end of the structure. Its interior walls and ceilings are finished with 3/16" asbestos board. The floor is a 4" reinforced concrete slab. The exterior walls of all four sides of the Office, as well as the east end of the building, are finished with drop siding.

The exterior wall on the south side of the shed is of 1" barn boards spaced 3/4" apart. The north side of the shed is open.

A Storage Loft is located at the east end of the building. It has a 2" thick plank flooring.

The overall dimensions of this building are 25' x 201'-6" x 22', the cross-sectional area is 5,037 square feet, and the displacement volume is 93,697 cubic feet.

715 OIL AND PAINT STORAGE

One Oil and Paint Storage Building is provided for the 700 Area. It is located south of the 713-A Building and north of the 722 Building. It consists of the oil and paint storage building, unloading platform and an open concrete-paved storage area.

The building is a one-story frame structure with a 4" reinforced concrete slab floor resting upon 8" concrete foundation walls. The floor slopes toward a french drain installed in the center. A 6" curb is constructed upon the east foundation wall. Outside walls consist of 7/8" sheathing, building paper and drop siding.

The roof is gable-type consisting of 7/8" sheathing covered with built-up roofing. An A.C.M. Ventilator with damper is installed in the center of the roof. This building has double rafters to support a 500# hoist.

A wooden sliding door is located at the northeast corner of the building. A pedestrian door is located at the rear of the building. Three wooden shelves are provided and installed along the south side of the storage room.

A concrete-paved storage area located east of the building extends from the north building line south 60 feet. This open storage area is 25 feet wide and consists of a sloping 4" reinforced concrete slab floor supported by 8" foundation walls.

An unloading platform is located north of the concrete paved storage area and adjacent to the railroad spur. Extending over the unloading platform and to the north end of the storage area is erected a wooden frame structure which supports the monorail that extends the full length of this frame structure and which supports the electrically-operated hoist. A wood shelter for the hoist has been erected over the south side of the platform. It has a roof of 1" T & G sheathing covered with roll roofing.

The overall dimensions are 25' x 30' x 20', the displacement volume is 12,562 cubic feet, and the cross-sectional area of the Oil and Paint Storage Building is 750 square feet, the concrete-paved storage area is 1,500 square feet, and the unloading platform is 100 square feet.

716 AUTOMOTIVE REPAIR SHOP

One Automotive Repair Shop is provided for the 700 Area and is located in the center of the area just north of the Main Gate Road and approximately 100 feet north of the 713 Building. This one-story, wooden framed, rectangular-shaped building with its long axis running east and west, contains in the east end a Tire Storage Room, a Vehicle Wash Room, and an area containing an Automotive Pit and Hydraulic Lift; in the center the Garage and Repair Shop; and in the west end, a General Office, Small Office, Spare Parts Storage Room, Shop Foreman's Office, Labor Tool Room, Labor Locker Room, Labor Foreman's Office, Rest Room and Toilet.

This building has a 6" reinforced concrete slab floor in the Garage and Repair Shop area and 4" reinforced concrete slab floors at either end supported by foundation walls and piers. The walls are of drop siding over building paper and 1" T & G sheathing, while the roof above the Garage and Repair Shop area supported by wooden trusses, rafters and sheathing, is of built-up felt. The roofs over either end of the structure, supported by wooden rafters and T & G decking, are built-up roofs with tar and gravel surface. Interior linings are a combination of masonite, asbestos, and gypsum board. Four large vertical rolling wooden doors are located along the north and south sides of the Garage and Repair Shop area. Second story windows surround this portion of the building to provide additional light. Two 36", one 24" and one 12" roof ventilators are provided.

The overall dimensions of this building are 158' x 65½' x 30', the cross-sectional area is 10,350 square feet, and the displacement volume is 258,660 cubic feet.

717 FABRICATION SHOP

One Fabrication Shop is located in the central part of the area just north of the Main Gate Road and approximately 100 feet east of the 723 Building. This one-story, rectangular-shaped, wooden frame, gable roof structure with long axis running north and south, contains at the south end a large Fabrication Shop; along the west wall a Storeroom; and at the north end, two Offices, an Assembly Room, and two Toilets. A central corridor runs from the north end of the building to the general fabrication shop.

This structure has a 4" reinforced concrete slab floor with 6" concrete curb supported by concrete foundation walls. The exterior walls are of drop siding over 1" T & G sheathing, and the gable roof, supported by wooden trusses and 1" T & G sheathing, is of built-up felt. The interior partitions are lined one side with presdwood, and the rooms, with the exception of the fabrication shop at the south end, are sealed with gypsum board. One plenum chamber is located beneath the gable at either end of the structure. A large double swing door is located at each end of the building. Four 24" roof ventilators are provided.

The overall dimensions of this building are 90' x 41½'x 32', the cross-sectional area is 3,740 square feet, and the displacement volume is 101,000 cubic feet.

717-A FABRICATION SHOP

One Fabrication Shop is located in the north central part of the 700 Area approximately 50 feet due north of the 723 Building. This one-story, wooden frame, rectangular-shaped, gable roof building with shed roof addition along the south side has its long axis running in an east-west direction. The building contains at the west end a Lecture and Demonstration Room; along the north wall a Circuit Room, Rest Room, two Toilets, Calibration Room and Office, and along the south wall a Storeroom, Sub-Assembly Tube Shop, and a dust-free Tube Shop. A central corridor runs from the east end of the building to the Lecture and Demonstration Area at the west end. A Ventilation Equipment Room is located under the shed roof addition along the south side of the building.

This building has a 4" reinforced concrete slab floor with 6" concrete curbing supported by reinforced concrete foundation walls and well-tamped earth. The floor is covered with linoleum except for the Ventilation Equipment Room. The walls are of drop siding over 1" T & G sheathing and the gable roof supported by wooden trusses, rafters and sheathing, is of built-up felt. The portion of the roof over the Ventilation Equipment Room is a built-up felt roof supported by wooden rafters and 7/8" T & G sheathing. The exterior walls and the partitions are lined with asbestos board, ceilings also are asbestos board. Two-inch balsam blanket insulation is provided in the ceilings, the exterior walls, and some of the partitions. A double swing door opens out onto a small reinforced concrete platform at either end of the structure. The building is windowless but ventilation louvers are located beneath the gables at either end of the building.

The overall dimensions of this building are 90' x 59½' x 32', the cross-sectional area is 4,610 square feet, and the displacement volume is 117,600 cubic feet.

721 MILITARY INTELLIGENCE BUILDING

One Military Intelligence Building has been provided for the 700 Area and is located in the eastern portion of the area north of the Main Gate Road and approximately 100 feet north of the 705 Building. This one-story, wooden frame, gable roof, "T" shaped, seventeen-room building contains in the leg of the "T" an Agent's Room, and File Room; and in the top of the "T" connected by a central corridor, a Supply Room, Photographic Laboratory, two Toilets, and eleven Offices.

The wooden floor is supported by outside concrete block foundation walls with an intermediate wooden sill support. The interior walls are of drop siding over 1" T & G sheathing. The gable roof, supported by wooden rafters and 1" sheathing, is of built-up asphalt felt. Interior partitions are a combination of masonite, gypsum board, and asbestos board. Some blanket insulation and acoustic tile is also installed. Three 8,000 c.f.m. humidifying units are installed in the gable roof and a wooden louvre is located at the three ends of the building beneath each gable.

The overall dimensions of this building are 105' x 70' x 24½', the cross-sectional area is 4,340 square feet, and the displacement volume is 90,140 cubic feet.

722-A AREA SHOP

One Area Shop has been provided for the 700 Area and is located in the east central portion of the area south of the Main Gate Road, and approximately 75 feet west of the 702 Building. This one-story, wooden frame, gable rood, "L" shaped building contains a Machine Shop, General Material Shop, and Blacksmith Shop in the western portion of the building with Storeroom in the southwest corner and toilet in the northwest corner.

A Riggers' Shop with Office is located in the eastern portion of the structure and the wing which runs south from the Riggers' Shop contains a Miscellaneous Repair Shop, a Radio and Telephone Room and an Electric Shop with Office in the southeast corner.

This building has a 4" reinforced concrete slab floor with 6" concrete curb supported by reinforced concrete foundation walls and well-tamped earth. The walls are of drop siding over 1" T & G sheathing and the gable roof supported by wooden trusses, rafters and 7/8" T & G sheathing, is of built-up asphalt felt. Interior linings are of concrete block and asbestos board, while the ceilings over the offices, storeroom, toilet and telephone room are of 7/8" T & G board. At the southwest corner of the building, south of the storeroom is a cement brick wall which separates the structure from three small shed-roof storage spaces for live hydrogen, acetylene, and oxygen storage, and dead cylinder storage. Four small reinforced concrete platforms are located as follows: one at the west end, one at the east end, one at the south end and one at the junction of the main portion of the building with the south wing. A two-ton monorail and hoist runs from the machine shop to the west end of the building. A one-ton monorail and hoist runs from the electrical shop to the south end of the building, and a half-ton monorail and hoist is located in the miscellaneous repair shop.

The overall dimensions of this building are 90' x 84½' x 30', the cross-sectional area is 5,070 square feet, and the displacement volume is 126,800 cubic feet.

722-C CARPENTER SHOP

One Carpenter Shop has been provided for the 700 Area and is located in the central portion of the area approximately 75 feet east of the 714 Building. This one-story, wooden frame, gable roof, rectangular structure with its long axis running in a north-south direction contains a large Carpenter Shop with office and toilet in the southeast corner.

The building has a 4" reinforced concrete slab floor with 6" concrete curb supported by reinforced concrete foundation walls and well-tamped earth. The walls are of drop siding over 7/8" T & G sheathing and the roof supported by wooden rafters and 7/8" T & G sheathing is of built-up asphalt felt. The office and toilet are lined with a combination of masonite and gypsum board and are sealed with 7/8" T & G sheathing. A large double-swing wooden door opens out on a reinforced concrete platform at either end of the structure. Three 24" ventilators are provided. A small dust collector building containing a mill type exhauster with removable sides, is located at the south end of the building.

The overall dimensions are 90' x 41½' x 32', the cross-sectional area is 3,735 square feet, and the displacement volume is 100,800 cubic feet.

723 LAUNDRY

One Laundry has been provided for the 700 Area and is located in the central part of the area just north of the Main Gate Road and approximately 50 feet east of the 716 Building. This one-story, wooden frame, rectangular building with long axis running north and south consists principally of a large general laundry area with a small office in the northeast corner. Along the south end of the building are located a rest room, two locker rooms, two toilets, and in the southeast corner, a water softener room.

The building has a 4" reinforced concrete slab floor supported by reinforced concrete foundation walls and concrete piers. The walls are of drop siding over 1" T & G sheathing, and the flat roof, with central portion raised 5' above the rest of the roof, is supported by wooden posts, wooden rafters and 1" T & G sheathing and is a built-up roof with tar and gravel surface. Interior linings are a combination of masonite and asbestos board. Two double, horizontal, sliding doors are located along the north side of the building and a double swing, wooden door opens from the water softener room to a small concrete platform on the east side of the structure. Windows are located around the raised section of the roof and four roof ventilators are provided. A 10,000 gallon outside, wooden storage tank for soft water is located near the east side of the building.

The overall dimensions of this building are 90' x 75' x 21½', the cross-sectional area is 6,750 square feet, and the displacement volume is 143,900 cubic feet.

729 SPARE MACHINERY STORAGE BUILDING

The Spare Machinery Storage Building located west of the 713-A Building consists of a Storage Room, Office, and Loading Platform. It is a one-story, wood frame, shed roof structure.

Foundation walls, pedestals, piers and floors are of concrete, exterior walls are of drop siding and the roof is built-up asphalt felt with gravel surface applied over 1" T & G sheathing. The office ceiling and wall lining is asbestos wallboard.

Additional support to the building is provided by two rows of interior wooden posts, anchored to concrete pedestals.

A concrete loading platform with steps is provided at the east end of the building. A one-ton hoist is installed and operates upon an eight inch monorail extending the full length and 14' beyond the east end of the building. The extended portion of the monorail is supported by a wooden frame structure which rests upon concrete piers.

Overall dimensions are 126' x 48' x 18', the displacement volume is 13,205 cubic feet, and the cross-sectional area is 6,048 square feet.

734 CENTRAL CYLINDER STORAGE BUILDING

One Cylinder Storage Building has been provided for the 700 Area and is located in the western part of the area adjacent to a north-south railroad spur. This one-story, wooden frame, rectangular building with its long axis running north and south, contains in the north end, a storage area for non-inflammable cylinders; in the central portion, an open area for the storage of empty cylinders; and in the south end, a storage area for inflammable gas cylinders.

The building has a 5" reinforced concrete slab floor 4' above grade, supported by reinforced concrete foundation walls. The walls, open at both the top and bottom, are of drop siding; the flat, built-up roof with tar and gravel surface is supported by wooden rafters and 1" T & G sheathing.

The center storage area which extends the width of the building is open at both ends and has a removable pipe railing along the west end. An 8" concrete block wall separates the empty cylinder storage area from the inflammable gas cylinder storage area.

An outside reinforced concrete platform with steps at either end extends the entire length of the building on the east side.

The overall dimensions of this building are 55' x 34' x 17', the cross-sectional area is 1,870 square feet, and the displacement volume is 31,800 cubic feet.

744 BRICK STORAGE BUILDING

The Brick Storage Building located south of the 715 Building is a one-story, wood frame structure with earthen floor. Foundation walls and piers are of concrete, exterior walls are of drop siding, and the roof is built-up asphalt felt with gravel surface applied over 1" T & G sheathing.

Additional support to the interior of the building is provided by two rows of wooden posts resting upon concrete piers.

A gravel surface road extends the full length inside the building. Entrance is provided through a double sliding door at the east end of the building.

Overall dimensions are 126' x 48' x 18', the cross-sectional area is 6,048 square feet, and the displacement volume is 13,205 cubic feet.

784 BOILER HOUSE

One Boiler House has been provided for the 700 Area and is located in the south central portion of the area, approximately 250 feet west of the 703 Building. This three-story, structural steel frame, concrete block, rectangular-shaped structure with long axis running east and west contains four 450 HP boilers on the ground floor along the north side; an Electrical Room at the east end; and above in the southeast corner, an office with toilet; four elevated coal bunkers along the south side with coal conveyor system above.

The building has a 4" reinforced concrete slab floor supported by concrete foundation walls. The walls are of concrete block and the slightly sloping roofs at 33' elevation above the boilers, and 50' elevation above the coal bunker and coal conveyor platforms, are of pre-cast cement tile covered with built-up asphalt felt. A 200' tall, reinforced concrete stack with base diameter of 14½', and top diameter of 9½' supported by a reinforced concrete octagonal base is located on the north side of the building. Steel breeching runs from this stack paralleling the north wall of the building to the four boilers within. A reinforced concrete coal crusher is located beneath a spur railroad track approximately 50' north of the structure. A 30 ton/hr. coal handling conveyor system runs from this pit to the third floor of the building above the coal bunkers. A second coal handling system runs from the crusher pit to an open coal storage area on the north side of the track. The coal from the elevated bunkers is conveyed by gravity to four Detroit Spreader Stokers and thence to the boilers.

An 8" ash pipe line beneath ground floor level runs from the boilers to an elevated live ash storage silo located just outside the east end of the building. Several levels of reinforced concrete platforms and steel grating walkways run beside the boilers, beneath the bunkers, and at the east end of the building. A deaerator and flash tank are located on different levels at the east end of the structure. Eight foot, ten foot, and eleven foot wide vertical rolling steel doors provide access to the structure while a 72' long wooden louvre runs along either side of the building at the third floor coal conveyor platform level. Four 48" roof ventilators are located above the boilers.

The overall dimensions of this building are 107' x 45' x 57', the cross-sectional area is 4,815 square feet, and the displacement volume is 216,000 cubic feet.

784-A EMERGENCY GENERATOR AND WATER SOFTENING BUILDING

One Emergency Generator and Water Softening Building has been provided for the 700 Area and is located in the south portion of the area approximately 75 feet due east of the 784 Building. This one-story, structural steel frame, concrete block, rectangular-shaped building, with long axis running east and west contains in the east end a Water Softening Equipment Room and in the west end a Diesel Engine and Generator Room.

