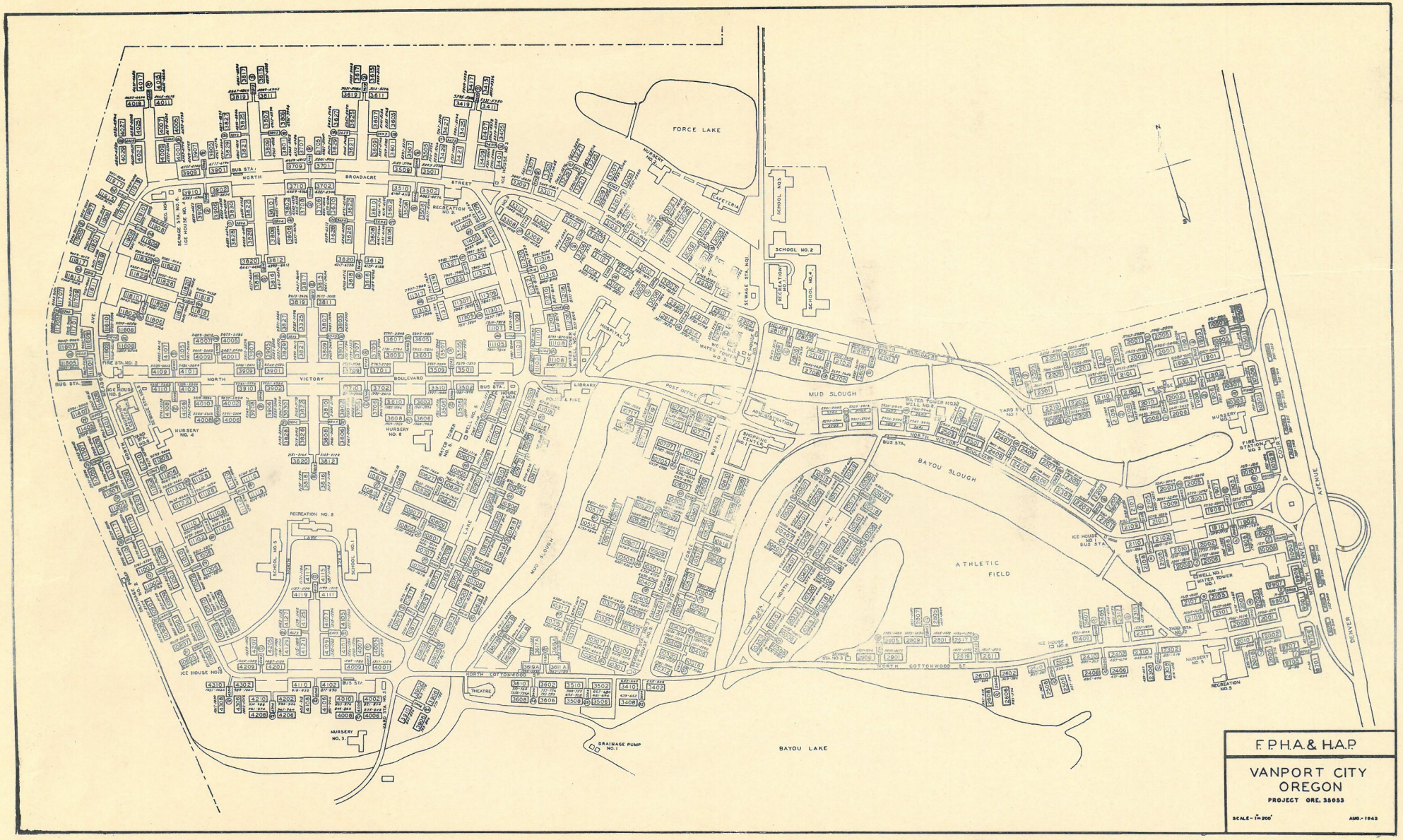

F.P.H.A. & H.A.P.

VANPORT CITY OREGON

PROJECT ORE. 35053

SCALE - 1" = 200'

AUG. - 1943

A HISTORY OF THE CONSTRUCTION OF

VANPORT CITY

Federal Public Housing Project

No. Oregon 35053

September 1, 1943

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GENERAL CONDITIONS

Preliminary Contract and Investigation

On August 1, 1942, a general construction contract was entered into by the Federal Public Housing Authority and Kaiser Company, Inc., a Nevada Corporation, Portland Yard, whereby Kaiser Company, Inc. was to locate and purchase a suitable site for a housing project. After a careful investigation, the most likely site chosen was the one now in use. On August 18th it was inspected, examined and approved by officials representing the Federal Public Housing Authority, the Housing Authority of Portland and Kaiser Company, Inc.

Original Site

The present site of Vanport had as its principal advantage its proximity to the three large Maritime Commission shipyards of the Portland area, the furtherest of which is within four and one-half (4½) miles by bus.

The original site, which is located west of Denver Avenue adjacent to the northern boundary of Portland, consisted of 647 acres of farm land composed of a sandy clay loam at an average elevation of approximately 14 feet above mean sea level. To prevent flooding during high water it is surrounded by an impervious earth fill dikes, rebuilt under the supervision of the United States Engineering Department in 1940. Of the original 647 acres, approximately 110 acres were occupied by sloughs, lakes, and swamps. Subsequent work revealed many variable water tables which were maintained by hydrastatic head, capillary action or a combination of both. The site was included in a Drainage District which maintained a drainage system that made the land suitable for farming.

Description of Work

To provide the Vanport war housing project it was necessary to do the work listed:

1. Build and furnish apartments supplied in 720 apartment buildings and served by 181 service or utility buildings.

2. Build 43 community service buildings including an administration building, six yard stations, three fire stations, ten ice houses, five

recreation buildings, two shopping centers, one cafeteria, one theatre, five schools, one hospital, six child day care centers, one post office, and one library.

3. Improve and greatly enlarge the site drainage system.

4. Do all site grading and clearing.

5. Construct and pave an 8½ mile street and access road system.

6. Build the Denver Avenue Underpass and entrance.

7. Construct more than 45 acres of parking lots.

8. Construct a complete power distribution system.

9. Construct a sanitary sewer system consisting of six pumping stations, pressure and gravity lines and manholes.

10. Build a complete water system consisting of five wells, pumps, water towers, a fire protection system, and the necessary mains and fittings.

11. Construct 50 miles of sidewalk.

12. Provide landscaping.

13. Carry on a slough improvement program.

14. Provide parks and recreational areas.

15. Build a coal unloading spur and platform.

16. Do other miscellaneous work.

Prime Construction Contract

After the site was approved the prime contract was awarded to the Kaiser Company, Inc. by the Federal Public Housing Authority for the construction of 6022 apartments and the necessary appurtances. On

November 1 a supplement to the Prime Contract increased the number of apartments and appurtances to the quantity now available. The Kaiser Company undertook the original contract and supplement for cost plus a fee of two dollars.

Architects and Engineers

Wolff & Phillips, Architects, Portland, Oregon, designed and provided the general layout of the project. They were assisted by Cunningham and Associates, Portland, Oregon, who designed the water and sanitary sewage systems, by George H. Pettingill, Portland, Oregon, who also designed the electrical distribution system, and the Oregon State Highway Department who designed and supervised the Denver Avenue Underpass. Field engineering on the project was provided by Kaiser Company, Inc.

Sub-Contracts

Kaiser Company, Inc. sublet the construction to three Portland firms-George H. Buckler, Wegman and Son, and Twoer Sales and Erecting Company.

George H. Buckler built approximately one-half the war apartments, supplied furniture and rangettes for all of the dwelling units, built all utilities, did all site development including grading, street and walk construction, landscaping, and did all the other work not listed herewith as done by the other two subcontractors. This work was done for cost plus a pre-determined "Fixed Fee".

Wegman and Son built approximately one-half the war apartments and all the Community Facility Buildings for a consideration of cost plus a pre-determined "Fixed Fee".

Tower Sales and Erecting Co. constructed the Denver Avenue Underpass for unit prices set by a "unit price" bid contract.

Other Companies

The Pacific Telephone and Telegraph Company provided their own telephones and transmission system.

