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RLO-CG-5,REV 1 (E.O.UP)
10/16/95

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1st REVIEW-DATE: 4/17/74
AUTHORITY AOC (ADC) ADD
NAME: McNeight
ORG: AEC-HQ
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NAME: JBriggs
ORG: PNNL-ADD

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JBriggs 8/18/98

P. Sullivan 7-17-02

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DON'T SAY IT --- *Write It!*

DATE 5/4/72

TO L. F. Perkins

FROM B. F. O'Mealy

Subject: Classification Review of HAN-10970 Volume 3
Hanford Engineer Works - History Of The Project.

The portion of this document from page 784 through page 791 is considered to be SRD-1 under Hanford Guide Topic 307.3.2 b. This portion of the document also contains information which is CRD-1 under guide topic 308.4.2 b. The balance of the document contains no classified information.

B F O

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"SOME LEARN FROM EXPERIENCE, SOME NEVER RECOVER FROM IT"

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HAN 10970 VOLUME 3

CONSTRUCTION

HANFORD ENGINEER WORKS

U. S. CONTRACT NO. W-7412-ENG-1

DU PONT PROJECT 9536

HISTORY OF THE PROJECT

VOLUME III

START MARCH 22, 1943

COMPLETE MARCH 31, 1945

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1st REVIEW-DATE: 4/17/74
AUTHORITY AOC (ADC) ADD
NAME: McNeight
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P. Sullivan 7/25/2012

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RLO-CG-5,REV 1 (E.O.UP) 10/16/95

E. I. DU PONT DE NEMOURS & COMPANY, INC.
WILMINGTON, DELAWARE

AUGUST 9, 1945

S. Weber 7/24/94

Classification reviewed for declassification but left unchanged by B. F. O[illegible]ly Date 5/[illegible]/72

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b. 100 Areas

(1) Description of Site

(a) Location

The three 100 Areas are situated in the northern portion of the Project bordering on the Columbia River. They are located in a triangular bulge of land included in an inverted "U" shaped bend of that river. The 100-D Area is located at the vortex or northernmost point of the triangle, approximately 32 air miles northwest of Richland. The 100-B Area is approximately 7 air miles southwest of the 100-D Area, and the 100-F Area, approximately 9.5 miles southeast.

The 100-B Area is located in Township 12 North, Range 25 East, Benton County, occupying principally Section 11, but extending into Section 12 and portions of Sections 1 and 2. The 100-D Area is located in Township 14 North, Range 26 East, and occupies portions of Sections 14, 15, 22 and 23. The 100-F Area is located in Township 14 North, Range 27 East, principally in Section 13, but extending into the eastern portion of Section 32.

The three 100 Areas lie to the north and northwest of the basalt rock outcroppings known as Gable Mountain and Gable Butte. They are on a gradual sloping alluvial plain affording excellent drainage and soil-bearing capacity. Their close proximity to the Columbia River affords an ample supply of water and provides a means for carrying off waste water.

(b) Fenced Areas

The 100 Areas are roughly rectangular in shape with the south bank of the Columbia River cutting off a portion of the northwest corner of the 100-B and 100-D Areas, and the northeast corner of the 100-F Area as it loops southward toward Richland.

Beginning at the southwest corner of each area and proceeding clockwise around the area, are the following coordinates which locate the outer fence line:

	100-B	100-D	100-F
SW Cor.	N66500.0-W78000.0	N89400.0-W50100.0	N76400.0-W28300.0
W to	N66500.0-W84350.0	N89400.0-W56400.0	N76400.0-W33600.0
N to	N70100.0-W84350.0	N92336.0-W56400.0	N82200.0-W33600.0
NE to	N71473.2-W82360.0	N92870.0-W55670.0	
E to	N71473.2-W81780.0		
NE to		N94670.0-W53660.0	
NE to	N71900.0-W80300.0	N94900.0-W53400.0	
E to	N71900.0-W78000.0	N94900.0-W50100.0	N82200.0-W31280.0
SE to			N80105.0-W28300.0
S to	N66500.0-W78000.0	N89400.0-W50100.0	N76400.0-W28300.0

The following tabulation shows the approximate sizes and elevations of the three 100 Areas:

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Area	Size	Area Elevations Max.	Average	Min.	River Elevations Max.	Min.
100-B	724 Acres	495	460	420	421	380
100-D	676 Acres	468	466	420	413	372
100-F	611 Acres	416	412	388	399	352

(c) Geographic Locations as to other Process Areas

Upstream (southwest) of the 100-B Area at a distance of 14 river miles is the Priest Rapids Power Dam, while the Midway Substation is six airline miles to the west.

The following is a tabulation listing the air mileage distances, and direction from the center of the 100-Areas to the center of the other process areas and Richland:

From	To 200-E	to 200-W	To 300-Area	To Richland
100-B	5-3/4 S	7-3/4 SW	25½ SE	30½ SE
100-D	10-3/4 SW	9-1/2 S	25½ SE	31½ SE
100-F	11-1/2 SW	8-1/4 SW	21½ SE	27½ SE

(d) Soil Conditions

For the most part these areas prior to the start of construction, were thickly covered with sagebrush and cheat grass on extremely sandy top soil, averaging approximately 1' in depth. Approximately 1/4 of the land surface was rocky soil with boulders protruding or lying on the ground, ranging in size from 1" gravel to rocks 2½' in diameter. These rocks were mostly in the northern portions of the areas toward the river. Underneath this top surface to a depth of approximately 50' was sand, medium gravel, coarse gravel, some cobbles and boulders. Some gravel mounds were also present.

1 Preliminary Investigation

Three core borings were made for the "Gable Project", now known as the Hanford Engineer Works, by the Portland Office of the United States Geological Survey to determine the nature of overburden on the Project Area. These deep borings, varying in depth from 95' to 540', were made at the following locations: Station L-3 located in the southwest corner of Section 30, T12N-R28E; Station L-6, located in the southwest corner of Section 28, T12N-R25E; and Station L-1, located in the southwest corner of Section 15, T13N-R27E. The results of these borings as well as the log of Station L-6 which is closest to the 100 Areas are covered under "Preliminary Investigations" in the sections applying to the 200 Areas.

2 Test Wells

Four 6" test wells were sunk by the Ranney Water Collector Corporation of New York the first week of May, 1943, along the south bank of the Columbia River.

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The purpose of these wells was to determine the permeability of the water-bearing materials and their capabilities as producers of ground water. All of these wells were abandoned buttthe logs of the test well borings indicate the materials encountered.

Test Well No. 1

T13N, R25E, SE ¼ of Section 3, 50' from Columbia River

Depth	Strata
0'-12'	Yellow Sand and Sandy Yellow Clay
12'-27'	Coarse Gravel and Boulders

Test Well No. 2

T14N, R26E, NE ¼ of Section 32, 50' from Columbia River

Depth	Strata
0'-12'	Yellow Sand and Sandy Yellow Clay
12'-23'	Coarse Gravel and Boulders

Test Well No. 3

T14N, R26E, NE ¼ of Section 32, 20' from Columbia River

Depth	Strata
0'-38'	Coarse Gravel, Cobbles, and Boulders with very little sand.

Test Well No. 4

T14N, R26E, NE ¼ of Section 32, 200' Upstream from No. 3

Depth	Strata
0'-23'	Coarse Gravel, Boulders and Cobbles with very little sand.
34'-38'	Medium and Coarse Sand and Gravel

3 Test Tables and Test Poles

Test tables were set up within the site area of all major structures to determine an accurate load-bearing capacity of the soil in order to prepare adequate foundation designs to meet field conditions. A maximum settlement of 10/32 of an inch was allowed for a bearing load of 8000 pounds per square foot, for all process buildings, i.e., 105, 181, 182, 183, 184, 185, 186,187, 189 and 190 Buildings. A description of these tables and the method of making the tests are covered in the sections applying to the 200 Areas.

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Fifteen tests were made on the 100-B Buildings between August 20, 1943, and January 1, 1944, seven covering the 105-B Building. Eleven tests showed soil-bearing results of 16,000 lbs. per square foot or better. Three tests at the 105-B, one test at the 181-B Building, and one test at the 107-B Building failed at less than 8,000 pounds per square foot.

Forty-one tests were made on the 100-D Buildings between October 13, 1943 and May 2, 1944. Twenty-eight showed soil-bearing results of 8,000 lbs. per square foot or better. Thirteen tests failed at less than 8,000 lbs. per square foot. Eleven of these failures occurred at the 183-D, 186-D, and 189-D Buildings.

Twenty-six tests were made on the 100-F Buildings between December 7, 1943 and June 8, 1944. All tests showed soil-bearing results of 8,000 lbs. per square foot or better, except for two out of 7 tests made on the 105-F Building. In all instances, the materials causing the failures were removed and lean concrete was poured into the holes to raise the soil-bearing capacity above the proper limit.

A series of pole foundation tests were conducted to determine the maximum deflection of overhead lines due to the varying top soils found in the Plant Area. Additional tests were made by applying unbalanced loads to supports set in different types of soil and by encasing butts of pole supports in concrete to determine the maximum anchoring effect.

(e) Existing Facilities at 100-Area Locations

A single track spur line of the Chicago, Milwaukee, St. Paul and Pacific Railroad from Beverly, Washington to Hanford traversed the 100-B Area prior to the start of construction. This railroad entered the 100-B Area in the southwest portion and proceeded in a northeasterly direction across the area. The railroad then roughly paralleled the bend of the Columbia River passing just south of the 100-D Area, and on through the town of White Bluffs located between the 100-B and 100-F Areas to Hanford. The road passed west of the 100-F Area after leaving White Bluffs. A railroad telegraph line paralleled the track on the south side.

Approximately ½ mile south of the 100-B Area a 66-KV Pacific Power and Light Company Line ran from the Priest Rapids Substation to the Allard Substation and thence due East to the Hanford-White Bluffs Road where it paralleled that road to Hanford. Another 66-KV Line ran along the south side of the Allard Road to the 100-B Area from the west. Telephone lines existed beneath this 66-KV Line. Located approximately 3½ miles south of the 100-D Area and 1½ miles northwest of the 100-F Area was White Bluffs, a town of 250 inhabitants and approximately 50 commercial facility buildings and homes. This town had buildings and facilities which were used in the construction of the 100 Areas. Most of these buildings and facilities remained in the town abandoned after the completion of construction. Use was also made of the existing 66-KV Lines, railroad tracks and roads outside of the town of White Bluffs during the construction of the 100 Areas.

The main road from Cold Creek to Hanford running in an east-west direction

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paralleled the south boundary of the 100-B Area at a distance of approximately three miles, while the Allard-White Bluffs County road following the south bank of the Columbia River ran from Midway through the 100-B Area to White Bluffs. Two branch trails near the 100-B Area ran from this county road to the Cold Creek Road. There were no roads located within the 100-D Area although there were numerous existing roads around the outskirts of White Bluffs near the 100-D Area. There were two small unimproved roads just within the western edge of the 100-F Area. Here again, however, the existing White Bluffs Roads were close and convenient enough to serve this area.

A single abandoned rock root cellar in the north-east corner of the 100-B Area comprised the only building structure within that area. There were no existing buildings within the 100-D Area while only a few small scattered frame buildings were located within the 100-F Area.

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(2) Preliminary Work

(a) Layout

Layout work in the 100 Areas was inaugurated on March 19, 1943, at which time field work for preliminary topography survey and the preparation of topographic maps was begun. This work was completed in the 100-B Area on April 15, 1943, in the 100-D Area on May 28, 1943, and in the 100-F Area on June 3, 1943. From time to time, additional area topography was requested by Design for locating connecting facilities and covering outlying portions of these areas which had not been included in the original survey.

In the establishment of horizontal and vertical co-ordinates for both the 100 and 200 Areas, a line through Section corners 25-26-35-36, and 29-30-31-32, both in Township 13 North, Range 26 East, was assumed as N50000.0 and became the base line for all co-ordinates in the "Plant" system. This system includes the entire project with the exception of Hanford itself, and that portion south of the northern boundary of the 300 Area. The easterly point of the line (Section corners 25-26-35-36) was assumed as W47360.0, which put W50000.0 at the center of Section 35 (T13N, R26E,), at that time proposed as the east edge of the 200 East Area. This placed the zero point for both the north-south and east-west axis of the plant co-ordinate system in Section 17, Township 11N, Range 28E, which is slightly east of the main highway between Richland and Hanford at a point approximately 10 miles south-southeast of Hanford. Chaining from the easterly point (W47360.0) of the N50000.0 base line to the westerly point (Section corners 29-30-31-32) gave the latter the value of W68775.76. This point was assumed as 0 + 00 of the overall co-ordinate survey traverse. This traverse ran west (on the Cold Creek Road) three miles to an existing road (now Route No. 6 from the Cold Creek Road to the 100-B Area), thence north along this road to the Chicago, Milwaukee, St. Paul & Pacific Railroad track, at which point it turned easterly, and in general, followed the railroad alignment (through the 100-B Area) to Hanford. At Hanford the traverse followed Pope Avenue (or Division Street) to intersect the Cold Creek Road. It then followed the Cold Creek Road to the point of origin. This traverse was 185,601.66 in length and had a lineal error of closure of 1 in 5802 which was adjusted between P.I.'s by the length of course method. There was no angular error of closure.

Prior to the completion of the above traverse, co-ordinates in the 100-B Area were established. To accomplish this, a traverse was computed, using the Milwaukee Railroad track alignment and that portion of the control traverse principally west of W75000.0 as a loop. The total length of this traverse was 62,333.05' and it had a lineal error of closure of 1 in 6724. Therefore, an additional traverse was run through Section Corners 2-3-10-11, and 1-2-11-12, Township 13N, Range 25E, and was 9586.65' in length. These two traverses were then arbitrarily adjusted.

Co-ordinates in the 200 West Area were established by the same method. Co-ordinates in the 200 East, 100-D, and 100-F Areas were established by taking off tangents from the main adjusted traverse.

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At the time construction started in Hanford, very little had been done on the plant co-ordinate system. Consequently, it was necessary to set up a separate system for Hanford. The south edge of "A" Street was assumed as the base line and given the designation of zero north-south. Division Street was designated zero east-west. The Hanford system is at an angle of approximately 45° with the plant system.

The Richland system was also assumed in a similar manner, but was laid out by the Architect-Engineer for the Village and is discussed under the 1100 Area. Co-ordinates for the 300 Area were extended from the Richland system. The Richland system differed from the plant system by 41 minutes, in a counterclockwise direction. A tie-in was made between the two systems locating S59805.0 - E13362.0 of the plant system at N19600.0 - E14400.0 of the Richland system. (See map of Project Co-ordinate Systems of the following page.)

Hub-tacked wooden stakes (2" x 2" x 16") protected by 4' x 4' wooden barricades were used as temporary co-ordinate points. Later, brass caps bearing co-ordinates and elevations were set in concrete monuments at undisturbed points for future reference. A United States Coast and Geodetic Survey bench-mark No. N49 existed just east of the 100-B Area at N70950-W77950 and was used as the control or base bench mark for all elevations on the project. The elevation of this bench-mark was 465.088' above mean sea level datum.

During the last two weeks in October, 1943, the fence line for the 100-B Area, which included both part of the temporary fence and part of the permanent fence was staked out. Prior to this, the temporary Labor and Concrete Office was staked out the first week in September, 1943. Layout for site clearing and excavating of the first permanent process building 107-B, was made on July 29, 1943, and similar layout for last permanent process building in the 100-B Area, No. 111-B, was made June 24, 1944. Layout for the first process building in the 100-D Area, 181-D, was made September 15, 1943, while the last process building 103-D, was laid out October 10, 1944. In the 100-F Area, the first permanent process building 181-F was laid out on December 17, 1943, and the last permanent process building 103-F was laid out on October 14, 1944.

(b) Organization

On May 21, 1943, a Division Engineer was assigned to handle all construction work in the 100-B Area. This work was handled from Pasco and Hanford until October 13, 1943, at which time the Division Engineer and his personnel moved into the 100-B Area.

The Division Engineer assigned to handle all construction work in the 100-D Area arrived on the project October 13, 1943. He worked in the 100-B Division Engineer's Office until the second week in December, 1943, at which time the Division Engineer and his personnel moved into the 100-D Area.

On April 1, 1944, the 100-B Division Engineer was assigned to handle all the construction work in the 100-F Area, as well as the 100-B Area. From that time on, until August 18, 1944, the 100-B Division Engineer's personnel gradually moved from the 100-B Area to the 100-F Area, as the work in the 100-B Area was closed out and the Division Engineer completed the moving of his headquarters to the 100-F Area.

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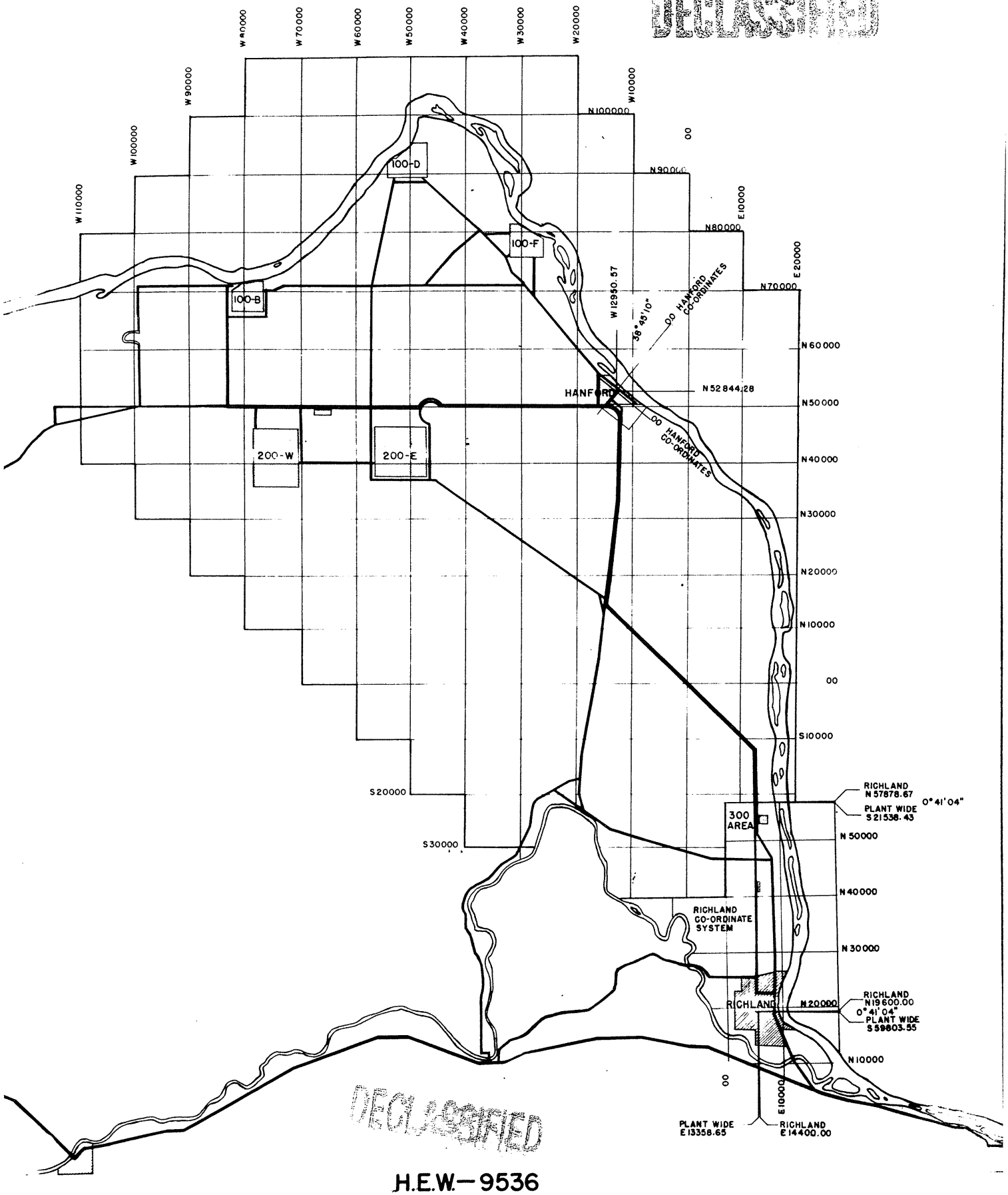

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CO-ORDINATE SYSTEMS

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On July 19, 1943, an Assistant Field Superintendent was assigned to supervise all construction work in the 100 and 300 Areas. On October 15, 1943, the Assistant Field Superintendent moved out to the 100-B Division Engineer's office and remained there until August 15, 1944, at which time he was transferred to other duties. From that time on, the Division Engineer in the 100-B and 100-F Areas and the Division Engineer in the 100-D Area were under the supervision of the Direct Assistant to the Field Superintendent in charge of the 100, 200, 500, 600, 800 and 900 Areas. The only buildings in the 100 Areas not under the control of the 100 Area Division Engineers were the 105 and 116 Buildings which were under the control of the 105 Area Division Engineer (See 105 Area Section).

Construction in the 100-D Area was completed December 4, 1944, at which time the 100-D Division Engineer's office was abandoned and all permanent files and records moved to Hanford. On February 10, 1945, construction work in the 100-F Area was completed and the 100-F Division Engineer's office was closed, with all files and records being moved to Richland.

(c) Establishment of Temporary Construction Facilities

The single track Chicago, Milwaukee, St. Paul, and Pacific Line through the 100-B Area, the nearby 66-KV line, the Columbia River, and the various buildings and facilities in the town of White Bluffs as described in the previous section under "Existing Facilities", provided a basis for the establishment of temporary construction facilities in the three 100 Areas. In addition to these existing facilities, the following additional temporary buildings and facilities had to be provided: construction offices and shops, storage buildings and yards, electric power distribution facilities, water pumping and transmission facilities, steam, telephones, roads, railroads, walks, fences, commuting facilities, etc.

Plot plans showing the layout of temporary construction buildings and facilities in the 100-B, D and F Areas are included in the section on Temporary Construction. These Plot Plans also include the temporary buildings and facilities for the 105 Areas. However, the latter are discussed under the 105 Area Section.

In order to avoid interference in the construction of permanent buildings and facilities certain locations were designated as temporary construction areas in the 100 Areas at the beginning of construction. These areas were located in the 100-B Area as follows: along ordinate W83200 between ordinates N68400 and N70000 in the Area roughly bordered by the following co-ordinates W81200-W84400-N66800-N68200, and two areas in the northwestern portion of the 100-B Area along ordinates N70000 and N70400 between W80800 and W83800. Other small temporary buildings were scattered throughout the 100-B Area, while the subcontractor's concrete plant was located in the vicinity of N68800-W80800.

In the 100-D Area, much of the temporary construction was situated west of the north-south area road with center line along ordinate W55235 in the western section of the area. Other temporary buildings were located north of the east-west area road with its center line on ordinate N92950 and south of the east-west area road with line on ordinate N91760. The subcontractor's

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concrete plant was located in the 100-D Area in the vicinity of co-ordinates N92900-W52450.