The building has a reinforced concrete slab floor supported by reinforced concrete foundation walls. The walls and the one partition are of concrete block and the roof above the east end of the building is a precast concrete slab roof with tar and gravel surface, while the roof with tar and gravel surface, while the roof above the west end of the building is a 6" reinforced concrete slab roof with tar and gravel surface. A reinforced concrete clearwell runs beneath floor level, the entire width of the building, at the west end of the Water Softening Equipment Room. This room contains numerous wooden tanks and an elevated wooden platform in the southeast corner. A double swing wooden door is located on the east end of the building and on the south side opposite the Diesel Engine and Generator.

The overall dimensions of this building are 48' x 24' x 25', the cross-sectional area is 1,128 square feet, and the displacement volume is 24,400 cubic feet.

751 PRIMARY SUBSTATION

One open frame Primary Substation was constructed to provide 2300 volt power for the 700 Area. This Substation is located just outside the 700 fenced area at the northwest corner of the intersection of Swift Boulevard and Stevens Drive.

The Substation is composed of a wooden fenced, gravel surfaced area 125 feet by 100 feet and contains three 1667 KVA transformers, two current transformers, two potential transformers and a lighting transformer. The wooden pole framework rises to a height of 37½' to carry the necessary lines and elevated equipment. A 20' above grade wooden walkway with ladder is provided. The transformers are set on concrete pads.

APPENDIX G

PHYSICAL DESCRIPTION OF 1100 AREA FACILITIES

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The "A" House [1109 Structure]

The "A" house, of which 400 buildings are authorized in the first 2000 group of houses, is a two-story duplex residence, housing two families. Its two units each have three bedrooms. Each family unit is identical, the house being symmetrical about the central axis, except that the left hand unit is always the reverse in plan of the right hand unit. This arrangement creates only one party wall and provides each unit with three outside walls, so that cross ventilation is possible in practically all rooms of the house. In a desert-like country this is an important comfort factor. During the hottest weather there is usually a gentle wind from the west and southwest and, since the nights are reasonably cool, window ventilation is highly desirable.

This fact was partly responsible for the selection of the duplex as a basic unit. The row-type dwelling so common in defense housing, although appropriate for smaller units and having the advantage of lower original cost per unit, seemed unsuitable for the larger units in this development. Also, such houses are difficult to plan without inner rooms, spaces poorly lighted, and inadequate natural ventilation. In an area with considerable temperature extremes, not only seasonal but sometimes from day to night, the comfort of the worker has a marked effect upon his efficiency. Moreover, there would undoubtedly be a psychological hazard in a too-cramped plan. Although city dwellers are confined to narrow lots and restricted views, these are an accepted part of their environment. In the desert, where space is the key characteristic of the view, a cramped village of cramped houses would be out of character, a palpable and conscious discord.

The form of this duplex is of course box-like, but the designs on the outside, which are basically colonial (in proportion), make a dignified dwelling. Together with other types of units in the blocks, there is no effect of monotony. Inside, there is adequate living space for a family of four to six people, depending upon their ages and sexes. The living room, almost 13 feet by 23 feet, is ample by any modest standards. The dining room is of the alcove type, and while not large, can expand on occasion into the living room. The kitchen is adequate, having floor space for two or three people to work at one time, and the basement is sufficiently large for drying laundry in inclement weather and for storing trunks and other miscellaneous equipment. Upstairs, the second story accommodates three bedrooms and a bath adequately. All bedrooms are ample for double beds and additional furniture; all have good light and good ventilation. The sizes of all rooms are better than minimum standards, yet the total arrangement forms a compact unit in volume (a material factor in expense), without extra external or re-entrant angles, which is also a point in favor of economy. The various divisions of the "A" house are shown on the accompanying chart.

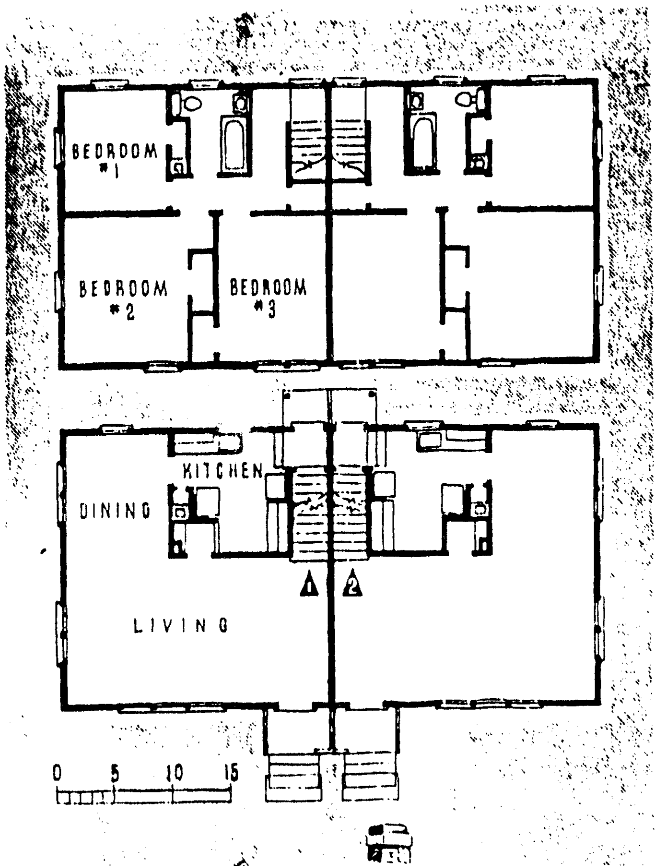
In appointments, the "A" house is adequate without being luxurious. Extra toilets on the first floor, breakfast rooms, and similar additions are omitted. The floors, walls, and built-ins are neat and pleasant; the floors of most rooms are natural stained woods, with the kitchen and bathroom floors linoleum. Walls and trim are painted. Each bedroom is provided with closets which will store a quantity of clothes, and in addition to a linen closet upstairs, there is a coat closet on the first floor. The kitchen has a built-in flush sink, cabinets with linoleum worktops. There are five upper cabinets for dishes and supplies, five lower cabinets for pots, pans, and more supplies, six drawers and a cutting board underneath the work shelf, two bin- drawers on rollers, an enclosed space beneath the sink, and a small full-length broom closet. Provided also are an electric the sink, and a small full-length broom closet. Provided also are an electric refrigerator and an electric stove. The bathroom has a tub with shower, a lavatory with a medicine cabinet, and a water closet. Although these appointments are not luxurious, they are all sanitary and neat, and conform to the critical material restrictions of the War Production Board.

TABLE VIII DIVISIONS OF THE "A" HOUSE

Type:	Two-Family Unit Two Stories Three Bedrooms	
Overall Size:	25'-0" x 47'-0"	
Rooms:	Size *	Area*
Basement		
Furnace) Fuel) Laundry)	10'-6" x 19'-6"	205 square feet
Stairs	3'-0" x 10'-6"	31½
First Floor		
Living Room	12'-10" x 22'-10"	293
Closet	2'-8" x 3'-0"	7½
Dining Room	9'-0" x 11'-5"	103
Kitchen		89
10' lin. ft. worktop		
8' lin. ft. cupbd.		
Broom Closet	1'-9" x 1'-3"	2
Stair Area		34½
Second Floor		
Bedroom #1	9'-0" x 11'-0"	99
Closet	1'-7" x 3'-4"	5
Bedroom #2	11'-5" x 12'-10"	154
Closet	1'-9" x 5'-5"	9½
Bedroom #3	9'-0" x 12'-10"	115
Closet	1'-9" x 4'-0"	7
Bathroom		47½
Hall and Stairs		83½
Linen Closet		6½

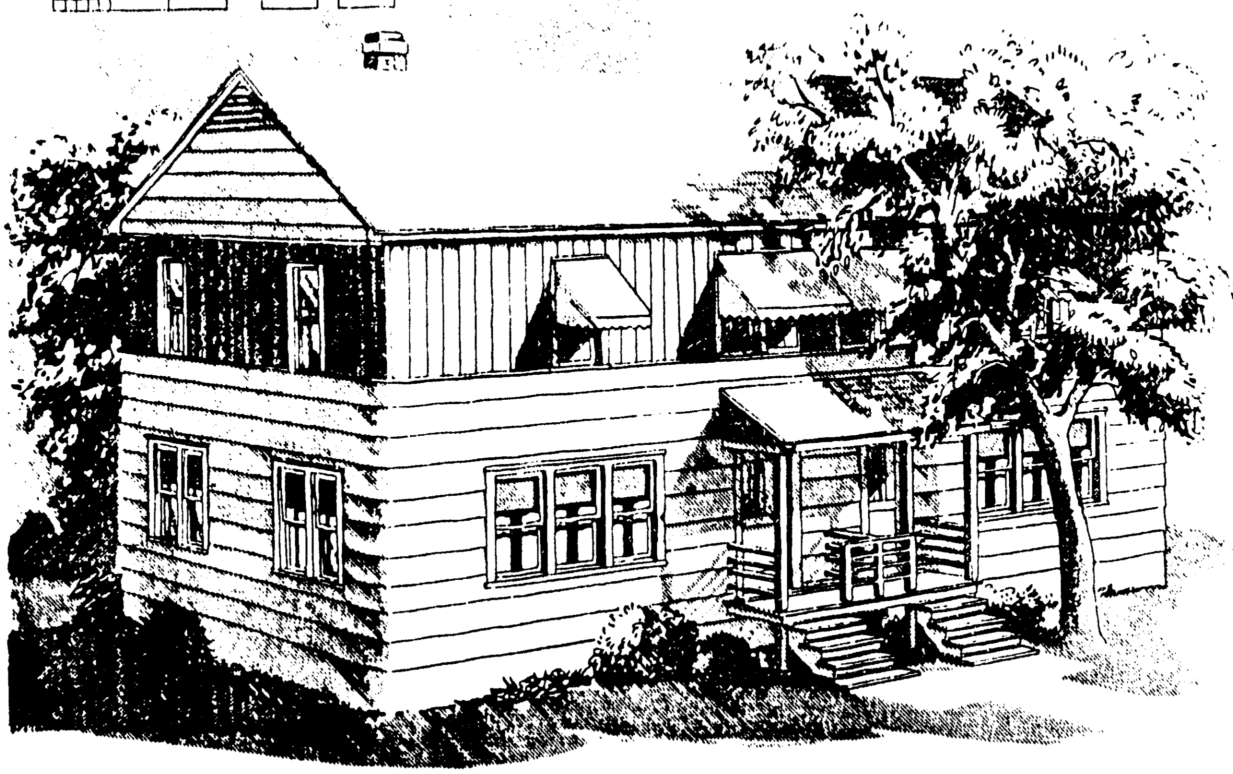
* As the figures are for purpose of comparison only, sized have been rounded out. In the case of dimensions, to the nearest inch. In the case of area, to the nearest square foot. Minimums rather than maximums are shown to give the truest picture of usable floor area.

Two Family House
Type A Unit



Two Family House

TYPE A UNIT



The "B" House [1109 Structure]

The "B" house, of which 900 buildings are authorized in the first unit of 2000 houses, is also a duplex residence, housing two families. It is a one-story house of two units with each unit having two bedrooms. Each family unit is identical, the house, like the "A" house, being symmetrical about a central axis. Thus again each house is similar is every respect except that the left hand unit is always the reverse in plan of the right hand unit.

The advantages of light and ventilation discussed in connection with the "A" house are true of this unit also. The two bedrooms are kept on the exterior angles of the house so that each will have two exposures and diagonal ventilation. The living room is kept to the party wall but as the dining room is of the alcove type, fully open on one wall to the living room, there is adequate cross ventilation from side to side of these two rooms. The bathroom and kitchen are grouped together in the rear center of each unit with the stairway to the basement intervening. Thus there is a grade entrance or outside door at grade-level in each unit.

This well-tested, standard arrangement permits direct access from the basement to the outdoors, from the outdoors to the first floor via the kitchen via the grade landing. With this plan, service trips from outdoors to the basement do not interfere with or "dirty-up" the kitchen. Also the outside rear steps are eliminated, together with their accompanying porch or railings. The stair landing serves in a measure as a rear hall or intermediate space between yard and kitchen, another factor in keeping the kitchen tidy. The wall and door on the kitchen level, which are familiar to this scheme, are omitted; for safety, however, a door or gate has been introduced between the landing and the basement. This plan, it was felt, would avoid the awkwardness of an extra door in the already small kitchen.

If the service rooms are compact in this layout, the closet and storage space can only be considered generous under any standards. Besides the basement area, there are, on the first floor, five ample closets using every available inch of what would otherwise be lost space. There are two closets in the living room, both large. One is bulkheaded over the basement stairs, the other is adjacent to the front door. Each bedroom has ample wardrobe-type closets. In the bedroom hall there is a linen closet and a closet suitable for storing cleaning equipment. Privacy in the bedroom hall, with circulation from each bedroom to the bath, is achieved at a minimum cost of floor area and without unnecessary doors.

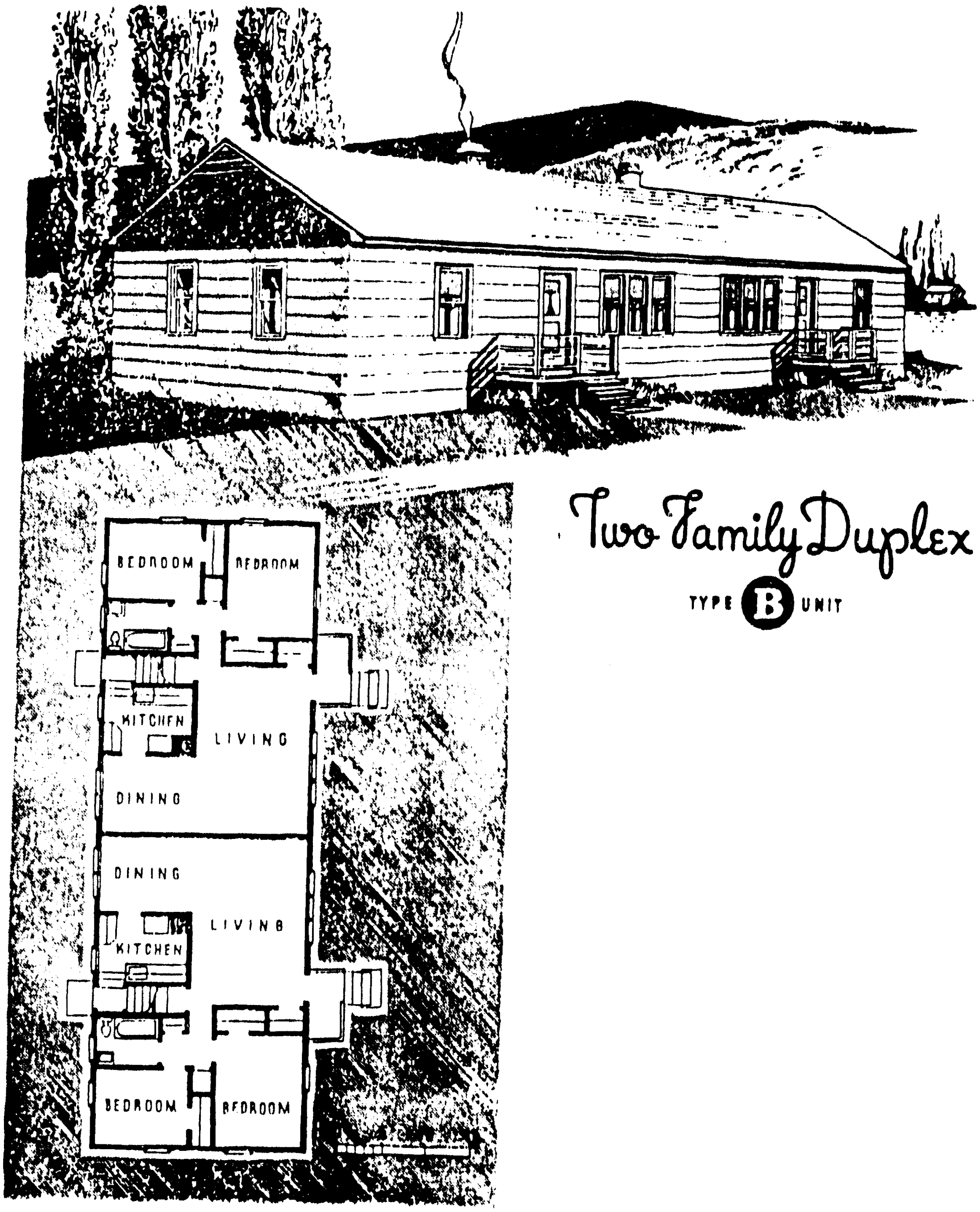
The living room, while smaller than its counterpart in the "A" house, is ample and of good proportion. When in the house, one feels a sense of space and openness, except in the kitchen. By ordinary standards this room is definitely minimum for this size of house. The refrigerator, however, will supplement the storage facilities, which consist of about ten feet nine inches of upper cupboards of two and three shelves and about seven feet three inches of lower cabinets including those under the sink. There are four drawers, and two bins on rollers in this space. The flush-rim sinks and set-in linoleum-covered tops with linoleum backs are standard throughout the project. The stove sets free against the dining room wall.