General Construction Time

Two days after the site was approved construction shacks and earth moving equipment were moved onto the job. The next day, August 21, 1942, general construction began. One year and eleven days later, September 1, 1943, the project was completed and delivered to the Federal Public Housing Authority.

Labor Conditions

To utilize workers to the fullest extent women were hired to do whatever work they were capable of doing. During the peak of construction 5,023 men and women were employed on construction to attain this peak employment; the total number hired was approximately 13,000.

The relatively large turn-over of workers has been generally ascribed to unrest because of the war, to a lack of housing in the Portland area, to an extreme labor demand with no restriction on the mobility of labor, and to the disagreeable weather coincident with the construction period.

Weather Conditions

The major setback to the project due to weather occurred during the snow storm that began January 20 and ended February 2. The maximum snowfall in any one day occurred January 21 with 15.5 inches falling. There were no months when precipitation exceeded the rainfall record while the project was under construction. There were, however, four months with more than average rainfall. The maximum amount above normal per month was during November, when the average was exceeded by 8.29 inches, resulting in a total rainfall for the month of 14.39 inches. This period of excessive rainfall was particularly detrimental because it occurred when building construction was accelerating.

Purchasing

Material was purchased from over 1,000 vendors, 90 percent of whom were in the Portland area. By virtue of efforts made by the management, the job was at no time closed down because of lack of materials. There were a number of extraordinary events that had to be overcome which are listed below:

1. A restrictive orderon the use of fir lumber materials issued by the W.P.B.

2. A jurisdictional dispute between labor unions which delayed deliveries that were made during the months of October and November.

3. Freight deliveries were slow and uncertain because of heavy war traffic.

4. Many critical items were difficult to obtain because of other war demands.

Receiving

All incoming material was checked by representatives of one of the subcontractors and by a representative of the Federal Public Housing Authority. One thousand six hundred and forty-four carloads and approximately 37,000 truckloads of materials excluding gravel, sand and earth fill have been received.

Storage

Temporary on-site warehouses were used for all materials susceptible to weather damage except furniture, which was stored in permanent off-site warehouses.

WAR APARTMENTS AND APARTMENT AND UTILITY BUILDINGS

Typical Apartment

The basic living unit consists of a combination living room with bath, which may be occupied as such or in conjunction with 1, 2, or 3 bedrooms, depending upon family requirements.

Sealed, varnished random grain fir is used for flooring of all rooms except the bathrooms which are of mastipave covering; however, in some cases the lower grades of unfinished flooring are covered with mastiave. The walls are done in fire resistant sheet rock, finished with an attractive knotty pine or mahogany paper applied during manufacture. Light colored factory-finished firtex covers the ceiling. The millwork and trim are finished in harmonious tan stain and clear varnish. The windows are stationary units with screened louvres beneath, which provide cross ventilation in apartments of two or more rooms.

The kitchenette of the combination living room and kitchen is equipped with built-in shelves, cupboards, ice box, sink and a combination two burner, electric rangette and oven placed in an asbestos protected section of the built-ins. The room has a ample closet space and is supplied with one daveno, one occasional chair and a breakfast set. The bathroom provides a water closet, lavatory and shower, a convenient medicine shelf and mirror. Each bedroom has a large closet and is equipped with a double bed or twin beds, springs, mattresses, blankets, and a dresser or a chest of drawers and mirror.

Construction Time

The first war apartment buildings were begun September 12, 1942. George H. Buckler Contractors and Wegman and Son both began operations that date. Their building program expanded rapidly and on November 14th they had 391 buildings under construction. The number under construction steadily increased until the maximum number, 634 buildings, was achieved on February 19. At this date all but 44 of the 901 apartment and utility buildings were under construction or complete. From this date on completions steadily decreased the number under construction until the last building was finished and equipped with furniture on August 12, 1943.

Completion Schedule

Nine hundred and thirty-four apartments were completed and released for occupancy December 12, 1942. After that apartments were completed at an average rate of 260 apartments per week until August 15, 1943, when all of the 9,942 apartments were delivered.

Types of Apartment & Utility Buildings

There are three types of apartment buildings- "A", "B", and "C". All three types are of frame construction, with red cedar pads used as foundations. The "A" type buildings are two story structures providing 14 apartments each, arranged in groups of four or three around a central heating and home laundry building called an utility or service building. The "B" type buildings are two story structures providing eight apartments each, also arranged in groups of four around utility buildings. The "C" type buildings are one story, self-contained units, providing four apartments each. Since they utilize an unit space heater and hot water heater in each apartment, they are not provided with utility or service buildings.

The utility buildings which are used for "A" and "B" apartment buildings are one story frame construction with concrete foundations. The front of the building serves as coal storage space, the middle part is occupied by the heating units, hot water heaters and two storage rooms, and the back half is occupied by a home laundry and two bathrooms.

The following table indicates the number of each type of building and the total number of apartments in each type.

Type of Building	No. of Apts. in each Bldg.	No. of Buildings	Total No. of Apts.
A	14	703	9,842
B	8	8	64
C	4	9	36
Utility Bldgs.		181	
TOTAL		901	9,942

Lumber in Apt. Bldgs.-Deliveries of lumber were stored in yards adjacent to the framing yards of the two

building sub-contractors. Millwork, plasterboard, celotex and other building materials susceptible to weather damage were placed in temporary frame warehouses centrally located in the building areas. Weather resisting supplies were delivered directly to the point of use.

*In the framing yard practically all dimension stock was cut to size, and many items such as stairs, footing pads, beams, studding sections, small roof section, and heat ducts were prefabricated. By using production line methods it was possible to deliver the maximum amount of ready-to-use material with a minimum of waste.

After passing through the framing yard, material was hauled to the building site where it was to be used. During good weather it was possible to deliver directly by truck, but during the rainy season it was necessary to transport material from the main roads to the building sites by crawler type tractors and sleds or over plank roads by truck. Both methods were expensive and time consuming.

Buildings were constructed by a progressive stage method; for example, one crew did nothing but lay foundation pads; another placed floor joists; while another followed in turn with the studding sections and so on until the building was completed.

The efficiency of the method used is illustrated by the fact that of the 54 million board feet of lumber used for all phases of the project there is a difference of only 1.6 million board feet between the amount delivered and the amount incorporated into useful structures. This indicates a loss of only 3 percent due to handling and fabrication. Labor costs were kept to a lower level by requiring the workmen to learn only one phase of the work. This was particularly important because it was impossible to hire a large number of skilled carpenters and much of the work was done by men trained on the job.

*In addition to preframing lumber for apartment and utility buildings, there were many more items such as storm drain inlets, valve boxes, clothes line posts, and stakes cut or assembled in the framing yard. Wood stave pipe was cut to length and beveled for joints at this location.

Utilized in the construction of the 901 apartment and utility buildings were 39,535 thousand board feet of lumber, 5,006,520 square feet of fiber board, 2,815,669 square feet of plywood, 11,965,807 square feet of plaster board, 1,014,360 pounds of nails, and 57,475 rolls of roofing.

Plumbing

Plumbing materials were delivered to the project plumbing shops of the two building subcontractors where seventy-five percent of the "roughing in" was done. After the shop work was done the materials were transported to the building site where specialized crews did each phase of work as the building progressed.

Each apartment is equipped with one shower, one water closet, one lavatory, and a kitchen sink. In the "C" buildings hot water is supplied by electric hot water tanks located in each apartment. In the "A" and "B" buildings, which comprise the major number of apartment buildings, hot water is supplied from a 700 gallon hot water storage tank to which the hot water is fed by a manually-fired, coal-burning, cast-iron hot water heater, which is located in the utility building adjacent to the furnace. The tank and heater installation serves four common apartment buildings or 56 apartments in addition to the laundry room within the utility building itself.

The total number of fixtures used in apartment and utility buildings was 40,683 in addition to 181 hot water tanks and heaters.

Heating

Since most of the heating ducts were made of masonite and installed by the carpenters, no heating mechanics or sheetmetal workers were needed until the building was more than fifty percent complete. The order of procedure in the "A" and "B" groups was to install the sheetmetal ducts in the furnace room, place the furnace, attach the warm air jacket, connect the warm air fans and install the stokers. When the apartment buildings were nearly complete, the registers were installed as the final step in heating installations.