In the 100-F Area, temporary construction facilities and buildings were principally located in the west half of the area, west of the main process buildings and west of area road running north and south along co-ordinate W31300. Other temporary buildings bordered the main process area east of the north-south area road with center line at coordinate W30110. The subcontractor's concrete plant was located in the vicinity of coordinate N78700, W30500. The majority of the 105 TC Buildings in all areas were included within the 105 fenced areas, while the other 105 TC Buildings were located just outside of the 105 fenced areas.

1 Construction Offices and Shops

On August 27, 1943, construction was officially opened in the 100-B Area, at which time ground was broken at the site of the 107-B Building. The first evidence of temporary construction work in this area by du Pont was the erection of a combined labor and concrete office, 24' x 40', which was located in the vicinity of the 182-B Building and was completed on October 1, 1943. Temporary construction in general in the 100-B Area was delayed due to the shortage of carpenters and the necessity of placing the available carpenters on the Hanford Camp Buildings. Temporary construction in both the 100-D and 100-F Areas was delayed because of the scarcity of carpenters. These carpenters were required for work in the 100-B and 200-W Areas which held higher construction priority than either the 100-D or 100-F Areas.

A total of 64 temporary construction buildings in 100-B Area, 59 temporary construction buildings in the 100-D Area and 45 temporary construction buildings in the 100-F Area were constructed for the accomplishment of permanent work. In addition to the above-mentioned temporary construction buildings, numerous other small buildings and equipment, were constructed in the three 100 Areas as follows:

Description	Total Number
Tool Boxes	1088
Field Toilets	199
Field Offices and Misc. Small Shacks	167
Field Desks	65
Pay Booths	44
Equipment Lockers	27
Ice Boxes	25
Guard Shelters	15
Trash Boxes	11
Small Platforms and Racks	4

The following temporary construction facilities were also required: Roads, walks, fences, storage and parking lots, railroads, water, fire protection lines, sewers, septic tanks, electric power lines, light, temporary boilers, steam lines, air lines and telephones.

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Temporary construction work was essentially completed in the 100-B Area by January 30, 1944, in the 100-D Area by April 14, 1944, and in the 100-F Area by August 22, 1944. However, scattered work on the TC Buildings and facilities, such as the erection of additional fences and the moving of buildings on skids continued throughout the construction period. A discussion of the type of construction and materials found in the TC Buildings and facilities is given under the section of this history devoted to temporary construction.

2 Electric Power

Temporary power for the 100 Areas was obtained by tapping the existing 66-KV Pacific Power & Light Company transmission line which ran in an east-west direction across the project parallel to and approximately 3½ miles north of the Cold Creek Road. A branch of this line running north from the Allard Substation to the Allard Coyote Pumping Station, was tapped at a point approximately 1000 ft. southeast of the intersection of N70000-W75000 for the 100-B Area. The temporary line from this point then proceeded due west to a substation within the 100-B Area located at N69600-W80550. An additional tie-in was made in the 100-B Area from this substation to an existing 60-KV line paralleling the Allard Road which was originally used as a distribution line and later provided power for the Haven Gravel Pit. This existing line was tied-in with the same 66-KV line from Priest Rapids to Allard Substation by a connecting line running along ordinate W87500.

The original Pacific Power & Light Company 66-KV line was tapped at a point due south of White Bluffs to provide power for the 100-D Area. This line ran in a northerly direction to the outskirts of White Bluffs and then in a northwesterly direction into the 100-D Area to a temporary substation located at co-ordinate N93255-W52800, which is approximately 300 ft. north of the 108-D Building.

The same 66-KV transmission line was again tapped at a point approximately two miles further east than the 100-D Area tap. This line extended due north approximately 2½ miles to the 100-F temporary substation located within the area at co-ordinate N78600-W30800 just south of the 105-F Area fence. These three substations each consisted of a 3000 KVA, 6600 V, secondary, 3-phase, 60 cycle transformer.

The substation in the 100-B Area was energized on August 30, 1943, in the 100-D Area on January 10, 1944, and in the 100-F Area on May 28, 1944. Six temporary transformer banks were constructed in the 100-B and 100-D Areas, while five temporary transformer banks were constructed in the 100-F Area. These transformer banks furnished 440/220/110 power to the area.

The overhead transmission line remained in place after the completion of construction. These lines could provide a source of auxiliary power with the installation of suitable transformers should the permanent power lines fail. The setting of temporary power poles was minimized by the installation and use of permanent pole lines whenever possible.

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3 Telephones

Temporary telephone service in the 100-B Area was inaugurated the first week in November, at which time a single telephone line was run in from the Cold Creek exchange at Central Shops to a single emergency telephone located on a pole in the 100-B Area approximately 1/8 of a mile south of 107-B. This provided the only telephone service to the area until January 18, 1944, at which time the permanent Olive Exchange located in the 100-B Area went into operation. Temporary telephone service to the 100-D Area was furnished by running six lines from the permanent Olive (100-B) switch board to the 100-D Area. These lines furnished telephone service for such temporary buildings in 100-D as the Division Engineer's Office, First Aid, Safety and Patrol, until May 1, 1944, at which time the permanent Pine Exchange located in the 100-D Area went into operation. The original telephone service in White Bluffs was made available to, and used by construction in the 100-F Area until the permanent Maple Exchange went into operation on March 1, 1944. The use of permanent telephone exchanges instead of temporary exchanges minimized the expenditure of materials and labor. All three exchanges consist of single position, 60 circuit, manually-operated switchboards located in the 1720 Patrol Headquarters Building. All telephone cable installed in the area was part of the permanent system.

While the above exchanges were being used for construction purposes, a total of 21 buildings were served by 61 telephones, plus approximately 10 extensions in the 100-B Area, a total of 21 buildings were served by 49 telephones, plus approximately 10 extensions in the 100-D Area, and a total of 18 buildings were served by 45 telephones, plus approximately 20 extensions in the 100-F Area. Inter-exchange telephone service was limited during the major portion of construction due to the small capacity of connecting trunk lines installed for permanent service.

All telephone installations and wiring were handled by the Signal Corps and the Corps of Engineers (see 500 Area).

4 Water

Water for construction purposes in the 100 Areas was obtained from the Columbia River. Prior to the completion of suitable pumping, chlorination, storage and piping facilities, water for drinking purposes was brought from Central Shops by tank trucks, while water for road stabilization, concrete mixing, etc., was hauled from the river where portable type pumps were used.

Myers Brothers-N. M. Ball & Sons, Road and Excavating Contractors, under Contract RPG 407, hauled water for du Pont construction work, from the first of September to the latter part of October, 1943. The initial pumping of water from the Columbia River began September 15, 1943, at which time water was pumped directly to the 100-B Area concrete plant.

In the 100-B Area, the temporary water system consisted of a marine river pump house on included railroad tracks, capable of pumping 600 GPM, a chlorinator station, a 100,000 gallon wooden ground storage tank, and the piping system. A booster station of 600 GPM capacity, driven by both electric

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and gasoline motors maintained from 60 to 65 lbs. per sq. inch pressure in the system. Identical equipment was used in both the 100-D and 100-F Areas, except that the marine pumping stations were located on floating rafts. An additional ground wooden tank holding 25,000 gallons was located in the 100-B Area approximately 400 ft. southeast of Building 188-B. Water services through the 100-B Area temporary system were completed on January 30, 1944, through the 100-D Area temporary system on February 10, 1944, and through the 100-F Area temporary system on April 14, 1944.

All water in these systems was chlorinated regardless of final usage. In most cases, the temporary water lines were run 3 to 4 ft. underground. The following amount of temporary piping was used:

100-B	100-D	100-F
600' - 8" diam.	11,525' - 8" diam.	8,350' - 6" diam.
11,200' - 6" diam.	3,025' - 4" diam.	4,450' - 4" diam.
2,250' - 4" diam.	3,200' - 2½" diam.	1,000' - 2½" diam.
750' - 3" diam.	650' - 1½" diam.	1,000' - 2" diam.
1,000' - 2" diam.		500' - 1" diam.
15,800' - Total	18,400' - Total	15,300' - Total

Steel welded piping was used for water mains 3" in diameter and larger, while screwed schedule 40 pipe was used on the smaller diameter lines.

5 Roads

At the beginning of construction, access to the 100-B Area could be had by means of the Allard-White Bluffs County Road, and two small roads connecting this road with the Cold Creek Road. Access to 100-D could be had by a road branching from the Allard-White Bluffs County Road north to the area which then followed along the bank of the Columbia River in a southwesterly direction and rejoined the Allard-White Bluffs County Road. The 100-F Area had several roads which ran to it from the town of White Bluffs and from the White Bluffs-Hanford County Road. These roads had firm gravel surfaces and being approximately 15 ft. in width were readily available for construction usage. Additional temporary roads were laid out within each area having approximately similar line locations as proposed permanent roads wherever possible so that they could be used later as a basis for permanent roads. Guerin Brothers, a sub-subcontractor for Myers Bros.-N. M. Ball & Sons, Excavating Contractors, constructed the majority of the temporary roads in the 100 Areas, while completing major excavation work.

Temporary roads were constructed of packed sand and gravel obtained from area excavations and borrow pits and during the summer months were daily stabilized with water to eliminate dust and to maintain a compacted surface. Approximately 10,700 lineal feet of temporary road was constructed in the 100-B Area, and 10,000 ft. in each of the 100-D and 100-F Areas. These roads were 20 ft. in width.

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Due to the necessity of excavating across roads for underground lines and of blocking roads for various construction purposes, additional small sections of temporary roads were constructed from time to time wherever necessary. Most of these were used for a short period of time and then abandoned. These small sections of temporary roads were principally constructed by du Pont. The stabilization of the entire working area near all major construction reduced the number of lineal feet of temporary road and greatly eased congested transportation problems.

6 Railroads

The original branch line of the Chicago, Milwaukee, St. Paul and Pacific Railroad, which ran directly through the 100-B Area, served as a basis for the temporary and permanent trackage constructed within this area. However, the original line was extended due east from the west edge of the area, roughly along ordinate N68000 to serve the temporary lumber yard. An additional track was carried through the area from west to east leaving the original track near the west fence line of the area, running roughly along ordinate N68500 and joining the original track near the east boundary. This section of track, together with additional spurs and ladder tracks served the temporary concrete mixing plant and adjacent buildings. Additional ladder tracks and sidings were built from the original track roughly along ordinate W70400 to serve the MS Stores Building and Material Storage Platforms. A temporary track left the northern loop of track about in the center of the 100-B Area and was extended northwest approximately one-half mile to the Haven Gravel Pit to carry the aggregate for the concrete mixing plants in the 100 and 200 Areas.

A spur was extended due north to the 100-D Area from the original Milwaukee track just west of where the track curves in a south-east direction toward White Bluffs. Within the 100-D Area, temporary track was extended to the temporary MS Warehouse on the west side and to the temporary Area Warehouse and unloading platforms on the north side. Concrete and aggregate ladder tracks were extended to the temporary Concrete Mixing Plant and adjacent buildings located on the east side of the area near the 105-D Building.

A track was extended northeast to the 100-F Area from Leazer Spur located on the Milwaukee Railroad 2.5 miles south of White Bluffs. Within the area, temporary concrete and aggregate ladder tracks were extended due north to the temporary Concrete Mixing Plant located near the 105-F Building. Temporary track was also built to the Pipe Warehouse in the north central portion of the area. In all, approximately 21,000' of temporary track was laid within the 100-B Area, approximately 19,300' was laid within the 100-D Area and approximately 7,400' was laid within the 100-F Area.

Used rail varying from 65 lb. to 85 lb. per lineal yard with No. 8 frogs and hand-throw switches were used. The original Milwaukee Railroad Track consisted of 65 lb. rail. All rails, both temporary and permanent in the 100 Areas, were laid by Labor furnished by Guy F. Atkinson Company, Railroad Subcontractors, covered in their Contracts RPG-403, and RPG-4339. Railroad material, with the exception of ballast, was furnished by government allocation. Track maintenance work was performed by du Pont forces under the supervision of the 600 Area Division Engineer. Approximately 2000' of temporary railroad track was left in place in the 100-B and 100-F Areas.

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In order that through railroad traffic from the Riverland Classification Yards to other areas on the project would not have to pass through the 100-B Area, additional permanent track was laid around the 100-B Area, leaving the original Milwaukee tracks approximately 2,500' west of the west boundary of the 100-B Area and roughly paralleling the south boundary of the 100-B Area, joining again with the original Milwaukee track approximately 3,000' east of the east fence line.

7 Aggregate Barrow Pits

The only material resources usable for construction to be found in the 100 Areas were sand and gravel deposits immediately underlying the surface. Two aggregate barrow pits were opened in the 100-B Area for temporary and permanent road construction and stabilization work. One barrow pit was approximately 500' square, and from 4' to 13' in depth, having its southeast corner at co-ordinate W82150-N66750 and the other barrow pit was approximately 1,000' x 900' with its southeast corner located at co-ordinates W78000-N70100. This second pit sloped irregularily, having approximate depth of 10'. No aggregate barrow pits were excavated in the 100-D or 100-F Areas. However, a stockpile of material from building excavations approximately 300' x 400' was maintained in the 100-D Area for some time until needed for stabilization. Excess material from foundation excavations was used for stabilization work in the 100-F Area. Fines for final surfacing at Operating Buildings in the 100-D and 100-F Areas were hauled from the Hanford Gravel Pit.

Concrete aggregate was shipped to the 100-B Area by rail and truck from the Haven Gravel Pit located approximately ½ mile west of the 100-B Area. Concrete aggregate was furnished the 100-D and 100-F Areas from both the Haven Gravel Pit and the Hanford Gravel Pit by rail and truck.

The Haven Pit was capable of producing 9,600 tons of concrete aggregate daily. The Hanford Gravel Pit located just west of Hanford proper was capable of producing 14,832 tons of concrete aggregate daily.

Upon clearing the sage from the working area, it was imperative that these sites be immediately stabilized in order to proceed with temporary construction work. The top soil in the 100 Process Areas consisted of loose sand and boulders protruding from and scattered on the surface. This impeded the movement of trucks, equipment and material. Wind movement readily produced an undesirable dust condition. Therefore, working areas around permanent and temporary buildings, storage yards, fabrication yards, and parking lots were covered with gravel and sand from building excavations and barrow pits. The use of irrigation and the sowing of grass for permanent stabilization in process areas were discarded in favor of the packed sand and gravel stabilization method. Therefore, the majority of this work was chargeable to permanent construction under general grading as it was desirable to have dust-proof operating conditions in the 100 Areas.

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The following is a tabulation of the stabilization work performed in the 100 Areas:

STABILIZATION WORK

	100-B	100-D	100-F
Stabilized Area	11,070,000 sq.ft.	13,311,000 sq.ft.	4,620,000 sq.ft.

8 Concrete Plants

One concrete mixing plant was erected in the immediate vicinity of the 105 Building in each of the 100-B and 100-D Areas by the Hanford Concrete Contractors to furnish ready-mixed concrete for construction, in accordance with RPG-410. Since a sizeable portion of the concrete yardage was concentrated at the 105 Building and the 185, 189 and 190 Building group, both nearby, a Pumpcrete method (i.e., concrete mix pumped through pipes) of placing concrete from a central pumping plant was used. Concrete was accepted by du Pont at the mix plant and was placed by the various methods with labor furnished by du Pont. Operation of the concrete plant at 100-B started October 11, 1943, and stopped April 11, 1944, after having produced 102,304 cu. yds. of concrete. Operation of the concrete plant at 100-D started February 10, 1944, and stopped August 31, 1944, after having produced 135,030 cu. yds. On April 11, 1944, the concrete plant at 100-B was dismantled and set up in the 100-F Area. This plant started June 3, 1944, and stopped October 31, 1944, after having produced 99,192 cu. yds.

A portable plant supplemented the large concrete plants, in each of the three 100 Areas, prior to their installation and subsequent to their removal. These portable plants were erected and operated by du Pont and consisted of paving mixer and a batching bin.

Listed below is the type and size of equipment comprising the Hanford Concrete Company's mixing plants in the 100 Process Areas:

100-B & 100-F Plant	100-D Plant
1 - 50 Ton Aggregate Bin (2½" gravel)	1 - 100 Ton Aggregate Bin (2½" gravel)
1 - 50 Ton Aggregate Bin (1½" gravel)	1 - 100 Ton Aggregate Bin (1½" gravel)
1 - 50 Ton Aggregate Bin (3/4" gravel)	1 - 100 Ton Aggregate Bin (3/4" gravel)
1 - 40 Ton Sand Bin	1 - 100 Ton Sand Bin
1 - 450 bbl. Cement Bin	1 - 450 bbl. Cement Bin
2 - 2 cu.yd. Koehring Tilting Mixers	2 - 3 cu.yd. Smith Tilting Mixers
3 - 160 Ton Gravel Track Bins	3 - 160 Ton Gravel Track Bins
1 - 100 Ton Sand Track Bin	1 - 100 Ton Sand Track Bin

In each area a two-story wood frame Pumpcrete Building was erected by du Pont, adjoining the mixing plant and housed three two-cylinder Rex Pumpcrete machines having a total capacity of 50 cu. yds. each per hour. Portable one-cylinder Pumpcrete machines were used as booster pumps on pours a long distance from the central pumping plant. Ready-mixed concrete was delivered to these machines in transit mix trucks from the central mixing plant in the area. Approximately 30 percent of the total yardage was pumped directly into forms.

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Erection of the Raven Aggregate Pit started July 10, 1943, and production of aggregate began September 6, 1943. The plant was shut down for the winter during the period from November 20, 1943, to January 24, 1944.

(3) Permanent Area Work

Included in the construction of the Hanford Engineer Works were three separate but very similar areas known as the 100 Process Areas; these areas were designated 100-B, 100-D and 100-F. Within each 100 Area, two buildings No. 105 and No. 116, were constructed by a separate organization and were designated as the 105 Area. They are covered in the section entitled "105 Area".

Three general types of permanent building construction were used in the 100 Areas, i.e., reinforced mass concrete construction, structural steel framing together with concrete block and/or reinforced concrete, and wood frame construction.

The 100-B, 100-D and 100-F Areas are composed of a total of 32, 33 and 29 permanent buildings and 22, 23 and 24 facilities respectively. These buildings and facilities are divided into six groups as follows:

Process Buildings

Building Number	100-B	100-D	100-F	
103	1	1	1	Fresh Metal Storage
107	1	1	1	Retention Basin
108	1	1	1	Chemical Pump House
110	1	1	1	Gas Storage Tanks
111	1	--	--	Test Building
115	1	1	1	Gas Purification Building
181	1	1	1	River Pump House
182	1	1	1	Reservoir and Pump House
183	1	1	1	Filter Plant
184	1	1	1	Power House (Incl. Coal Storage Pit and Coal Conveyors)
185	1	1	1	Deaerating Building
186	--	1	--	Water Treatment Plant
187	2	2	2	Elevated Process Water Tank
188	1	1	1	Ash Disposal Basin
189	--	1	1	Refrigeration Building
190	1	1	1	Process Water Pump House
	15	16	15	

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Outside Electrical Facilities

Building Number	100-B	100-D	100-F	
151	1	1	1	Primary Substation (230KV/13.8KV)
152	10	12	11	Secondary Substations (13.8KV/2300V & 2300V/440-220-110V)
153	8	6	6	Distribution Substations (2300V/440-200-110V)
1501	X	X	X	Fence and Road Lighting
1503	X	X	X	Outside Transmission Lines (Including wood poles and hardware)
1505	X	X	X	Fire Alarm Systems
1506	X	X	X	Telephones and Telephone Cable

General Facilities

1601	X	X	X	Standard Gauge Railroad Tracks
1603	X	X	X	Roads and Walks
1605	X-(11)	X-(10)	X-(8)	Fences-(Including Guard Towers)
1607	7	5	5	Underground Septic Tanks
1608	--	1	1	Process Waste Lift Station
1612	--	--	X	Open Drainage Ditches
1613	X	X	X	Automobile and Bus Parking Areas
1614	3	3	3	General Monitoring Substations
1621	3	3	3	Emergency Gasoline Electric Generator Buildings

Service Buildings

1701	1	1	1	Gate House and Clock Alley
1704	1	1	1	Supervisors' Office and Laboratory
1707	2	2	2	Change Houses
1709	1	1	1	Fire Headquarters
1713	3	2	2	Storehouses
1715	1	1	1	Oil and Paint Storage
1716	1	1	1	Automotive Repair Shop
1717	1	1	1	Combined Shops
1719	1	1	1	First Aid Building
1720	1	1	1	Patrol Headquarters
1722	2	2	1	Area Shops
1729	1	1	--	Extra Machinery Storage
1734	1	1	1	Gas Cylinder Storage
1735	--	1	--	Training Headquarters
	17	17	14	

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Building Number	100-B	100-D	100-F	
				Outside Overhead Pipe Lines
1801	X	X	X	Pipe Supports
1802	X	X	X	Steam Lines
1803	X	X	X	Air Lines
1805	X	X	X	Process Lines
				Outside Underground Pipe Lines
1901	X	X	X	Water Lines (Including Elevated Storage Tanks)
1902	X	X	X	Fire Lines (Including Elevated Storage Tanks)
1903	X	X	X	Sanitary Sewers
1904	X	X	X	Process Sewers

NOTE: X Indicates that the above facilities are installed in the respective areas.

Some of the above buildings and facilities were originally constructed as temporary or TC items to be used for construction purposes only and then be dismantled or removed. From time to time, however, the Operating Department requested that certain TC items be left in the various areas to become permanent parts of those areas. Such buildings and facilities were then assigned permanent building or code numbers and handled in the same manner as other permanent units.

Below is a list of the temporary buildings and facilities in the 100 Areas, which were taken over as permanent units. This list shows the permanent numbers and names as well as the TC numbers and names:

PERMANENT CONSTRUCTION		TEMPORARY CONSTRUCTION	
Number	Name	Number	Name
100-B Area			
1713-A	Essential Matl. Storehouse	TC-30	Receiving & Warehouse Bldg.
1713-B	Miscellaneous Storehouse	TC-30	Division Engineer's Office
1722-A	Electrical Shop	TC-30	Electrical Shop
1729	Extra Machinery Storage	TC-30	Pipe Storage Warehouse

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PERMANENT CONSTRUCTION		TEMPORARY CONSTRUCTION	
Number	Name	Number	Name
100-D Area			
1713-A	Essential Matl. Storehouse	TC-31	Receiving & Warehouse Bldg.
1722-A	Electrical Shop	TC-31	Millwright Shop
1729	Extra Machinery Storage	TC-31	Pipe Storage Warehouse
1735	Training Headquarters	TC-31	Division Engineer's Office
1601	Standard Gauge Track (2000' only)	TC- 6	Standard Gauge Track
100-F Area			
1713-A	Essential Matl. Storehouse	TC-32	Receiving & Warehouse Bldg.