The trim and finish are uniform with all units. Casein painted dry-wall construction has a painted soft wood trim. The floors are natural fir. Outside, the houses are finished mainly in soft-colored pro-dipped heavy cedar shakes with some variants in design using vertical siding either in the gables or as a sort of exterior wainscot. Because of the decidedly horizontal lines, this unit seems to hug the ground better than the two-story unit and is decidedly pleasing in appearance.

TABLE IX DIVISIONS OF THE "B" HOUSE

Type:	Two-Family Unit One Story Two Bedrooms	
Overall Size:	24'-6" x 72'-0"	1764 square feet
Rooms:	Sizes	Area*
Basement		
Laundry) Furnace) Fuel)	20'-10" x 23'-6"	490 square feet
Stairs	3'-0" x 10'-0"	30
First Floor		
Living Room	13'-0" x 19'-0"	247
Coat Closet	2'-6" x 4"-0"	10
Stair Closet	3'-0" x 3"-4"	10
Dining Room	8'-6" x 10'-6"	89
Kitchen 8 lin. ft. worktop 10½ lin. ft. cupbd.	7'-6" x 10'-0"	75
Hall		30
Linen Closet	2'-2" x 2"-10"	6
Broom Closet	1'-8" x 2'-4"	4
Bedroom #1	9'-11" x 12'-11"	128
Closet	2'-6" x 5'-3"	13
Bedroom #2	9'-9" x 10'-7"	103
Closet	2'-2" x 5'-6"	12
Bath	5'-6" x 7'-2"	39½
Stair	3'-0" x 6'-3"	18

Two Family Duplex
Type B Unit



Two Family Duplex

TYPE B UNIT

The "D" House [1107 Structure]

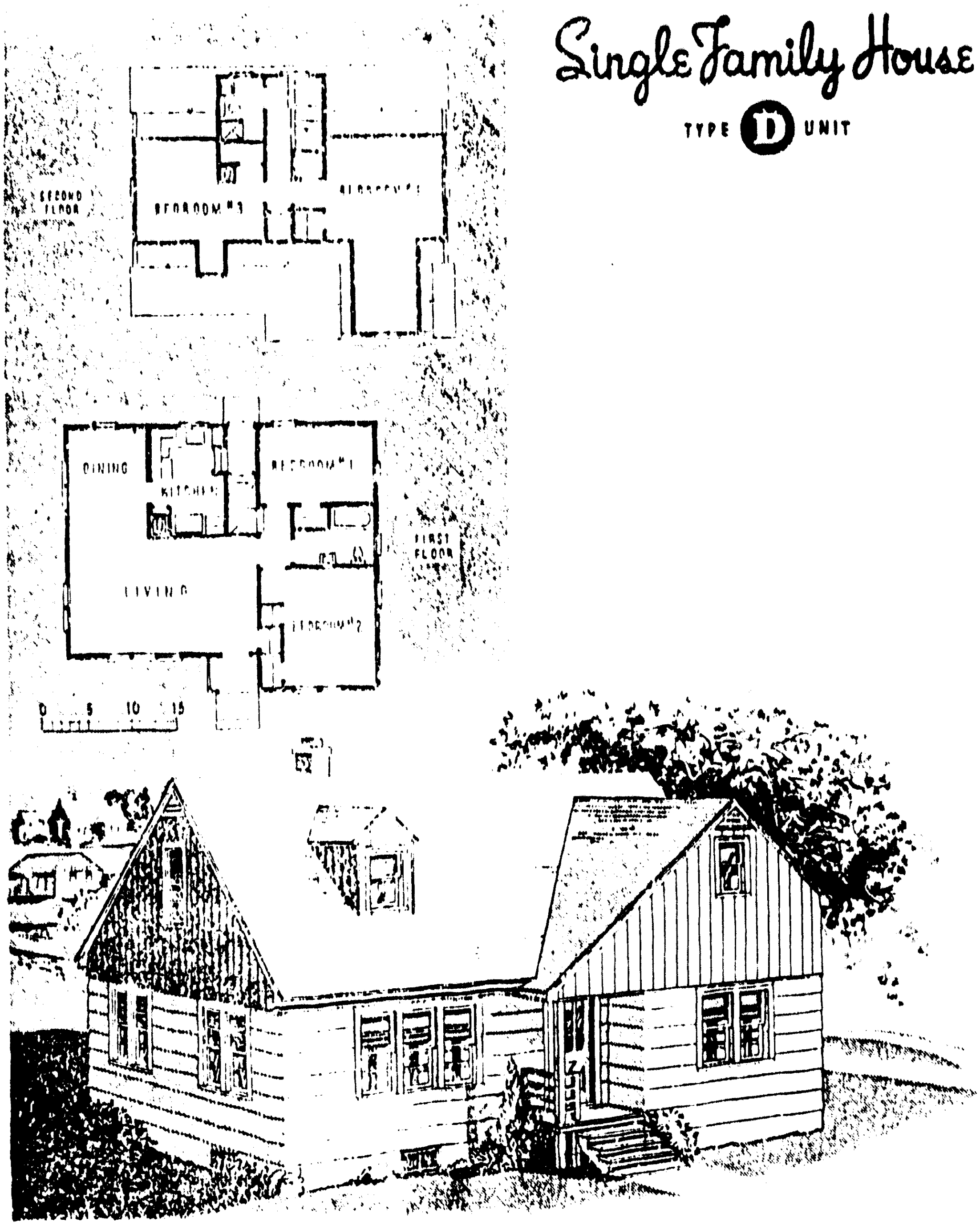
The "D" house, of which there are eight units and eight buildings authorized, is a single-unit house designed for executive occupancy. It is a story and a half in height and has four bedrooms arranged two upstairs and two down. The distinguishing feature of the first floor is the slightly projecting wing which breaks the front wall line and permits the bedrooms to be arranged with a bath between them on the side wall. A bedroom wing hall has access to a stairs connecting the two large bedrooms on the second floor. These are in the gable ends under the roof, one being cross ventilated with a front dormer, the other with the gable of the projecting wing. The upstairs bathroom with a shower-stall is situated in a large dormer over the kitchen, and a hall, equipped with a good-sized linen closet, connects it and the bedrooms with the stairs. On both floors, the smaller bedroom has one closet, the larger two closets. Downstairs, the bathroom has a lavatory with medicine closet, a water closet and a standard sized bath tub. The living room, which has a closet for wraps adjacent to the front door, is thirteen feet by twenty feet ten inches. The dining room, an alcove type, is nine feet by twelve feet. The kitchen is large and fully equipped with good storage space arranged on three walls. The drawer space is somewhat less than in some of the other types of houses, but the upper cupboards with their adjustable shelves are more ample. The work-shelf space and the drainboard area are definitely greater, and the floor area is sufficient for several to work in this kitchen simultaneously. The finish throughout is comparable with other types.

If one wished to compare the "D" house with the average, only the slightly increased room sizes and the additional rooms and service would distinguish it. It is notable that throughout the entire project a democratic principle has been adopted, so that the types of houses vary mainly in quantitative differences. These differences are reflected in the economics of housing. The few larger houses will probably be occupied by the more permanent executives upon whom certain socio-business demands are made.

TABLE X DIVISIONS OF THE "D" HOUSE

Type:	Single Family Unit One and one-half Story Four Bedrooms	
Overall Size:	26'-2" x 35'-0"	970 square feet
Rooms:	Size	Area
Basement		
Furnace) Fuel) Laundry)	20'-9" x 24'-10"	484½
Stairs	3'-0" x 6'-6"	19½
First Floor		
Living Room	13'-9" x 21'-0"	273
Coat Closet	2'-2" x 2'-0"	
Dining Room	8'-10" x 12'-0"	106
Kitchen		96
8 lin. ft. worktop		
9 lin. ft. cupbd.		
Broom Closet	1'-0" x 1'-10"	
Bedroom #1	8'-6" x 13'-0"	110½
Closet	2'-3" x 3'-9"	
Bedroom #2	10'-6" x 13'-0"	144
Closet	2'-2" x 3'-6"	
Closet 2A	2'-0" x 2'-10"	
Stair Area	3'-0" x 12'-0"	36
Hall Area	3'-0" x 6'-6"	19½
Second Floor		
Bedroom #3		136
Closet	2'-3" x 4'-9"	10½
		232
Bedroom #4	3'-0" x 3'-6"	10½
Closet	3'-0" x 3'-0"	9
Closet 4A		
Bathroom	4'-9" x 7'-2"	27
Stair	3'-0" x 5'-0"	15
Hall		55½
Linen Closet	2'-10" x 3'-0"	8½

Single Family House
Type D Unit



The "E" House [1107 Structure]

The "E" house, of which there are 84 units and the same number of buildings authorized, is a single-story three-bedroom house. As in the "D" unit, additional floor area has been achieved by adopting the T-shape plan. This allows for three bedrooms along one side with only closet areas intervening. The bathroom is moved to the back of the house next to the kitchen, as in the "B" house. The two exterior bedrooms have corner positions, and the smaller bedroom between them has a single outside wall. The arrangement of the closets will help to reduce inter-room noises. Although the kitchen floor area is larger than in the "B" unit, there is about the same cupboard space. The dining room compares in size with the "B" unit, and the living room, although of the same width, is two feet longer.

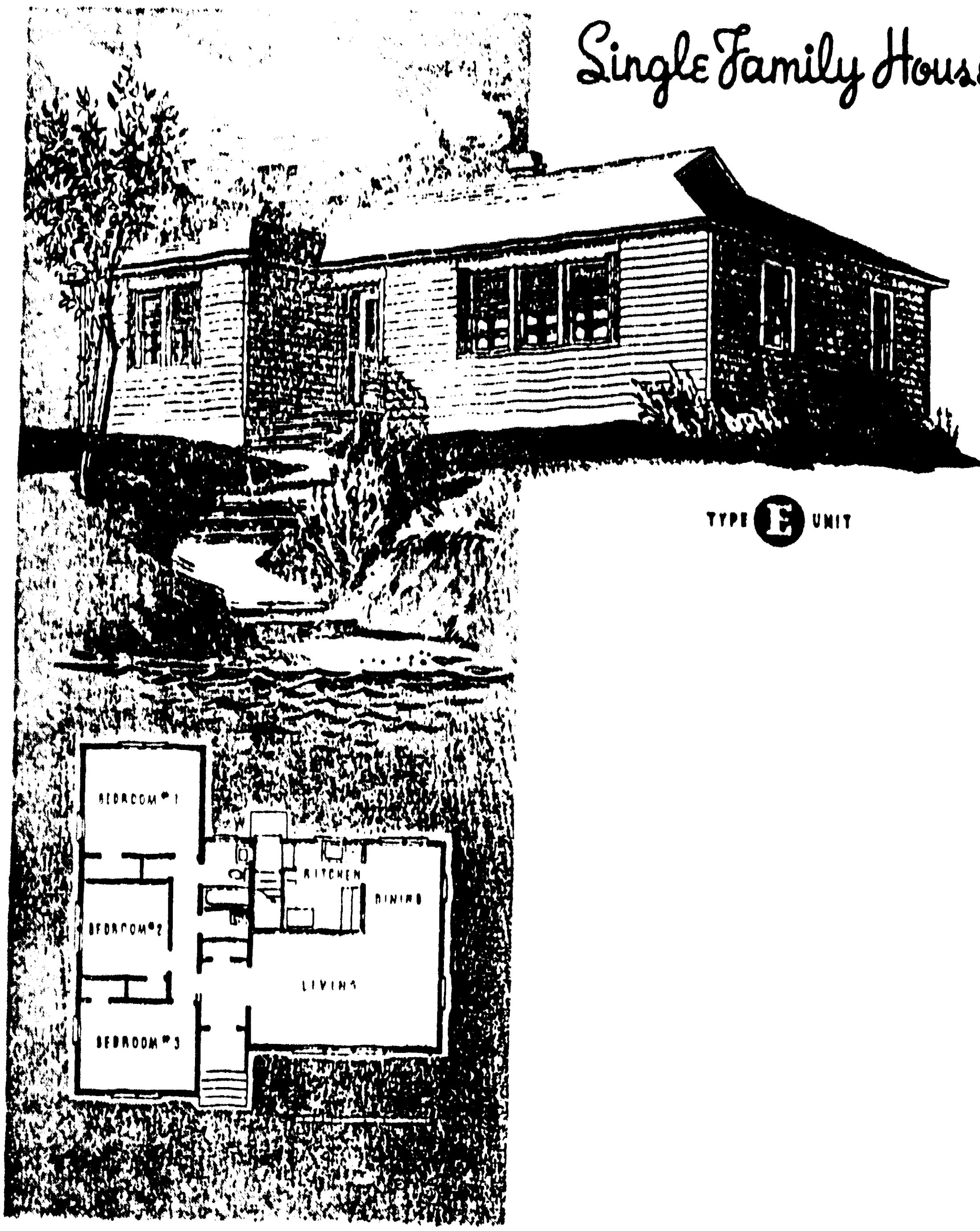
The distinguishing feature of the plan is the introduction of a hall between the front door and the living room, a logical addition because of the position of the bath. It was felt, too, that the hall would probably be more desirable than an enlargement of the already adequate living room. A good-sized coat closet in this hall is a service feature. The "E" house, like all the houses, has closet space of various kinds. Such space, as surveys made throughout the United States prove, is highly favored by the housewife. Especially in houses such as these, which have no attics, and whose basements are needed primarily for furnace rooms and laundries, adequate closet space is a necessity.

From the outside, the "E" house appears to have a cover over the entrance because the latter is indented slightly. This detail, compared with the treatment of entrances on other types of houses, decidedly improves its appearance. The exterior of the "E" house has two variants. One house has shakes and the usual gable roof; the other has wood siding and the gables are cut back to give a hipped roof. This change was felt to provide welcome relief to the general plainness of the types which were more numerous. Informal houses introduced into the block plan lend variety to the groups, and accomplish this effect more subtly than the too-conscious attempt to produce a striking array of types.