The "C" type buildings are equipped with unit heaters in each apartment. The much

larger number of apartments located in the "A" and "B" buildings are heated by a central warm air heating plant located in the utility building. Each utility building has two separate, complete heating units, each of which serves two apartment buildings or 28 apartments. Utilized by each thermostatically controlled heating unit is one 570,000 b.t.u. furnace, a hand fired stoker, a warm air blower fan and the necessary ducts and controls. Forty thousand tons of coal per year will be required for heating the entire project.

Other work

The other phases of work followed good building practice in the established manner. Among materials used were 1,204,000 brick, 75,672 windows and doors, 32,914 pounds of electric wire, and 7,411 cubic yards of concrete.

C O M M U N I T Y F A C I L I T I E S B U I L D I N G S

Requirement

Since Vanport was to be a city as well as a housing project, it was necessary to provide adequate community facilities. As a city, it required fire and police protection, educational facilities, postal service, recreational service, provisions for shopping, medical care, and ready-to-serve meals. As a housing project, it required administrative, storage, and maintenance quarters. As the home of working mothers, it necessitated provisions for the care of pre-kindergarten children, and as a community where no automatic refrigeration was available, it required convenient ice distribution.

General Description

All but two of the buildings are of frame construction, finished with cedar siding only, or used in conjunction with red brick veneer. The two exceptions, the Post Office and Library, are brick wall-supporting buildings. The only community facility buildings more than one story in height is shopping center number 1, which has only 1,664 square feet provided on the second floor out of a total floor space of 42,500 square feet.

All community facility buildings rest on concrete foundations and are equipped with concrete floors except the six child day care centers, the hospital and ten ice houses which rest on pads or skids and have wooden floors.

Framing

Nearly all the prefabrication for these buildings was done in the central framing yard; however, for the large buildings a small saw yard was set up at each building site.

Administration Bldg.

The construction of the permanent administration building which required two months was begun December 9, 1943. The building located near the center of the project provides over one-half acre of office and maintenance shop space in a frame structure attractively ornamented with a brick-faced entrance. Heat is provided by an individual air system similar to those used in the "A" apartments.

Service Buildings or Yard Stations

On January 2, 1943, construction of the first of the six small warehouses and supply stations called service buildings or yard stations was begun. These small buildings scattered throughout the project, providing 1,032 square feet each, are frame structures finished in cedar-drop siding with a false tile and brick chimney. They house a washroom and lavatory. By the middle of March all of them were complete.

Central Fire and Police Station

The fire and police station was completed within sixty-seven days after it was started on January 4, 1943. The building is near the center of the project where it provides facilities for a three-engine fire crew and their equipment, a central fire office and the Vanport police force. The frame building has a brick hose-drying tower and provides 5,267 square feet of floor space. Heat is provided by a semi-automatic warm air system.

Auxiliary Fire Stations

The two Auxiliary Fire Stations which were begun in the middle of January were both finished by April 1. Number 1 was occupied immediately, but Number 2 was not used until August 3 because the west end of the project was not fully occupied to justify its use. The two buildings, one at each end of the project, are of frame construction and provide facilities for one fire engine and equipment quarters for a crew on a floor area of 2,625 square feet. The heating system is similar to the Central Fire and Police Station.

Schools

The first school was begun January 18, 1943; the second, February 17, and the other three, during the first part of March. The first school was complete and in operation by March 20, the second and third were delivered in May, and the last two were completed by June 24, 1943. The average construction time for each building was 75 days.

The five "L" shaped buildings, which are of similar design, are one-story frame structures effectively ornamented with brick veneer.

A wide hall supplemented by many doorways runs the full length of each building. All foundations and floors are concrete, with mastipave surfacing.

Each building is designed to furnish ample office space and twelve or fifteen classrooms supplemented by other facilities. Four of the buildings are provided with a kindergarten, a library, and an auditorium with an adjacent cafeteria. In addition, three buildings are provided with gymnasiums and the necessary locker rooms.

The seventy-six classrooms in the school system which provide a seating capacity of 3,040 pupils at one shift for two and one-half shifts are characterized by ample blackboards and pin-up space, good ventilation, and light. Daylight is provided by 204 square feet of windows for each classroom of forty students.

There are two school building groups each arranged around a large recreation building. The central heating plants, which consist of two stoker-fired, coal-burning, scotch boilers are located in the recreation buildings. From the recreation building steam is piped to the individual school buildings. In each school building there is a large automotive type radiator where a heat transfer is made to a warm air system which carries the warm air to the individual rooms.

Large Recreation Building

The larger of the two recreation buildings was begun February 11, 1943, and finished May 5. The slightly smaller building was started one month after the larger one and was completed June 24, 1943. Both buildings provide a large gymnasium and stage finished with maple floors, a kitchen, a lounge, one or two offices, public restrooms, and two or three clubrooms. Both the larger building providing 18,405 square feet of flooring and the smaller, providing 10,275 square feet are of frame construction with more than half the exterior covered with brick veneer rather than siding. As is the case in the schools,

the buildings rest on concrete foundations and, with the exception of the gymnasium and stage, have concrete floors covered with mastipave.

Small Recreation Buildings

To supplement the two large recreation buildings, three small buildings were erected in areas not readily accessible to the larger ones. The first of the three small recreation buildings was begun March 23, 1943. By June 24th all three were complete. Each frame building provides an office, public restrooms, and a hall 30 feet by 75 feet and heated by two oil-burning, space heaters.

Shopping Centers

Shopping center No. 1 was begun January 13, 1943, completed within seventy-nine days and in service April 2nd. Shopping Center No. 2 begun February 3, 1943, was completed and in operation by June 18.

Both buildings are "L" shaped frame structures, equipped with individual warm air heating plants. Shopping Center No. 1, the larger of the two buildings, is located near the center of the project. Its 30,000 square feet of floor space provide a beauty shop, a barber shop, a lunch counter, a drug store, a tobacco shop, a drygoods store, a butcher shop, and a grocery store. Shopping center No. 2, which is at the west end of the project, provides a grocery store, a butcher shop, a drygoods store and a lunch counter on a floor space of 13,084 square feet.

Cafeteria

The cafeteria, begun February 3, 1943, was serving meals on March 27th---fifty-one days later. The low frame building provides facilities for 410 patrons in a large dining room and a small banquet room. To date the average number of meals is 3000 per day. Heat is provided by a semi-automatic warm air system. The heating furnace and stoker are parallel to the large stoker-fired boiler that provides hot water for cooking and dishwashing.

Theatre

The theatre which was begun February 18, 1943, was not opened until August 12 because of a delay in the delivery of certain theatre supplies. The "V" shaped building, ornamented with a brick veneer entrance, provides a seating space for 750 people. The building rests on a concrete foundation and has concrete floors sloping forward

the stage. By breaking up the flat walls by insets it was possible to use plasterboard and still retain good accoustics.

Hospital

The hospital, begun February 26, 1943, was finished June 24th. The Out Patient section was opened July 24 and the entire hospital was in operation August 2, 1943. The building is at a central location where it was carefully and attractively surrounded by effective landscaping. The hospital is in the shape of an "H" and is approximately 300 feet long, thus affording adequate window space for each room. It is equipped with two warm air heating systems, each of which serves approximately half the building. It has nearly an acre of floor area, providing space for 126 adult beds, 24 infant cribs, 2 major surgeries, 1 minor surgery, 1 emergency room, 2 delivery rooms, an X-ray department, a laboratory, a pharmacy, doctor and administrative offices, dining rooms for the staff, and a kitchen used both for general and special diets.

Child Day Care Centers

During the first two weeks of April 1943, six child day care centers were begun. After an average construction time of ninety-six days they were all completed by June 14. Each frame building provides three large playrooms, a staff office, a first aid station, a kitchen, and an individual heating system. The six buildings are conveniently located throughout the project, each having facilities for the care and feeding of 120 pre-school children. In each building the 7,123 square feet of floor space is heated by a semi-automatic hand-fired furnace.