Included in this section are Plot Plans and Aerial Photographs of the three 100-Areas. An inspection of these will show that the areas are very similar in layout and in the relative location of the various buildings and facilities. The 100-F Area differs basically from the other two areas in that it is laid out or turned 90° counter-clockwise. In other words, the "North" direction in the 100-B and 100-D Areas, is the "East" direction in the 100-F Area.

The 181 Building in all three Areas is placed on the river bank in the most desirable location rather than in any specific location with regard to another building or facility. Some of the buildings and facilities in the various areas have been moved slightly to conform to local conditions and terrain.

It should be noted that space has been provided in the 100-B Area between the 183 and 185 Buildings for the possible future construction of a 186 and a 189 Building. Space has also been provided in the 100-F Area between the 183 and 189 Buildings for the possible future construction of a 186 Building.

These plot plans, in addition to the Process and Service Buildings, include several of the more important facilities. The railroads, telephone lines, 230 and 66 KV electric lines, main process sewers, sanitary sewers handling the major process and service buildings, open drainage ditches, and the export water lines are all included on these plans.

In all three 100 Areas, most of the major process buildings are located in a line beginning with the 182 Building and ending with the 108-105-115 Buildings Group. The power house and service buildings are located in a group to the north of the process group in the 100-B and 100-D Areas, and to the east in the 100-F Area.

The three aerial photographs were taken from the same relative location in all three areas which is a point southeast of the 110 Building and the 100-B and 100-D Areas, and southwest in the 100-F Area. The photographs do not show the entire fenced areas, but only that portion containing the major process and

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service buildings.

The construction of the three 100 Areas made available services and facilities for use in these areas and raw water for use in the 200 Areas. Below is a tabulation showing the quantities of these various services and facilities provided by each of the 100 Areas:

AVAILABILITY OF SERVICES AND FACILITIES AS DESIGNED

Facility	100-B	100-D	100-F
Raw Water, GPM	92,500	152,500	132,500
Filtered Water, GPM	36,000	39,000	36,000
Demineralized Water, GPM	---	30,000	---
Deaerated Water, GPM	30,000	30,000	30,000
Refrigerated Water, GPM	---	15,000	15,000
Refrigeration, Tons	---	14,064	10,000
Drinking Water, GPM	600	600	600
Softened Water, GPM	1,100	1,100	1,100
Electric Power, KVA	35,000	40,000	30,000
Steam, lb./Hr.	460,000	460,000	460,000
Process Sewage Treatment, MGD	6.48	7.06	6.48
Sanitary Sewage Treatment, GPD	23,700	24,500	24,500

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(4) Progress of Construction of 100 Areas

In the section applying to "Planning and Scheduling" is a discussion of the project schedules and the methods by which they were developed. Included in that section is a chart showing the sequence of start-ups as requested by the Operating Department. This chart shows a requested completion date for the 105-B Building of August 15, 1944. The 105-D Building was requested for 60 days after the 105-B Building and the 105-F Building 120 days after 105-D or 180 days after 105-B. Inasmuch as the 105 Building was the controlling factor in the start-up and completion of each of the 100 Areas, these dates likewise applied to the 100 Areas as a whole.

Immediately following is a chart showing the percentage complete of each of the 100 Areas at the end of each month and the rate of completion for each individual month. This chart shows that although the 100-B Area was not completed until September, 1944, the 100-D and 100-F Areas followed in their scheduled order with the 100-F being completed approximately 150 rather than 180 days after the 100-B Area.

This chart also shows that although the 100-B Area got off to a slow start, progressing less than 15% in four months, from that point on the construction progressed at a much faster pace. The construction progress for the 100-D and 100-F Area was rather erratic due to the borrowing of labor from time to time and the shortage of pipe fitters. In other words, pipe fitters were borrowed from the 100-D and 100-F Areas to enable the 100-B Area to be completed. During August, the construction progress in the 100-D and 100-F Areas was very slow, but these areas showed unusual progress during September. The progress was slowed down in October due to the borrowing of workers for completing the 200-W Area Process "T" group.

Included in this section are two charts for each of the 100 Areas. The first chart is a Bar Chart showing the scheduled and actual progress of each building in each area and a number of weeks each building was behind schedule when completed. The schedules of these Bar Charts were drawn up by the Division Engineers on the basis of the start-up dates requested by the Operating Department. The significant thing about the Bar Chart is that although most of the buildings were completed behind schedule, the areas, as a whole, were not very far behind and the 100-F Area was completed slightly ahead of schedule. The second chart included in this section shows the actual progress of each building and facility in the area and lists the following dates:

Design release
Start of excavation
Excavation completed
Start of foundation
Foundations were completed
Start of superstructure
Superstructure completed
Start of steel erection
Steel erection completed
Start of equipment installation
Equipment installation completed
Test runs of equipment started
Test runs completed
Start-up date
Final completion
Building or facility accepted by Operations
Building or facility accepted by Government

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MONTH	100-B PERCENT COMPLETE	100-B RATE PER MONTH	100-D PERCENT COMPLETE	100-D RATE PER MONTH	100-F PERCENT COMPLETE	100-F RATE PER MONTH
August - 1943	0	0				
September	1	1				
October	2	1				
November	3	1	0	0		
December	13	10	1	1	0	0
January - 1944	24	11	4	3	1	1
February	38	14	5	1	2	1
March	48	10	14	9	3	1
April	61	13	20	6	3	0
May	78	17	28	8	4	1
June	88	10	40	12	11	7
July	96	8	51	11	26	15
August	99	3	54	3	29	3
September	100	1	77	23	53	24
October			80	3	55	2
November			99	19	70	15
December			100	1	90	20
January - 1945					99	9
February					100	1

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(5) Construction Delays

Prior to and during the construction of the three 100 Areas, numerous difficulties and delaying factors were encountered. These difficulties were due mainly to war-time conditions but the location of the Project and the type of plant to be constructed were also important contributing factors. It is impossible to evaluate these difficulties in terms of overall time lost, but is obvious that the elimination of any or all of them would have resulted in (1) advancing the start-up and completion date of the various buildings and areas and/or (2) decreasing the manpower requirements for the various buildings and areas.

The following is a discussion of the major delays and difficulties encountered in the construction of the 100 Areas.

(a) Labor

Undoubtedly the greatest single delay in the three 100 Areas was the scarcity of labor, both skilled and unskilled. This scarcity was more marked in the 100-B Area than in the 100-D or 100-F Area because the 100-B Area was the first constructed. Its manpower requirements, therefore, had to be obtained during one of the most critical periods of the Project force recruitment program.

The 100-B Area labor shortage was encountered in the very beginning of construction and continued intermittently until the latter part of June, 1944. During the months of April, May and June the scarcity was greatly lessened as labor was borrowed from the 100-D and 100-F Areas, and even some from the 200-N and 200-W Areas, to enable the 100-B Area to be completed and to be turned over to Operations in the shortest time possible. The 100-B Area had priority in the construction schedule and allocation of manpower over all the other process areas with the exception of the 300 Area. The initial scarcities in the 100-B Area were in those crafts most critical to the start of construction: i.e., carpenters, laborers and reinforced rodsetters who were needed for the excavation and concrete foundation work. During the period, roughly December 3, 1943 to March 1, 1944, only 50% of the laborers, 70% of the carpenters and 50% of the reinforced rodsetters considered necessary to maintain the area construction schedules were available for work in the 100-B Area. These delays at the start of construction were important in that entire buildings and all future work in those buildings were irreparably delayed. A glance at the 100-B Area construction schedule chart included in this section under the heading "Progress of Construction" will show that although each building in the 100-B Area was begun ahead of schedule, the greatest and longest lasting delays were encountered shortly after the start of construction. In other words, once the rough (machine) excavation was completed the building dropped behind schedule and the delays were never made up.

The most critical labor shortage in the 100-D Area was in the pipe fitters craft from July 1, 1944 through September 1, 1944. The shortage of fitters during this period varied from 200 to more than 500 which meant that only from 25% to 50% of the required fitters were available. This shortage was so serious that it delayed completion of every major process building in the 100-D

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Area. There also was a shortage of laborers and carpenters in the 100-D Area from approximately March 1, 1944 through June 1, 1944. However, a review of the 100-D Area "Progress of Construction Chart" will show that these delays were encountered far enough after the start of construction so that entire buildings were not delayed as a result.

The labor situation in the 100-F Area in comparison with the 100-B and 100-D Areas was not very serious although it remained rather tight until the completion of the 100-D and the 200-W Areas. In other words, the 100-F Area was far enough back in the construction schedule that it was able to draw on the manpower released from the 100-B and 100-D Areas. Immediately following this section are a group of charts of the critical du Pont and fixed-fee subcontractor crafts in the three 100 Areas. These charts list the number of workers in each of these crafts requested each week by the Division Engineers, in order to maintain their construction schedule, and the actual number of workers which were allocated to them.

Insofar as the lump sum contractors in the 100 Areas were concerned, they had practically the same problems and difficulties in securing manpower as the du Pont Company and its fixed-fee subcontractors. With one major exception, the lump sum subcontractors were able to secure sufficient manpower so they did not cause any noteworthy delays in the completion of the various buildings and areas.

This exception concerned the U. S. Rubber Company, who were given a subcontract for repairs to rubber-lined pipe damaged in shipment for the 100-D Area. This company had at the same time a sub-subcontract with the Chicago Bridge & Iron Company for rubber lining the four large steel tanks in the 190-D Building. Highly skilled and experienced personnel was required to provide this rubber lining and repair work. In view of the very limited number of individuals qualified, the U. S. Rubber Company was unable to locate a sufficient number of rubber liners to perform their work as scheduled. Consequently, the Corps of Engineers located seven men in the Armed Forces who were sent to the project to perform this work.

Although the above examples do not completely cover the labor situation insofar as the construction of the three 100 Areas are concerned, they serve to point out how serious it was. Suffice to say the supply of labor was the limiting factor in the construction progress of the 100 Areas. Although there were many other items encountered which ordinarily would have caused important delays, they were far overshadowed by the shortage of labor.

(b) Material

Throughout the construction of the three 100 Areas, the late delivery date promises on many items of material and equipment were considered critical to the completion and start-up of the area. With a few minor exceptions, persistent expediting and special handling of particular orders resulted in materials and equipment arriving on the project in sufficient time so as not to delay the final completion of the areas.

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Two factors encountered in the construction of the 100 Areas lessened the material procurement problem. The first of these was the supply of labor and this subject has already been covered. The second was the progress of the 105 Building in each of the 100 Areas which was the last building completed in the 100-B Area. Thus, any delay caused by material procurement for any of the 100 Area buildings did not delay the overall area. Although the 186-D Building was the last building completed in the 100-D Area, it was by-passed in the area start-up program so that here again, the 105-D Building was the last building on the process line completed. In the 100-F Area, the 105-Building was completed concurrently with the other process buildings so that material procurement did not greatly affect the completion and start-up of the area.

The most critical items of material causing delay in the 100 Areas were solenoid valves, self-cleaning strainers and synthetic cable. The materials which delayed completion of the 105 Buildings are covered in the 105 Area section. Additional critical material items causing delay in the 100-D Area only were stainless steel fittings and valves, as well as various items of the Permutit equipment in the 186 Building.

(c) Restricted Area Work

Inasmuch as the Hanford Engineer Works is a "Classified" plant, certain restrictive measures were necessary in order to safeguard the process areas from a Security angle. In the 100 Areas, there were no "Classified" Buildings with the exception of those in the 105 Area (105 and 116 Buildings). In other words, throughout the major portion of the construction period, the areas were entirely open to all construction, subcontractor, operations, and government personnel carrying the usual picture pass. There were, however, other restrictions which hampered the construction work in the areas.

For security reasons and to expedite start-up, as each major process building was completed, a temporary fence was erected around that building for the purpose of excluding construction or other unauthorized personnel. Until such time as each area as a whole was completed, all Wilmington salary and Exempt construction personnel were allowed free access to the operating buildings. Non-exempt personnel was allowed access only with the express permission of the area-operating superintendent, in which case a special permit was issued in addition to the usual pass. These permits were issued for a specified period of time up to a maximum of one week upon the specific request of the construction supervision in the area. Whenever a non-exempt employee was required to be in an operating area for any longer than one week, an additional permit had to be issued on Monday morning of each week.

As additional major process buildings were completed, the temporary fence mentioned above was extended to include them. When the 1700 Buildings, as a block, had reached a sufficiently advanced stage, the fence was extended to entirely surround them. Thus many locations in which construction work was proceeding were included in the temporarily fenced areas, and it was necessary for all non-exempt employees working in these areas to obtain a permit. Likewise, the amount of traffic and movement of material between the restricted and construction areas was hampered and slowed down. It can be readily seen that time was lost in this procedure, particularly whenever it was necessary to perform

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a certain job within the restricted area on short notice.

Construction of the Hanford Engineer Works differed from the usual industrial construction in that all major Process Buildings had to be started up over a comparatively short period of time; and all Construction personnel was excluded from each Process Area when the area as a whole was started up. It was necessary to set tight, fast schedules for all major Process Buildings in an area. This resulted in most of these buildings reaching their peak of construction at approximately the same time; requiring all miscellaneous construction work such as painting, clean-up, final grading, road surfacing, fence changing, etc., to be completed by the time the area was ready for start-up. This arrangement caused congestion due to the necessity for working several crafts in the same locations simultaneously.

There were very few "Classified" drawings for the 100 Area Buildings, with the exception of the 115 Building, and approximately 30 per cent of the drawings for this Building were "Classified", and restricted to selected individuals. Delays were encountered because foremen and immediate supervision did not have ready access, whenever necessary, to information obtained only in "Classified" drawings.

(d) Failures

Throughout the construction and particularly at the completion of the three 100 Areas, some failures of equipment and materials were encountered. Most of these difficulties concerned such items as condensate water in turbine casings, improperly functioning valves, overheated bearings, etc. These were the normal difficulties to be expected for this type of plant.

In addition to the foregoing, a portion of the gunite work in the 100-D Area and the York refrigeration units in the 100-D and 100-F Areas, while not delaying start-up, presented problems due to physical and mechanical difficulties encountered. Both these items were furnished by subcontractors who, in each case, satisfactorily remedied the existing conditions.

(e) Design Changes

As there had been no experience in the construction and operation of a plant similar to the Hanford Engineer Works, it was only natural that many design changes would occur. The need for some of these changes was not apparent until the start-up of the 100-B Area. Many of the design changes in the 100 Areas were made as construction expedients rather than due to changes in the process. The greater portion of these changes occurred in the 100-B Area since it was the first of the three 100 Areas completed and started up. The major type of design change encountered in the 100 Areas was revision of piping. With the shortage of pipe fitters at this stage, these changes required considerable overtime to keep schedule.

However, piping revisions were not confined to the 100-B Area; but occured in the 100-D and 100-F Areas as well; and due principally to the experience gained in the start-up of operations in the 100-B Area. For example, there were almost as many piping revisions in the 115-D Building as in the 115-B,

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but to a large extent they were different revisions. The piping revisions in the 115-F Building were kept to a minimum due to the experience gained in the 115-B and 115-D Buildings.

The concrete plants in the three 100 Areas were placed in the most economical locations with regard to existing and proposed railroad tracks, and the buildings to be served by the pumpcrete method. All three plants were located adjacent to the 105 Buildings. Due to the existing Milwaukee track in the 100-B Area, the concrete plant in this area was located on the south side of the 105 Building. Consequently, the 115-B Building was moved approximately 90' east which resulted in lengthening the pipe tunnel between the 115 and 105 Buildings and all pipe contained therein. Since the 110 Building was so closely associated with the 115 Building, it too was moved 90' east. In addition, the 187-B2 Elevated Water Tower was moved approximately 260' southwest since it would have been located directly over the above mentioned pipe tunnel. Although these changes caused additional work and required additional materials, there was no actual delay in the field inasmuch as they were noted in advance.

The sampling system in the 107 Building was changed resulting in the addition of a small building housing three pumps at the outlet end of the basin. This change caused a delay in the completion of this building of approximately two weeks due principally to the late placement of orders for the unforeseen additional items. The same addition on the 107-D and 107-F Buildings caused no delay, being added early in the construction schedules.

The laboratory in the 108 and 185 Buildings in both the 100-D and 100-F Areas were combined by enlarging the laboratory in the 185 Buildings. Although this change required additional work in the 185 Buildings, it was offset by the decrease of work in the 108 Buildings.

There were other design changes and revisions encountered in the 100 Areas, principally in 100-B and 100-D Areas, such as the addition of small rooms and structures, revisions in electrical wiring minor dimension changes, substitution of materials, etc. Although these changes, taken as a whole, undoubtedly delayed completion of portions of the 100 Areas, it is impossible to estimate their actual effect in view of various other factors involved.

(f) Miscellaneous

There were other miscellaneous delays and difficulties encountered in the construction of the 100 Areas which are too numerous and minor to list. In the 200 Areas' write-up, under the section "Construction Delays" are a group of miscellaneous delays which apply to the 100 Areas as well. Reference should be made to these general delays.

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(6) Construction Expedients

In view of the many delays encountered in the construction of the three 100 Areas, every attempt was made to employ expedients wherever possible. It is not possible to evaluate these expediencies in terms of overall time gained or manpower saved. However, they were used wherever it was felt they would assist in speeding up the construction program or would result in a saving in manpower or materials or both. The following is a discussion of the construction expedients used in the construction of the 100 Area.

(a) Extended Work Periods

In order to fully utilize the supply of labor available for the 100 Areas, shift work, extended work periods and Sunday work were used.

Originally, the work week at the Hanford Engineer Works consisted of six 8-hour days. On September 14, 1943, however, this was changed to six 9-hour days or a total of 54 hours per week minimum for manual and non-manual employees alike. In addition, many of the employees, particularly manual, worked 10 hours or more a day seven days a week for periods as long as three or four months.

Much Sunday work was used in the 100-B Area during the spring and summer of 1944, and in the 100-D Area during the winter of 1944-45. Sunday work in the 100-F Area on the other hand was kept to a minimum until the early months of 1945 at which time a slightly speeded-up schedule, concurrent with start-up, required additional man-hours of work for specific periods of time.

In addition to these extended working periods and Sunday work, shift work was used particularly in the 100-B and 100-D Areas. The shift work varied from two shifts of 9 or 10 hours a day each to three over-lapping shifts of 9 hours each. The following is a list of the major buildings in the various areas requiring shift work:

BUILDING	NUMBER OF SHIFTS	DATE REQUESTED	TIME IN EFFECT	REASON
100-D	2	4-18-44	6 Months	Complete on schedule
110-D	2	4-18-44	4½ Months	Complete on schedule
181-B	2	10-13-43	3 Weeks	Concrete work
181-B	3	10-15-43	4 Months	Concrete work
181-D	2	11-24-43	1½ Months	Excavation work
181-D	2	1-22-44	3 Months	Foundation work
181-F	3	2- 1-44	1 Week	Excavation work
182-D	2	4-18-44	4½ Months	Speed-up schedule
183-B	2	12-30-43	4 Months	Concrete work
184-D	2	4-18-44	5½ Months	Complete schedule
184-F	2	12- 9-44	2 Weeks	Complete schedule
185-B	2	12-30-43	1 Month	Foundation work
185-F	2	12-15-44	6 Weeks	Speed-up work
186-D	2	10- 4-44	3 Weeks	Complete on schedule
186-D	2	10-12-44	6 Weeks	Complete on schedule
190-B	2	12-30-43	2 Months	Foundation work

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In addition to the specific building work, various items of general area program had to utilize the available labor as fully as possible. The following is a list by areas of the area work placed on a shift work basis:

DATE REQUESTED	Number of Shifts	WORK
		100-B Area
8-30-43	2	Concrete finishing
1-22-44	2	Area machine shop
4- 6-44	2	Process water piping, sand blasting
5-18-44	2	Coal Handling
6-12-44	2	Repair and maintenance of transportation equipment
		100-D Area
1- 8-44	2	Underground pipe excavation, sewer and form work
5-31-44	2	Repair and maintenance of transportation equipment
8- 7-44	3	Grinding and repairs to rubber-lined pipe
8- 8-44	2	Sand blasting process water piping
8-21-44	2	Area machine shop - 3 months
8-21-44	3	Wetting down concrete pipe sections - 2 months
9- 2-44	2	Loading coal pit
		100-F Area
6-12-44	2	Repair and maintenance of transportation equipment
8-26-44	3	Wetting down concrete pipe sections 2 months
12-15-44	2	Condenser hotwells - 1 month

(b) Subcontracts

A portion of the labor employed and the materials used in the construction of the three 100 Areas was done under subcontract. It was found expedient to award 32 individual subcontracts to 25 different vendors for work in these areas. The primary reason for employing subcontractors was due to the specialized nature of the particular work involved. In other words, the subcontractors had available the qualified personnel and the necessary equipment for the performance of the required work. On the pages immediately following is a complete list of the subcontracts in the 100 Areas, the vendors with whom they were placed, the type of work performed and the buildings or facil-

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SUBCONTRACTORS - 100 AREAS

RPG	SUBCONTRACTOR	SCOPE OF WORK	100-B	100-D	100-F
241½	Clinton Bridge Co.	Purchase and Steel Erection	*105,108,115 151,181,182 183,184,185 190,1717	*105,108,115,151 181,182,183,184 185,186,189,190 1717	*105,108,115 151,181,182 183,184,185 189,190,1717
307½	Combustion Eng. Co.	Boiler Erection	184	184	184
403	Guy F. Atkinson Co.	Railroad Construction	Area	Area	Area
407	Myers Bros. & N. M. Ball Sons	Road Construction	Area	Area	Area
407	Myers Bros. & N. M. Ball Sons	Excavation	105,107,151 182,183,184 190,1601 1603,1901 1904	107,151,182,183	151
408	Newberry, Chandler & Lord	Electrical Work	Area	Area	Area
410	Hanford Concrete Co.	Concrete	Area	Area	Area
411	Hankee, James, Zahniser & Warren	Pipe Work	Area	Area	Area
565½	W. E. Caldwell Co.	Elevated Wood Tanks	1901	1901	1901
566½	Rust Engineering Co.	Concrete Stacks	184	184	184
567½	W. E. Caldwell Co.	Elevated Wood Tanks	1902	1902	1902
637½	Chicago Bridge & Iron Co.	Elevated Steel Tanks	187	187	187

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SUBCONTRACTORS - 100 AREAS - Cont'd

RPG	SUBCONTRACTOR	SCOPE OF WORK	100-B	100-D	100-F
659½	Link Belt Co.	Coal Handling Equipment	184	184	184
808½	Philadelphia Iron Works	Boiler Breechings	184	184	184
823½	Chicago Bridge & Iron Co.	Storage Tanks	190	190	190
1170½	Connery Construction Co.	Air Ducts	184	184	184
1245½	Haughton Elevator Co.	Electric Elevators	105	105	105
1473½	Asbestos Supply Co.	Insulation	Area	Area	Area
1588½	National Gunite Construction Co.	Concrete Storage Tanks	--	186	--
1862½	Alphons Custodis Co.	Stacks	116	116	116
4321	Curtis Gravel Co.	Sand	Area	Area	Area
4324	American Pipe and Construction Co.	Concrete Piping	1901,1904	1901,1904	1901,1904
4332	William Vail Co.	Roofing	103,105,107 151,181,182 183,184,185 190,1700 Bldgs.	103,105,107 151,181,182 183,184,185 189,190,1700 Bldgs.	103,105,107 151,181,182 183,184,185 189,190,1700 Bldgs.
4334	Guerin Bros.	Excavation	--	105,115,181 184,185,186 189,190,1601 1603,1901, 1904	105,107,115 181,182,183 184,185,189 190,1601,1603 1901,1904

SUBCONTRACTORS - 100 AREAS - Cont'd

RPG	SUBCONTRACTOR	SCOPE OF WORK	100-B	100-D	100-F
4335	National Gunite Co.	Gunite Work	107,182,183	107,182,183, 186	107,182,183
4336	G. R. Jessen & J. C. Wright Co.	Concrete Block & Cement Brick	Area	Area	Area
4337	Guy F. Atkinson Co.	Channel Excavation	--	181,1904	--
4339	Guy F. Atkinson Co.	Railroad Construction	Area	Area	Area
4341	Ball and Simpson	Aggregate Hauling	Area	Area	Area
4354	H.R.Parsons Tile Co.	Flooring	184,1719	184,1719	184,1719
29,312	Fryer-Knowles	Hot Mastic Flooring	105,184	105,184	105,184
29,328	U. S. Rubber Co.	Rubber Lining	Misc.	190-Misc.	Misc.