TABLE XI DIVISIONS OF THE "E" HOUSE

Type:	Single Family Unit One Story Three Bedrooms	
Overall Size:	39'-6" x 41'-0"	
Rooms:	Size	Area
Basement		
Furnace) Fuel) Laundry)	22'-8" x 26'-6"	562
Stairs	3'-0" x 7'-0"	21
First Floor		
Living Room	13'-0" x 21'-11"	272
Closet	2'-6" x 5'-2"	12½
Dining Room	8'-3" x 9'-10"	74½
Kitchen		78½
6½ lin. ft. worktop		
7 lin. ft. cupbd.		
Broom Closet	1'-2" x 1'-4"	1½
Bedroom #1	12'-0" x 13'-3"	159
Closet	2'-6" x 6"-5"	15
Bedroom #2	9'-10" x 10'-6"	95
Closet	2'-3" x 5'-3"	10½
Bedroom #3	10'-0" x 13'-3"	132½
Closet	2'-3" x 4'-5"	7
Bath	5'-2" x 7'-8"	38
Hall		
Linen Closet	2'-6" x 3'-2"	97½
Closet	2'-9" x 5'-2"	7½
		13½
Stair	3'-0" x 6'-6"	19½

Single Family House
Type E Unit



The "F" House [1108 Structure]

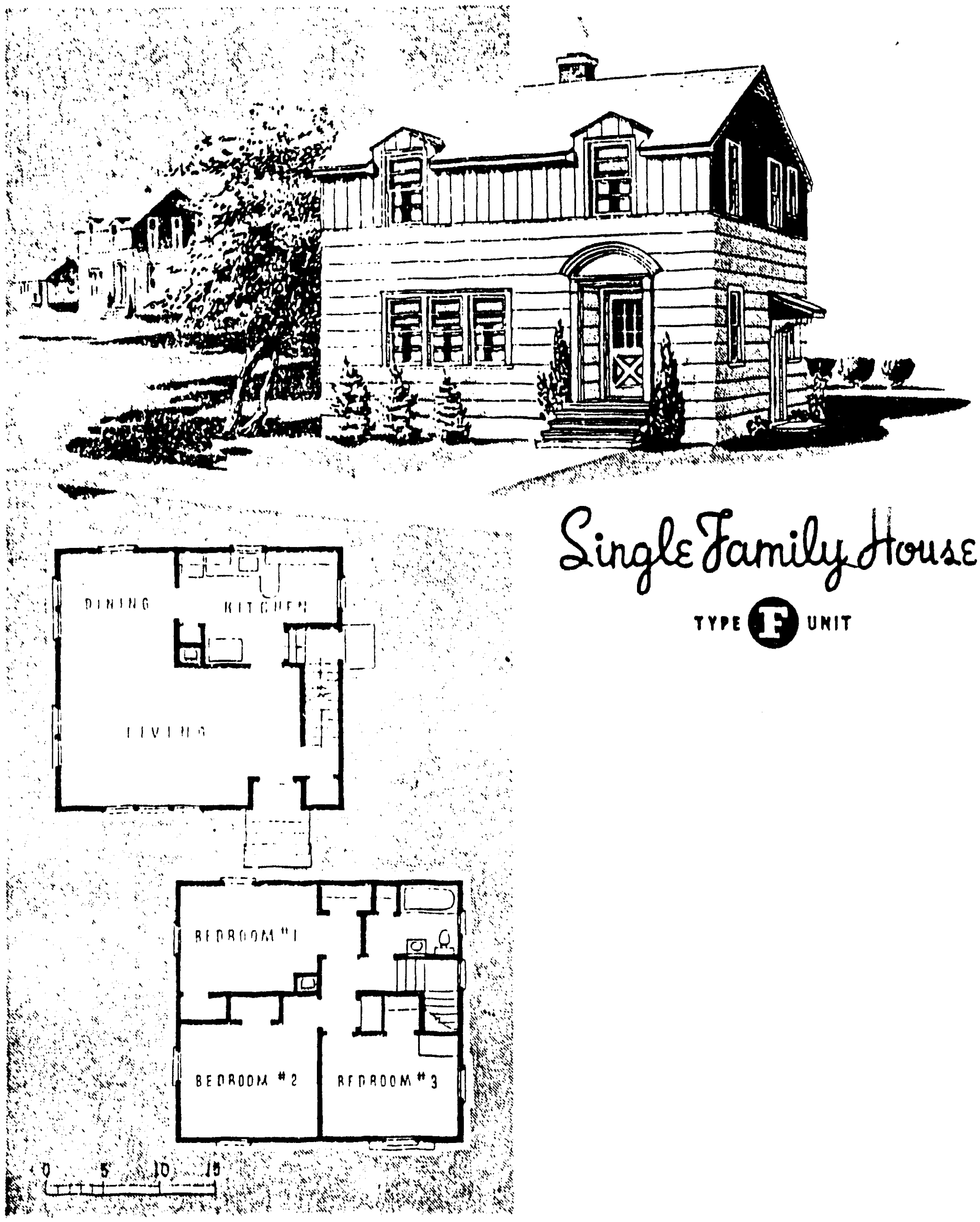
The "F" house, of which there are 250 units and 250 buildings, is a full two-story, three-bedroom house. A version of an old and much-admired plan, it offers every possible utilization of space and advantage of orientation with a minimum of cubic cost. Every room in the house has two exposures. The three bedrooms on the second floor are adequate and all have good-sized closets. There is additional closet space on both floors. The dining room and living room and kitchen are all ample. In fact, the kitchen is the only one of all the types that is large enough for a breakfast table. Its cabinets, too, are generous in size.

The exterior of this type of house is always boxy. Being nearly square in plan and having two stories make it appear unusually high. This effect is corrected by dropping the ceiling at the front and back of the second floor and by the introduction of dormers. Although this style of house is greatly improved by keeping the floor line nearly at grade, this was impractical for several reasons. There is the possible water hazard of a too-deeply excavated basement; there is the elimination of areaways or wells for light; and there is the difficulty in handling wood framing too close to grade. All these factors would have increased the expense of the house.

TABLE XII DIVISIONS OF THE "F" HOUSE

Type:	Single Family Unit Two Stories Three Bedrooms	
Overall Size:	23'-8" x 25'-8"	
Rooms:	Size	Area
Basement		
Furnace) Fuel) Laundry)	14'-2" x 22"-4"	312 square feet
Stairs	3'-0" x 6'-6"	19½
First Floor		
Living Room		270
Coat Closet	2'-6" x 3'-0"	7½
Dining Room	10'-2" x 10'-6"	105
Kitchen		119½
14' lin. ft. worktop		
10½ lin. ft. cupbd.		
Broom Closet	1'-6" x 2'-0"	3
Hall	3'-0" x 4'-6"	13½
Stair	3'-6" x 6'-9"	23½
Second Floor		
Bedroom #1	10'-0" x 12'-4"	123
Closet	2'-0" x 4'-3"	8½
Bedroom #2	10'-0" x 12'-4"	123
Closet	2'-0" x 4'-3"	8½
Bedroom #3	9'-0" x 12'-0"	108
Closet	3'-0" x 3'-0"	6
Bath		42
Closet	2'-3" x 1'-10"	3
Hall and Stairs	2'-0" x 3'-0"	6
Linen Closet	2'-0" x 3'-0"	6
Closet	2'-3" x 4'-4"	9½

Single Family House
Type F unit



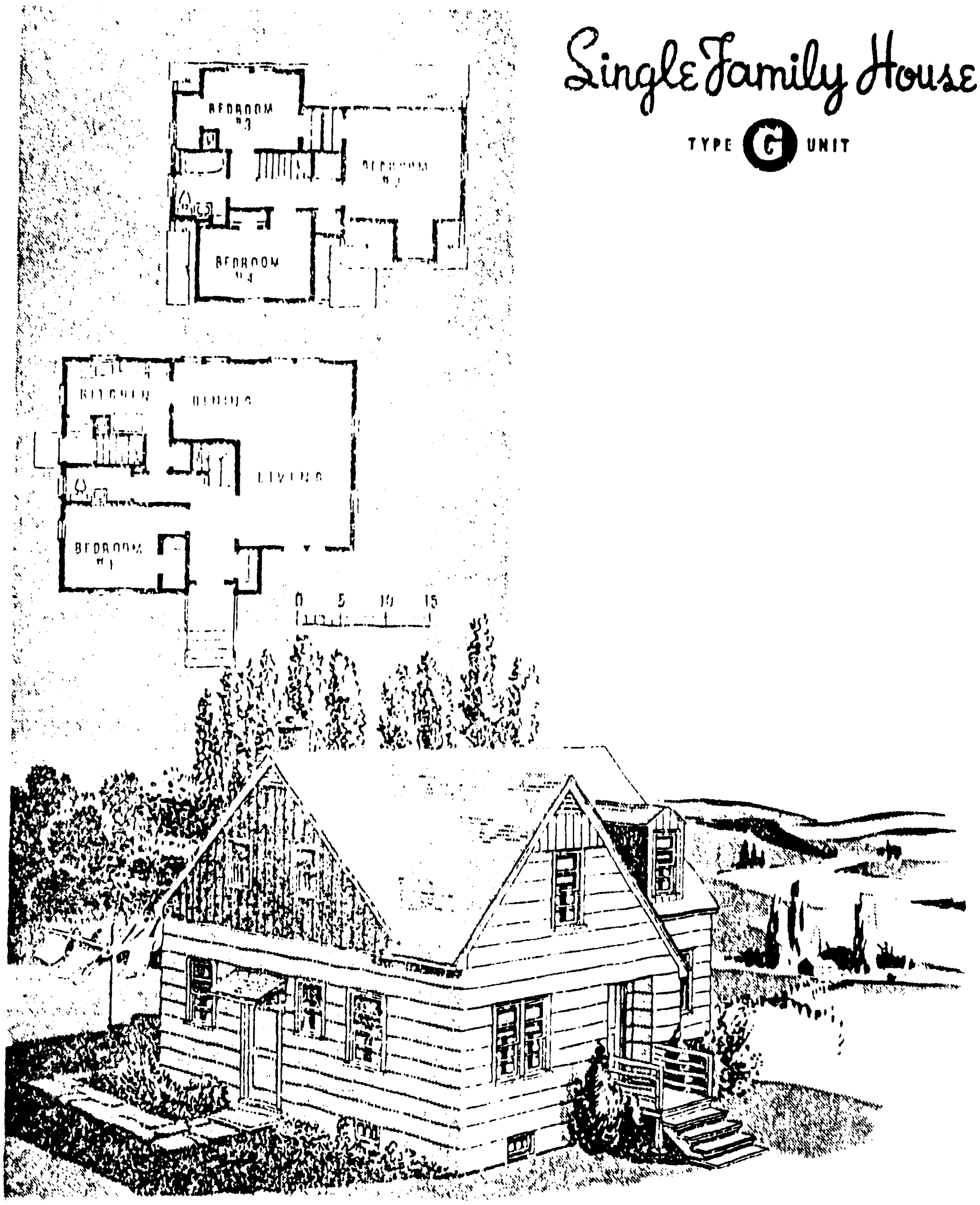
The "G" House [1107 Structure]

The "G" house, of which there are 8 units and 8 buildings, is a story and a half in height and has four bedrooms. The outside dimensions are slightly smaller than the "D" house to which it best compares in kind and probably type of occupancy. In arrangement, however, it is different from all the others. It has one bedroom on the first floor and three on the second. The upstairs has a full bathroom and the first floor has a lavatory and a water closet. This plan allows great flexibility since the first floor bedroom can be used as a study, as a residential office if necessary, or as a special guest room. The living room size is about average for the larger houses; the dining room is smaller than most. The kitchen is well-arranged with ample cabinet space. The circulation in this house is exceptional, for one may pass from the kitchen direct to the front part of the house without going through the dining room or living room. Like the "E" house, it has a front hall and a recessed door. The roof has several dormers and an off-center ridge on the front wing which lend it an informal air. In appearance it would look well in any pleasant village of modestly priced houses. These few houses are grouped principally in two locations: approximately half in Area 3 near the river and the other half in Area 2 close to the Elementary School. In service equipment, laundry, and so fourth, the "G" house is similar to all single and duplex houses in the project.

TABLE XIII DIVISIONS OF THE "G" HOUSE

Type:	Single Family Unit Two Stories Four Bedrooms	
Overall Size:	26'-9" x 33'-2"	
Rooms:	Size	Area
Basement		
Furnace) Fuel) Laundry)	18'-6" x 25'-6"	441 square feet
Stairs	3'-6" x 5'-10"	18
First Floor		
Living Room	13'-0" x 21'-0"	273
Dining Room	8'-0" x 9'-0"	72
Kitchen		88
8½ lin. ft. worktop		
11 lin. ft. cupbd.		
Broom Closet	3'-3" x 3'-0"	6½
Bedroom #1		114
Closet	2'-6" x 6'-6"	15
Toilet	3'-8" x 6'-10"	23
Hall	2'-3" x 4'-6"	81
Closet		9
Stairs		45
Second Floor		
Bedroom #2	12'-0" x 13'-0"	169
Closet 2A	2'-0" x 5'-0"	10
Closet 2B	2'-9" x 2'-0"	5½
Linen Closet	3'-0" x 3'-0"	9
Bedroom #3	9'-0" x 11'-0"	110
Closet	2'-0" x 5'-0"	10
Bedroom #4	8'-0" x 12'-6"	109
Closet	1'-8" x 4'-8"	6
Bath		39
Hall		48
Stair	3'-0" x 6'-6"	19½

Single Family House
Type G Unit



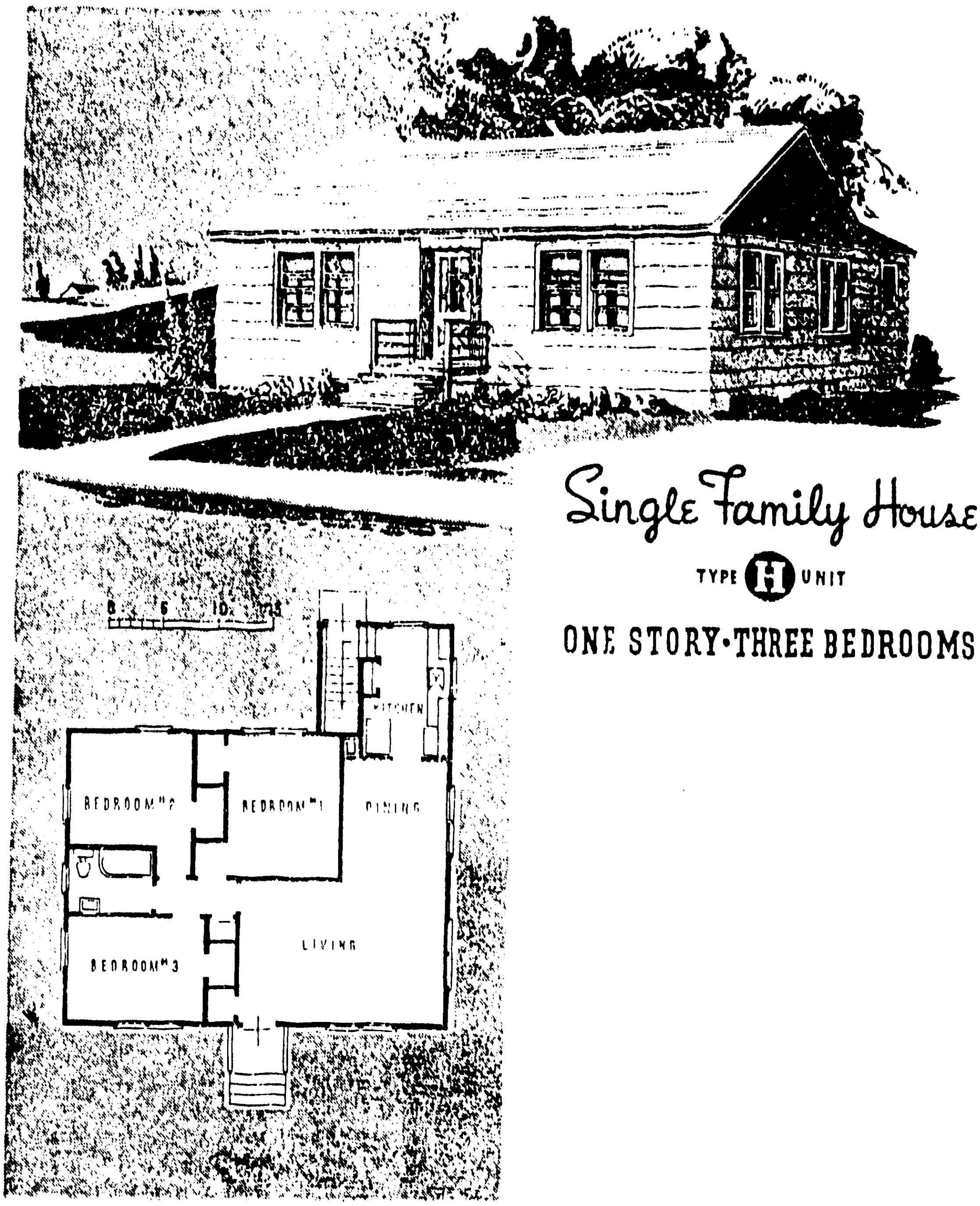
The "H" House [1108 Structure]

The "H" house, of which there are 250 units and 250 buildings, is similar in plan to the "E" house. It is a one-story, three-bedroom house. The room sizes are generally a little smaller than the rooms in the "E" house and the plan is a little more regular, only the kitchen breaking outside the main rectangular mass. The two corner bedrooms have an intervening bath and adjoining them at the rear center of the house is a third bedroom. The remaining space across the back of the rectangle is used for a dining room alcove. The kitchen and the stairs to the basement thus become a wing behind the dining room. Although the house has slightly less closet space proportionately, each bedroom has an ample closet. There is the usual coat closet off the front room adjacent to the front door and there are two additional closets, one for linen in the bedroom hall and one for cleaning equipment in the kitchen. The kitchen has good cabinet space, is well arranged, and because of its corner position, has good light and air from two directions. Quality and type of finish compare with the standards adopted throughout the project. The front of the house is very simple but a note of interest may be found in a Colonial type cross panelled door and fluted trim. There are no variants planned, all the house being finished in prestained cedar shakes.