Post Office

The post office, begun January 4, 1943, was delivered to the United States Postal Department on April 16, 1943. The wall-supporting brick building has concrete floors and foundations covering 4,308 square feet. Heat is supplied by two oil-burning space heaters.

Library

The library, begun April 28, 1943, was finished seventy-two days later on July 9. The library, which is a brick wall-supporting building, provides a large reading and book stack room, 32 feet by 60 feet, an office, restrooms, and a furnace room equipped with a hand-fired, semi-automatic furnace.

Ice Houses

The ten ice houses, begun April 1, 1943, were completed and in final location by June 7. The ten small frame buildings were built in the framing yard and skidded on or trucked to final location. They are located throughout the project so that all apartments are within easy walking distance of an ice house. Each house furnishes a small attendant's office and a storage space for ten tons of ice.

S I T E D E V E L O P M E N T A N D U T I L I T I E S

Site Drainage

Slough channel improvement began on the first day of construction. For the first three weeks draglines and power shovels were used, but after the results of two blasting experiments were observed, the remaining improvement was done by ditching powder. Blasting continued until November 7 when the last slough channel was cleaned. In those areas remote from natural drainage, open ditches were dug by power hoes and tile lines were laid to remove the excess water. On October 24, when ditch digging began, tile line construction was also started. Tile was laid only when the slough channels were ineffective, open ditch was unfeasible and street gutters were insufficient. The ditch digging program was completed by April 30. The tile lines were laid throughout most of the construction period until the date of drainage completion on August 1, 1943.

The original drainage system consisted of tule-choked slough channels that allowed the water to drain slowly to a drainage pump that discharged into Columbia Slough. Supplementing the system described was a small antiquated lift pump that drained the lowest 240 acres into the site slough system. The original system allowed a large amount of stagnant water in the uncleaned sloughs and swamps. Also, during at least three months of the year, approximately 40 acres of ground used for building sites were covered with water ranging from six inches to three feet in depth. The problem was increased by the addition of eight miles of streets, 45 acres of parking lots and 82.2 acres of roof area, all of which greatly increased the run off.

The blasting program provided 15,200 feet of improved channel in the bottom of the slough with an average width of six feet and an average depth of four feet. A total of 9,400 feet of open ditches were dug with a maximum depth of 10 feet. These ditches were finished with reasonable slopes to eliminate danger to small children and to provide a pleasing appearance. Utilized in the tile lines are 51,000 feet of concrete pipe ranging from 4 to 36 inches in diameter.

Since the soil is relatively impervious, most of the water picked up by tile lines in addition to direct down spout connections is by catch basins. Practically all of

the catch basins are made of creosoted lumber, fabricated in the framing yard. Ten thousand and three hundred and sixty board feet of lumber were used in the construction of catch basins, all of which were made in the framing yard where they were made largely of scrap lumber. The antiquated lift pump in the west end of the project was replaced by a modern pumping station equipped with two automatically controlled pumps with a combined capacity of 13,000 gallons per minute. The large pumping station that discharges into Columbia Slough had an original capacity of 30,000 gallons per minute which is supplemented by an addition of one pump with a capacity of 9,000 gallons per minute.

Site Grading

Since no buildings could be placed before the site was reworked, grading began the first day of construction, August 21, 1942. The policy followed was to grade completely one area suitable for construction, then move on to another. Most of the site was graded before October 31, when adverse weather terminated the use of heavy equipment.

After November 14, in the areas that had not been site graded, buildings that otherwise would have been too low were set on posts.

In the course of site grading, in excess of 900,000 cubic yards of material were moved between cuts and fills, several of which were as much as six feet in depth. At the peak of site grading more than 88 pieces of earth-moving equipment were in use.

Street and Access Road Development

On the first day of construction, August 21, 1942, street subgrading began. As intended, all the main streets within the project were subgraded and graveled before the heavy rains in November. Graveled streets were maintained through the main construction period with no attempt to pave them until favorable weather in March. During the time they were used as graveled streets, the soft spots showed up and were corrected before paving was attempted. All streets were completed August 15, 1943.

In addition to the streets on the project proper two access roads were built by George H. Buckler. The first one they de-

veloped was the North Access Road, which provides an entrance from Swift Boulevard through the Union Livestock Yards. It was developed as a graveled road at approximate grade during the last of November. Since it was used as a route for heavy equipment moving to and from the job, it was not finish graded and paved until June. The construction of the West Access Road began with the driving of piling for the first bridge on March 26, 1943. The bridges and over sixty percent of the subgrading were done by May 21. Subsequent subgrading and graveling were delayed by high water in the Columbia Slough and by work on the O.W.R. and N. Railroad trestle done by the railroad company; however, the road was subgraded, graveled and opened to restricted traffic by July 9. The road was completed including guard rails, paving, curbs, and divider strips by August 15, 1943.

The West Access Road provides an entrance to Swift Boulevard from the west. It is carried on a two lane bridge, 358 feet long, under the State Highway bridge and S.P.&S. railroad bridge that both cross Columbia Slough. It goes under the O.W.R. &N. railroad trestle over Columbia Slough and then over the main dyke into Vanport City where it crosses a 144 foot bridge over one of the small sloughs within the project before it connects with the main project street system.

Most of the streets were built with a crowned middle section, 22 feet wide, and two rolled asphalt gutters, each of which is 4 feet wide and 3 inches deep. One hundred and forty-two thousand and fifty-five cubic yards of gravel and rock were used to provide a base varying from six inches to two feet in depth. The variation in depth was determined by the character of the subgrade. During the process of applying a two and one-half inch coat of plant mix asphalt to the 46,465 lineal feet of streets and access roads, 21,100 tons of paving material were used. The five bridges utilized for major channel crossings required 275,000 board feet of lumber and 133,000 board feet were used for screeds. In addition, 5,064 lineal feet of culverts were used for small drainage crossings.

Denver Avenue Underpass and Entrance

Tower Sales and Erecting Company began the first phase of preliminary underpass construction on October 24, 1943. As soon as the detour bridge was completed excavation was begun for the east half of the permanent bridge; the piling was driven and the superstructure completed the far east half of the bridge, which was opened for traffic on January 8, 1943.

Following this was the excavation for and the construction of the west half of the bridge which was completed March 12. Included in the sub-contract were the necessary acceleration lanes and approaches from the Denver Avenue to the project. The delivery of fill material for these began December 5 and was finished April 16. The curbs were poured as was practical during the construction process. The paving continued intermittently from April 3 to April 29 when the underpass was opened for Vanport traffic. The last item finished were the sidewalks--completed May 14.

Traffic was maintained on Denver Avenue by the use of a two lane detour bridge over which the south bound traffic was routed during the construction of the permanent bridge. The underpass is the major item in the entrance and exit system to Denver Avenue by which traffic is handled without the necessity of sending any of it through an adverse lane of traffic.

The major items required for construction were 87,399 cubic yards of fill material, 9,000 square yards of asphalt surfacing, 2,317 cubic yards of gravel, 6700 feet of concrete curb, one detour bridge and one 5 lane permanent bridge which utilized 117,525 board feet and 4,200 feet of piling.

Parking Lots

Parking lots were rough graded during site grading. Later, beginning October 19, when most of the street grading was complete, parking area subgrading began. After grading had been under way for 2 weeks, the application of the gravel base started. In February, when favorable weather had reappeared, the application of pit run 1/4 inch minus material, which set up into a water bound macadam, was begun as the final operation in parking lot surfacing. The last parking lot was subgraded in June and all the gravel, rock, and pitrun material were

in place by the middle of August. As the parking lots were finished they were surrounded and divided by logs that served as bumper blocks.

Two million one hundred thirteen thousand and one hundred eighty-one square feet or approximately 45 acres of parking lots furnish parking space for three out of five apartments. These parking lots are built in two general shapes; they are rectangular or "T" shaped. The "T" shaped lots, which have the bar of the "T" lying against the street, serve only the apartments in cul de sac groupings. Most of the remaining buildings are furnished with the rectangular lots. The depth of the rock and gravel base varies from six inches to two feet. As was the case with streets, the depth depends upon the strength of the subgrade. To provide this base 144,085 cubic yards of rock and gravel were used. The water-bound macadam surface required 82,000 cubic yards of 1/4 inch minus pit run material, and approximately 72,000 lineal feet of logs not less than 10 inches in diameter were used.