* Steel for 151, 181, 182 and 1717 Buildings erected by du Pont.

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ities in each of the areas on which the work was performed.

In addition to these "formal" subcontracts, requiring labor on the Plant Site, were a number of purchase orders involving erection supervision. In these cases, an erection engineer or superintendent representing the vendor came to the Project and supervised and directed the installation of materials or equipment furnished by that particular vendor. Some of these erection supervision subcontracts involved rather large items such as the Permutit equipment in the 183 and 186 Buildings of the 100 Areas. Practically all the equipment in these buildings was purchased from Permutit and installed under their supervision. Below is a list of vendors supplying erection supervision in the 100 Areas, the order numbers on which it was supplied and the type of equipment involved:

Vendor	KPG Nos.	Equipment
Allen-Sherman-Hoff Co.	4347	Power House Equipment
Allis-Chalmers Mfg. Co.	29324	Pumps
American Blower Corp.	29316	Blowers
American Monorail Co.	4350	Monorails and Scales
American Pipe & Constr. Co.	4340, 29320	Reinforced Concrete Pipe
Chain Belt Company	2120	Pumpcrete Equipment
J. R. Clancy Company	3232½	Baffle Curtains
Gamewell Company	1869½	Fire Alarm Systems
General Electric Company	Various	Electrical Equipment
Hagan Corporation	4356	Combustion Controls
Huntington Rubber Mills	4345	Repairs to Rubber Lining
Ingersoll-Rand Company	29302	Pumps
Oilgear Company	4348	Hydraulic System
Permutit Company	198½, 910½	Filter Plants and Tanks
Pomona Pump Company Div.	29303	Pumps
Republic Flow Meters Co.	4360	Flow Meters
Ring Balance Instr. Co.	23½	Flow Meters
Roberts Filter Mfg. Co.	125½, 199½, 404½	Filter Plants
Terry Steam Turbine Co.	4351	Turbines
Toledo Scales Company	29310	Scales
Wallace-Tiernan Sales Corp.	Various	Chlorinating Equipment
Westinghouse Elec. & Mfg. Co.	4353	Steam Equipment
Whiting Corporation	4349	Cranes and Hoists
York Corporation	4346	Refrigeration Equipment

(c) Procurement

During the construction of the three 100 Areas, the problem of procurement was kept to a minimum through persistent expediting and advance planning. No attempt will be made in this history to cover this problem since it was mainly developed by, and handled through, the du Pont Company's Wilmington office. A few examples indicative of the extent of this advance planning are worth noting.

One important example was the manner in which steel plate, steel pipe and fabricated steel vessels were handled. Rather than simply ordering these

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items from one or more vendors, du Pont, fully aware of the scarcity of all materials, particularly stainless steel, in many cases purchased raw materials from various vendors to be used by the fabricating vendors. In some cases, due to the lack of adequate facilities one vendor would perform only a portion of fabrication while other vendors would perform additional fabrications and still another would assemble. In one instance (steel plate), several different vendors delivered raw stock to another single vendor. The single vendor then warehoused, cut and issued the steel to other vendors, who in turn fabricated the finished articles and shipped them to the project. It should also be noted in connection with this method of procurement that most of the raw material orders for critical items were placed prior to the completion of design in order that no delays would be encountered when the drawings were issued.

Due to the remoteness of the Hanford Engineer Works and the extended shipping distances from most of the vendors, unusual means were necessary in many cases to bring material to the project in sufficient time so as not to delay the building schedule. Air, express and truck shipment were used whenever necessary. Many items were given special handling and were flown directly to the project by the Air Transport Command of the Army Air Forces.

(d) Design Representation in the Field

Early in 1944, a group of representatives of the Wilmington Design Division came to the project. Those connected with the 100 Areas were located in the Division Engineers' office in the 100-B Area. These representatives were specialists in various lines of work and were authorized to make most of the design changes in the field without consulting Wilmington. This procedure greatly speeded up work in the areas for whenever a problem arose in the field concerning design, it was handled promptly.

(e) Miscellaneous

Throughout the construction of the three 100 Areas, various improvements in methods of work were developed. Most of these improvements received recognition through a project-wide Job Improvement Suggestion System. A total of approximately two hundred and twenty-five Job Improvement Suggestions were adopted for the Hanford Engineer Works, the majority of them being field or actual construction suggestions. The Job Improvement Suggestion System is covered in a subsequent section of this history. A typical example of suggestions developed in the 100 Areas is worth noting.

Wherever the design called for close parallel concrete walls or for expansion joints in heavy concrete slabs, difficulties were encountered in providing suitable form work for both walls or for both sections. The method used at the start of the job was to pour one section or wall, strip the forms and then pour sand in between the poured wall and the form work for the second section or wall in order to provide suitable bracing for this form work. This method was time-consuming and expensive because it not only necessitated a delay in placing the sand but in removing it as well, either by blowing or washing out. An improved method was developed whereby two pieces of channel steel were inserted between the poured wall and the new form and then expanded

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by means of a cam operation. When the second wall had been poured, the channels could be easily collapsed and removed and were ready for use in another expansion joint or between parallel walls.

There were numerous other improved methods developed during the construction of the three 100 Areas.

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(7) Construction Methods

In the construction of the three 100 Areas, several types of construction were encountered. The construction of the 181 Building river intake channels and foundations, and the 1904 process waste piping is worth noting.

In the construction of the foundation for the 181-B Building, an earthfill coffer dam or dike was placed on the river side of the foundation excavation. A sheet pile enclosure was placed around the excavated area to take care of ground water and river water seepage. This seepage was found to be so low, however, that it could be handled adequately with batteries of temporary pumps. Consequently, the sheet pile enclosure was not used for the 181-D and 181-F Buildings.

To construct the water intake channel for the 181-B Building, an earthfill causeway for supporting the excavation equipment was constructed in the river to the far end of the proposed channel. Starting at that end with clam shells, both the channel and the causeway were excavated back to the shore line, the excavated material being hauled by trucks and deposited along the river bank, both above and below the pump house. When the concrete foundations and channel excavation had been completed, the earthfill dike was removed.

Work on the 181-D channel was subcontracted to the Guy F. Atkinson Company, which, due to its previous experience and proper equipment, was well qualified for this type of work. The excavation scheme employed by this company was similar to that adopted for the 181-B channel, differing principally in types of equipment and temporary supports. To support the two large electrically-driven dragline excavators, instead of building an earthfill causeway the entire length of the proposed channel, a wooden pier beginning at the shore was erected for approximately two-thirds of the distance and earthfill was used for the remaining third. The pier was removed after the channel excavation had been completed.

The construction of the 181-F channel, which was much shorter than the 181-B or 181-D channels, was handled similarly to the 181-B channel.

Below is tabulation showing the length and width of the river intake channels and the distances the process sewers extend into the river:

Channel	Width	Length
181-B	70 ft.	1,000 ft.
181-D	90 ft.	1,560 ft.
181-F	90 ft.	210 ft.

Process sewer extensions into the river:

Channel	Length
1904-B	750 ft.
1904-D	1,850 ft.
1904-F	450 ft.

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The design of the process sewer for the 100-B and 100-F Areas called for a 42" steel pipe running out into the river, the distances shown above. The process sewer for the 100-D Area called for two steel pipes running out into the river. The entire length of these steel pipes were buried 3' beneath the river bottom with the exception of a few feet back of the discharge ends. Du Pont installed these pipes for the 100-B and 100-F Areas by excavating a channel out from the shore and forming a causeway with the excavated material. The pipe was laid on this causeway and completely welded, lowered into the excavated channel and backfilled.

Installation of the discharge pipes for the 100-D Area was subcontracted to the Guy F. Atkinson Company. The Atkinson Company excavated a channel and formed a causeway with the excavated material the same as the du Pont Company. Sheet piling was then driven on both sides of the channel, and for the entire length of the channel, and screw operated jigs were suspended between this piling. The pipe was then laid on the jigs and completely welded, after which it was lowered into the channel by simultaneously operating all of these screws. When the pipe had been placed, the sheet piling was removed and the channel was backfilled.

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(8) Building Descriptions

On the following pages are described the Process and Service Buildings in the 100 Areas. Descriptions of the facilities in these areas will be found under the 500, 600, 800 and 900 Area sections except in one or two instances where the description is included in the 100 Area. Several buildings originally constructed as TC Buildings were taken over by Operations for permanent use. Descriptions of these buildings will be found under the section devoted to temporary construction.

These descriptions recite in a brief and concise manner the component parts of each of the permanent buildings erected in the 100 Areas. Included with each description is a photograph of the finished structure. In many instances, identical or almost identical buildings were constructed in each of the 100 Areas. These buildings have been described only once and any major differences have been noted. In some instances, identical buildings have been included in the following descriptions.

The data used in the building descriptions was secured by direct knowledge of the buildings as they were constructed and through a study of the prints. The overall dimensions of the building show the longest length and width of the structure regardless of its shape while the height is taken from the bottom of the foundation to the top of the roof. The area of the building is a cross sectional area and the volume is figured from the bottom of the foundation to the mean height of the roof. Only the major items of equipment have been listed and approximate quantities of construction material have been given for the major materials used.

The following buildings have been described in this section:

Building Number	100-B	100-D	100-F	Building
103	1	1	1	Fresh Metal Storage
107	1	1	1	Retention Basin
108	1	1	1	Chemical Pump House
110	1	1	1	Gas Storage Tanks
111	1	--	--	Test Building
115	1	1	1	Purification Building
181	1	1	1	River Pump House
182	1	1	1	Reservoir and Pump House
183	1	1	1	Filter Plant
184	1	1	1	Power House (Incl. Coal Storage Pit and Coal Conveyors)
185	1	1	1	Deaerating Building
186	--	1	--	Water Treatment Plant
187	2	2	2	Elevated Process Water Tank
188	1	1	1	Ash Disposal Basin
189	--	1	1	Refrigeration Building
190	1	1	1	Main Pump House

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(Cont'd)

Building Number	100-B	100-D	100-F	Building
151	1	1	1	Primary Substation
152	10	12	11	Secondary Substations
153	8	6	6	Distribution Substations
1608	--	1	1	Process Waste Lift Station
1701	1	1	1	Gate House and Clock Alley
1704	1	1	1	Supervisors' Office and Laboratory
1707	2	2	2	Change Houses
1709	1	1	1	Fire Headquarters
1713	3	2	2	Storehouses
1715	1	1	1	Oil and Paint Storage
1716	1	1	1	Automotive Repair Shop
1717	1	1	1	Combined Shops
1719	1	1	1	First Aid Building
1720	1	1	1	Patrol Headquarters
1722	2	2	1	Area Shops
1734	1	1	1	Gas Cylinder Storage

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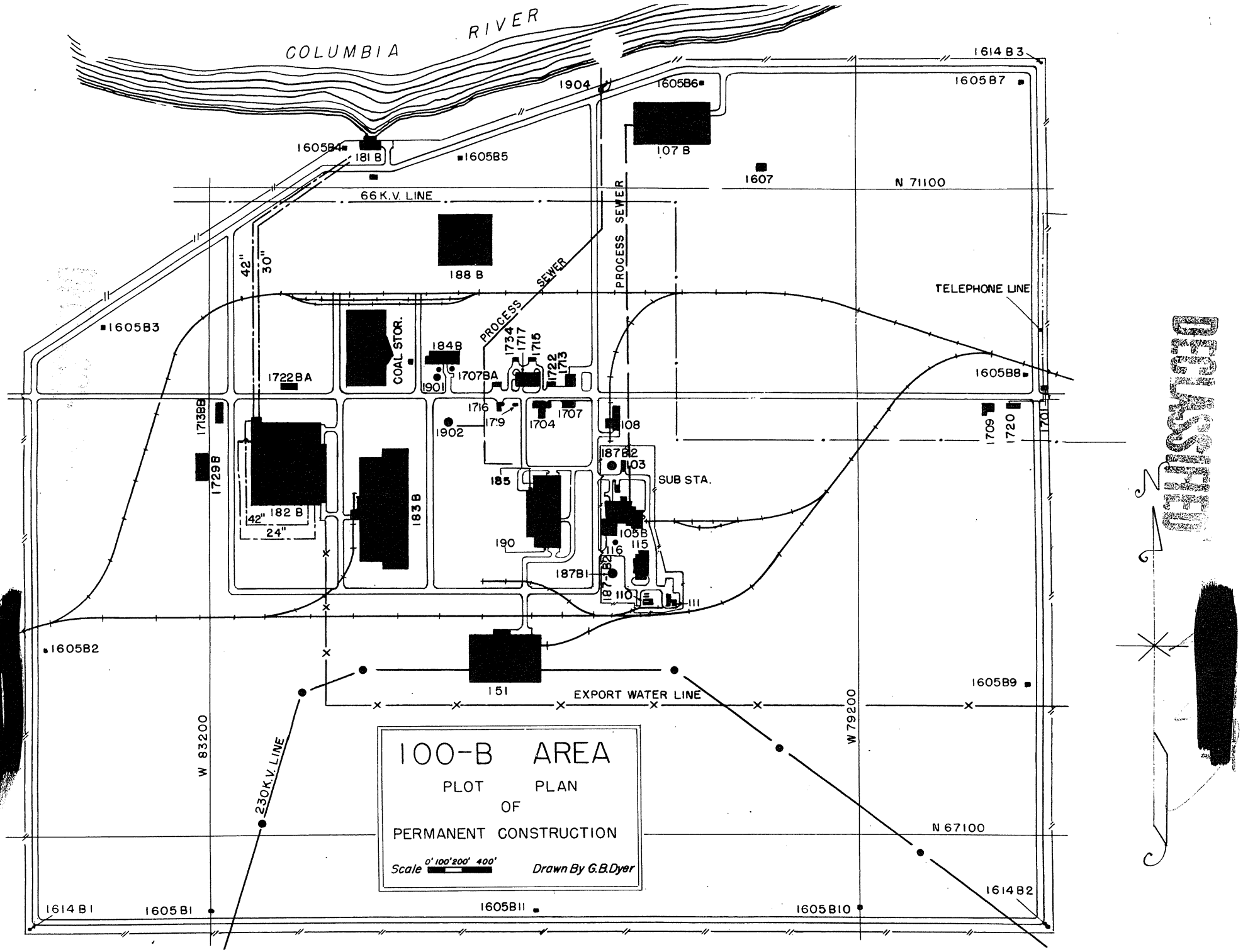

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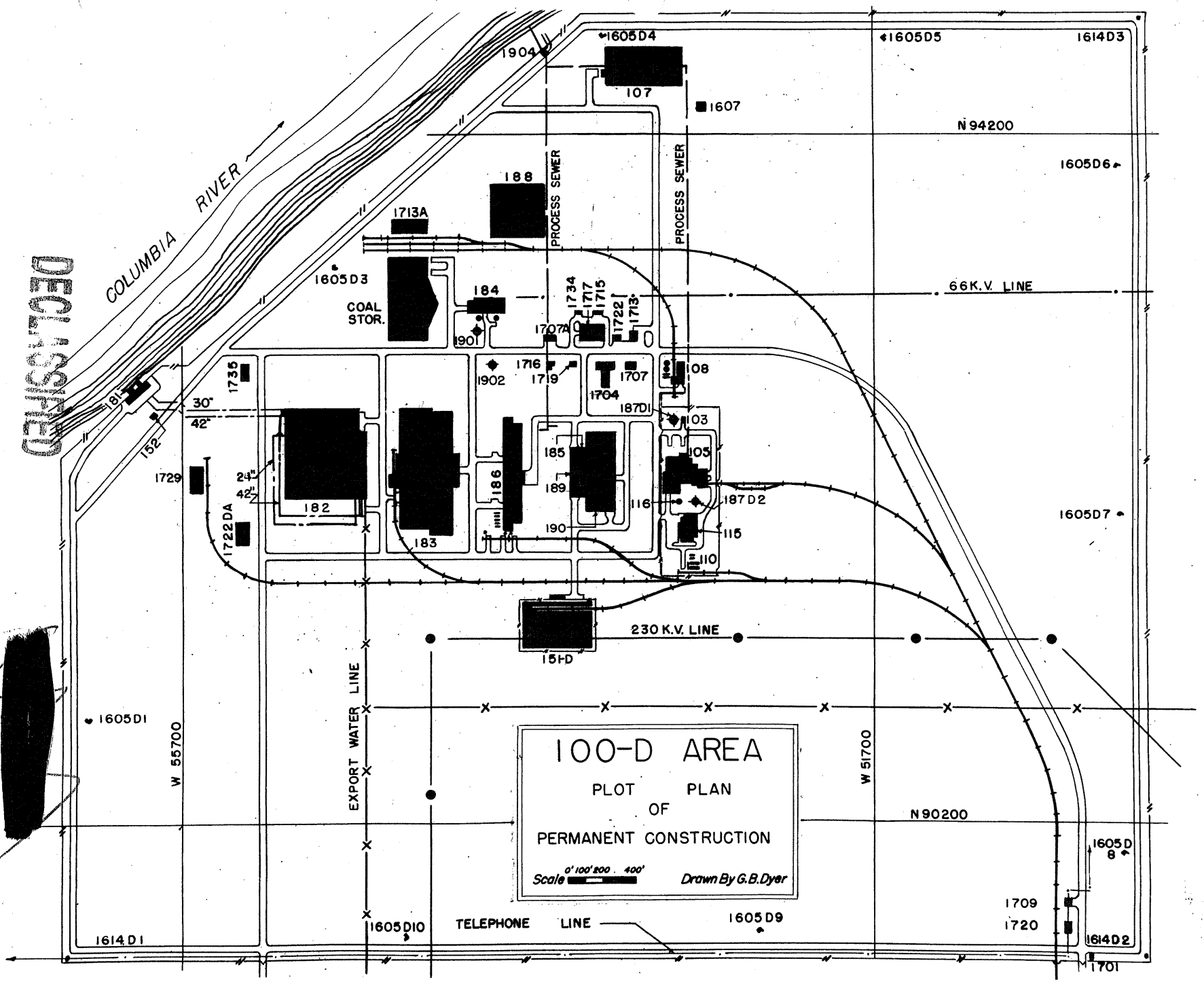

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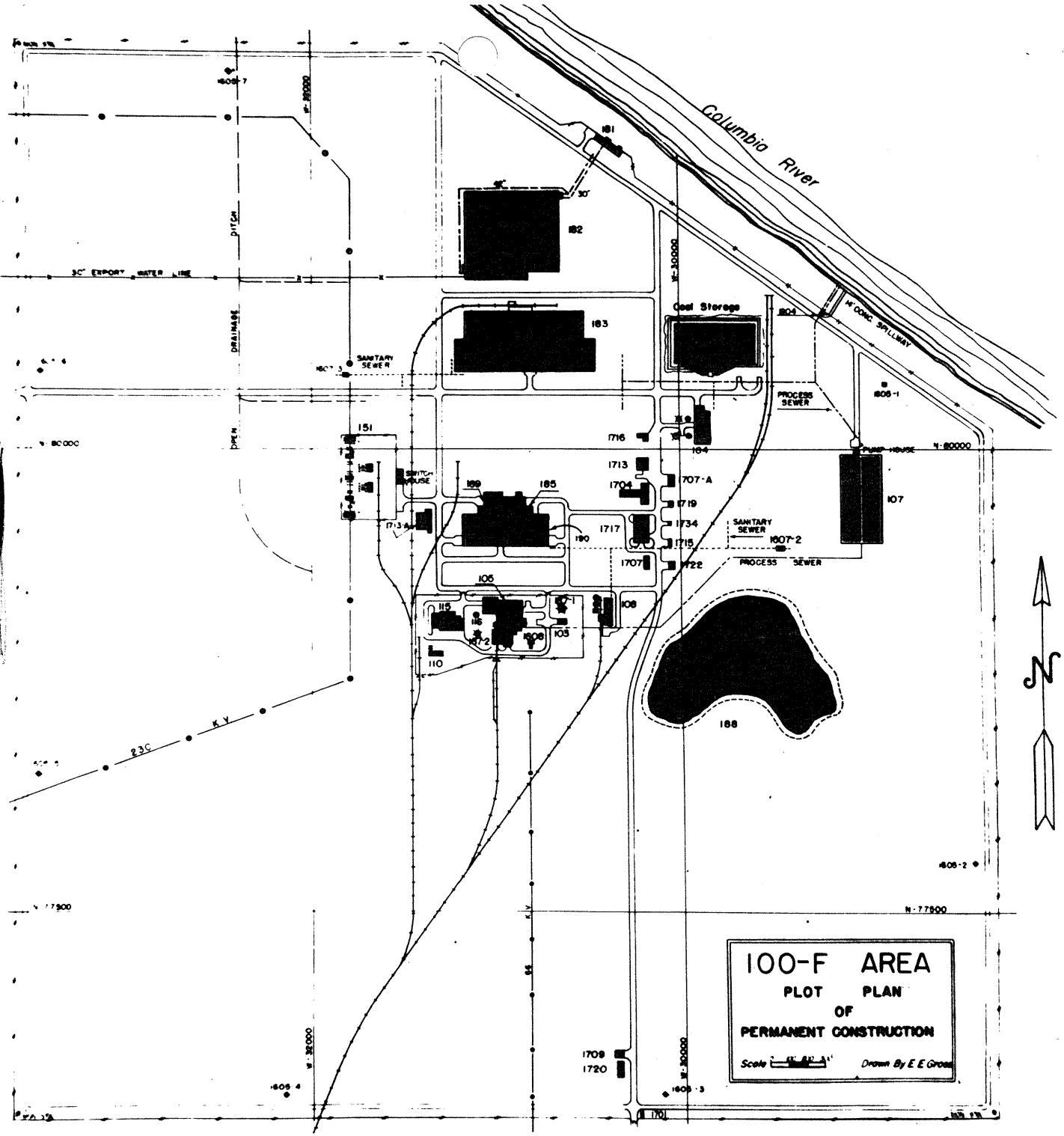