TABLE XIV DIVISIONS OF THE "H" HOUSE

Type:	Single Family Unit One Story Three Bedrooms	
Overall Size:	34'-11" x 37'-0"	
Rooms:	Size	Area
Basement		
Furnace) Fuel) Laundry)		310½ square feet
Stair		33
First Floor		
Living Room	13'-0" x 18'-6"	240½
Closet	2'-4" x 3'-0"	7
Dining Room	9'-6" x 11'-0"	104½
Kitchen		83
9 lin. ft. worktop		
8 lin. ft. cupbd.		
Broom Closet	1'-3" x 3'-0"	3½
Bath	5'-9" x 7'-6"	37½
Bedroom #1	10'-0" x 12'-10"	133
Closet	2'-6" x 4'-6"	10
Bedroom #2	10'-0" x 11'-0"	118
Closet	2'-6" x 4'-6"	10
Bedroom #3	9'-6" x 12'-6"	114
Closet	2'-4" x 4'-0"	9
Hall	3'-0" x 7'-3"	21½
Closet	2'-0" x 2'-4"	4½
Stair		31

Single Family House
Type H Unit



1110 DORMITORIES

Eight K-type dormitories and seventeen J-type dormitories have been provided for the 1100 Area. These two types of dormitories are identical in size, shape and design, except for slight variations in the use of some of the rooms. The eight K-type dormitories for men are located along the west side of Goethals Drive between Swift Boulevard and Williams Boulevard. The seventeen J-type dormitories for women are located in the block surrounded by Goethals Drive, Lee Boulevard, Stevens Drive and Knight Street. These two-story, wooden frame, gable roof, rectangular shaped structures contain a vestibule, lounge room, storage room, wash room, toilet, shower, and 14 bedrooms on the ground floor; and on the second floor are a storage room, wash room, toilet, shower, and 17 bedrooms. In the J-type dormitory for women, a laundry room, and a writing room are substituted for two of the second floor bedrooms.

The building is supported by concrete piers and concrete block foundation walls with concrete footings. The exterior walls are a combination of vertical siding and horizontal siding. The asphalt shingle roof is supported by wooden trusses, rafters and T & G sheathing. All floors are of wood except the shower room which has a cement floor. Linoleum is added in the wash rooms and toilets. Interior partitions are of wallboard and Kimsul insulation. Central corridors run the entire length of the building on both floors, and an inside wooden stairway runs from the lounge room to the second story corridor. An outside second story wooden stairway is located at either end of the building.

The overall dimensions of this building are 110½' x 33' x 30', the cross-sectional area is 3,940 square feet, and the displacement volume is 100,500 cubic feet.

1111 FOOD STORE

Five Food Stores identical in size, shape, and design, have been provided for the 1100 Area and are located at the intersection of Symons Street and Goethals Drive, at the intersection of Williams Boulevard and Thayer Drive, at the intersection of Goethals Drive and Jackson Street, at the intersection of Snow Ave. and Jewett Street, and at the intersection of Goethals Drive and Comstock Street. These one-story, wooden frame, flat roof, rectangular-shaped buildings contain a large sales area with a walk-in meat refrigerator with side compartments for dairy refrigeration. At the rear of the building is a storage room, a work room and two toilets. A small addition has been added to the rear of the structure to enlarge the storage space and to provide an area with an outside window for the dispensing of bottled beverages. Four of the stores also contain a small basement room which houses a heating plant. The central store located at the intersection of Goethals Drive and Jackson Street does not contain this basement room as steam is piped directly form the central heating plant to this unit.

The buildings have a 4" reinforced concrete slab floor supported by reinforced concrete foundation walls and concrete piers. A portion of the floor at the rear of the building is of wood construction. The exterior walls are of shakes over 1" T & G sheathing while the roof supported by wooden trusses is of composition over shiplap sheathing. The interior walls and ceilings are of 1/2" wallboard. Brick chimneys are provided for those stores having heating plants. The building is windowless except along the front. It has a corner entrance consisting of a double swing door and full length windows. This immediate area contains an entrance turnstile and cashiers' checking and wrapping desks with cash registers.

The overall dimensions of this building are 135' x 60' x 28½', the cross-sectional area is 8,100 square feet, and the displacement volume is 164,500 cubic feet.

1111 DRUG STORE

Three Drug Stores - A, B, and C - identical in size, shape and design except for minor interior partitions and an addition, have been provided for the 1100 Area. Drug Store A is located at the intersection of Symons Street and Keller Avenue; Drug Store B at intersection of Williams Boulevard and Thayer Drive; and Drug Store C in the center of the Village just west of Theater #1. This one-story, wooden frame, roughly rectangular-shaped building with small basement at one end for a boiler room, fuel storage area and storage room, contains on the ground floor a large central sales room and a kitchen, stairway, small hall, and two toilets at one end. In Drug Store C a prescription room with counter is also provided in one corner of the sales area and a 14' wide addition has been made along the south side to provide a large area for stock storage and to enlarge the kitchen. A smaller shed roof addition 25' long by 30' wide has been made to the ends of the Drug Stores A and B to provide stock storage space. Entrances are provided on either side and at one end of the structure. A saw-tooth window arrangement runs along one side of the building by the sales area.

The building has a 4" reinforced concrete slab floor supported by reinforced concrete foundation walls and central concrete piers. Wooden floors are provided in the kitchen, storeroom, toilets, and stairway area. The floors are covered with "Mastipave" linoleum. Reinforced concrete walls 12" in thickness are located at one end of the building around the boiler and storerooms. The exterior walls are a combination of vertical siding, shakes and shingles. The flat roof supported by wooden rafters and shiplap sheathing is a built-up roof of asphalt felt. Interior linings and ceilings are of 1/2" wallboard. Insulation is provided in the walls and ceilings. Since Drug Store C is located in the center of the Village, it is heated by the central heating plant and the boiler room in the basement is used for additional storage.

The overall dimensions of Drug Store A and B are 137' x 36' x 23', the cross-sectional area is 4,450 square feet, and the displacement volume is 75,900 cubic feet. The overall dimensions of Drug Store C are 112' x 50' x 23', the cross-sectional area is 5,270 square feet, and the displacement volume is 89,390 cubic feet.

1111 GENERAL MERCHANDISE STORE

One General Merchandise Store has been provided for the 1100 Area and is located in the center of the Village at the intersection of Lee Blvd. and Goethals Drive. This large, wooden frame, square, one-story building with inside balcony, contains on the main floor a large general sales area with a receiving room, stock room, mechanical equipment room, and toilet located along the west wall beneath the balcony. The balcony, which is approximately 10 feet above floor level, runs along the west wall of the building and extends out for a distance of 45 feet. The balcony contains a sales area and office space with two toilets, rest room, locker room, and janitor's closet located along the west wall.

This building has a 4" reinforced concrete slab floor supported by reinforced concrete foundation walls and concrete piers. The exterior walls are, for the most part, of shakes but small sections are of vertical siding. The flat roof which is supported by wooden trusses and shiplap sheathing is a built-up roof of asphalt felt. Interior linings and ceilings are of 1/2" wallboard and 1" insulation is provided for the exterior walls and 2" insulation for the ceiling. The balcony floor is of wooden construction and the balcony is reached by two stairways which run from the main sales room. Customer access to the store is provided by double swing doors on the north, east and south sides of the building. Show windows are provided along three sides of the building for general merchandise display.

The overall dimensions of this building are 150' x 150' x 24½', the cross-sectional area is 22,500 square feet, and the displacement volume is 552,000 cubic feet.

1111 VARIETY STORE

One Variety Store has been provided for the 1100 Area and is located in the central shopping district on the northwest corner of the intersection of Goethals Drive and Lee Boulevard. This one-story, wooden frame, rectangular-shaped building with long axis running east and west contains a large sales area in the east and central part of the structure, and at the west end a stock room, receiving and marking room, candy room, rest room and two toilets.

The 4" reinforced concrete slab floor is supported by concrete and concrete block foundation walls with concrete piers. The exterior walls are of shakes over wooden sheathing and the flat roof supported by wooden rafters and shiplap sheathing is of composition asphalt felt. Interior walls and ceilings are of 1/2" wallboard. Blanket insulation is provided in the exterior walls and above the ceilings. The main entrance is at the east end of the building with display windows along the front and south sides.

The overall dimensions of this building are 150' x 60' x 22', the cross-sectional area is 9,000 square feet, and the displacement volume is 168,000 cubic feet.

1111 SHOE REPAIR SHOP

One Shoe Repair Shop has been provided for the 1100 Area and is located in the central shopping district between George Washington Way and Goethals Drive, just north of the Variety Store. This one-story, wooden frame, rectangular-shaped building with its long axis running east and west contains a lobby at the east end with a customer counter extending the width of the building. A large work area and a small drying room are located along the south wall. A storage area, small hallway, and two toilets are at the rear of the building.

The 4" reinforced concrete slab floor covered with "Mastipave" is supported by reinforced concrete foundation walls and well-tamped earth. The exterior walls are of shakes over sheathing with small sections of vertical siding provided between the windows. The flat composition roof of asphalt felt is supported by wooden trusses, rafters and shiplap sheathing. Interior linings and ceilings are of 1/2" wallboard. Blanket insulation is provided in the exterior walls and above the ceiling. A customer-entrance is provided at the east end of the structure and opens on a shoppers' lane.

The overall dimensions of this building are 60' x 30' x 16½', the cross-sectional area is 1,800 square feet, and the displacement volume is 29,700 cubic feet.

1111 WOMEN'S & CHILDREN'S APPAREL SHOP

One Women's and Children's Apparel Shop has been provided for the 1100 Area and is located in the central shopping area between George Washington Way and Goethals Drive with the Shoe Shop to the south and the Barber and Beauty Shop to the north. This one-story, wooden frame, rectangular-shaped building with long axis running north and south contains a large general sales area with two show windows at the north end and a display platform along the east wall; a large stock room and a receiving and marking room at the south end; and a janitor's closet, coat room, toilet and public rest room along the west side of the structure.

The building has a 4" reinforced concrete slab floor with linoleum covering supported by reinforced concrete foundation walls and concrete piers. The exterior walls of the building are for the most part of shakes with occasional sections of vertical siding. The flat roof, which is supported by central wooden posts, beams and shiplap sheathing, is a composition roof of asphalt felt. All interior walls and ceilings are covered with 1/2" wallboard. The fir wood trim is natural. Customer entrances are provided on the north and east sides of the building. Small windows are provided on the west and south sides of the building while show windows are provided on the north and east sides.

The overall dimensions of this building are 110' x 60' x 16½', the cross-sectional area is 6,600 square feet, and the displacement volume is 108,900 cubic feet.

1111 BARBER AND BEAUTY SHOP

One Barber and Beauty Shop Building has been provided for the 1100 Area and is located in the central shopping district between George Washington Way and Goethals Drive. This structure is a one-story, wooden frame, rectangular building with its long axis running north and south. The north end contains a 12-chair Barber Shop and the south end a 10-booth Beauty Shop. On the east side of the central portion of the building is a vestibule with two locker and toilet rooms, a closet, small hallway and basement stairway. The Beauty Shop comprises a waiting room with receptionist's desk, a central area with sixteen electric hair driers, and along the walls are nine hair dressing booths and one facial treatment booth. Beneath the locker and toilet rooms is a reinforced concrete basement containing a large hot water tank and a general storage space.

This building has a 4" reinforced concrete slab floor covered with linoleum throughout and supported by concrete and concrete block foundation walls and concrete piers. The exterior walls are of shakes and the flat roof is supported by wooden rafters and shiplap sheathing covered with built-up asphalt felt. Interior linings and ceilings are of wallboard. Small windows, approximately 6 feet above floor level, are located on three sides of the building while the east side contains two entrance doorways for customers and normal size windows along the center of the building. A wooden roof ventilator is located in the center of the building.

The overall dimensions of this building are 96½' x 40' x 17', the cross-sectional area is 3,620 square feet, and the displacement volume is 61,640 cubic feet.

1111 MILK DEPOT

One Milk Depot has been provided for the 1100 Area and is located in the center of the Village at the intersection of Cullum Avenue and Harding Street.

This one-story, rectangular-shaped, wooden frame, flat roof structure includes a large milk depot at the east end; and a large ice dock at the west end. A small addition at the southwest corner contains an office with counter; a public reception room; and two toilets. Within the building are a large inside dock adjacent to the milk dock, a milk and cream storage area, an ice cream storage area, an ice storage area, an equipment room, a vestibule and a connecting hallway.

The building has, for the most part, reinforced concrete slab floors supported by concrete block and reinforced concrete foundation walls. Beneath the refrigerated storage areas is a 6" layer of gravel. The floors in the vestibule, public office, and public reception room are of wood with linoleum covering added in the office and public reception room. The flooring of the two toilets is concrete with linoleum covering. The exterior walls are of shakes over wooden sheathing. The flat roof, supported by cross-bridging and shiplap sheathing, is of composition asphalt felt. The interior linings and ceilings are a combination of 1/2" wallboard, T & G sheathing, and 1/2" cement plaster. Blanket insulation is provided in exterior walls and above the ceiling. In the refrigerated areas, the walls are lined with insulation varying from 3" to 6" in thickness. The docks are wooden platforms supported by wooden posts resting on concrete piers. Two sliding doors are located at the east end of the building between the milk dock and the inside dock. A third large door is located on the north side of the building entering into the equipment room.

The overall dimensions of this building are 66' x 56' x 19', the cross-sectional area is 3,190 square feet, and the displacement volume is 51,000 cubic feet.

1111 ELECTRICAL SHOP

The Electrical Shop is located in the central shopping district on the east side of George Washington Way at its intersection with Knight Street.

This existing structure is a two-story, rectangular-shaped building with its long axis running east and west. On the ground floor at the west end is a customer reception room with service counter, and along the north wall a small room for phonograph record storage. A small hallway runs from the customer area to the east end of the building with a work shop along the south wall, a toilet and office along the north wall, and storage area at the rear. The second story is an apartment containing a living room, two bedrooms, kitchen, and toilet. The building has a full basement.

The foundations are of concrete, the exterior walls are of stucco, and the gable roof is of composition asphalt shingles over wooden sheathing and rafters. The floors are of wood construction and covered with linoleum in the customer area, apartment kitchen, and toilet. The walls and ceilings are a combination of plaster and wallboard.

The overall dimensions of this structure are 45' x 24' x 28', the cross-sectional area is 1,080 square feet, and the displacement volume is 25,000 cubic feet.

1111 OPTICAL SHOP

One Optical Shop has been provided for the 1100 Area and is located in the central shopping district on the west side of George Washington Way just north of the Hardware Store. This one-story, small rectangular-shaped concrete block building with long axis running east and west contains at the west end of the ground floor a waiting room, and two refraction rooms at the east end. The center of the building has a small hallway, two toilets, and a stairway leading to the basement. The concrete basement with reinforced concrete slab floor contains a general basement area and a small work shop in the northeast corner.

This building is a remodeled existing structure which is supported by reinforced concrete and concrete block foundation walls. The flooring is of wood construction with linoleum added in the toilets. The exterior walls are concrete block except the two ends of the building which are stucco over wooden framing with a poured concrete wall 8" thick above the west entrance. A 16" concrete coping is around the top of the building. The flat roof sloping slightly from west to east is a composition roof supported by wooden rafters and sheathing. Interior partitions and ceilings are of 1/2" wallboard. A customer entrance is provided at either end of the structure.

The overall dimensions of this building are 36' x 25' x 30', the cross-sectional area is 900 square feet, and the displacement volume is 25,200 cubic feet.

The building contains one 20-gallon capacity electric hot water tank in the basement, and is heated from the central heating plant.

1111 HARDWARE STORE

One Hardware Store has been provided for the 1100 Area and is located in the central shopping district on the northwest corner of the intersection of George Washington Way and Lee Boulevard. This large. one-story, rectangular-shaped building is of tile, brick, and wooden frame construction with its long axis running north and south. The tile and brick existing portion contains a large sales area and in the smaller wooden framed addition at the north end a receiving and marking room, an office, a radio and phonograph demonstration room, a garden furniture salesroom, janitor's closet, rest room and two toilets.

This building has been remodeled from an existing structure with the exception of the addition at the north end. The 4" reinforced concrete slab floor is supported by reinforced concrete and concrete block foundation walls. The exterior walls are of red glazed building tile, brick, horizontal and vertical siding, and shakes over wooden sheathing. The flat, composition roof of asphalt felt is supported by wooden rafters and 1" sheathing. Interior partitions and ceilings are 1/2" wallboard except in the sales area where acoustic tile board ceilings are provided. Blanket insulation is provided in the walls and ceilings. A "Mastipave" floor covering is used throughout the public sales areas. Customer-entrances are located on both the east and west sides of the structure and plate glass show windows extend along either side of these entrances.

The overall dimensions of this building are 100' x 74½' x 19', the cross-sectional area is 7,450 square feet, and the displacement volume is 110,000 cubic feet.