Power Distribution System

Shortly after construction began, temporary power lines were strung to the two framing yards. Due to a delay in electrical plans it was not until September 19 that the first permanent poles were set. Construction of the power distribution system continued at a relatively even rate until it was completed July 15th.

The power system is served from a central metering point by an 11,000 volt line owned by the Portland General Electric Company. At the point of service the system is broken up into four sections each equipped with a lighting arrestor, any one of which may be disconnected without affecting the remainder of the system. Included in the construction of this utility was the placement of new poles on which the P. G. E. line, that crosses the project, was relocated.

One unusual thing in the system is the large amount of guys required by the muddiness of the site during construction. The materials used in the system include 83 transformers, 457 poles, and 551,200 feet of wire.

Sanitary Sewer System

Sewer construction began the middle of September, 1943. Within the first week 1,600 feet of gravity line was laid. After that the average rate of construction of gravity line continued at about 2,500 feet per week until completion on June 24th, with the exception of the period between January 1 and February 15th when the weekly amount did not exceed 1,000 feet. The pressure system which was begun in the middle of November was in operation by March 12. The most critical period in sewer construction was during the laying of the 24 inch outfall line. Since new pressure pipe in the desired size could not be obtained when required, reclaimed steel pipe was used. After a long painstaking search, satisfactory used pipe was finally located at an abandoned hydraulic mining operation and shipped from southern California. It was dismantled and shipped. Upon delivery all available welding machines were operated 24 hours a day until the 3,000 feet of pipe was installed. This effort was made because it was the last item before initial occupancy. The first sewage pumping station was begun October 21. It was in operation with temporary pumps on December 12. All stations were in operation by March 12, with the use of a few temporary pumps. The pumping stations were completed with the remainder of the system June 24th.

The site is nearly level; consequently, to eliminate gravity lines laid at more than 20 feet below the surface, it was necessary to build six sewage pumping stations. The fourteen pumps used in these stations have a combined capacity of 15,300 gallons per minute. After sewage has run into the well of a station, pumps exhaust it into pressure lines that carry the sewage into a high point further on in the gravity system from which it flows to the final pumping station. The last two pumping stations exhaust into the outfall line which discharges into Oregon Slough. In the process the sewage from one area passes through three separate pumping stations; however, most of it goes through two only on the manner described. Utilized in the pressure system are 9,967 feet of welded steel pipe ranging from 10 to 24 inches in diameter and 500 feet of 12 inch wood stave pipe. Comprising the gravity section are 127 concrete manholes, 108,600 feet of concrete pipe and 3,480 feet of gravity steel pipe varying from 6 to 21 inches in diameter.

Gravity pipe was laid on a gravel cushion to prevent the pipe from sinking into the mud. Many small pumps were used to keep trenches dry long enough to lay the pipe and, in the deeper cut sections, shoring was required to hold the trench open.

Water System

The drilling of well number 1 which began September 10, 1942, was completed on September 19. Subsequently each of the other four wells was drilled and tested until the last one was completed in the middle of November. Pump house No. 1 which was begun November 21 was complete and had the pump in operation with a temporary chlorinator on December 12. The five pump houses were complete with pumps and permanent chlorinators May 21, 1943. October 17, 1942, the driving of pile footings for the towers began. After all the footings were driven, concrete caps were poured preparatory to tower erection which began during the first of March. By March 12, 1943, the first water tower was in operation; tower erection continued, however, until May 21 when they were completed. The first water pipe was laid October 24, 1942, from then until May 31, 1943. It was laid at an average rate of 3,400 feet per week. After May 31 several small hookups were made, the last of which were completed June 24, 1943, when the entire system was considered complete. During the pipe laying process hydrants, as well as other special fittings, were put in place as their location was encountered on the line. It is estimated that the daily demand will be 2,000,000 gallons per day.

The five towers which supply an average effective head of 116 feet of water pressure at the base have an individual capacity of 150,000 gallons. Each pumping station is equipped with one 1,200 gallons per minute pump and an automatic chlorinator. The wells vary in depth from 116 to 152 feet in depth. In the water system 48,476 feet of wood stave and 45,950 feet of galvanized steel pipe were used. Most of the 792 valve boxes were made of creosoted wood cut and assembled in the framing yard. The amount of lumber used in valve boxes totaled 5,600 board feet, in addition to 1,774 board feet in each of the five pump houses. In addition to buildings the valve boxes in the framing yard, special connections of wood pipe was cut to length and beveled for joints at this location.

Sidewalks

Sidewalk construction did not begin until December 9, 1942, because they could not be built in any area until the utilities were connected, the buildingscompleted and the area's drainage system installed. Sidewalks were constructed in two stages; the placement of the two-by-four screeds and distribution of a 2 1/2" crushed rock leveling course; then later, the laying of a 1 1/2 inch asphalt surface. The second phase did not begin until February 5, 1943. The long time interval between steps was caused by inclement weather, but it did allow considerable compaction of the base material in the meanwhile. During the following summber when the final connecting walks were being built, the two steps were a continuous operation. The last walks was finished by August 15, 1943.

Most of the paved walks are three feet wide and account for approximately 42 miles of the 50 mile walk system. The remaining 8 miles are constructed of two two-by-four stringers surfaced by random width lumber, two inches thick and three feet long, which again provides a wlk three feet wide. Wooden walks were used when site conditions made other type inadvisable. In the construction of sidewalks, 4,750 tons of asphalt, 8,000 cubic yards of gravel, and 850,000 board feet of lumber were used.

Landscaping

During site grading most elevations around building were built approximately to grade, but after all the other work was done in an area considerable reshaping of the earth was required. In December, when finish landscaping began, the site was so muddy due to rain and traffic that it was necessary to add sand to give it a workable consistency. After the ground was in a finished condition, shrubs were planted and grass was seeded. Shrub planting and lawn seeding could not begin until favorable weather in March, however. In the large areas not adjacent to buildings, finish grading continued until August 20, 1943, when all grading was completed. All the shrubs and lawns were planted and seeded by September 1. The meadows were not planted until late in September, 1943, however, because they could not be artificially watered and, consequently, depended on rainfall.

Shrubs of 161 native varieties were planted around the buildings. In the beautification program not less than 27,000 shrubs were set out. The seeded lawns were planted to include all areas within 40 feet of any building and wherever necessary to maintain the landscaping design. To complete the lawn program 135 acres were seeded to grass. In the large areas not near buildings 180 acres of clover and grass meadows were planted. Fill material hauled in from off the site for landscaping purposes included 90,000 cubic yards of sand and 5,000 cubic yards of earth.

Slough Improvement

In the spring of 1943 it was decided to further beautify the site by a slough improvement program. This program included the sloping of the steeper slough banks, the filling of one large swamp and two small ones, the sanding of the more accessible slough banks and the south bank of Force Lake; also, four foot bridges were sanded. Practically all phases began June 1, 1943, and were concluded by August 15th.

The principal materials used in this program were 101,200 cubic yards of earth fill, 41,000 cubic yards of sand, and 23,400 board feet of lumber used in constructing five footbridges.

Park Development and Recreation Areas

During the construction period all trees that did not interfere with required structures were saved, and as work progressed brush and brambles were cleared. During the first of June, 1943, a footbridge and diving float were built for Force Lake Park, followed in August by the construction of tables, benches and the installation of sanitary equipment which were placed in position here as well as in other favorable areas. Today there is a total of more than ten acres of natural tree shaded parks available.

Coal Unloading Spur and Storage Platform

Since practically all heat is supplied by coal burning equipment, specialized handling facilities were constructed. The coal unloading spur and storage platform were begun November 7, 1942. Coal was being handled by these facilities December 12;

however, the structures were not all complete until January 8, 1943.

The facilities built for coal handling consist of a timber railroad trestle, 550 feet long and approximately 20 feet high, and an asphalt storage platform approximately three-quarters of an acre in area. Coal is delivered by railroad cars to the trestle where the cars are unloaded to the platform below.