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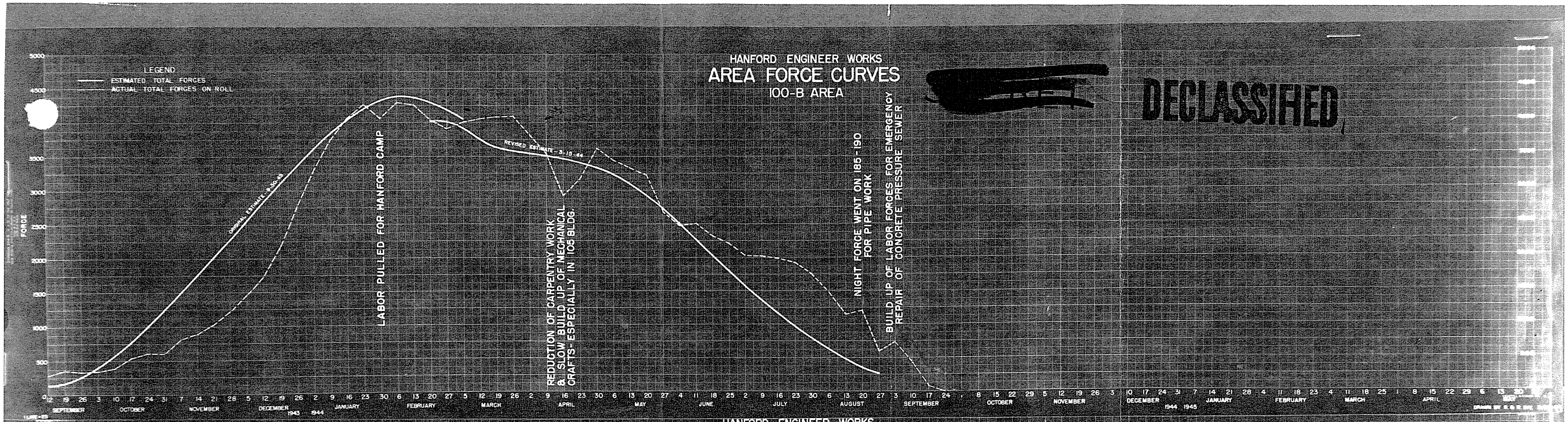

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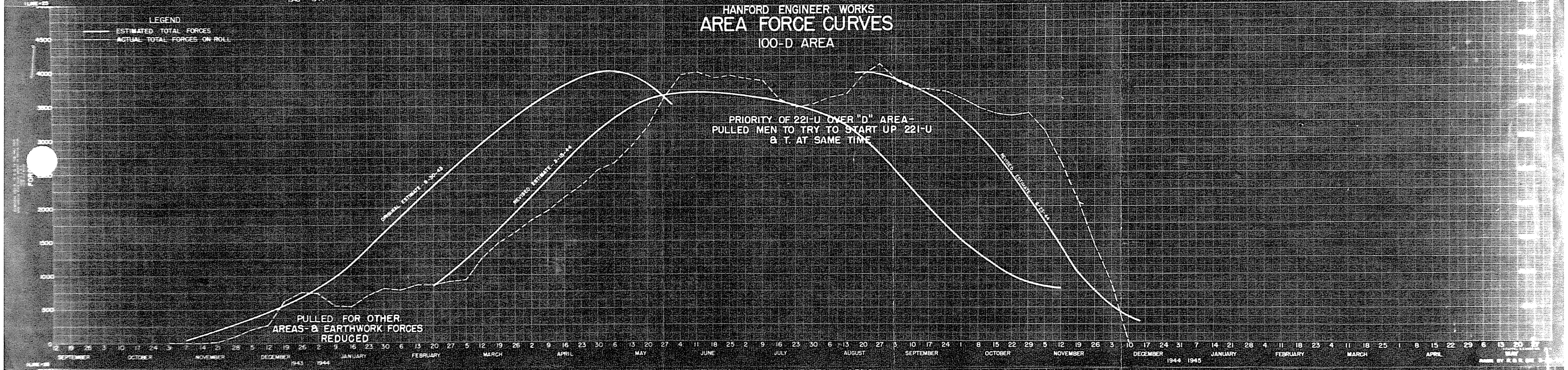

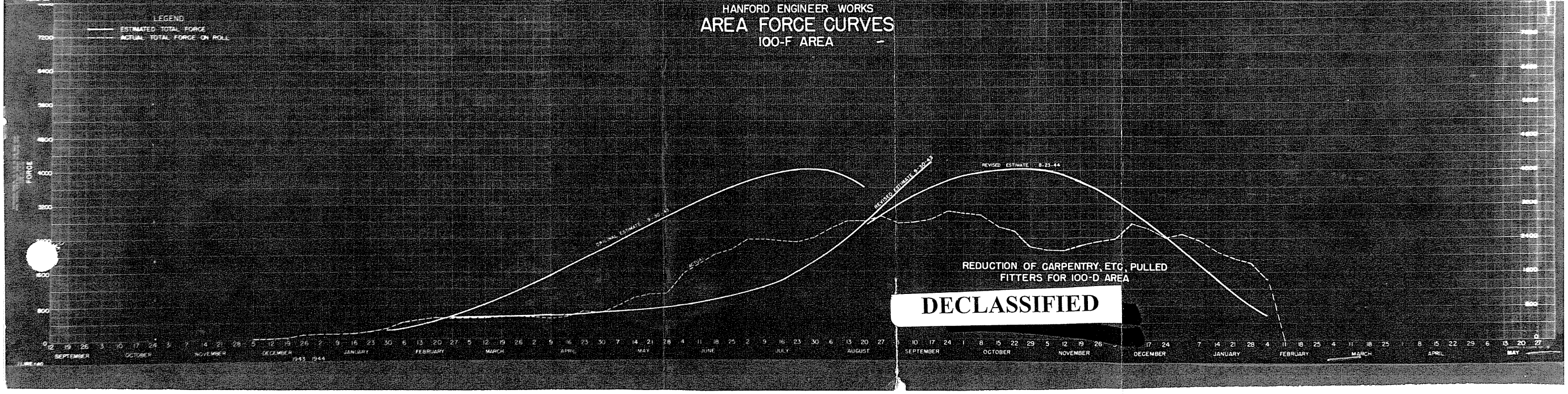

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PROJECT 9536

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BUILDING NUMBER	NAME	DESIGN RELEASED	EXCAVATION		FOUNDATIONS		STRUCTURAL STEEL		SUPERSTRUCTURE		EQUIPMENT INSTALLATION		TEST RUNS MAJOR EQUIPMENT		START-UP DATE	COMPLETION DATE	DATE ACCEPTED BY	
			STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE			OPERATION	GOV'T.
	Total 100-B Area		7/21/43													9/8/44		
103-B	Fresh Water Storage	12/15/43	3/10/44	3/19/44	3/12/44	6/9/44	-----	-----	4/16/44	6/9/44	-----	-----	-----	-----	-----	8/1/44	8/29/44	8/23/44
107-B	Retention Basin	9/9/43	8/27/43	9/20/43	9/4/43	3/26/44	-----	-----	1/8/44	5/12/44	2/18/44	4/16/44	7/12/44	7/14/44	8/5/44	8/1/44	9/19/44	9/13/44
108-B	Chemical Pump House	1/25/44	4/1/44	4/6/44	4/7/44	5/10/44	4/17/44	5/1/44	4/25/44	5/19/44	5/8/44	8/14/44	8/6/44	8/14/44	8/12/44	8/14/44	8/28/44	9/21/44
110-B	Gas Storage Tanks	12/10/43	2/8/44	2/13/44	2/18/44	6/16/44	-----	-----	4/11/44	7/14/44	3/3/44	5/19/44	8/12/44	8/15/44	8/5/44	8/1/44	9/19/44	9/13/44
111-B	Test Building	6/17/44	6/26/44	6/30/44	6/30/44	7/20/44	-----	-----	7/5/44	7/30/44	7/5/44	8/12/44	8/1/44	8/12/44	8/14/44	8/12/44	8/29/44	8/23/44
115-B	Purification Building	12/13/43	1/8/44	2/2/44	1/10/44	4/18/44	3/3/44	3/13/44	3/14/44	7/30/44	4/12/44	8/15/44	7/28/44	8/15/44	8/16/44	8/15/44	9/23/44	9/13/44
151-B	Primary Substation	12/5/43	1/7/44	1/25/44	1/10/44	5/12/44	3/12/44	3/15/44	3/3/44	5/5/44	5/1/44	6/5/44	5/29/44	6/1/44	6/1/44	8/1/44	12/14/44	11/24/44
152-B	(10) Secondary Substations	12/15/43	3/27/44	5/19/44	4/12/44	6/12/44	-----	-----	5/5/44	7/1/44	-----	-----	6/5/44	7/1/44	7/1/44	8/1/44	12/14/44	11/24/44
153-B	Distribution Substation	4/1/44	5/13/44	5/14/44	5/13/44	5/19/44	-----	-----	5/15/44	6/15/44	6/12/44	6/15/44	6/10/44	7/1/44	7/1/44	7/1/44	12/14/44	11/24/44
181-B	River Pump House	9/13/43	9/6/43	3/5/44	9/11/43	4/23/44	12/19/43	12/28/43	12/29/43	4/16/44	2/25/44	4/16/44	6/1/44	6/18/44	6/1/44	8/1/44	9/28/44	9/21/44
182-B	Reservoir and Pump House	8/17/43	8/31/43	9/10/43	9/4/43	4/16/44	1/24/44	7/20/44	2/1/44	6/23/44	4/20/44	6/16/44	6/18/44	7/20/44	6/20/44	8/1/44	9/28/44	9/21/44
183-B	Filter Plant	8/31/43	8/31/43	9/20/43	9/4/43	4/9/44	12/19/43	4/8/44	12/29/43	6/16/44	2/13/44	6/9/44	6/26/44	7/4/44	7/5/44	8/1/44	9/28/44	9/21/44
184-B	Power House	8/20/43	10/6/43	10/12/43	10/16/43	12/19/43	12/11/43	1/20/44	12/20/43	5/5/44	11/26/43	6/9/44	5/22/44	6/20/44	7/16/44	8/1/44	9/28/44	9/21/44
185-B	Deaerating Plant	11/15/43	11/26/43	12/4/43	12/5/43	2/1/44	2/10/44	4/5/44	2/20/44	5/5/44	2/18/44	7/25/44	7/25/44	8/1/44	8/5/44	8/1/44	9/28/44	9/21/44
187-B	(2) Elevated Process Water Tanks	1/6/44	1/26/44	2/3/44	2/4/44	3/20/44	3/24/44	4/8/44	-----	-----	3/24/44	7/25/44	7/25/44	7/26/44	7/26/44	8/1/44	8/29/44	8/23/44
188-B	Ash Disposal Basin	9/30/43	2/9/44	2/13/44	2/13/44	5/19/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	5/22/44	8/29/44	8/23/44
196-B	Main Pump House	11/4/43	11/26/43	12/16/43	12/5/43	3/25/44	2/10/44	4/10/44	2/20/44	7/5/44	2/18/44	7/25/44	7/25/44	8/5/44	8/5/44	8/1/44	9/28/44	9/21/44
1501-B	Fence and Road Lighting	12/1/43	10/1/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	9/8/44	12/14/44	12/1/44
1503-B	Outside Electric Lines	7/12/43	12/20/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	9/8/44	12/14/44	12/1/44
1505-B	Fire Alarm System	12/14/43	6/1/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8/15/44	12/14/44	12/1/44
1506-B	Telephones and Telephone Cable	12/14/43	1/18/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8/15/44	See 506 Building	
1601-B	Standard Gauge Railroad Track	7/9/43	7/21/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8/16/44	8/29/44	8/23/44
1603-B	Roads and Walkways	7/9/43	7/21/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8/18/44	8/29/44	8/23/44
1605-B	Fence, Incl. (11) Guard Towers	9/22/43	11/1/43	1/25/44	1/8/44	5/19/44	-----	-----	1/8/44	7/25/44	-----	-----	-----	-----	-----	8/1/44	8/29/44	8/24/44
1607-B	(7) Underground Septic Tanks	10/11/43	1/1/44	1/19/44	2/10/44	5/19/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	5/11/44	8/18/44	8/15/44
1612-B	Open Drainage Ditches (Roads)	7/9/43	7/21/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8/18/44	8/29/44	8/23/44
1613-B	Auto and Bus Parking Area	7/9/43	8/1/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8/15/44	8/29/44	8/23/44
1614-B	(3) General Monitoring Stations	1/20/44	6/7/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	6/30/44	9/26/44	9/13/44
1621-B	(3) Emergency Gas Elec.Gen.Bldgs.	5/20/44	6/5/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8/15/44	8/18/44	8/15/44
1701-B	Gate House and Clock Alley	7/27/43	11/8/43	11/12/43	11/20/43	5/5/44	-----	-----	3/16/44	6/23/44	5/16/44	5/18/44	-----	-----	-----	7/1/44	11/3/44	10/31/44
1704-B	Supervisors' Office & Laboratory	8/10/43	11/10/43	11/16/43	11/20/43	6/9/44	-----	-----	12/11/43	12/13/43	4/12/44	4/15/44	-----	-----	-----	7/1/44	9/19/44	9/13/44
1707-B	(2) Change Houses	7/9/43	11/10/43	5/27/44	11/20/43	5/23/44	-----	-----	12/11/43	5/11/44	5/8/44	6/19/44	-----	-----	-----	7/1/44	11/3/44	10/31/44
1709-B	Fire Headquarters	1/15/44	2/1/44	2/3/44	2/4/44	3/5/44	-----	-----	2/10/44	2/12/44	4/12/44	4/26/44	-----	-----	-----	7/1/44	11/3/44	10/31/44

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• PROGRESS OF CONSTRUCTION •
BUILDINGS & FACILITIES
100-B AREA
PROJECT 9536

DECLASSIFIED

BUILDING NUMBER	NAME	DESIGN RELEASED	EXCAVATION		FOUNDATIONS		STRUCTURAL STEEL		SUPERSTRUCTURE		EQUIPMENT INSTALLATION		TEST RUNS MAJOR EQUIPMENT		START-UP DATE	COMPLETION DATE	DATE ACCEPTED BY	
			STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE			OPERATION	GOV'T.
1713-B	Warehouse	6/29/43	11/22/43	11/25/43	11/26/43	4/28/44	—	—	3/10/44	3/14/44	—	—	—	—	—	7/1/44	10/2/44	9/13/44
*1713-BA	Storehouse - Essential Materials	5/15/43	10/10/43	—	—	—	—	—	—	—	—	—	—	—	—	1/21/44	10/26/44	10/23/44
*1713-BB	Storehouse - Misc. Storage	5/15/43	9/15/43	—	—	—	—	—	—	—	—	—	—	—	—	12/10/43	10/26/44	10/23/44
1715-B	Oil and Paint Storage	6/23/43	11/10/43	11/12/43	11/14/43	11/20/43	—	—	12/5/43	12/10/43	—	—	—	—	—	7/1/44	11/3/44	10/31/44
1716-B	Automotive Repair Shop	10/13/43	3/29/44	4/2/44	4/2/44	6/2/44	—	—	4/12/44	4/16/44	—	—	—	—	—	7/1/44	9/25/44	9/13/44
1717-B	Combined Shops	10/6/43	12/6/43	12/12/43	12/11/43	12/18/43	4/8/44	4/10/44	3/3/44	4/6/44	4/12/44	8/5/44	—	—	7/20/44	8/5/44	11/3/44	10/31/44
1719-B	First Aid Building	7/6/43	9/1/43	9/3/43	9/4/43	10/2/43	—	—	9/26/43	11/20/43	10/2/43	7/22/44	—	—	—	8/1/44	9/28/44	9/23/44
1720-B	Patrol Headquarters	6/23/43	10/6/43	10/18/43	10/16/43	10/23/43	—	—	10/16/43	10/22/43	7/5/44	7/10/44	—	—	—	8/1/44	11/3/44	10/31/44
1722-B	Area Shops	6/23/43	11/10/43	11/15/43	11/20/43	5/5/44	—	—	12/25/43	11/23/43	5/5/44	5/10/44	—	—	—	8/1/44	11/3/44	10/31/44
*1722-BA	Shop Electrical	4/23/43	11/11/43	—	—	—	—	—	—	—	—	—	—	—	—	12/15/44	10/26/44	10/23/44
*1722-B	Extra Machinery Storage	8/30/43	10/23/43	—	—	—	—	—	—	—	—	—	—	—	—	12/15/44	10/26/44	10/23/44
1734-B	Gas Cylinder Storage	6/23/43	11/10/43	11/20/43	12/20/43	12/11/43	—	—	11/20/43	5/5/44	—	—	—	—	—	5/1/44	10/2/44	9/13/44
1801-B	Pipe Supports	10/20/43	1/22/44	7/18/44	—	—	7/16/44	7/22/44	—	—	—	—	—	—	—	8/1/44	8/18/44	8/15/44
1802-B	Steam Lines	3/9/44	3/29/44	7/16/44	—	—	—	—	—	—	—	—	7/16/44	7/22/44	7/16/44	8/1/44	8/29/44	8/23/44
1803-B	Air Lines	3/9/44	7/15/44	—	—	—	—	—	—	—	—	—	—	—	—	7/18/44	8/29/44	8/23/44
1805-B	Process Lines	11/6/43	7/3/44	7/20/44	—	—	—	—	—	—	—	—	7/25/44	7/28/44	8/1/44	8/5/44	8/29/44	8/23/44
1901-B	Outside Water Lines	11/16/43	3/29/44	5/20/44	—	—	—	—	—	—	—	—	6/1/44	7/30/44	8/1/44	8/1/44	8/29/44	8/23/44
1902-B	Fire Lines	10/18/43	1/1/44	7/18/44	—	—	—	—	—	—	—	—	6/1/44	7/30/44	8/1/44	8/1/44	8/29/44	8/23/44
1903-B	Sanitary Sewers	12/14/43	1/1/44	5/3/44	—	—	—	—	—	—	—	—	6/1/44	6/15/44	6/1/44	8/1/44	8/18/44	8/15/44
1904-B	Process Sewers	12/14/43	12/26/43	3/18/44	—	—	—	—	—	—	—	—	6/1/44	6/2/44	6/1/44	8/1/44	9/26/44	9/13/44

*Denotes Temporary Construction Taken Over By Operations for Permanent Use.

NOTE: The dates shown on this sheet reflect the time at which the various interim stages of construction were essentially complete. In some cases these dates will vary slightly from the final dates carried in the weekly Progress Report.

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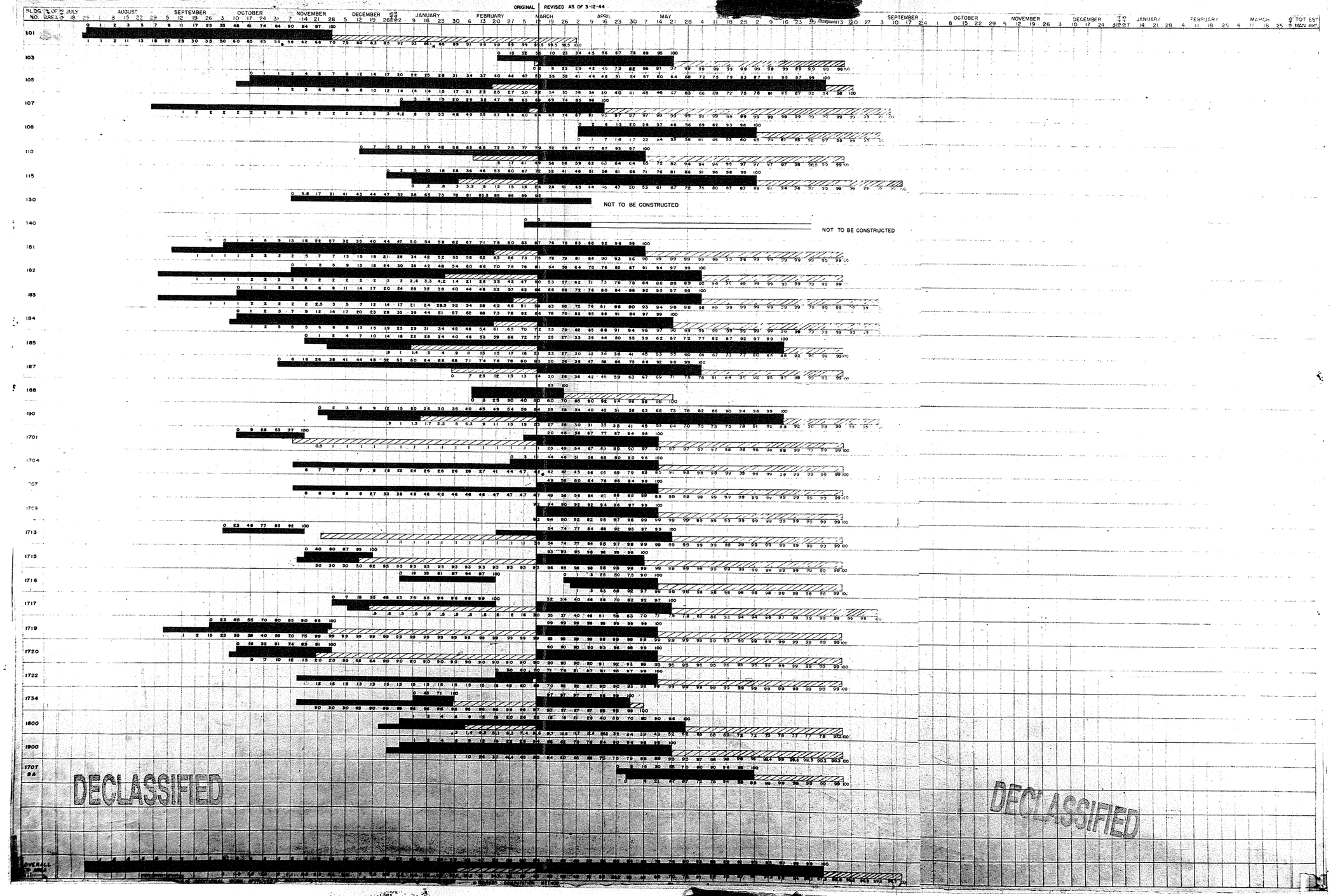
HANFORD ENGINEER WORKS