1111 MEN'S APPAREL SHOP AND SHOE STORE

One Men's Apparel Shop and Shoe Store Building has been provided for the 1100 Area and is located in the central shopping district on the west side of George Washington Way across the street from the Recreation Building and a short distance south of the Western Union Building. This concrete block, one-story, square-shaped building with half basement is divided into two stores. The Men's Apparel Shop is on the north and the Shoe Store is on the south.

The Men's Apparel Shop has a large, general sales area which runs the entire length of the store with a customer-entrance on the east and west ends; a dressing room, and a cashier counter along the north wall; a second dressing room, and two toilets near the east end of the store. Two large show windows extend out into the shopping lane on the west end and a third but smaller show window is located in the northeast corner. The basement contains an alteration room, office, hallway, and general storage area.

The Shoe Store contains a large sales area which extends the entire length of the store and has the main customer-entrance at the west end of the building opening onto the shoppers' lane and a second customer-entrance at the east end facing George Washington Way. On either side of the general sales area is located a passageway, and stock storage area with a hallway. A cash and wrapping counter, office, receiving room, janitor's closet, and two toilets are near the rear of the building. Two large show windows protrude out into the shopping lane at the west end of the store while one show window is located on the southeast corner facing George Washington Way. The basement has a large stock storage area with a work shop in the southeast corner.

This building is a remodeled existing structure. The original walls are of concrete blocks 12" thick. The flooring is of wood construction supported by reinforced concrete foundation walls. The store was widened slightly along the west side and an 8" concrete block wall provided. Surrounding the four show windows is 1" T & G siding and an 8' wide wooden marquee provides a roof for the show windows and extends out 4' over the shopping lane. The flat roof is of built-up asphalt felt supported by wooden studs, rafters and T & G sheathing. The interior linings and ceilings are of 1/2" wallboard. Blanket insulation is provided above the ceilings.

The overall dimensions of this building are 75' x 75' x 27', the cross-sectional area is 5,625 square feet, and the displacement volume is 121,000 cubic feet.

1111 AUTOMOTIVE GARAGE AND SERVICE STATION

One Automotive Garage and Service Station has been provided for the 1100 Area and is located at the intersection of Goethals Drive and Newton St. in the central shopping district. This one-story, wooden frame, rectangular building with curved roof has its long axis running north and south. Two small, flat-roof additions are at the south end of the structure. The main portion of the building consists of a large garage and repair area with a wash rack and paint shop in the northwest corner. The addition at the southwest corner contains a Parts room, small office, toilet and shower room. The Service Station addition at the southeast corner contains a lubrication room with two hydraulic lifts, an office, a small storage room and two toilets.

The 4" reinforced concrete slab floor is supported by reinforced concrete and concrete block foundation walls. The exterior walls are of shakes over wooden sheathing while the curved composition roof of asphalt felt is supported by wooden trusses, rafters and shiplap sheathing. The garage, lubrication, storage and repair shop areas are lined with wood wainscot to a height of 7' while the paint shop has concrete block walls and plaster ceiling. Wash rack area has plaster walls and ceiling and the rest of the structure has 1/2" wallboards, partitions and ceiling. The garage and repair area is not sealed. A canopy extends above three gasoline pumps located just south of the service station office at the southeast corner of the building. Two 8" "I" beam monorails run the entire length of the repair area near the east wall. A 12' vertical sliding wooden door is located at either end of the repair area.

The overall dimensions of this building area 134½' x 105' x 25', the cross-sectional area is 9,400 square feet, and the displacement volume is 189,000 cubic feet.

1111 SERVICE STATION

Three Service Stations identical in size, shape and design have been provided for the 1100 Area. One Service Station is located in the northern portion of the Village at the intersection of Goethals Drive and Symons St.; a second at the intersection of Williams Boulevard and Perkins Avenue; and the third in the southern portion of the Village at the intersection of Casey Avenue and Comstock Street. This one-story, wooden frame, flat roof building contains a lubrication room, storage room, office, and two toilets.

The 4" reinforced concrete slab floor is supported by concrete foundation walls. The exterior walls are of drop siding over building paper and wooden sheathing. The flat roof, supported by wooden rafters and 13/16" shiplap sheathing, is a composition asphalt felt. Interior linings and ceilings are of 1/2" wallboard except in the lubrication room where T & G sheathing is provided. Blanket insulation is provided in the exterior walls and roof. Three pumps are located on a concrete slab in front of the building and are covered by a canopy extension of the roof. A 10' wide, wooden and glass, vertical sliding door provides access to the lubrication room.

The overall dimensions of this building are 28½' x 24' x 17'. The cross-sectional area is 615 square feet, and the displacement volume is 10,450 cubic feet.

1111 WESTERN UNION BUILDING

One Western Union Building has been provided for the 1100 Area and is located in the central shopping district on the southwest corner of the intersection of George Washington Way and Lee Boulevard. This small, one-story, stucco, rectangular-shaped building with long axis running east and west contains at the east end a public reception area with counter and a general work area. At the west end a hallway extends the width of the building, and a rest room, janitor's closet, and two toilets are along the wall.

This building is a remodeled existing structure with an addition. The east end containing the reception room and work area is part of the original structure while a shed roof addition was added at the west end to enlarge the work area and provide additional facilities.

The building has concrete foundation walls and wooden flooring covered with linoleum throughout. The exterior walls are of stucco and the flat, composition roof is supported by wooden rafters and sheathing. The east end of the building has plaster on the interior walls and ceiling while the addition has 1/2" wallboard partitions and ceiling. Two inch blanket insulation is provided above the ceiling.

The overall dimensions of this building are 52½' x 20' x 16', the cross-sectional area is 1,050 square feet, and the displacement volume is 15,750 cubic feet.

Unassigned Store No. 85X

In the Commercial Center of the Village is the existing building 85X, the former barber shop, which is to be reconditioned. This building has not been assigned to any particular type of occupancy. It has an overall dimension of 20 feet by 26 feet, and an unobstructed sales or office room area of about 19 feet by 20 feet. In the southwest corner is a small toilet room with lavatory and water closet. Next to it, in the center rear, is a small hall opening into the main room and leading to a rear door on the Shopping Court. In the northwest corner is a closet space or storage room about 5 feet wide and 7 feet long. The exterior of the building is of concrete blocks, which will be painted. There is a center door on the front wall and two large wooden sash symmetrically placed on either side of it. The rear has a center door and two smaller windows one into each of the above mentioned rooms. The interior will have new wood floors, plaster walls and a celotex ceiling. There is no basement.

1112 CHURCHES

Two Churches have been provided for the 1100 Area and are located at the "Y" intersection of Stevens Drive and Long Avenue. These structures are identical in size, shape and design except for the addition of a steeple to one of them. The Protestant Church with its long axis running north and south is located to the east of the "Y" intersection, and the Catholic Church with its long axis running east and west is located south of the intersection in the "Y" between Stevens Drive and Long Avenue.

This one-story, wooden frame, gable roof, rectangular shaped building with half basement contains on the main floor a vestibule at the front, the nave of the church, and a raised altar at the rear. A room is located on either side of the altar. In the Catholic Church, these rooms are called Sacristy No. 1 and No. 2; in the Protestant Church, one is a choir room and the other is a study. In the half basement, a social room runs almost the entire length of the buildings, and at the rear are two toilets, a boiler room and a fuel bin.

The floor of the church proper is wooden and is supported by reinforced concrete foundation walls and concrete piers. The basement has concrete walls and a 4" reinforced concrete slab floor. The exterior walls of the church are of shakes over wooden sheathing. The wooden-shingled, gable roof is supported by wooden trusses and sheathing. The inside of the exterior walls is of insulation board above a 5'-1" high wooden wainscot. Ground floor partitions and ceilings are of insulation board. The basement rooms have gypsum board partitions and ceilings. A small wooden balcony with railing is located at the front of the church above the vestibule. Access to the basement is provided by stairways at the front and rear of the church and also by a concrete outside stairway at the rear.

A small, wooden frame, wooden shingle and shake steeple is provided for the Protestant Church.

The overall dimensions of the building are 109' x 57½' x 42½', the cross-sectional area is 5,920 square feet, and the displacement volume is 177,300 cubic feet.

1113 HIGH SCHOOL

One High School has been provided for the 1100 Area and is located just south of Long Avenue and approximately 300 feet east of Thayer Drive. This one-story building is shaped roughly in the form of an "E" with its long axis running north and south and the three wings extending toward the west.

A main central entrance on the east side of the building enters into a foyer with central corridor running north and south. Public entrances are also provided on the east side of the building opposite the auditorium in the north wing and the gymnasium in the south wing. Along either side of this corridor are classrooms for instruction in cooking, sewing, chemistry, physics and general science, biology, typing, shorthand, bookkeeping, also a conference room, four additional classrooms, four toilets, two first aid rooms, three waiting rooms, three offices, principal's office, examination room, superintendent's office, and several storage rooms.

In the north wing, a large auditorium with elevated stage is located. Above the east end is a projection room and a small general purpose room. At the west end there are two dressing rooms. A school workshop, stock room, planning room, finishing room, and tool room are located at the west end beyond the auditorium. Three music rooms, an instrument storage room, and a janitor's closet are located along the south side of the wing. A corridor runs between the music rooms and the auditorium and provides access to the workshop and adjacent rooms.

The middle wing contains five classrooms, a large study hall, a library with librarian's office and stack room, two toilets, a janitor's closet and storage area. This wing has a central corridor. Extending north from this wing almost entirely below ground level is a reinforced concrete boiler room with adjacent fuel storage area, switch panel room and transformer room.

The south wing contains a large gymnasium with equipment storage at one end and bleachers running along the south side. Beneath the bleachers are a shower room, boys' dressing room, and physical director's office. A laundry room and small storage area is located above the physical director's office. A corridor runs along the north wall of this wing to a lunch room and kitchen at the west end. In the southwest corner of this wing is located a girls' dressing room with showers and a second physical director's office.

The building is supported by concrete block and reinforced concrete foundation walls and interior wooden posts resting on small concrete piers. The floor is of wooden construction except in the auditorium, dressing rooms, toilets, entrances, and boiler room area where the flooring is of 4" reinforced concrete. The exterior walls are of shakes over T & G sheathing except around the entranceways where siding is used. The gable roofs above the classroom areas are supported by wooden beaming, rafters and shiplap sheathing and have a composition shingle surface. The curved roofs above the auditorium and gymnasium are of composition asphalt felt supported by wooden trusses, rafters and shiplap sheathing. The flat roofs above the dressing rooms and lunch room in the south wing and the school workshop and adjacent rooms in the north wing are also of composition asphalt felt. The boiler room area has a 4" reinforced concrete roof. Interior linings and ceilings are of plaster. Acoustic tile board ceilings are provided in the auditorium and gymnasium. Blanket insulation is used in the exterior walls, above the ceilings, and beneath the wood flooring.

The overall dimensions of this building are 497' x 245' x 42'. The cross-sectional area is 63,000 square feet, and the displacement volume is 1,541,000 cubic feet.

1113 GRADE SCHOOL

Three Grade Schools were constructed in the 1100 Area. Grade School #1 and #3, identical in size, shape and design, are located along the south side of Williams Boulevard just west of Stevens Drive and along the south side of Lee Boulevard between Winslow Avenue and Snow Avenue respectively. Grade School #2 is located along the south side of Van Giesen Street between George Washington Way and Hunt Avenue.

Grade Schools #1 and #3 are 16-classroom schools which include in addition to the classrooms a kindergarten with adjacent coat room and toilet, a large assembly and recreation hall with stage at one end, two shower rooms beneath the stage, lunch room, kitchen, boiler room, waiting room, two first aid rooms, principal's office, teachers' room, physical director's room, four toilets, and five storage and supply rooms. These schools have two wings each, one at right angles and the other at an angle to the central portion of the building. The assembly and recreation hall extends from the rear of the structure. The building contains central connecting corridors.

Grade School #2 is roughly rectangular in shape and contains eight classrooms, a vestibule, principal's office, library, two first aid rooms, rest room, examination room, boiler room, kitchen, four toilets, three storage and supply rooms, and an assembly and recreation hall projecting from the rear central portion of the building. A main corridor runs along the center of the structure.

These buildings are supported by concrete block and reinforced concrete foundation walls and interior wooden posts resting on small concrete foundation piers. The floor is of wood construction except in the boiler rooms; entranceways, and toilets which have 4" reinforced concrete slab floors. The exterior walls are of shakes over T & G sheathing except near the entrances where some siding is used. The gable roofs, supported by wooden trusses, rafters and shiplap sheathing, are of composition shingles except over the assembly and recreation hall where the curved roof has an asphalt felt surface. Interior partitions and ceilings are of plaster. The assembly and recreation hall has an acoustic tile board ceiling while the assembly hall in Grade School #2 is lined with wooden siding. Blanket insulation is provided in all exterior walls and above the ceilings. The boiler room is of brick construction and Grade Schools #1 and #3 have two fire walls of brick 13" in thickness.

The overall dimensions of Grade School #1 and #3 and 408' x 230' x 41'. The cross-sectional area is 35,200 square feet, and the displacement volume is 872,500 cubic feet.

The overall dimensions of Grade School #2 are 264' x 78½' x 37½', the cross-sectional area is 16,400 square feet, and the displacement volume is 432,000 cubic feet.

1113 EXISTING GRADE SCHOOL

One Existing Grade School, originally roughly rectangular in shape, is located southwest of the central shopping district on a plot of land bounded by Church Avenue, Gillespie Street, Cullum Avenue and Davenport Street. The building faces east on Church Avenue with long axis running north and south. A main entranceway, two offices with waiting room, and four classrooms are located along the east side. A large gymnasium is on the west with two classrooms to the north and four classrooms to the south. A toilet is located at either end of the north-south corridor running between the gymnasium and the classrooms on the east. Along the west wall of the gymnasium are elevated bleachers with boys' and girls' locker rooms, and shower rooms beneath. A concrete-enclosed boiler room with adjacent fuel room is located at the south end of the gymnasium.

Two wings, similar in construction and design to the existing building, were constructed on the west side of the building. The north wing with central corridor contains four classrooms, a large lunch room, kitchen with adjacent storage area, toilet, and entry way facing the north. In the south wing on either side of the central corridor are located four classrooms, a library, teachers' room, kindergarten, cubicle with adjacent storage room, toilet, and entrance facing the south.

The building has reinforced concrete foundation walls with interior wooden posts supported by concrete piers. Floors for the most part are of wood construction with 4" reinforced concrete slab floors in the boiler room, toilets, locker rooms, kitchen, and entrances. Exterior walls are of brick veneer over sheathing with T & G siding provided beneath the gables. The gable roof, supported by wooden beaming, rafters and shiplap sheathing, has a rigid asbestos shingle surface. The curved roof over the gymnasium is of composition asphalt felt supported by wooden trusses, rafters and shiplap sheathing. Interior linings and ceilings are of plaster.

The overall dimensions of this building are 268' x 185' x 36', the cross-sectional area is 32,500 square feet, and the displacement volume is 780,000 cubic feet.

1113 NURSERY

The Nursery is a remodeled existing house to which have been added two metal hutments with connecting hallways. It is located in the central shopping district on the northwest corner of the intersection of Goethals Drive and Lee Boulevard. At the east end of the existing portion of this rambling one-story structure is an office with entrance facing Goethals Drive; play room; children's dining room; large kitchen complete with electric range, two refrigerators, and cooking equipment; toilet; small bedroom; and isolation room. The metal hutment connected to the south side of the building by means of a hallway is used as a large play room while the second metal hutment connected to the west end or rear of the building by a right-angle hallway is used as a sleeping room for the children.

The building has a concrete and stone foundation. The exterior walls are of siding and shakes and the gable roof is of composition shingles over rafters and sheathing. The floors are of wood construction and completely covered with linoleum. Interior linings and ceilings are of plaster and wallboard.

The standard 40' x 22' semi-circular metal hutments have been painted on the outside and partially dressed with exterior shakes and siding.

The overall dimensions of this building are 80' x 75' x 25', the cross-sectional area is 3,200 square feet, and the displacement volume is 45,000 cubic feet.

1114 THEATER

Two theaters have been provided for Richland. The first is located just west of George Washington Way between Gillespie Street and Lee Boulevard, and the other on the east side of George Washington Way between Lee Boulevard and Knight Street. The two buildings are identical and consist of the main auditorium seating 526 people, all on one floor, a small stage mounting the projection screen, and a lobby or foyer having two floors.