Used in the construction of these facilities were 1,370 lineal feet of railroad rails, 349,338 board feet of lumber, and 60 tons of asphalt.

Other Miscellaneous Work

The eight bus waiting stations that were constructed required a total of 25,842 board feet. They consist of seating space protected by an overhung roof. Theywere built by George H. Buckler during the month of June at convenient locations along the bus route.

The job was guarded during the early stages by the Pinkerton Detective Company; later, arrangements were made for the Multnomah County Sheriff's Office to take over this duty. The maximum number of guards required for this job was .

During construction a large number of small drainage pumps were required to keep sewer and pipe trenches and some site areas dry.

Required for storage space and tool buildings were over 100 structures, ranging from 100 square feet to 12,000 square feet in area.

F I R E P R O T E C T I O N S Y S T E M

Fire Protection System

* Fire Protection is directed from the central fire and police station located near the center of the project. It is supplemented by two auxiliary stations located at each end of Vanport. Within these three buildings there is housed a total of six fire engines, a chief's car and the necessary fire crews of 52 men.

The fire alarm system utilizes 41 alarm boxes connected with the central station; required for this hookup is five miles of connecting circuits.

**There is a total of more than 100 fire hydrants, one of which is within 650 feet of every building. Adequate storage is provided in the five 150,000 gallon water towers. Delivery of water is assured at all times by a loop water system.

* For a more detailed description of the fire station buildings, see page 15.

**For a more detailed description of the water system, see page 27.

APPENDIX A

A DIARY OF CONSTRUCTION

August 1, 1942	A general construction contract was entered into by the Federal Public Housing Authority and Kaiser Company, Inc. whereby Kaiser Company, Inc. was to locate and purchase a suitable site for a housing project.
August 7	A preliminary survey and exploration of the present site of Vanport was made.
August 18	The site was inspected, examined and approved by the Federal Public Housing Authority, The Housing Authority of Portland, and Kaiser Company, Inc. officials.
August 20	Grading equipment and construction shacks were moved in.
August 21	Street and site grading was begun, preparatory to the construction of 6,022 apartments.
August 24	Drainage channel improvement was begun with the use of power shovels.
August 27	Work was begun on the temporary railroad unloading spur.
September 1	The framing yards were assembled by the two sub-contractors, George H. Buckler, Contractors, and Wegman and Son. The temporary power system was begun.
September 9	The difficulty obtaining laborers was realized and recruiting was begun.
September 10	The drilling of well No. 1 began and the temporary unloading spur was completed.
September 11	Building materials were being unloaded at the unloading spur.
September 12	Footing were laid for the first war apartment buildings, Wegman and Son and George H. Buckler-Contractors, each began a building on this date.
September 14	Final and complete plans were received for apartment buildings.
September 15	Blasting powder was adopted as a method of slough channel improvement.
September 19	The first well was tested and approved. The first street bridge was begun and the first poles were set in the permanent power distribution system.

September 25	The laying of sewer pipe began.
October 3	Two buildings were completed enough to be used as office buildings - one by each of the two sub-contractors.
October 8	A labor recruiter was sent to Coeur d' Alene, Idaho.
October 15	Shift staggering was adopted to alleviate traffic congestion on Denver Avenue.
October 17	Pile footings were driven for water tower No. 1.
October 19	Subgrading of parking lots was started.
October 24	Work was begun on the Denver Avenue Underpass. Excavations were completed for the first sewage pumping stations. First wood stave water pipe laid.
October 31	A severe rainstorm stopped the use of heavy grading equipment.
November 1	Supplement No. 1 to the general contract was signed. This supplement authorized an increase in the number of apartments from 6,022 to the present number.
November 7	The major part of channel improvement was completed. A 600 foot coal unloading trestle was begun.
November 14	The continuance of inclement weather made it apparent that finish grading could not be resumed, therefore, buildings were set on posts where necessary.
November 21	Water pump house No. 1 was started. Law enforcement by County Sheriff's begun in temporary offices.
December 5	Five hundred apartments were completed exlusive of water and sewer connections and cooking facilities.
December 9	Rough landscaping began and sidewalks construction began. (sand was required)
December 12	Nine hundred and twenty-four apartments were completed and accepted for occupancy. The first segment of the water and sewer systems were put in operation with the use of a temporary water pressure tank and temporary sewage pumps. Coal was being handled on the newly completed coal trestle. Outfall sewer 3 shift operation, all available welding equipment and men working.

December 18	Occupancy of apartments was begun.
December 22	Three hundred and ninety-one apartments were occupied.
January 8, 1943	The East half of the Denver Underpass bridge was opened for traffic. The first parking lots were in use.
January 15	Half of the construction required had been completed on war apartments.
January 18	It was unusually cold, 18° F., and many men did not report for work.
January 20	Due to 18 inches of snow, operations were curtailed.
January 25	Operations were being carried on with short crews. Inside work, snow removal and hauling of incoming freight were the principal activities.
January 26	Alternate raining and freezing made conditions bad but production was being rapidly resumed.
January 27	Construction had resumed its usual pace.
February 5	The paving of sidewalks was begun.
February 12	The Housing Authority of Portland moved into the new Administration Building. The shape of the parking areas was revised.
February 26	Construction of the hospital was begun.
March 5	The water system, power distribution system, and sanitary sewage system were 60 percent complete and construction on the war apartments was 75 percent complete.
March 12	A group of apartment buildings were used for the first temporary school. Shrub planting began and water tower No. 2 was placed in operation. All sewer pressure lines were complete and all sewage pumping stations were in operation, using temporary pumps where necessary.
March 15	The paving of service drives and allyes was begun.
March 19	The West Access road was begun with the driving of piling for the first bridge.
March 20	Street paving was begun.
March 26	The permanent post office was opened, eliminating temporary post office.
March 29	The cafeteria was opened and during the first week 5000 meals a day were being served.

April 2	Shopping Center No. 1 was opened for business.
April 9	The first permanent school was put in session.
April 16	The Denver Avenue Underpass was opened to traffic. The fire stations (3) were completed. Station No. 1 was immediately occupied.
April 23	The sewer, water and power distribution systems had been connected to all apartment and utility buildings.
May 5	The large recreation building was completed.
May 7	Site grading was completed and landscaping continued.
May 14	The temporary railroad spur was taken up.
May 18	The large recreation building was opened and dedicated.
June 4	The beautification of Force Lake Park was begun.
June 11	Swamp filling began and the work of increasing the amount of asbestos around rangettes was begun.
June 24	The sewage and water systems were turned over to the Housing Authority of Portland. The hospital was completed.
June 25	All streets were completely paved except the West Access Road, some repairs were to be made by the contractor, however.
July 2	Shopping Center No. 2 was opened.
July 9	The West Access Road was opened as a route for fill and landscaping material.
July 14	The nurseries and library were completed.
July 15	Beach sanding began. The Power distribution system was completed.
July 16	All structural work was completed on the war apartments. The only materials required to make all apartments available for occupancy were a few davenos.
July 31	The West Access road was completed and opened to general traffic.
August 1	Site drainage was completed.
August 5	The slough filling and beach sanding program was completed.

August 10	The sidewalks were complted. All landscape grading was completed.
August 15	All war apartments were completed and ready for occupancy. All public service buildings were done and the theatre was opened. All work on streets was completed. The shrub planting was completed.
August 24	Lawn planting was completed.
September 1	Vanport was officially complete and was being operated entirely by the Housing Authority of Portland. The total required construction time was one year and eleven days.

APPENDIX "B"

SUMMARY OFQUANTITIES

Apartment and Utility Buildings

Type of Building	No. of Apts. In Each Bldg.	No. of Buildings	Total No. of Apts.
A	14	703	9,842
B	8	8	64
C	4	9	36
Utility Bldgs.		181	
Total		901	9,942

Lumber	39,535,000	Bd. Ft.
Fiber Board	5,006,500	Sq. Ft.
Plywood	2,815,600	Sq. Ft.
Plasterboard	11,965,800	Sq. Ft.
Roofing	57,475	rolls
Nails	1,014,400	pounds
Plumb ing Fixtures	41,045	Fixtures
Brick	1,204	Hundred
Windows and Doors	75,672	Items
Electric Wire	32,914	Pounds
Concrete	7,411	Cu.Yds.