CONSTRUCTION PROGRESS

BUILDING AND AREA ESTIMATED AND ACTUAL PERCENT COMPLETE

100-B [redacted]



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• PROGRESS OF CONSTRUCTION •
BUILDINGS & FACILITIES
100-D AREA
PROJECT 9536

DECLASSIFIED

BUILDING NUMBER	NAME	DESIGN RELEASED	EXCAVATION		FOUNDATIONS		STRUCTURAL STEEL		SUPERSTRUCTURE		EQUIPMENT INSTALLATION		TEST RUNS MAJOR EQUIPMENT		START-UP DATE	COMPLETION DATE	DATE ACCEPTED BY	
			STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE			OPERATION	GOV'T.
	Total 100-D Area		11/1/43													12/4/44		
103-D	Fresh Metal Storage	6/11/43	10/1/44	10/3/44	10/3/44	11/3/44	-----	-----	11/1/44	11/12/44	-----	-----	-----	-----	11/28/44	11/14/44	11/30/44	11/21/44
107-D	Retention Basin	7/27/43	11/17/43	2/21/44	4/27/44	5/31/44	-----	-----	5/31/44	10/13/44	10/1/44	11/10/44	11/4/44	11/16/44	12/17/44	10/24/44	11/30/44	11/21/44
108-D	Chemical Pump House	3/22/44	5/30/44	6/24/44	6/24/44	8/31/44	8/31/44	9/6/44	7/2/44	11/5/44	7/7/44	11/11/44	11/14/44	11/21/44	11/29/44	11/11/44	1/2/45	11/29/44
110-D	Gas Storage Tanks	7/3/43	5/27/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/18/44	10/15/44	11/30/44	11/11/44
115-D	Purification Building	1/4/44	3/25/44	3/30/44	4/13/44	5/5/44	7/26/44	7/27/44	5/24/44	8/25/44	8/28/44	11/10/44	10/4/44	11/23/44	12/9/44	11/25/44	12/6/44	12/2/44
151-D	Primary Substation	12/18/43	2/14/44	4/2/44	2/14/44	5/15/44	6/26/44	6/30/44	-----	-----	3/7/44	11/1/44	-----	-----	8/24/44	11/15/44	1-4-45	12-1-44
152-D	(12) Secondary Substations	1/20/44	7/10/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8/24/44	12/1/44	1/4/45	12/1/44
153-D	Distribution Substation	3/31/44	7/25/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8/24/44	10/25/44	1/4/45	12/1/44
181-D	River Pump House	9/18/43	11/11/43	1/17/44	1/15/43	5/1/44	4/1/44	8/1/44	6/23/44	9/23/44	4/17/44	9/22/44	9/4/44	9/24/44	9/10/44	10/15/44	2/1/44	11/11/44
182-D	Reservoir & Pump House	12/4/43	11/8/43	4/11/44	4/12/44	6/19/44	-----	-----	4/25/44	10/19/44	6/21/44	10/11/44	8/15/44	10/15/44	9/11/44	10/20/44	11/30/44	11/21/44
183-D	Filter Plant	8/11/43	11/1/43	11/30/43	3/13/44	6/7/44	7/19/44	8/8/44	4/15/44	11/3/44	7/22/44	11/3/44	9/13/44	10/30/44	10/15/44	11/4/44	1/2/45	12/20/44
184-D	Power House	8/19/43	11/18/43	5/2/44	12/18/43	5/5/44	5/3/44	6/15/44	3/27/44	11/3/44	2/25/44	11/3/44	8/1/44	11/15/44	11/22/44	10/20/44	1/2/45	12/20/44
185-D	Deaerating Plant	11/22/43	2/18/44	4/18/44	4/9/44	5/1/44	4/25/44	7/3/44	4/9/44	9/16/44	5/29/44	11/24/44	11/4/44	11/27/44	11/29/44	11/30/44	1/2/45	11/30/44
186-D	Water Treatment Plant	10/11/43	12/13/43	4/12/44	4/8/44	6/1/44	6/14/44	7/26/44	5/5/44	11/13/44	6/23/44	12/1/44	11/4/44	12/1/44	Not Started	12/4/44	1/2/45	12/18/44
187-D	(2) Elevated Process Water Tanks	1/13/44	4/22/44	5/10/44	5/13/44	5/23/44	6/6/44	9/1/44	-----	-----	6/1/44	10/20/44	10/20/44	11/10/44	11/15/44	10/15/44	12/1/44	11/27/44
188-D	Ash Disposal Basin	10/6/43	4/10/44	-----	-----	-----	-----	-----	-----	-----	-----		-----	-----	9/15/44	9/20/44	10/30/44	10/23/44
189-D	Refrigeration Building	11/22/43	2/18/44	3/16/44	3/18/44	6/16/44	5/15/44	7/5/44	6/16/44	8/26/44	7/26/44	11/25/44	10/4/44	11/26/44	11/30/44	11/30/44	1/24/45	12/1/44
190-D	Main Pump House	11/22/43	2/8/44	3/18/44	3/14/44	5/11/44	4/12/44	6/29/44	5/12/44	11/12/44	4/14/44	11/24/44	11/4/44	11/27/44	11/29/44	11/26/44	1/2/45	12/20/44
1501-D	Fence & Road Lighting	1/19/44	10/15/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/1/44	1/2/45	12/14/44
1503-D	Outside Electric Lines	7/15/43	1/4/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	12/1/44	1/2/45	12/14/44
1505-D	Fire Alarm System	1/13/44	10/31/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/25/44	1/2/45	12/14/44
1506-D	Telephones & Telephone Cable	1/13/44	8/15/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	12/9/44	See 506 Bldg.	
1601-D	Standard Gauge Railroad Tracks	9/17/43	10/19/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/7/44	11/28/44	11/17/44
1603-D	Roads & Walks	9/17/43	9/21/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/10/44	12/6/44	12/1/44
1605-D	Fence Incl. (10) Guard Towers	10/13/43	12/20/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/1/44	12/27/44	12/18/44
1607-D	(5) Underground Septic Tanks	10/18/43	3/14/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	9/13/44	12/27/44	10/23/44
1608-D	Process Waste Lift Station	12/30/43	1/20/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/1/44	11/28/44	11/17/44
1613-D	Auto and Bus Parking Area	4/17/44	8/9/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	9/22/44	12/4/44	11/11/44
1614-D	(3) General Monitoring Stations	1/20/44	6/1/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	10/15/44	11/12/44	11/1/44
1621-D	(3) Emergency Gas Elec. Gen. Bldgs	5/20/44	6/3/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	10/21/44	11/28/44	11/17/44
1701-D	Gate House & Clock Alley	7/31/43	5/3/44	5/10/44	5/12/44	5/30/44	-----	-----	5/26/44	9/22/44	9/1/44	9/29/44	-----	-----	-----	9/29/44	12/27/44	12/20/44
1704-D	Supervisors' Office	7/13/43	12/20/43	12/28/44	12/31/43	8/28/44	-----	-----	5/12/44	11/10/44	9/15/44	11/10/44	-----	-----	-----	11/4/44	11/28/44	11/11/44
1707-D	(2) Change Houses	4/9/43	7/3/44	7/5/44	7/5/44	7/11/44	-----	-----	7/11/44	9/22/44	9/20/44	10/6/44	-----	-----	-----	10/15/44	12/27/44	12/18/44
1709-D	Fire Headquarters	1/20/44	3/21/44	3/26/44	3/28/44	4/8/44	-----	-----	4/6/44	6/10/44	9/28/44	10/6/44	-----	-----	-----	10/24/44	12/6/44	11/11/44

DECLASSIFIED

• PROGRESS OF CONSTRUCTION •
BUILDINGS & FACILITIES
100-D AREA
PROJECT 9538

DECLASSIFIED

BUILDING NUMBER	NAME	DESIGN RELEASED	EXCAVATION		FOUNDATIONS		STRUCTURAL STEEL		SUPERSTRUCTURE		EQUIPMENT INSTALLATION		TEST RUNS MAJOR EQUIPMENT		START-UP DATE	COMPLETION DATE	DATE ACCEPTED BY	
			STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE			OPERATION	GOV'T.
1713-D	Storeroom	6/30/43	4/12/44	4/16/44	5/8/44	5/12/44	-----	-----	5/25/44	9/5/44	-----	-----	-----	-----	-----	9/8/44	11/30/44	11/11/44
*1713-DA	Storeroom, Essential Material	5/15/44	12/15/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	4/7/44	12/6/44	12/2/44
1715-D	Oil and Paint Storage	6/30/43	7/17/44	7/17/44	7/17/44	7/19/44	-----	-----	7/19/44	9/5/44	-----	-----	-----	-----	-----	9/8/44	12/27/44	12/18/44
1716-D	Automotive Repair Shop	10/18/43	11/26/43	11/27/44	11/27/43	12/3/43	-----	-----	12/16/43	4/28/44	10/3/44	10/27/44	-----	-----	-----	10/29/44	12/4/44	11/24/44
1717-D	Combined Shops	10/9/43	5/30/44	6/2/44	6/1/44	7/1/44	-----	-----	6/20/44	10/27/44	7/25/44	11/11/44	-----	-----	-----	11/11/44	12/6/44	12/1/44
1719-D	First Aid Building	6/5/43	11/25/43	11/26/43	11/27/43	12/3/43	-----	-----	12/13/43	9/22/44	9/15/44	9/22/44	-----	-----	-----	10/18/44	12/3/44	10/23/44
1720-D	Patrol Headquarters	7/6/43	12/10/43	12/15/44	2/7/44	3/5/44	-----	-----	3/2/44	4/14/44	3/20/44	7/28/44	-----	-----	-----	10/18/44	12/27/44	12/20/44
1722-D	Area Shops	6/30/43	6/12/44	6/13/44	6/13/44	7/4/44	-----	-----	6/20/44	10/6/44	-----	-----	-----	-----	-----	9/15/44	12/8/44	11/11/44
*1722-DA	Electrical Shop	4/23/43	12/12/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	4/7/44	12/27/44	12/18/44
*1729-D	Extra Machinery Storage	4/23/43	12/21/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	4/7/44	12/6/44	12/1/44
1734-D	Gas Cylinder Storage	5/31/43	7/17/44	7/17/44	7/17/44	7/20/44	-----	-----	7/20/44	9/1/44	-----	-----	-----	-----	-----	9/1/44	11/3/44	10/23/44
*1735-D	Training Headquarters	5/15/43	11/17/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2/2/44	12/6/44	12/1/44
1801-D	Pipe Supports	7/19/44	5/8/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	10/13/44	11/19/44	11/9/44
1802-D	Steam Lines	1/3/44	8/21/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/15/44	12/3/44	11/27/44
1803-D	Air Lines	1/3/44	10/9/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/1/44	11/19/44	11/9/44
1805-D	Process Lines	1/3/44	8/28/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/24/44	12/1/44	11/27/44
1901-D	Outside Water Lines	9/29/43	12/1/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/11/44	12/4/44	11/27/44
1902-D	Fire Lines	10/2/43	12/14/43	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/1/44	12/8/44	11/27/44
1903-D	Sanitary Sewers	12/13/43	3/14/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/1/44	11/19/44	11/9/44
1904-D	Process Sewers	12/30/43	1/20/44	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11/11/44	11/30/44	11/21/44

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*T.C. Building Transferred to Operations and Assigned Permanent Building Numbers.

NOTE: The dates shown on this sheet reflect the time at which the various interim stages of construction were essentially complete. In some cases these dates will vary slightly from the final dates carried in the weekly Progress Report.

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HANFORD ENGINEER WORKS

CONSTRUCTION PROGRESS

BUILDING AND AREA ESTIMATED AND ACTUAL PERCENT COMPLETE

100-D [redacted]

LEGEND

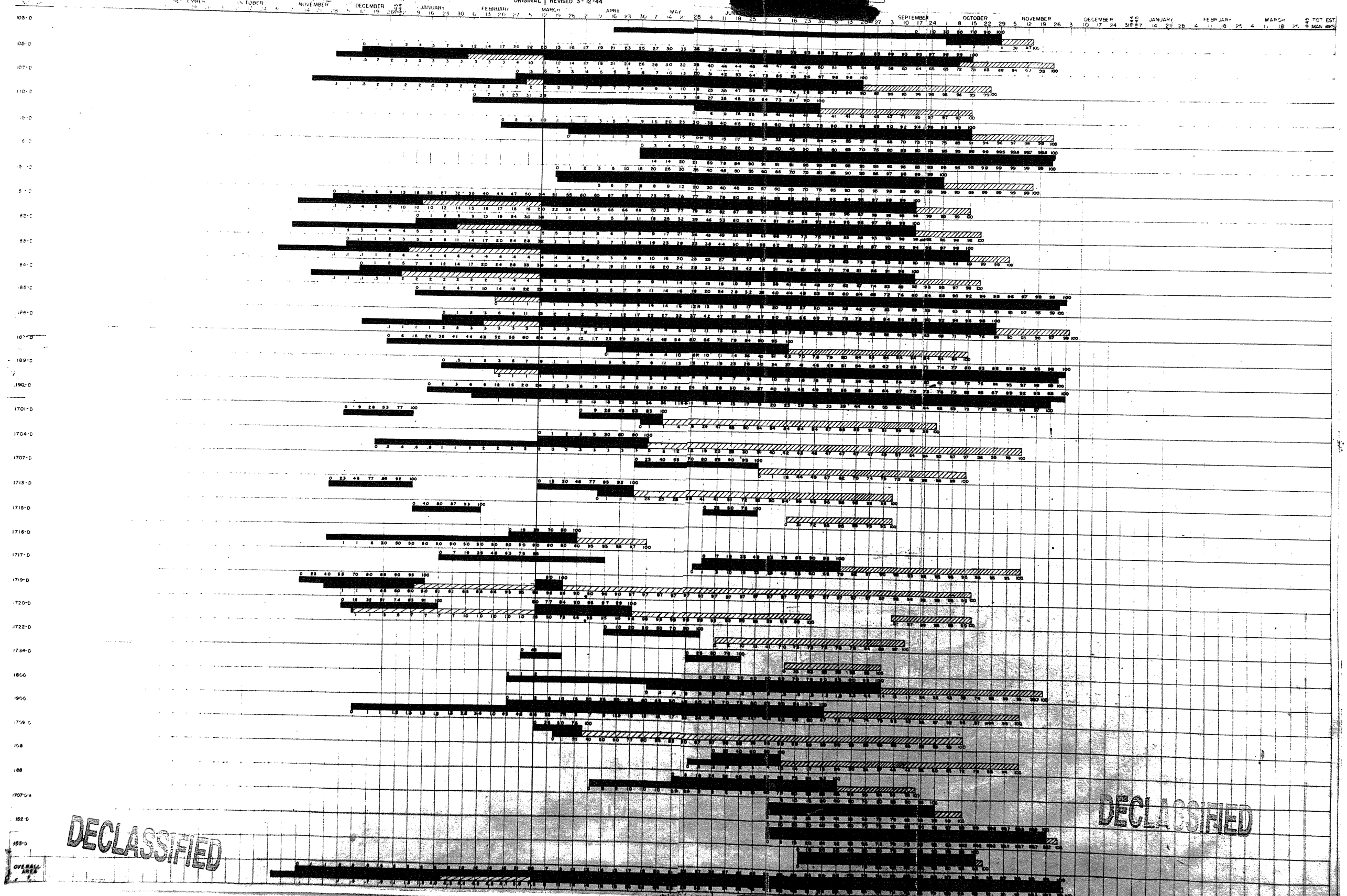
UPPER BAR AND PERCENTAGE FIGURE INDICATE ESTIMATED CONSTRUCTION SCHEDULE

LOWER BAR AND PERCENTAGE FIGURE INDICATE ACTUAL CONSTRUCTION SCHEDULE

INDICATES NUMBER OF WEEKS ACTUAL PROGRESS WAS BEHIND SCHEDULED PROGRESS

* ADDITIONAL WORK APPROVED

ORIGINAL | REVISED 3-12-44



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• PROGRESS OF CONSTRUCTION •
BUILDINGS & FACILITIES

DECLASSIFIED

100-F AREA
PROJECT 9536

BUILDING NUMBER	NAME	DESIGN RELEASED	EXCAVATION		FOUNDATIONS		STRUCTURAL STEEL		SUPERSTRUCTURE		EQUIPMENT INSTALLATION		TEST RUNS MAJOR EQUIPMENT		START-UP DATE	COMPLETION DATE	DATE ACCEPTED BY	
			STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE			OPERATION	GOV'T.
	TOTAL 100-F AREA		12/21/43													2/10/45		
103-F	Fresh Metal Storage	3/6/44	10/14/44	10/17/44	10/18/44	10/21/44	---	---	10/23/44	1/3/45	---	---	---	---	---	1/13/45	2/5/45	2/1/45
107-F	Retention Basin	12/5/43	2/10/44	5/10/44	8/7/44	10/18/44	---	---	10/8/44	10/11/44	11/1/44	1/18/45	1/20/45	1/27/45	1/20/45	1/27/45	2/5/45	2/1/45
108-F	Chemical Pump House	8/6/44	8/12/44	8/22/44	8/21/44	10/12/44	9/8/44	9/23/44	9/8/44	11/3/44	9/22/44	1/22/45	1/12/45	1/27/45	1/20/45	1/27/45	2/5/45	2/1/45
110-F	Gas Storage Tanks	4/3/44	7/14/44	7/17/44	7/17/44	7/22/44	---	---	9/10/44	9/18/44	7/24/44	1/13/45	1/18/45	2/10/45	1/20/45	2/10/45	2/11/45	2/7/45
115-F	Purification Building	4/6/44	4/23/44	5/3/44	7/19/44	10/20/44	---	---	9/4/44	2/3/45	9/15/44	2/1/45	1/18/45	2/10/45	1/22/45	2/10/45	2/11/45	2/7/45
151-F	Primary Substation	12/18/43	3/20/44	---	---	---	---	---	---	---	---	---	---	---	11/10/44	1/27/45	2/15/45	2/12/45
152-F	Secondary Substations (11)	1/4/44	8/23/44	---	---	---	---	---	---	---	---	---	---	---	1/10/45	1/27/45	2/19/45	2/12/45
153-F	Distribution Substation	3/31/44	10/30/44	---	---	---	---	---	---	---	---	---	---	---	11/21/44	1/27/45	2/19/45	2/12/45
161-F	River Pump House	11/2/43	12/28/43	2/6/44	2/6/44	4/2/44	8/1/44	8/5/44	4/23/44	10/15/44	5/30/44	12/3/44	12/13/44	1/12/45	12/13/44	1/15/45	2/5/45	2/1/45
182-F	Reservoir and Pump House	12/5/43	1/21/44	2/15/44	6/7/44	10/20/44	7/18/44	8/1/44	6/30/44	12/26/44	9/11/44	1/10/45	1/5/45	1/27/45	1/5/45	1/27/45	2/5/45	2/1/45
183-F	Filter Plant	11/6/43	3/6/44	4/20/44	6/5/44	10/13/44	8/20/44	10/10/44	7/10/44	1/5/45	7/21/44	1/12/45	1/6/45	1/27/45	1/6/45	1/27/45	2/5/45	2/1/45
184-F	Power House	8/5/43	1/20/44	5/10/44	5/8/44	6/30/44	6/25/44	8/25/44	6/25/44	1/3/45	6/12/44	1/22/45	12/26/44	1/27/45	12/26/44	1/27/45	2/5/45	2/1/45
185-F	Deaerating Plant	11/19/43	4/24/44	5/3/44	5/28/44	9/15/44	7/20/44	9/20/44	7/20/44	1/18/45	9/6/44	1/23/45	1/20/45	2/10/45	1/20/45	2/10/45	2/12/45	2/12/45
187-F	Elevated Process Water Tanks (2)	12/2/43	4/6/44	4/17/44	4/17/44	5/12/44	8/5/44	11/3/44	8/5/44	11/5/44	8/15/44	1/31/45	1/12/45	1/18/45	1/12/45	1/18/45	2/5/45	2/1/45
188-F	Ash Disposal Basin	10/19/43	10/16/44	10/19/44	---	---	---	---	---	---	12/6/44	12/22/44	12/29/44	12/29/44	12/29/44	1/6/45	2/5/45	2/1/45
189-F	Refrigeration Building	11/2/43	4/24/44	5/4/44	6/12/44	8/21/44	8/1/44	9/16/44	8/1/44	1/18/45	9/1/44	1/26/45	1/23/45	2/10/45	1/25/45	2/10/45	2/12/45	2/12/45
190-F	Main Pump House	11/21/43	4/21/44	5/4/44	5/24/44	10/6/44	7/5/44	9/16/44	7/5/44	1/3/45	7/21/44	2/2/45	2/1/45	2/10/45	2/1/45	2/10/45	2/12/45	2/12/45
1501-F	Fence and Road Lighting	1/27/44	9/1/44	---	---	---	---	---	---	---	---	---	---	---	---	1/27/45	2/19/45	2/12/45
1503-F	Outside Electric Lines	2/23/44	8/1/44	---	---	---	---	---	---	---	---	---	---	---	1/10/45	1/27/45	2/19/45	2/12/45
1505-F	Fire Alarm System	2/15/44	8/1/44	---	---	---	---	---	---	---	---	---	---	---	2/10/45	1/27/45	2/19/45	2/12/45
1506-F	Telephones and Telephone Cable	6/29/44	8/1/44	---	---	---	---	---	---	---	---	---	---	---	---	2/10/45	(See Building #506)	
1601-F	Standard Gauge Railroad Track	9/12/43	3/16/44	1/12/45	---	---	---	---	---	---	3/16/44	1/18/45	---	---	---	---	2/5/45	2/1/45
1603-F	Roads and Walks	9/10/43	3/13/44	1/18/45	---	---	---	---	---	---	---	---	---	---	---	2/1/45	2/5/45	2/1/45
1605-F	Fence Ind. (8) Guard Towers	11/6/43	1/10/44	1/28/44	---	---	---	---	3/20/44	10/16/44	---	---	---	---	---	1/18/45	2/12/45	2/12/45
1607-F	Underground Septic Tanks (5)	11/4/43	3/15/44	3/22/44	6/1/44	9/11/44	---	---	---	---	---	---	---	---	---	10/16/44	2/5/45	2/2/45
1608-F	Process Waste Lift Station	5/24/44	6/25/44	---	---	---	---	---	---	---	---	---	---	---	---	1/31/45	2/3/45	2/5/45
1612-F	Open Drainage Ditches	8/4/44	8/8/44	8/22/44	---	---	---	---	---	---	---	---	---	---	---	1/15/45	2/5/45	2/1/45
1613-F	Auto and Bus Parking Area	9/9/44	9/15/44	---	---	---	---	---	---	---	---	---	---	---	---	1/3/45	3/10/45	3/10/45
1614-F	General Monitoring Stations (3)	7/2/44	---	---	---	---	---	---	9/4/44	11/6/44	10/20/44	2/10/45	---	---	---	1/13/45	2/5/45	2/1/45
1621-F	Emergency Elec. Gen. Bldg. (2)	6/3/44	6/15/44	6/17/44	6/19/44	6/23/44	---	---	6/26/44	7/15/44	7/18/44	7/21/44	---	---	7/21/44	1/13/45	2/5/45	2/1/45
1701-F	Gate House and Clock Alley	1/5/44	4/3/44	4/5/44	5/15/44	5/22/44	---	---	5/22/44	1/3/45	10/6/44	1/10/45	---	---	---	1/13/45	2/5/45	2/1/45
1704-F	Supervisors' Office	12/23/43	12/28/43	1/5/44	4/3/44	5/20/44	---	---	5/15/44	12/20/44	9/22/44	1/8/45	---	---	---	1/13/45	2/5/45	2/1/45
1707-F	Change Houses (2)	2/6/44	3/28/44	4/3/44	4/20/44	5/12/44	---	---	6/19/44	12/5/44	9/18/44	1/11/45	---	---	---	1/13/45	2/5/45	2/1/45
1709-F	Fire Headquarters	5/8/43	3/20/44	3/25/44	3/22/44	4/28/44	---	---	4/23/44	11/6/44	9/15/44	1/8/45	---	---	---	1/13/45	2/5/45	2/1/45