The first floor of the foyer contains rest rooms and a small confectionery stand, the second floor contains the projection room, a one-bedroom apartment for the theater manager, an office, and an ushers' room.

The building is of wood frame construction, having 8" concrete wall foundations and a 4" concrete floor. The roof is spanned over the auditorium and stage with bow-string trusses; the ceiling is carried on the lower chord of these trusses and follows down the line of the wind braces at either side. Interior walls and ceiling are of 16" squares of tile board, the whole area being broken up into panels. Exterior walls are of wood shingles and vertical siding. The roof consists of 13/16" shiplap sheathing covered with 20 lb. built-up asphalt saturated roofing felt. There is a 2" layer of blanket insulation in the ceiling and a 1" layer in the side walls.

The stage opening is bounded by 1" white pine planking. The first floor of the foyer is lined with 8" knotty pine siding. The theater aisles, 4 ft. wide, as well as the ground floor of the foyer are covered with plush carpeting. The second floor of the foyer is finished similar to the conventional type houses in the village.

The theater is completely desert-cooled. There are three 8,000 c.f.m. evaporator coolers on the roof. Eight air diffusers are located in the ceiling of the auditorium, and a lighting fixture extends from the center of each diffuser. The entire building is heated by steam from the central heating plant, Building 784. The auditorium chairs have leather-bound, inner-spring seats with cloth-covered backs.

All equipment in these buildings, with the exception of the projection equipment, was installed by du Pont and its subcontractors. The projection equipment was furnished by the concessionaire operating the theater.

The building is 128 ft. long by 43 ft. wide by 32 ft. in height, has a cross-sectional area of 5,504 square feet, and a displacement volume of 150,000 cubic feet.

1115 BANK BUILDING

One Bank Building has been provided for the 1100 Area and is located in the central shopping district at the intersection of Goethals Drive and Knight Street. This one-story, wooden frame, rectangular-shaped building with long axis running north and south has at the north end a vestibule entrance and two offices, the central portion of the building contains public space along the west side and work space along the east side. At the south end of the building are located a large, reinforced concrete vault, a rest room, two toilets, and a stairway leading to a small basement. This basement area contains a mechanical equipment room, a storage room, and a book vault located in the southwest corner directly beneath the main vault.

The 4" reinforced concrete slab floor is supported by concrete block and reinforced concrete foundation walls. Exterior walls are of shakes over 1" T & G sheathing except for a small section at the entrance of the building where vertical siding is used. The flat roof, supported by wooden trusses, rafters and shiplap sheathing, is of composition asphalt felt. The interior linings and ceilings are of 1/2" wallboard. The outer walls of the main vault are covered with a 1/2" layer of plaster. The concrete floor is paved with asphalt tile except at the south end of the building. Two inch insulation is provided above the ceilings and one inch insulation is in the exterior walls. The basement is of reinforced concrete 8" in thickness; the two vaults have 1' thick reinforced concrete walls and 8" thick reinforced concrete slab roofs. The west side of the building is windowless but the east side has ten large windows. The only customer-entrance is located at the north end.

The overall dimensions of this building are 96' x 40' x 27', the cross-sectional area is 3,840 square feet, and the displacement volume is 88,900 cubic feet.

1116 MUNICIPAL BUILDING

One Municipal Building has been provided for the 1100 Area and is located along Goethals Drive between Newton and MacKenzie Streets. This one-story, wooden frame, "L" shaped building contains in the north wing, storage space for three fire trucks and Chief's car, a repair shop, a toilet, hose storage room, and hose drying tower. The remainder of the building, connected by a passageway to the fire truck storage area, contains a large general office, fire chief's office, records storage room, locker and shower room, police chief's office, magistrate's office, ordnance room, central hallway, three offices and two toilets.

The 4" reinforced concrete slab floor is supported by reinforced concrete foundation walls and concrete piers. The exterior walls are a combination of shakes and vertical siding over wooden sheathing. The flat roof, supported by wooden rafters and shiplap sheathing, is composition asbestos felt. Interior partitions and ceilings are of 1/2" wallboard. Four large, vertical rolling wooden doors are located along the fire truck storage space, facing Goethals Drive. A fifth vertical rolling wooden door is located on the north side of the building at the end of the repair shop. A small covered concrete porch at ground level is located at the east end of the structure. A horizontal wooden hose drying rack is located on a ground level concrete platform at the northeast corner of the building.

The overall dimensions of this building are 108½' x 86½' x 37'. The cross-sectional area is 6,550 square feet, and the displacement volume is 105,000 cubic feet.

1116 PATROL HEADQUARTERS

Patrol Headquarters Building is an existing structure located along the north side of Lockwood Street between Goethals Drive and George Washington Way. This small, one-story, square-shaped structure contains at the southeast corner a porch with an entranceway to a reception room with police desk. Three small offices, of toilet, and a small hallway comprise the remainder of the building. A one-car, frame garage is attached to the northeast corner of the building.

The building has concrete foundations, tile exterior walls, and a flat roof of built-up asphalt felt supported by wooden rafters and sheathing. The floors are of wood, the walls of plaster, and the ceilings are of acoustic tile board.

The overall dimensions of this building are 25' x 25' x 22', the cross-sectional area is 625 square feet, and the displacement volume is 13,000 cubic feet.

1117 TRANSIENT QUARTERS

One Transient Quarters Building has been provided for the 1100 Area and is located on the east side of George Washington Way directly opposite Lockwood Street. This two-story, wooden frame, gable roof, roughly "V" shaped building contains a lobby, a women's lounge, a men's lavatory, two storerooms, and 55 bedrooms on the first floor. The second floor has 67 bedrooms. Each bedroom is provided with closet space, toilet and lavatory. Each has either an individual shower or shower stall common to the adjoining room. In the basement area, beneath the east half of the lobby, is a kitchen, coffee shop, private dining room, refrigerator room, storage rooms, two locker rooms, and two toilets.

The building is supported by reinforced concrete foundation walls and piers. The flooring in the basement area is a 4" reinforced concrete slab. In the remainder of the building, the flooring is wooden with the addition of linoleum in the bath and toilet rooms. The exterior walls are a combination of vertical siding, horizontal siding shakes, while the gable roof with ventilation dormers is shingled and supported by wooden trusses, rafters and T & G sheathing. Interior walls and ceilings are a combination of wallboard and plaster. The decking over the east portion of the coffee shop at ground floor level has a celotex promenade tile surface, and is surrounded by a wooden railing. Central corridors run the entire length of the building on the second story. On the ground floor the corridors extend from the end of the wings to the lobby. The lobby contains magazine racks and counters, a hotel desk, telephone booths, writing desks, and numerous lounging chairs and divans. Two fire walls of brick divide the structure into three sections.

The overall dimensions of this building are 280' x 80' x 45', the cross-sectional area is 16,700 square feet, and the displacement volume is 443,800 cubic feet.

1118 HOSPITAL

One Hospital has been provided for the 1100 Area and is located near the central part of the Village on a slight prominence north of Swift Boulevard between Stevens Drive and Guthrie Avenue. The Hospital is set apart from other buildings except for the adjacent Professional Building and Ambulance Garage.

This large, one-story, wooden frame, gable roof structure consists of five large, parallel wings with long axes running in a north-south direction. These wings are connected by the central portion of the building which runs in an east-west direction and passes through the mid-point of each wing. The building contains approximately 240 rooms which are connected by central corridors which run the length of each wing and the central portion of the structure. The main entrance, located at the east end of the building, enters the east wing which contains the administration offices. The north half of the second wing is devoted to examinations while the south portion is an outpatient clinic. The center or third wing is set aside for inpatients; the fourth wing on the north side contains operating rooms and on the south side, delivery rooms. The fifth or west wing, which is irregular in shape, contains the service facilities of the hospital in its center portion while the isolation ward is located in the extreme north end of this wing and is connected to the service area by means of a narrow corridor. At present, the fifth wing has not been extended south of the service area.

The building is supported by reinforced concrete foundation walls with spread footing. Four types of flooring have been provided, namely, 4" reinforced concrete slab; wood finish; wood covered with linoleum; and wood covered with terrazzo. The type of flooring used in different sections of the building was determined by the actual usage of that particular area. The exterior walls are of shakes over wooden sheathing and the gable roof, supported by wooden trusses, rafters and sheathing, is a composition shingle roof. Interior walls, partitions and ceilings are of plaster. Exterior walls, floors, and ceilings are provided with blanket insulation. A nurses' station is located in the middle of the central wing which contains a large screened-in porch at either end. Several ramps and platforms are provided for the ambulances and service trucks. Four fire walls of brick divide the hospital into five units. Attic cooling is provided. A small wooden cupola is located above the middle wing.

The overall dimensions of this building are 531' x 282' x 24½', the cross-sectional area is 55,600 square feet, and the displacement is 1,140,000 cubic feet.

1119 POST OFFICE

One Post Office has been provided for the 1100 Area and is located in the central shopping district at the southwest corner of the intersection of George Washington Way and Knight Street. This one-story, wooden frame, flat roof building contains two vestibules and lobby on the north side, and the Postmaster's office in the northwest corner. The central portion of the building is devoted to a general working space and in the south section of the structure is a mail room, storage room, mechanical equipment room, and two toilets. A covered, mail-handling platform of concrete is located on the south side of the building adjacent to the mail room.

The wooden floor is supported by reinforced concrete foundation walls and concrete piers. Linoleum floor covering has been added only in the Postmaster's office, and the toilet rooms. The exterior walls are of asbestos siding over T & G sheathing and the flat built-up roof of asphalt felt projects 2' beyond the east and west sides of the structure and is supported by wooden rafters and shiplap sheathing. Interior linings and ceilings are of 1/2" wallboard with insulation provided in the exterior walls, beneath the flooring, and above the ceilings. Asphalt tile is laid in the lobby and vestibules. Along the east side of the lobby are individual postoffice boxes and along the south side the various counter-windows for services such as general delivery, stamps, money orders, registry, etc. are located.

The overall dimensions of this building are 80' x 67½' x 19'. The cross-sectional area is 4,730 square feet, and the displacement volume is 85,100 cubic feet.

1120 LAUNDRY

One Laundry has been provided for the 1100 Area and is located on the north side of Harding Street about midway between Cullum and Duane Avenues.

This one-story, wooden frame, rectangular-shaped building with its long axis running in an east-west direction contains a brick-enclosed dry cleaning unit in the northeast corner. An ironing and pressing area with clothes racks for finished work is located in the southeast corner, and an adjacent office area with customer-entrance and service counter. Along the north side of the building are located a rest room, locker room, two toilets, and a lunch room. The remainder of the building is a general laundry work area. A small addition on the southwest corner of the building houses a hot water tank, air compressor, and water softening equipment.

The 4" reinforced concrete slab floor is supported by reinforced concrete foundation walls and an earth fill. The exterior walls are of shakes over sheathing with the exception of 1' thick brick walls around the dry cleaning unit. The roof which slopes slightly to the north and south is composition asphalt felt supported by wooden trusses, rafters and shiplap sheathing. The center portion of the roof above the general work area is raised 5' above the rest of the building and contains six 42" turbine ventilators. Interior walls in the work area and dry cleaning unit are a combination of wooden wainscot to a height of 6' with 1/2" wallboard above. The equipment room is lined with 1" shiplap sheathing. The lunch room, toilet rooms and office have 1/2" wallboard, walls and ceilings. The remainder of the structure is not sealed. An outside, ground level, concrete platform is located along the south side of the structure. Two double swing doors and four laundry bins with outside hopper doors are located along this platform.

The overall dimensions of this building are 195' x 81' x 23', the cross-sectional area is 15,030 square feet, and the displacement volume is 284,700 cubic feet.

1121 CAFETERIA

One Cafeteria has been provided for the 1100 Area and is located in the central shopping district on the southwest corner of the intersection of Goethals Drive and Knight Street. This wooden frame, one-story building with dome-shaped roof over the northern portion and flat roof over the southern portion contains a large service room on the north with two large dishwashing rooms, one on the east and one on the west side of the structure; a large kitchen with adjacent refrigeration rooms for meat, dairy products, salads, vegetables, and fish. Two locker rooms with showers, four toilets, a mechanical equipment room, scullery room, compressor room, office, small hall and large bulk storage room at the south end.

This building has a 4" reinforced concrete slab floor supported by reinforced concrete foundation walls and concrete piers. The exterior walls are of shakes over shiplap sheathing and the dome-shaped roof, supported by bow string wooden trusses and sheathing, is composition asphalt felt. The flat roof over the southern portion of the building which slopes gently from the center of the structure to the south is also of composition asphalt felt. Interior partitions, walls, and ceilings are a combination of wallboard, gypsum board, and plaster. Blanket insulation is provided in the exterior walls and above the ceilings. Cork insulation 3" to 6" in thickness is provided for the refrigeration area. The service room provides seating capacity for 488 patrons and is entered through two double-swing wooden doors on the north. Exit doors are provided on the east and west sides. Two cafeteria counters run along the south wall of the service room, one counter serving the east half and the other counter serving the west half. A small canteen for the sale of cigarettes, ice cream, etc. is located near the southeast corner of the service room. A screened porch is located on either side of the building adjacent to the two dishwashing rooms.

The overall dimensions for this building are 165' x 132' x 26'. The cross-sectional area is 16,980 square feet, and the displacement volume is 332,800 cubic feet.

1123 RECREATION BUILDING

One Recreation Building has been provided for the 1100 Area and is located in the central business district on the southeast corner of the intersection of George Washington Way and Lee Boulevard. This rambling, one-story, wooden frame building parallels George Washington Way as it curves toward Kennewick. At the extreme south end is the main lounge with two large card rooms, two toilets, a women's lounge, coat room, and storage area to the north. A concrete front entrance is located along the west side of the building and opens onto a public corridor. The manager's office, canteen storage area, and canteen capable of seating 35 people at the counter, extend along the west side of the structure north of the main entrance. Opposite the canteen is located a large pool room containing ten pool and billiard tables. East of the pool room is a large dining hall with semi-circular bay window facing the river. This dining hall is entered directly from the public corridor. Adjacent to the north side of the dining hall is the kitchen with refrigeration space, dry storage area, vegetable room, ice room, garbage room, and receiving platform of concrete construction. Ground level concrete terraces extend along the south side of the dining hall and the east side of the main lounge.

A fire wall of brick separates the south portion of the building just described from the north portion. North of the fire wall is a bowling room which runs the entire width of the building and contains 12 alleys with spectators' bleachers along the west wall. A storage room, pin-boys' lounge, mechanical equipment room, toilet and shower are located along the east wall. At the north end of the structure is a tap room with outside entrance at the northwest corner of the building. The tap room contains numerous tables and a service counter runs along the south wall. A women's lounge, two toilets, and vestibule are located along the west wall of the tap room and a small rest room, toilet, janitor's closet, and storage area are provided at the east end.

The building is supported by reinforced concrete and concrete block foundation walls and concrete piers. The terraces, porches, kitchen area, and toilets have 4" reinforced concrete slab flooring. The remainder of the flooring is of wood construction covered with asphalt tile except in the main lounge and the bowling alleys. The exterior walls are of shakes over wooden sheathing except for the entrances which are of vertical siding. The gable roof over the southern half of the building, except above the dining hall and kitchen, is a composition shingle roof supported by wooden trusses, rafters and shiplap sheathing. The remainder of the structure is covered with flat composition asphalt felt and also supported by wooden trusses, rafters and shiplap sheathing. Interior linings and ceilings are of 1/2" wallboard except in the kitchen area where they are of plaster.

The overall dimensions of this building are 380' x 160' x 36'. The cross-sectional area is 37,000 square feet, and the displacement volume is 850,000 cubic feet.

1124 SEWAGE DISPOSAL PLANT

One Sewage Disposal Plant has been provided for the 1100 Area and is located approximately 500 feet southeast of the outskirts of Richland Village just east of George Washington Way. The Sewage Disposal Plant consists of a Pump House, Scale and Chlorinator House with Diversion Wier and Chlorine Contact Chamber beneath, Chlorine Tank Storage House, Biofilter, two Primary Clarifiers, two Secondary Clarifiers, Digester and Sludge Bed.

The Pump House is a three-story reinforced concrete structure containing two small sludge pumps on the first floor, two larger sludge pumps and two recirculation pumps on the second floor, and a laboratory and small toilet room on the third floor.

The Scale and Chlorinator House is a reinforced concrete, concrete block and corrugated transite structure containing the chlorinating equipment, chlorine scales and storage space.

The Diversion Wier and Chlorine contact Chamber are located beneath and just east of the Scale and Chlorinator House and are of reinforced concrete with inside wooden baffles located in the contact chamber. An air exhaust system is provided for the Scale and Chlorinator House.