Community Facility Buildings

Total Number of Buildings	43
Administration Building	1
Yard Stations	6
Fire Stations	3
Ice Houses	10
Recreation Buildings	5
Shopping Centers	2
Cafeteria	1
Theatre	1
Schools	5
Hospital	1
Child Day Care Centers	6
Post Office	1
Library	1

Site Drainage

Improved Channel - by blasting	15,200	Feet
Excavated Ditches	9,400	Feet
Concrete Tile	51,000	Feet
Improved Pumping Station	1	
New Pumping Station	1	

Site Grading

Earth Moved	900,000 Cu.Yds.
Maximum pieces of equipment	58

Streets and AccessRoads

Length	46,465 Feet
Asphalt	21,000 Tons
Gravel	142,055 Cu.Yds.
Five Bridges	275,000 Bd.Ft.Lbr.

Denver Avenue Underpass and Entrances

Lumber in Bridge	117,525 Bd. Ft.
Fill Material	87,399 Cu. Yds.
Asphalt Surfacing	9,000 Sq. Yds.
Concrete Curb	6,700 Lin. Ft.
Detour Bridge	1

Parking Lots

Area	2,113,181 Sq. Ft. or approx. 45 Acres
Gravel	145,000 Cu. Yds.
Pit run surface	82,000 Cu. Yds.

Power Distribution System

Wire Used	551,200 Lin. Ft.
Length of System	66,000 Lin. Ft.
Transformers	83
Poles	457

Sanitary Sewer System

Gravity Lines	108,600 Lin. Ft. Conc. Pipe
Pressure Lines	10,467 Lin. Ft.
Pumping Stations	6
Number of Pumps in all stations	14

Water System

Water Towers	5 - 150,000 Gal. Tanks
Pumping Houses	5
Wood Stave Pipe	48,476 Lin. Ft.
Galvanized Steel Pipe	45,950 Lin. Ft.

Sidewalks

Length	Approximately 50 Miles
Asphalt	4,750 Tons
Lumber	850,000 Bd. Ft.

Landscaping

Area of Lawns - - - - - - - - - -	135 Acres
Area of Meadows - - - - - - - - -	180 Acres
Number of Shrubs - - - - - - - - -	27,000 or more
Sand Fill Material - - - - - - - -	90,000 Cu. Yds.
Earth Fill Material - - - - - - -	5,000 Cu. Yds.

Slough Improvement

Earth Fill Material - - - - - - -	101,200 Cu. Yds.
Sand - - - - - - - - - - - - - - -	41,000 Cu. Yds.
Lumber in 5 foot bridges - - -	23,400 Bd. Ft.

Coal Unloading Spur and Platform

Length - - - - - - - - - - - - - -	600 Feet
Lumber - - - - - - - - - - - - - -	349,338 Bd. Ft.
Area of Platform Approximately -	0.75 Acres

APPENDIX "C"

LIST OF WORK DONE BY

EACH SUBCONTRACTOR

George H. Buckler

1. Build the following apartment and utility buildings.

93 Service Buildings	
362 "A" Type Buildings - - - - -	5,068 Apts.
9 "C" Type Buildings - - - - -	36 Apts.
Total	5,104 Apts.

2. Improved and greatly enlarged the Site Drainage System.

3. Did All Site Grading.

4. Constructed and paved an 8½ mile street and access road system.

5. Construct more than 45 acres of parking lots.

6. Construct a complete power distribution system.

7. Construct a sanitary sewer system.

8. Build a complete water system including pumps, storage tanks and devices for fire protection.

9. Construct 50 miles of sidewalk.

10. Provide landscaping.

11. Carry on the slough improvement program.

12. Provide the parks and recreational areas.

13. Build a coal unloading spur and storage platform.

14. Do other miscellaneous work not assigned to the other two subcontractors.

Wegman and Son

1. Build the following apartment and utility buildings.

88 Service Buildings	
341 "A" Type Buildings - - - - -	4,774 Apts.
8 "B" Type Buildings - - - - -	64 Apts.
Total	4,838 Apts.

2. Build the 43 community facilities buildings listed on page 40.

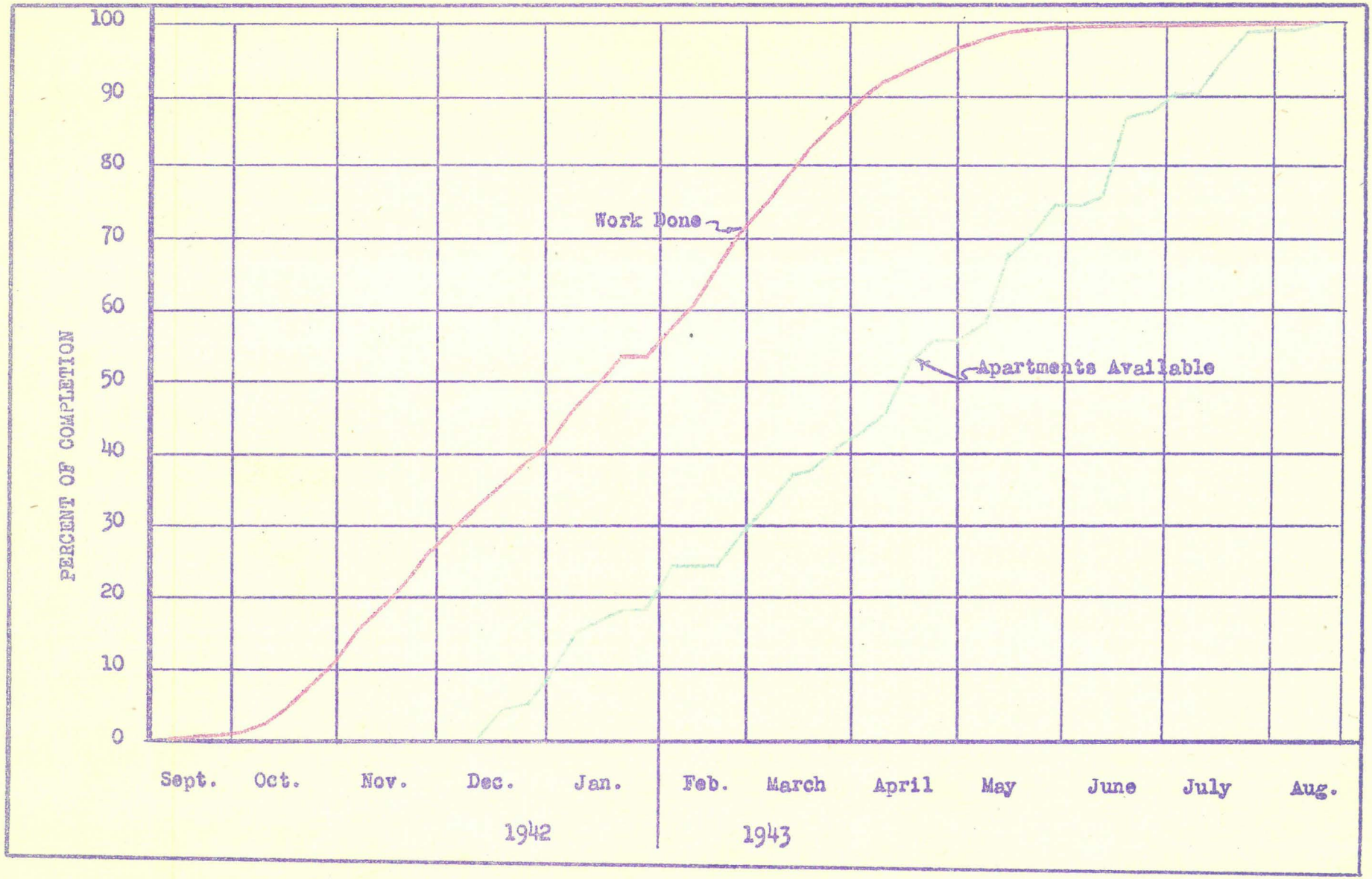
Tower Sales and Erecting Company

1. Build the Denver Avenue Underpass and entrances.

APPENDIX "D"