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• PROGRESS OF CONSTRUCTION •
BUILDINGS & FACILITIES

100-F AREA
PROJECT 9536

BUILDING NUMBER	NAME	DESIGN RELEASED	EXCAVATION		FOUNDATIONS		STRUCTURAL STEEL		SUPERSTRUCTURE		EQUIPMENT INSTALLATION		TEST RUNS MAJOR EQUIPMENT		START-UP DATE	COMPLETION DATE	DATE ACCEPTED BY	
			STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE			OPERATION	GOV'T.
1713-F	Storehouse	3/12/44	3/30/44	4/4/44	5/26/44	6/2/44	---	---	6/2/44	11/5/44	---	---	---	---	---	1/15/45	2/5/45	2/1/45
*1713-FA	Storehouse - Essential Material	---	5/15/44	---	---	---	---	---	---	---	---	---	---	---	---	1/12/45	2/5/45	2/1/45
1715-F	Oil and Paint Storage	5/16/44	3/30/44	4/1/44	5/12/44	6/9/44	---	---	6/9/44	1/15/44	---	---	---	---	---	1/15/45	2/5/45	2/1/45
1716-F	Bus Parking Station	5/18/44	3/30/44	4/4/44	5/19/44	8/25/44	---	---	---	---	---	---	---	---	---	1/11/45	2/5/45	2/1/45
1717-F	Combined Shops	2/18/44	3/29/44	4/3/44	4/17/44	6/2/44	---	---	5/1/44	5/25/44	6/19/44	1/7/45	---	---	---	1/12/45	2/5/45	2/1/45
1719-F	First Aid Building	9/3/43	12/28/43	12/31/43	12/29/43	1/5/44	---	---	2/1/44	3/8/44	3/15/44	1/19/45	---	---	---	1/22/45	2/5/45	2/1/45
1720-F	Patrol Headquarters	11/19/43	12/28/43	12/31/43	12/29/43	1/5/44	---	---	2/1/44	3/25/44	3/15/44	1/10/45	---	---	---	1/13/45	2/5/45	2/1/45
1722-F	Area Shops	12/4/43	3/30/44	4/3/44	5/22/44	6/16/44	---	---	6/19/44	9/6/44	11/10/44	1/6/45	---	---	---	1/11/45	2/5/45	2/1/45
1734-F	Gas Cylinder Storage	3/9/43	3/30/44	3/31/44	6/15/44	6/19/44	---	---	6/19/44	12/3/44	---	---	---	---	---	1/8/45	2/5/45	2/1/45
1801-F	Pipe Supports	1/6/44	9/4/44	1/7/45	---	---	---	---	9/4/44	1/7/45	---	---	---	---	---	1/8/45	2/1/45	2/1/45
1802-F	Steam Lines	1/6/44	---	---	---	---	---	---	---	---	9/20/44	1/2/45	---	---	1/2/45	1/15/45	2/5/45	2/1/45
1803-F	Air Lines	1/23/44	11/27/44	12/28/44	---	---	---	---	12/4/44	12/30/44	12/8/44	1/2/45	---	---	1/2/45	1/20/45	2/5/45	2/1/45
1805-F	Process Lines	9/5/44	12/13/44	12/16/44	---	---	---	---	12/15/44	12/30/44	12/15/44	1/2/45	---	---	1/2/45	1/15/45	2/5/45	2/1/45
1901-F	Outside Water Lines	1/21/44	1/22/44	1/3/45	1/24/44	1/10/45	---	---	4/5/44	7/25/44	---	---	---	---	12/13/44	1/10/45	2/5/45	2/1/45
1902-F	Fire Lines	1/21/44	1/22/44	1/6/45	1/24/44	1/12/45	---	---	4/10/44	7/25/44	---	---	---	---	12/5/44	1/12/45	2/1/45	2/1/45
1903-F	Sanitary Sewers	3/3/44	4/10/44	1/3/45	---	---	---	---	---	---	---	---	---	---	6/10/44	1/15/45	2/5/45	2/1/45
1904-F	Process Sewers	3/20/44	4/20/44	1/6/45	---	---	---	---	---	---	---	---	---	---	5/5/44	1/15/45	2/5/45	2/1/45

* Denotes Temporary Construction Taken Over by Operations for Permanent Use.

NOTE: The dates shown on this sheet reflect the time at which the various interim stages of construction were essentially complete. In some cases these dates will vary slightly from the final dates carried in the weekly Progress Report.

DECLASSIFIED
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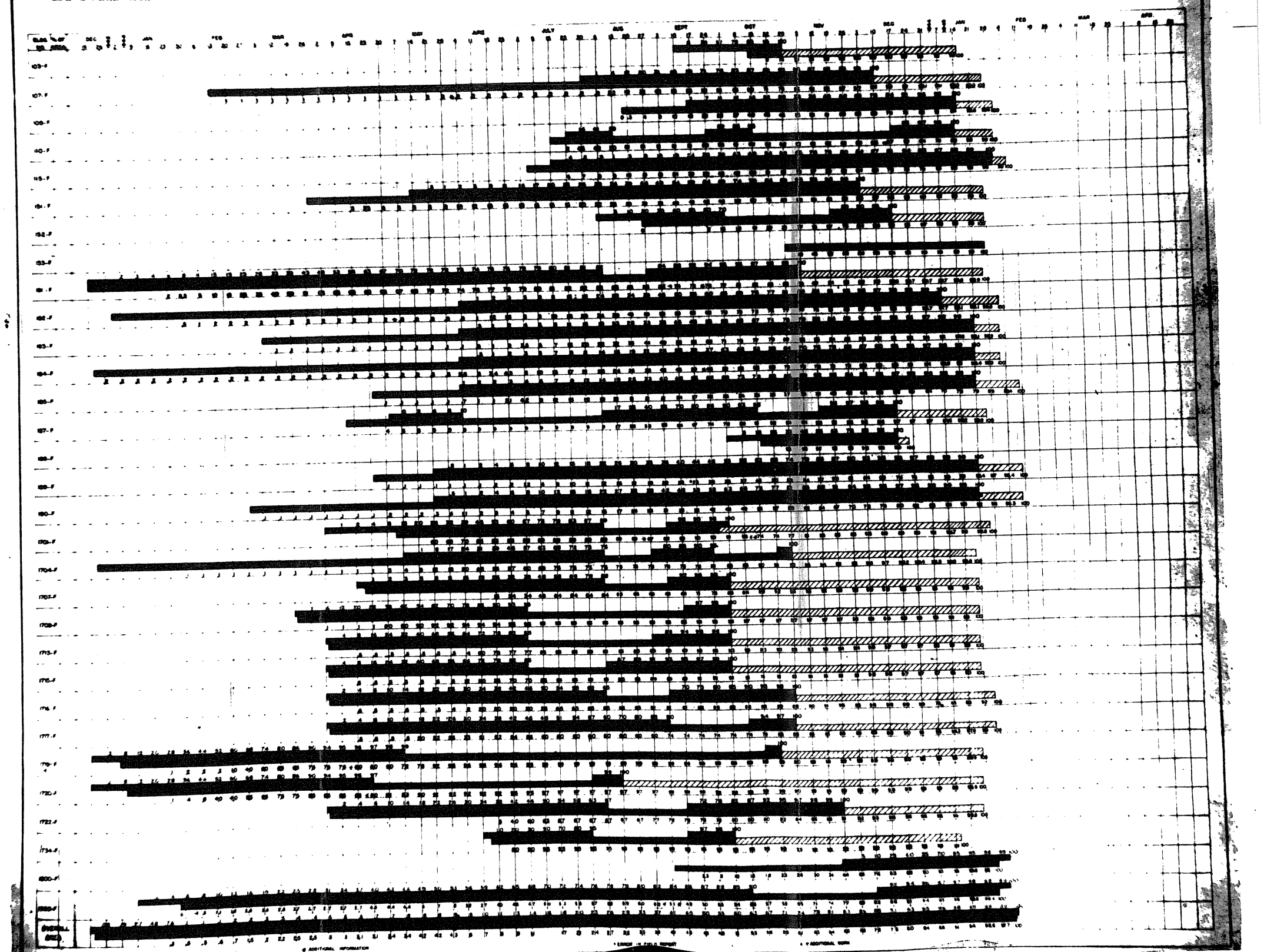
HANFORD ENGINEER WORKS

CONSTRUCTION PROGRESS

BUILDING AND AREA ESTIMATED AND ACTUAL PERCENT COMPLETE

100-F AREA



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CRITICAL CRAFTS

100-F AREA

PROJECT 9536

WEEK ENDING	LABORERS			CARPENTERS			REINF. RODSETTERS			RIGGERS			PIPEFITTERS			PIPE WELDERS			ELECTRICIANS			MILLWRIGHTS			MWT. WELDERS		
	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT
12/25/43	12	32	+ 20	32	64	+ 32	0	0	—	0	0	—	0	0	—	0	0	—	1	1	—	0	0	—	0	0	—
1/2/44	32	16	16	80	80	—	0	0	—	6	6	—	2	0	2	0	0	—	4	2	2	0	0	—	0	0	—
1/9/44	32	16	16	96	16	80	0	0	—	6	6	—	10	0	10	0	0	—	4	0	4	0	0	—	0	0	—
1/16/44	32	0	32	96	0	96	0	0	—	6	0	6	10	0	10	0	0	—	4	0	4	0	0	—	0	0	—
1/23/44	32	16	16	96	48	48	0	0	—	6	6	—	10	0	10	0	0	—	4	0	4	0	0	—	0	0	—
1/30/44	32	16	16	64	64	—	10	0	10	6	0	6	4	0	4	1	0	1	2	2	—	0	0	—	0	0	—
2/6/44	48	48	—	96	96	—	32	32	—	12	6	6	4	0	4	1	0	1	2	2	—	0	0	—	0	0	—
2/13/44	48	48	—	128	128	—	40	40	—	12	6	6	4	4	—	1	1	—	4	4	—	0	0	—	0	0	—
2/20/44	96	80	16	160	156	4	40	22	18	18	18	—	0	0	—	0	0	—	6	6	—	0	0	—	0	0	—
2/27/44	96	60	36	160	156	4	30	22	8	18	18	—	0	0	—	0	0	—	4	4	—	0	0	—	0	0	—
3/5/44	96	50	46	160	156	4	32	20	12	34	25	9	0	0	—	0	0	—	4	4	—	0	0	—	0	0	—
3/12/44	96	32	64	160	158	2	32	20	12	32	25	7	10	3	7	1	0	1	4	4	—	0	0	—	0	0	—
3/19/44	96	60	36	160	158	2	32	30	2	20	20	—	10	10	—	2	2	—	4	4	—	10	5	5	1	1	—
3/26/44	80	55	25	144	142	2	16	16	—	12	12	—	10	3	7	2	2	—	4	4	—	10	10	—	1	1	—
4/1/44	176	55	121	288	142	146	48	48	—	18	12	6	10	10	—	1	1	—	6	4	2	6	6	—	1	1	—
4/8/44	176	55	121	288	142	146	48	48	—	18	18	—	10	10	—	1	1	—	6	4	2	6	6	—	1	1	—
4/15/44	100	32	68	150	125	25	25	25	—	15	15	—	10	10	—	1	1	—	10	6	4	6	6	—	1	1	—
4/22/44	75	32	43	150	125	25	15	15	—	10	10	—	30	30	—	3	3	—	5	5	—	6	5	1	1	1	—
4/29/44	100	32	68	150	125	25	20	20	—	10	10	—	30	30	—	4	1	3	5	4	1	8	4	4	0	0	—
5/6/44	100	32	68	150	125	25	20	20	—	10	10	—	30	26	4	4	1	3	5	4	1	8	4	4	0	0	—
5/13/44	150	150	—	225	125	100	25	25	—	15	15	—	30	35	+ 5	3	2	1	5	4	1	6	4	2	0	0	—
5/20/44	200	150	50	225	125	100	25	25	—	20	15	5	30	28	2	3	3	—	15	4	11	6	4	2	0	0	—
5/27/44	250	150	100	300	144	156	40	25	15	30	30	—	30	78	+ 48	3	2	1	30	4	26	8	4	4	0	0	—
6/3/44	350	250	100	400	200	200	50	35	15	30	30	—	30	30	—	3	2	1	30	4	26	10	4	6	0	0	—
6/10/44	450	550	+ 100	700	378	322	70	70	—	35	35	—	35	35	—	3	3	—	35	10	25	15	4	11	0	0	—
6/17/44	550	600	+ 50	800	546	254	90	70	20	45	45	—	45	14	31	4	3	1	35	20	15	20	10	10	0	0	—
6/24/44	600	800	200	850	566	234	120	120	—	50	45	5	50	25	25	5	3	2	45	18	27	15	10	5	2	2	—
7/1/44	650	650	—	900	598	402	140	100	40	55	45	10	65	25	40	5	3	2	50	30	20	20	10	10	3	3	—
7/8/44	700	650	50	800	650	150	140	100	40	60	40	20	75	28	47	5	2	3	65	25	40	15	15	—	5	3	2
7/15/44	700	636	64	700	629	71	145	105	40	60	40	20	60	28	32	3	2	1	50	25	25	20	15	5	3	3	—
7/22/44	750	490	260	800	629	171	150	97	53	60	40	20	80	26	54	3	2	1	50	30	20	14	11	3	3	3	—
7/29/44	750	390	360	800	618	182	150	100	50	60	40	20	100	216	+ 116	4	2	2	60	30	30	25	18	7	3	3	—
8/5/44	750	370	380	800	610	190	160	120	40	60	47	13	100	35	65	6	2	4	60	60	—	40	30	10	6	6	—
8/12/44	800	400	400	700	700	—	130	110	20	70	52	18	110	35	75	6	3	3	90	88	2	50	25	25	10	6	4
8/19/44	800	350	450	700	700	—	130	110	20	100	84	16	130	50	80	10	5	5	110	110	—	50	25	25	10	10	—
8/26/44	800	350	450	700	700	—	110	100	10	110	100	10	130	50	80	15	5	10	120	100	20	60	60	—	15	15	—

DECLASSIFIED

CRITICAL CRAFTS

100-F AREA

PROJECT 9536

DECLASSIFIED

WEEK ENDING	LABORERS			CARPENTERS			REINF. RODSETTERS			RIGGERS			PIPEFITTERS			PIPE WELDERS			ELECTRICIANS			MILLWRIGHTS			MWT. WELDERS		
	NO. REQ	NO. ALLOC.	NO. SHORT	NO. REQ	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ	NO. ALLOC	NO. SHORT	NO. REQ	NO. ALLOC.	NO. SHORT
9/2/44	650	400	250	650	650	---	90	[illegible]	---	100	100	---	150	50	100	15	5	10	140	120	20	70	70	---	15	15	---
9/9/44	[illegible]	[illegible]	321	[illegible]	[illegible]	---	80	[illegible]	---	[illegible]	[illegible]	---	200	50	150	[illegible]	5	15	140	127	31	80	70	10	15	15	---
9/16/44	700	419	281	500	500	---	75	75	---	120	120	---	275	50	225	20	11	9	200	130	70	100	95	5	20	20	---
9/23/44	650	562	288	450	430	20	70	70	---	120	120	---	300	60	240	30	7	23	200	200	---	60	60	---	20	20	---
9/30/44	600	536	64	450	450	---	70	70	---	120	120	---	350	273	77	45	21	24	200	189	11	60	50	10	25	25	---
10/7/44	500	600	---	350	350	---	60	60	---	130	130	---	400	196	204	60	8	52	200	137	63	50	50	---	25	25	---
10/14/44	600	650	≠ 50	300	300	---	45	40	5	130	77	53	400	200	200	60	11	47	200	117	83	75	50	25	25	25	---
10/21/44	600	650	≠ 50	250	200	50	30	30	---	140	90	50	500	180	320	40	12	28	200	130	70	50	50	---	25	25	---
10/28/44	600	650	≠ 50	250	250	---	35	35	---	140	140	---	400	198	302	60	15	45	200	91	109	60	50	10	25	25	---
11/4/44	600	600	---	200	175	25	25	[illegible]	2	130	90	40	500	100	400	50	9	41	200	152	48	60	50	10	25	20	5
11/11/44	600	320	280	200	150	50	25	27	≠ 2	120	90	30	600	162	438	60	16	44	200	118	82	60	45	15	25	16	9
11/18/44	500	250	250	200	160	40	25	27	≠ 2	100	83	17	600	314	286	60	37	23	200	89	111	60	60	---	12	15	≠ 3
11/25/44	450	178	272	175	160	15	20	20	---	100	75	25	700	445	255	75	18	57	200	89	111	75	60	15	12	12	---
12/2/44	400	178	212	150	150	---	15	20	≠ 5	100	100	---	700	557	143	75	55	20	250	99	151	75	60	15	12	12	---
12/9/44	400	178	212	150	150	---	15	15	---	100	90	10	700	659	41	75	65	10	250	150	100	75	75	---	12	12	---
12-16-44	450	200	250	150	150	---	[illegible]	10	---	100	96	4	700	675	25	100	71	29	200	178	22	75	75	---	12	12	---
12-23-44	350	300	50	150	40	110	10	10	---	100	90	10	750	655	95	100	75	25	200	180	20	75	75	---	15	15	---
12-30-44	350	260	90	100	100	---	9	10	≠ 2	80	75	5	750	600	150	100	80	20	200	140	60	75	75	---	15	15	---
1-6-45	350	300	50	125	125	---	8	11	≠ 3	80	70	10	750	600	150	100	80	20	175	150	25	75	75	---	15	15	---
1-13-45	350	300	50	100	100	---	8	11	≠ 3	75	65	10	750	475	275	100	80	20	150	130	20	75	60	15	15	15	---

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CRITICAL CRAFTS

100-D AREA

PROJECT 9536

WEEK ENDING	LABORERS			CARPENTERS			REINF RODSETTERS			RIGGERS			PIPEFITTERS			PIPE WELDERS			ELECTRICIANS			MILLWRIGHTS			MNT WELDERS		
	NO REQ	NO ALLOC	NO SHORT	NO REQ	NO ALLOC	NO SHORT	NO REQ	NO ALLOC	NO SHORT	NO REQ	NO ALLOC	NO SHORT	NO REQ	NO ALLOC	NO SHORT	NO REQ	NO ALLOC	NO SHORT	NO REQ	NO ALLOC	NO SHORT	NO REQ	NO ALLOC	NO SHORT	NO REQ	NO ALLOC	NO SHORT
1/15/44	90	16	74	100	75	25	35	0	25	8	8	---	16	0	16	[illegible]	[illegible]	---	5	2	3	0	0	---	0	0	---
1/22/44	80	100	≠ 20	150	150	---	35	0	35	36	36	---	36	7	29	4	4	---	5	5	---	0	0	---	0	0	---
1/29/44	186	100	86	248	248	---	67	11	56	26	26	---	44	17	27	6	1	5	12	5	7	10	5	5	1	1	---
2/9/44	186	75	107	200	100	100	67	11	56	26	26	---	44	17	27	6	1	5	12	5	7	10	5	5	0	0	---
2/16/44	135	60	75	230	60	170	67	11	56	48	48	---	32	15	17	4	1	3	14	4	10	5	5	---	0	0	---
2/23/44	109	75	34	120	90	30	40	19	21	46	36	10	34	10	24	2	2	---	6	4	[illegible]	5	5	---	1	1	---
2/30/44	156	90	66	120	120	---	40	30	10	36	42	6	32	19	13	3	2	1	7	7	---	5	5	---	1	1	---
3/6/44	140	100	40	140	140	---	60	40	20	36	25	11	28	27	1	6	2	4	12	12	---	18	5	13	0	0	---
3/13/44	83	80	3	130	130	---	38	38	---	38	25	13	25	25	---	5	5	---	12	12	---	6	5	1	2	2	---
3/20/44	152	80	72	200	156	44	54	[illegible]	32	40	[illegible]	15	28	27	1	4	4	---	24	12	12	6	5	1	2	2	---
3/27/44	202	80	122	284	188	96	54	22	32	44	25	19	30	26	4	4	6	≠ 2	26	12	14	22	5	17	3	3	---
3/5/44	444	64	380	640	188	452	108	20	88	77	30	49	36	32	4	7	4	3	28	8	20	34	5	29	3	6	≠ 3
3/12/44	410	60	350	600	188	512	108	20	88	96	31	65	38	38	---	7	4	3	30	4	26	45	5	40	6	6	---
3/19/44	505	85	420	540	386	154	97	60	37	50	35	15	121	121	---	13	12	1	46	6	40	21	15	6	6	6	---
3/26/44	610	90	520	620	386	234	97	97	---	50	40	10	66	77	≠ 11	5	5	---	62	6	56	21	21	---	6	6	---
4/1/44	745	150	595	765	451	314	114	114	---	70	52	18	66	66	---	5	5	---	99	6	93	22	21	1	8	8	---
4/8/44	520	150	370	500	451	49	125	125	---	55	52	3	79	71	8	6	5	1	45	28	17	23	21	2	7	5	2
4/15/44	520	200	320	500	500	---	125	125	---	55	54	1	79	79	---	6	6	---	47	23	24	23	15	8	7	7	---
4/22/44	325	200	125	655	625	30	135	135	---	90	80	10	160	129	31	6	5	1	100	23	77	40	15	25	7	7	---
4/29/44	455	200	255	710	625	85	145	145	---	100	68	32	100	100	---	8	5	3	95	8	87	75	12	63	8	8	---
5/6/44	720	265	455	860	625	235	180	180	---	85	78	7	145	100	45	8	5	3	105	8	97	30	12	18	8	8	---
5/13/44	720	485	235	900	625	275	180	180	---	95	95	---	150	140	10	10	6	4	100	34	66	35	12	23	8	8	---
5/20/44	870	548	322	1000	773	227	210	196	14	100	85	15	180	120	60	20	8	12	120	34	86	35	12	23	10	10	---
5/27/44	900	650	250	1100	800	300	210	204	6	100	86	14	200	193	7	20	20	---	130	44	86	35	24	11	12	12	---
6/3/44	900	840	60	1100	930	170	225	200	25	100	90	10	210	210	---	25	20	5	130	44	86	45	24	21	15	15	---
6/10/44	700	850	≠ 150	1000	950	50	175	170	5	120	120	---	250	250	---	25	20	5	130	70	60	45	24	21	15	15	---
6/17/44	700	850	≠ 150	1000	950	50	175	170	5	125	125	---	250	150	100	25	20	5	130	70	60	45	34	11	15	15	---
6/24/44	700	900	≠ 200	900	900	---	150	150	---	130	125	5	260	160	100	30	25	5	140	90	50	60	55	5	15	15	---
7/1/44	850	900	≠ 50	1319	940	379	242	150	92	185	125	60	640	160	480	91	25	66	243	90	153	162	50	112	29	29	---
7/8/44	900	900	---	900	850	50	138	120	18	120	120	---	500	130	370	50	12	38	250	90	160	100	70	30	32	29	3
7/15/44	855	800	55	770	700	70	80	80	---	100	100	---	400	130	270	40	12	28	330	90	240	80	75	5	25	25	---
7/22/44	825	780	45	750	750	---	80	80	---	100	100	---	450	121	329	45	13	32	382	100	282	100	60	40	25	24	1
7/29/44	665	640	25	725	680	45	80	80	---	100	100	---	500	121	369	50	18	32	397	160	237	90	83	7	25	25	---
8/5/44	740	610	130	625	615	10	50	50	---	120	120	---	700	160	540	70	25	45	310	204	106	100	90	10	20	20	---
8/12/44	750	700	50	628	628	---	80	50	30	150	140	10	550	250	300	40	32	8	288	200	88	184	85	99	20	18	---