The Biofilter is a large reinforced concrete and concrete block circular basin 100' in diameter and 6' in height containing a 3' thick layer of gravel. The Primary and Secondary Clarifiers are 55' in diameter and approximately 9' in depth reinforced concrete circular basins. A motor-driven circular revolving rake at the bottom of each moves the sludge to a central sump. The Digester is a completely enclosed 45' diameter gunite tank with a sloping reinforced concrete base 12" in thickness, sides 12" in thickness, and a dome-shaped roof varying in thickness from 12" at the circumference to approximately 4" near the center. The Sludge Drying Pit is divided into 80 partitions by means of wooden baffles and is a large rectangular-shaped bed with 3" thick lumber sides and a base of 6" of sand over 2" of pea gravel.

These various units are interconnected with cast-iron and welded steel piping and various sizes of vitrified clay piping and flumes.

The units have the following overall dimensions, cross-sectional areas and displacement volumes:

	Dimensions	Area	Volume
Pump House	28' x 22' x 35'	495 Sq.Ft.	17,300 Cu.Ft.
Scale and Chlorinator House	24' x 11½' x 26'	276 Sq.Ft.	6,072 Cu.Ft.
Chlorine Tank Storage House	10' x 10' x 11'	111 Sq.Ft.	1,100 Cu.Ft.
Biofilter	100' diam. x 6'	7,850 Sq.Ft.	47,100 Cu.Ft.
Primary Clarifiers (2)	55' diam. x 9'	4,760 Sq.Ft.	42,800 Cu.Ft.

OVERALL DIMENSIONS (Continued)

	Dimensions	Area	Volume
Secondary Clarifiers (2)	55' diam. x 9'	4,760 Sq.Ft.	42,800 Cu.Ft.
Digester	45' diam. x 33'	1,590 Sq.Ft.	41,500 Cu.Ft.
Sludge Bed	160' x 97' x 3'	15,520 Sq.Ft.	46,560 Cu.Ft.
Chlorine Contact Chamber	30' x 30' x 5'	900 Sq.Ft.	4,500 Cu.Ft.

1125 WAREHOUSE

One Warehouse, not of temporary construction, has been provided for the 1100 Area and is located approximately 400 feet south of the intersection of Lee Boulevard and Stevens Drive along a railroad spur. This one-story, wooden frame, rectangular-shaped building with long axis running north and south contains an office and toilet in the northeast corner and a general storage area in the remainder of the structure.

The building has wooden flooring supported by wooden piers on mud sills. The walls are of horizontal siding and the flat roof, supported by wooden posts, rafters and sheathing, is composition asphalt felt. The walls and ceilings of the office and toilet are of 1/2" wallboard. Three double, horizontal sliding, wooden doors are located along the east side of the building adjacent to the railroad spur and a skirting of 1" vertical siding covers the wooden foundation piers along the east side. Three wooden roof ventilators are provided.

The overall dimensions of this building are 150' x 50' x 20', the cross-sectional area is 7,500 square feet, and the displacement volume is 135,000 cubic feet.

1130 COMMERCIAL BUS DEPOT

One Commercial Bus Depot has been provided for the 1100 Area and is located along the east side of George Washington Way approximately 400 feet southeast of the Recreation Building.

This one-story, wooden frame, rectangular-shaped building with long axis running north and south contains at the south end a rest room, janitor's closet, and two toilets. In the center, a large waiting room with "U" shaped food counter seating 18 people, four booths, a ticket and baggage counter, a two-chair shoe shine stand, tobacco stand, magazine rack, and waiting room benches. At the north end of the building is located a baggage and express room, kitchen, pantry, kitchen storage area, walk-in box refrigeration, concrete garbage can storage room, closet, and stairway leading to a small reinforced concrete basement which includes a water heater room, equipment room, and general basement area.

The building has a 4" reinforced concrete slab floor supported by reinforced concrete foundation walls. The exterior walls are of shakes with horizontal siding above. The flat roof, supported by wooden bridging, rafters and shiplap sheathing, is composition asphalt felt. A 6' wide marquee runs along the east and west sides of the building. Interior walls and ceilings are of 1/2" wallboard. The waiting room floor is covered with "Mastipave". A double-swing wooden door is located on the east and west sides of the waiting room and a large single-swing door is located near the northwest corner entering into the baggage and express room.

The overall dimensions of this building are 90½' x 40' x 25', the cross-sectional area is 3,310 square feet, and the displacement volume is 670,000 cubic feet.

1133 VILLAGE MAINTENANCE GROUP

The Village Maintenance Group of buildings is located in the southeast portion of the 1100 Area about halfway between the west bank of the Columbia River and George Washington Way where it intersects Davenport Street.

This group consists of twelve one-story buildings of temporary construction and design situated in a rectangular area 550' x 450' and bounded by a wire fence. Several of these buildings are prefabricated drop siding wooden structures; others are metal hutments; and in two instances, two parallel metal huts are joined with a wooden frame construction section.

These buildings were originally used by the construction forces but have been taken over by Operations and are being used for the upkeep of the Village.

A list of the buildings showing current usage, their overall dimensions, cross-sectional areas and displacement volumes follows:

Building	Dimensions	Area	Volume
Parts and Tire Storage	150' x 55' x 15'	8,250 Sq.Ft.	123,000 Cu.Ft.
Irrigation Supplies and Seed Storage	65' x 45' x 15'	2,925 Sq.Ft.	41,800 Cu.Ft.
Parts Storage, Sign Shop and Road Maintenance Offices	60' x 45' x 11'	2,700 Sq.Ft.	29,000 Cu.Ft.
Garden Tools Storage, Baggage Room and Seed Distribution Office	60' x 45' x 11'	2,700 Sq.Ft.	29,000 Cu.Ft.
Safety Office	75' x 20' x 11'	1,500 Sq.Ft.	16,500 Cu.Ft.
Lawn Mower Shop	45' x 20' x 11'	900 Sq.Ft.	9,900 Cu.Ft.
Storage Hutments (2)	45' x 22' x 11'	1,980 Sq.Ft.	19,800 Cu.Ft.
Transportation Office Hutment	45' x 22' x 11'	990 Sq.Ft.	9,900 Cu.Ft.
Labor Office Hutment	45' x 22' x 11'	990 Sq.Ft.	9,900 Cu.Ft.
Comfort Station	18' x 15' x 11'	270 Sq.Ft.	2,970 Cu.Ft.

1134 RED CROSS BUILDING

One Red Cross Building has been provided for the 1100 Area and is located in the central shopping district on the northeast corner of the intersection of George Washington Way and Lee Boulevard.

This in a one-story, concrete block, rectangular-shaped building with a small reinforced concrete basement area and its long axis running east and west. On the ground floor, there is a reception hall in the southwest corner; two offices, toilet, and production room along the south wall; a surgical dressing room, home nursing and first aid room, and canteen or kitchen completely equipped along the north wall. A hallway runs from the reception room along the center of the building to a large nursery in the southeast corner with adjacent toilet and closet. Outside the nursery is a children's playground enclosed by a 7' high wall of horizontal drop siding. At the east end of the building is a second play yard enclosed by a semi-circular wooden picket fence.

This building has been remodeled from an existing two-story, concrete block structure and is supported by reinforced concrete foundation walls. The flooring is of wood construction and linoleum covered throughout. The exterior walls are whitewashed concrete block. The flat roof which is supported by wooden rafters and sheathing is covered with asphalt felt. Interior walls and partitions are of plaster and the ceilings are of acoustic tile board. A small canopy is located above the main entrance at the southwest corner of the structure and a second canopy runs along the south wall above the play yard.

The overall dimensions of this building are 75' x 50' x 28', the cross-sectional area is 3,750 square feet, and the displacement volume is 81,000 cubic feet.

1136 PROFESSIONAL BUILDING

One Professional Building has been provided for the 1100 Area and is located at the intersection of Swift Boulevard and Guthrie Avenue just southeast of the Hospital. This one-story, wooden frame, gable roof structure is in the shape of a cross and contains 65 rooms connected by central corridors.

The East wing, which is for Surgery, contains a large office, supervisor of nurses' room, two medical or surgery rooms, two surgical consultation rooms, surgical treatment room, preliminary examination room, and two toilets.

The North wing, for eye, ear, nose and throat cases, contains a waiting room, eye refraction room, eye treatment room, nurses' room, three examination rooms, three consultation rooms, two preliminary treatment rooms, and two treatment rooms.

The Dental wing on the west contains a waiting room, prophylatic room, prosthetic room, two dental laboratories, five operating rooms, reception and records room, dental business room, dentists' room, dental X-ray room, sterilization and dark room, exodontia room, and rest room.

The South wing, which is for obstetrics and pediatrics, contains a large business office, physicians' room, pediatrics waiting room, five treatment rooms, three consultation rooms, a baby clinic, waiting room, and nurses' preliminary room.

In the center of the building is located a general waiting room with an information desk, a supply room, and below the northwest portion, a small basement containing a janitor's room and utility room.

The building is supported by reinforced concrete and concrete block foundation walls. The flooring is of wood construction and covered with linoleum except in the closets and supply rooms. Exterior walls are of shakes over sheathing and the gable roof of composition shingles is supported by wooden trusses, rafters and shiplap sheathing. Interior linings and ceilings are of plaster.

The overall dimensions of this building are 170½' x 170½' x 21½'. The cross-sectional area is 9,550 square feet, and the displacement volume is 168,000 cubic feet.

1165 AIRPORT

One Airport has been provided for the 1100 Area and is located approximately one-half mile northwest of the outskirts of the Village. The Airport consists of two 75' wide intersecting runways 1,200' long. These runways intersect one another at an angle of 81° at coordinates N30025 - E9010. The runways have a bituminous oil surface and are so laid out that they can be increased to 2,500' runaways, if necessary. The ground on either side of the runways to an overall width of 200' has been bladed smooth and provided with a penetration treatment. The runways are lighted with 1,000 lumen contact, guidance, and range lights. A 400' long and 15' wide taxi strip runs from the south end of the north-south runway to a 40' x 40' metal hangar at coordinates N29233 - E8947. The area between the runways and the hangar has been dust processed.

Just west of the hangar are three metal hutments which contain offices, storage space, a bedroom, toilet and shower. One of the these huts was used as a weather bureau station. The huts are cooled by one 5,000 c.f.m. air cooling unit. A wooden frame control tower with wooden stairway leading to an enclosed control room at 30' elevation is located just northwest of the three metal hutments. The control room has wooden flooring over 1" T & G sheathing, horizontal siding and roll roofing over 1" T & G sheathing. Windows are provided on all four sides of the control room.

A fourth hutment of wooden construction used for additional storage space is located northwest of the metal hutments beyond the control tower. Two small wooden shacks, one located at the foot of the control tower and the other just east of the hangar are also provided and house a 40-gallon soda ash fire extinguisher.

These structures contain the following overall dimensions, cross-sectional areas and displacement volumes:

	Dimensions	Area	Volume
Control Tower	11' x 11' x 45'	121 Sq.Ft.	5,450 Cu.Ft.
Hangar	40' x 40' x 18'	1,600 Sq.Ft.	25,600 Cu.Ft.
Hutments (4)	40' x 22' x 12'	3,520 Sq.Ft.	35,000 Cu.Ft.
Runways (2)	1,200' x 75'	18,000 Sq.Ft.	

1182 GROUND STORAGE RESERVOIR AND PUMP HOUSE

Two Ground Storage Reservoirs, one Consumers' Pump House and one Fire Pump House were constructed for the 1100 Area and are located just north of Lee Boulevard between the main irrigation canal and the High School Stadium.

The Ground Storage Reservoirs are rectangular-shaped basins with long axis running north and south. The reservoirs and essentially below ground level with 4" and 6" reinforced concrete bottoms and reinforced concrete sloping sides. The reservoirs are entirely covered with a slightly sloping roof of composition asphalt felt supported by wooden posts, beaming, rafters and 1" sheathing. Although the two reservoirs have different dimensions, the capacity of each is 1,000,000 gallons.

Two concrete and concrete block Pump Houses are located just east of the two reservoirs. These reservoirs. These pump houses have reinforced concrete foundation walls with spread footings, 4" reinforced concrete slab floors, concrete block and reinforced concrete walls, and 4" reinforced concrete slab roofs supported by concrete roof beams and are covered with composition roofing. The Consumers' Pump House contains six centrifugal pumps, five of which are operated by electric motors and one by a gasoline engine. The Fire Pump House contains a pump room which houses four gasoline engine driven centrifugal pumps, a small work shop, furnace room, coal room, and toilet. Interior partitions in the fire pump house are of concrete block.

These structures have the following overall dimensions, cross-sectional areas and displacement volumes:

	Reservoir #1	Reservoir #2
Overall Dimensions	202' x 92' x 17'	160' x 112' x 19½'
Cross-sectional Area	18,580 Sq.Ft.	17,920 Sq.Ft.
Displacement Volume	223,000 Cu.Ft.	232,000 Cu.Ft.
Capacity	1,000,000 Gals	1,000,000 Gals.
	Consumers' Pump House	Fire Pump House
Overall Dimensions	62' x 22½' x 14½'	61' x 30' x 14½'
Cross-sectional Area	1,395 Sq.Ft.	1,540 Sq.Ft.
Displacement	20,200 Cu.Ft.	22,300 Sq.Ft.

The Comfort Station and Bath House

The building second in importance to the recreation building in the recreation area is the comfort station and bath house. It is the service building of the play area, having toilet facilities for the public and rooms for men, women, and children who use the swimming pool or the wading pool. It is a building primarily for summer use, just as the recreation building is primarily for occasions when there is inclement weather and for winter use.

The building is symmetrical in design and in function, each half being practically the same in plan: designed for use either by men or women. The central portion, which is the comfort station, is completely housed in. Opening on the west or playground front, there are men's and women's rest rooms and toilet facilities. Behind these are additional facilities chiefly for bathers who use the dressing rooms. There is a small chlorinator room for the pool and a janitor's room. The north half of the building has a check room and control for the women's dressing area and south half the same rooms for the men. The actual dressing areas are of the stockade type: a walled enclosure roofed only around the sides with shed roofs. The center of the stockades are open to the sky so that privacy is combined with light and fresh air.

Each side of the bath room has the same operational plan. The users pass through a maze entry which prevents outsiders looking into the area, and proceed to the control area where they pick up a canvas bag hanger. The women take these to their dressing room, the men to the stockade benches, where they put on their swimming togs. On the way to the pool, they pass the locker room, where they check the bags, and go through a shower room, the only exit. The passage has a foot bath of chemicals intended to prevent the spread of foot infections. On the return, the bather again uses the foot bath, showers off the beach sand and proceeds to the stockade area. On the men's side there are only benches; on the women's side are screens without doors, but set at such angles as to assure privacy. Air circulation is obtained by the screens not reaching the floor and being only about head height. There are eleven of these screened cubicles.

The appearance of the building is excellent. The fence-like stockade is of vertical boards around the whole building. The roofs are low. The higher central room with its large natural ventilator gives an interesting accent to the building. It gives true recreational character, and besides several distinct features of its own, it has a practical plan that has proved successful in swimming parks of the Northwest. The construction is wood throughout except for the floor which are concrete slab on the ground. The rooms have curbs permitting the floors to be easily and quickly cleaned. The center of the slab is curbs permitting the floors to be easily and quickly cleaned. The center of the slab is omitted in both stockades, however, and these areas will be sodded. Outside of the showers, which are finished with cement plaster, and the comfort station rooms, which have shiplap lining, there are no special interior finishes. Most of the construction is exposed to view.

TABLE XXXVIII DIVISIONS OF THE COMFORT STATION AND THE BATH HOUSE

Type:	Comfort Station and Bath House	
Overall Size:	128'-0" x 38'-0"	
Rooms:	Size	Area
Toilets		
Men's #1	15'-6" x 18'-3"	283 square feet
#2	10'-9" x 10'-0"	108
Women's #1	15'-6" x 18'-3"	283
#2	10'-0" x 10'-0"	108
Check Room		
Women's	11'-6" x 15'-0"	172
Men's	11'-6" x 15'-0"	172
Shower Room		
Women's	6'-0" x 9'-6"	57
Men's	6'-0" x 9'-6"	57
Janitor's Closet	5'-6" x 5'-0"	28
Porch	31'-6" x 7'-6"	236
Passage Way 2@	11'-6" x 7'-6"	173
2@	4'-3" x 10'-0"	86
Chlorinator Room	7'-9" x 5'-6"	43

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