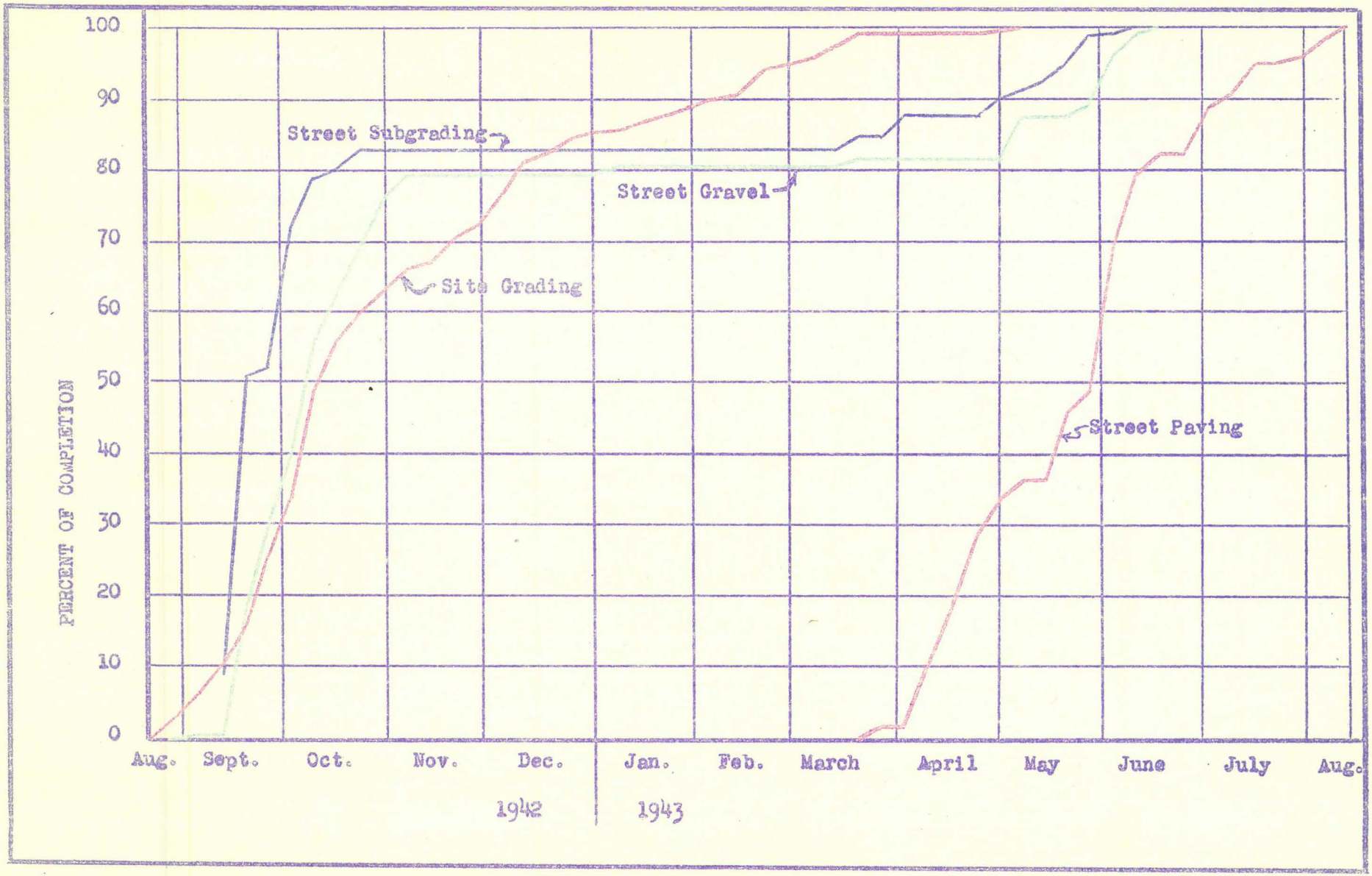
PROGRESS CHARTS

OF CONSTRUCTION

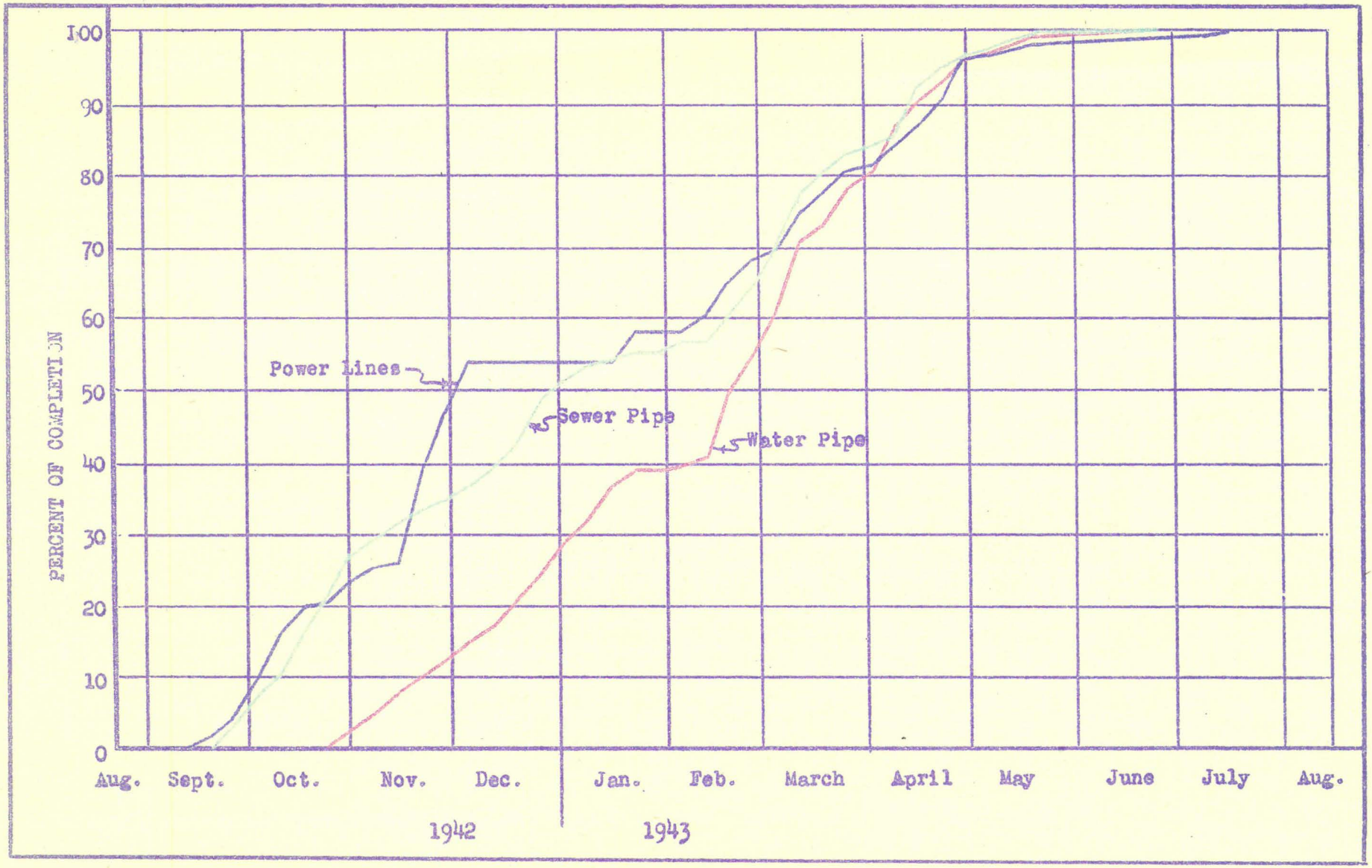


PROGRESS CHART OF APARTMENT AND UTILITY BUILDINGS

9/1/43



PROGRESS CHARTS OF SITE GRADING AND WORK ON STREETS AND ROADS



PROGRESS CHARTS OF UTILITIES

9/1/43