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CRITICAL CRAFTS

100-D AREA

PROJECT 9536

WEEK ENDING	LABORERS			CARPENTERS			REINF. RODSETTERS			RIGGERS			PIPEFITTERS			PIPE WELDERS			ELECTRICIANS			MILLWRIGHTS			MWT. WELDERS		
	NO. REQ	NO. ALLOC.	NO. SHORT	NO. REQ	NO. ALLOC.	NO. SHORT	NO. REQ	NO. ALLOC.	NO. SHORT	NO. REQ	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ	NO. ALLOC.	NO. SHORT	NO. REQ	NO. ALLOC.	NO. SHORT	NO. REQ	NO. ALLOC.	NO. SHORT	NO. REQ	NO. ALLOC.	NO. SHORT
8/19/44	750	700	50	557	557	---	80	62	18	150	150	---	750	388	362	70	43	27	295	292	3	184	151	33	20	20	---
8/26/44	750	650	100	550	500	50	80	70	10	150	150	---	750	542	208	70	56	14	291	291	---	150	150	---	25	25	---
9/2/44	600	600	---	400	400	---	70	70	---	100	100	---	750	750	---	70	70	---	275	275	---	110	110	---	15	15	---
9/9/44	600	600	---	340	340	---	70	70	---	135	135	---	800	750	50	78	78	---	250	250	---	110	100	10	15	15	---
9/16/44	1000	600	400	300	300	---	45	45	---	100	100	---	750	750	---	74	74	---	225	225	---	90	90	---	15	15	---
9/23/44	1000	900	100	250	225	25	35	35	---	75	75	---	850	850	---	85	65	20	225	225	---	90	90	---	10	10	---
9/30/44	600	600	---	280	280	---	25	25	---	75	75	---	850	736	114	85	70	15	270	225	45	90	80	10	10	10	---
10/7/44	450	450	---	250	250	---	20	20	---	75	75	---	750	716	34	75	74	1	225	225	---	80	80	---	10	10	---
10/14/44	512	650	+ 138	280	280	---	25	16	9	100	75	25	800	735	65	81	70	11	218	200	18	112	82	30	16	16	---
10/21/44	600	650	+ 50	400	380	20	11	11	---	80	80	---	1000	744	256	100	65	35	169	160	9	80	80	---	10	10	---
10/28/44	420	650	+ 200	316	316	---	20	20	---	100	99	1	800	765	35	81	71	10	192	160	32	97	82	15	16	16	---
11/4/44	600	600	---	400	400	---	16	16	---	80	75	15	1000	900	100	100	89	11	150	152	+ 2	80	78	2	10	10	---
11/11/44	500	423	77	300	300	---	6	8	+ 2	80	75	5	700	788	+ 88	70	70	---	150	143	7	60	60	---	3	3	---
11/18/44	300	290	10	225	225	---	4	8	+ 4	60	58	2	500	449	51	50	31	19	100	100	---	40	49	+ 9	3	3	---
11/25/44	250	206	44	125	125	---	1	1	---	50	45	5	250	261	+ 11	25	27	+ 2	150	130	20	60	50	10	5	5	---
12/2/44	125	120	5	45	45	---	1	1	---	30	30	---	75	140	+ 65	8	9	+ 1	65	50	15	60	45	15	5	5	---

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CRITICAL CRAFTS

100-B AREA

PROJECT 9536

WEEK ENDING	LABORERS			CARPENTERS			REINF. RODSETTERS			RIGGERS			PIPEFITTERS			PIPE WELDERS			ELECTRICIANS			MILLWRIGHTS			MWT. WELDERS		
	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT
12/19/43	576	500	76	144	154	+ 10	100	34	66	75	75	—	30	15	15	3	3	—	36	36	—	30	15	15	0	0	—
12/25/43	729	750	+ 21	670	670	—	114	104	10	70	70	—	30	30	—	3	3	—	35	35	—	40	20	20	5	5	—
1/2/44	900	800	100	1100	1100	—	200	104	96	75	75	—	70	55	15	5	3	2	80	50	30	40	35	5	5	5	—
1/9/44	900	900	—	1100	1060	40	200	100	100	75	75	—	70	70	—	5	5	—	80	50	30	40	40	—	5	5	—
1/16/44	1150	900	250	1200	1000	200	250	119	131	75	75	—	70	60	10	10	5	5	80	50	30	40	40	—	7	7	—
1/23/44	1450	666	784	1300	1000	300	300	100	200	75	70	5	125	96	29	15	9	6	120	50	70	40	40	—	9	9	—
1/30/44	1450	600	850	1450	984	466	340	100	240	75	72	3	125	125	—	15	7	8	120	86	34	40	40	—	9	9	—
2/6/44	1450	512	938	1550	1000	550	340	100	240	90	70	20	150	116	34	18	8	10	150	116	34	55	40	15	12	12	—
2/13/44	1450	587	863	1550	1000	550	340	140	200	95	75	20	200	174	26	30	8	22	200	93	107	80	40	40	18	18	—
2/20/44	1450	600	850	1550	1000	550	340	140	200	100	85	15	275	150	125	40	9	31	230	97	133	100	40	60	20	20	—
2/27/44	1000	600	400	1300	1000	300	250	140	110	112	112	—	325	190	135	45	12	33	265	127	138	125	40	85	25	25	—
3/5/44	1100	520	580	1300	1087	213	225	140	85	125	125	—	200	200	—	20	13	7	310	120	90	125	40	85	25	0	25
3/12/44	1100	500	600	1300	1100	200	160	140	20	125	125	—	200	200	—	25	14	11	175	115	60	75	55	20	20	20	—
3/19/44	1100	600	500	1280	1100	180	160	150	10	125	125	—	200	200	—	20	15	5	175	125	50	75	75	—	20	20	—
3/26/44	1100	625	475	1000	1000	—	100	100	—	125	125	—	240	258	+ 18	20	15	5	300	125	175	75	75	—	20	20	—
4/1/44	1080	800	280	900	900	—	100	100	—	110	110	—	250	250	—	30	30	—	300	100	200	75	75	—	20	20	—
4/8/44	900	700	200	800	800	—	75	75	—	100	100	—	275	275	—	35	32	3	330	125	205	90	75	15	20	20	—
4/15/44	800	650	150	700	700	—	58	58	—	100	100	—	300	300	—	40	40	—	330	140	190	95	95	—	20	20	—
4/22/44	700	526	174	500	500	—	50	50	—	100	100	—	325	325	—	45	40	5	350	130	220	105	86	19	20	20	—
4/29/44	700	600	100	400	400	—	40	40	—	125	125	—	350	350	—	45	22	23	375	197	178	125	98	27	20	20	—
5/6/44	700	600	100	300	300	—	30	30	—	125	125	—	350	350	—	75	27	48	375	197	178	125	98	27	20	20	—
5/13/44	700	600	100	300	300	—	25	25	—	125	125	—	350	350	—	75	32	43	375	219	156	125	98	27	20	20	—
5/20/44	500	500	—	275	275	—	20	20	—	125	125	—	350	350	—	75	39	36	375	212	163	125	98	27	20	20	—
5/27/44	500	500	—	275	275	—	20	20	—	125	125	—	300	300	—	35	35	—	375	209	166	100	100	—	20	20	—
6/3/44	450	450	—	275	275	—	20	20	—	125	125	—	350	350	—	45	40	5	375	206	169	100	100	—	20	20	—
6/10/44	400	480	+ 80	250	200	50	20	20	—	100	100	—	350	350	—	45	45	—	375	186	189	90	90	—	20	20	—
6/17/44	400	450	+ 50	200	180	20	15	15	—	100	100	—	375	350	25	40	40	—	375	225	150	85	85	—	20	20	—
6/24/44	350	450	+ 100	200	180	20	15	15	—	100	100	—	300	280	20	40	35	5	350	160	190	80	80	—	20	20	—
7/1/44	350	400	+ 50	125	125	—	10	10	—	100	95	5	375	254	121	40	35	5	200	160	40	80	80	—	20	20	—
7/8/44	350	350	—	125	125	—	10	8	2	75	75	—	350	302	48	40	38	2	200	155	45	100	100	—	20	20	—
7/15/44	250	250	—	125	125	—	5	5	—	65	65	—	250	250	—	40	38	2	200	150	50	80	80	—	20	20	—
7/22/44	300	300	—	150	150	—	5	5	—	55	55	—	250	294	+ 44	25	34	+ 9	150	150	—	70	70	—	15	15	—
7/29/44	250	230	20	150	130	20	5	5	—	55	55	—	260	260	—	30	30	—	140	140	—	65	63	2	15	15	—
8/5/44	200	200	—	75	75	—	3	3	—	20	20	—	150	150	—	15	15	—	100	100	—	20	20	—	6	6	—
8/12/44	150	150	—	50	50	—	0	0	—	15	15	—	75	75	—	5	5	—	50	50	—	20	20	—	3	3	—
8/19/44	100	100	—	16	16	—	0	0	—	5	5	—	25	25	—	1	1	—	25	25	—	5	5	—	1	1	—
8/26/44	150	150	—	15	15	—	0	0	—	5	5	—	25	25	—	3	3	—	15	15	—	5	5	—	1	1	—
9/2/44	0	0	—	0	0	—	0	0	—	0	0	—	0	0	—	0	0	—	0	0	—	0	0	—	0	0	—

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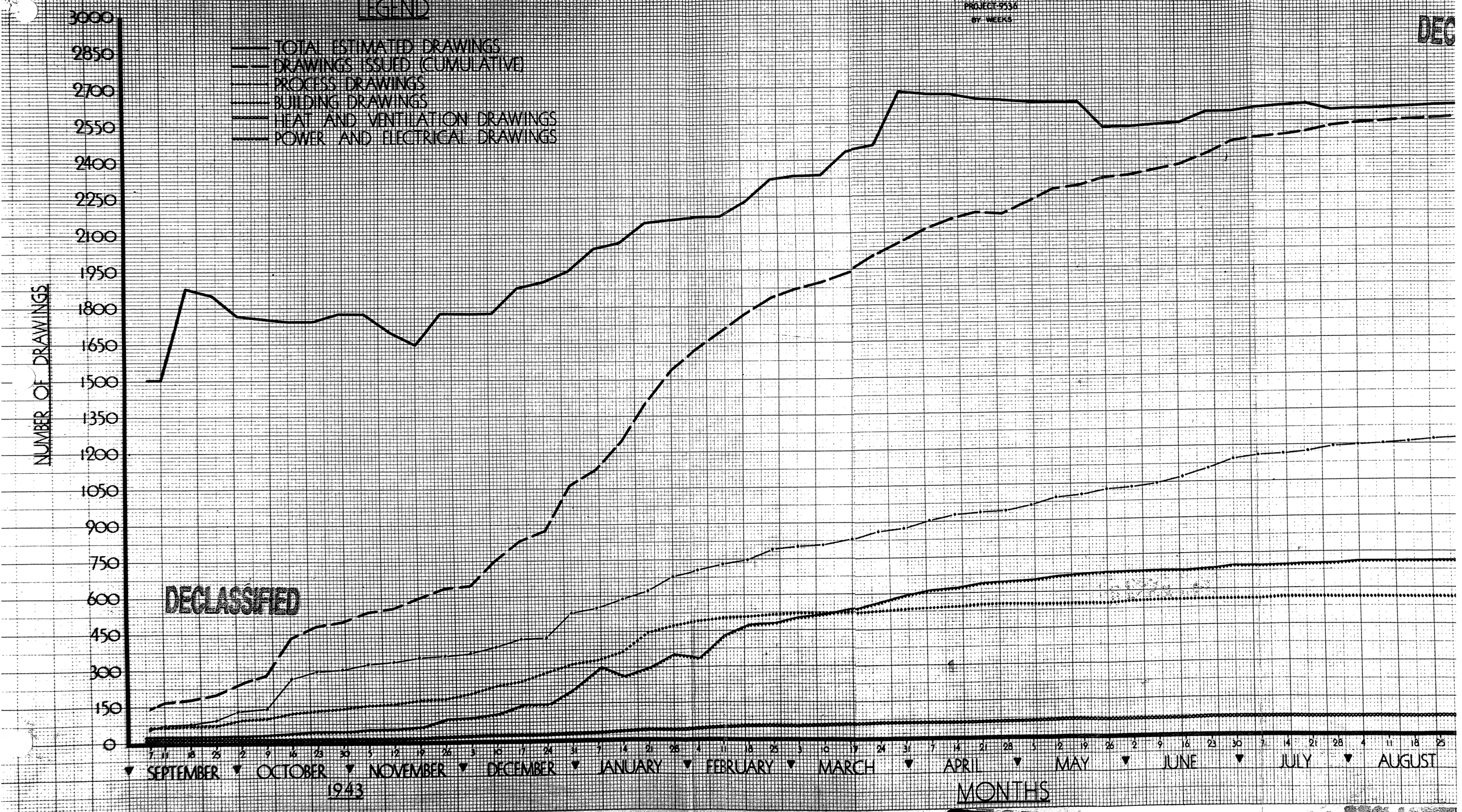
DESIGN STATUS

•100 AREA•

PROJECT-9536

BY WEEKS



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DESIGN STATUS

•100 AREA•

PROJECT-9536

BY WEEKS

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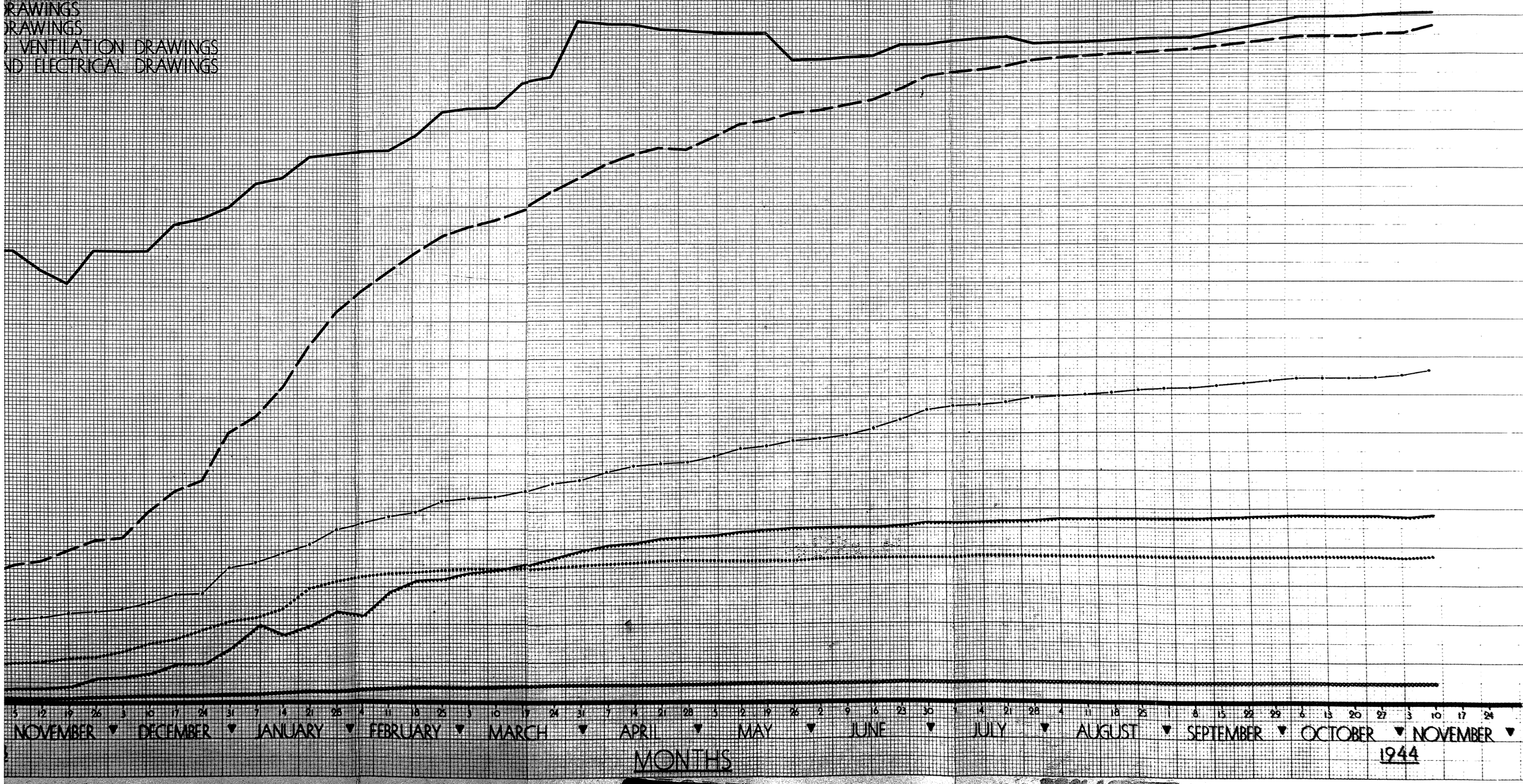
LEGEND

IMATED DRAWINGS
ISSUED (CUMULATIVE)
RAWINGS
RAWINGS
VENTILATION DRAWINGS
ND ELECTRICAL DRAWINGS



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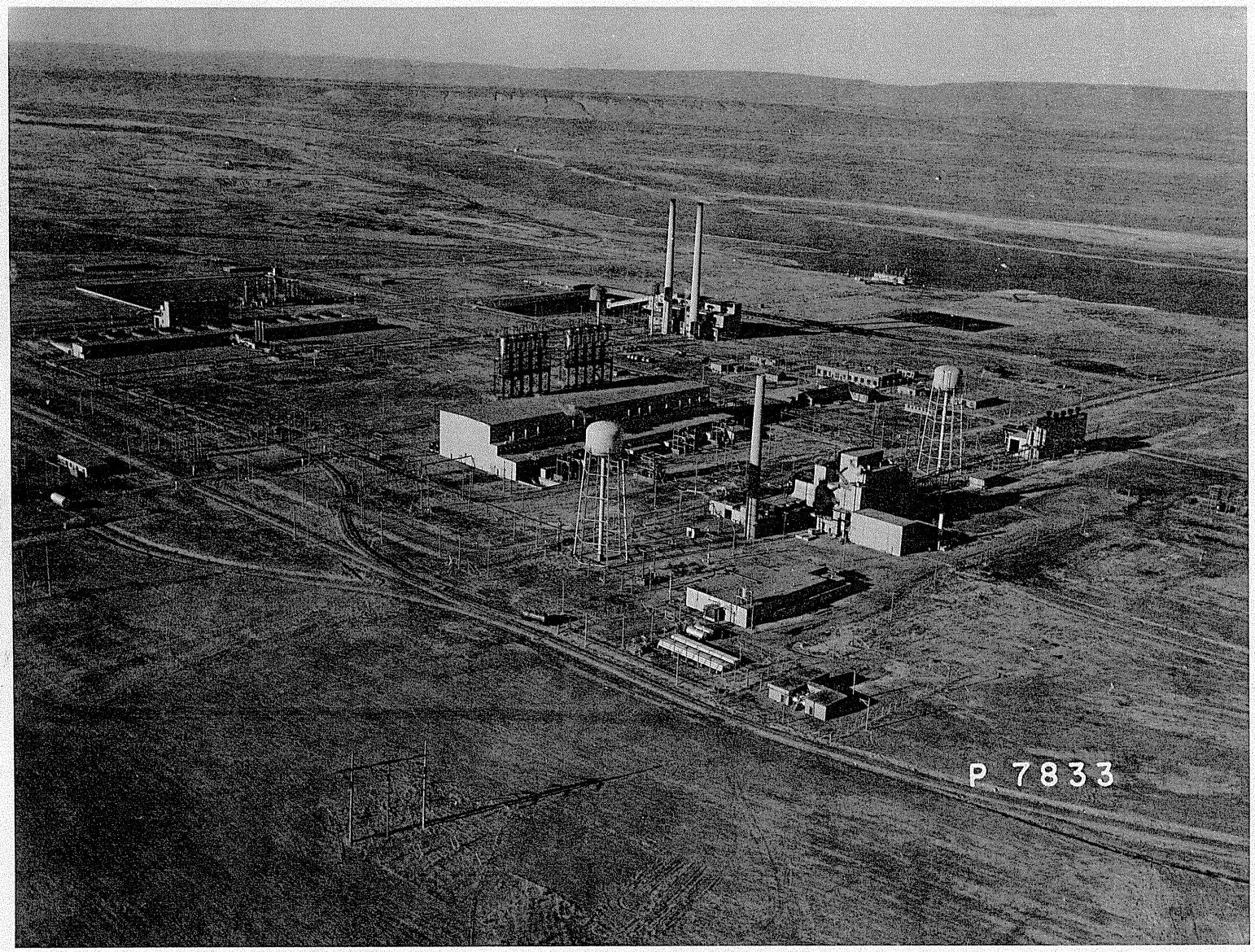

100 - B AREA
Aerial View Looking Northwest

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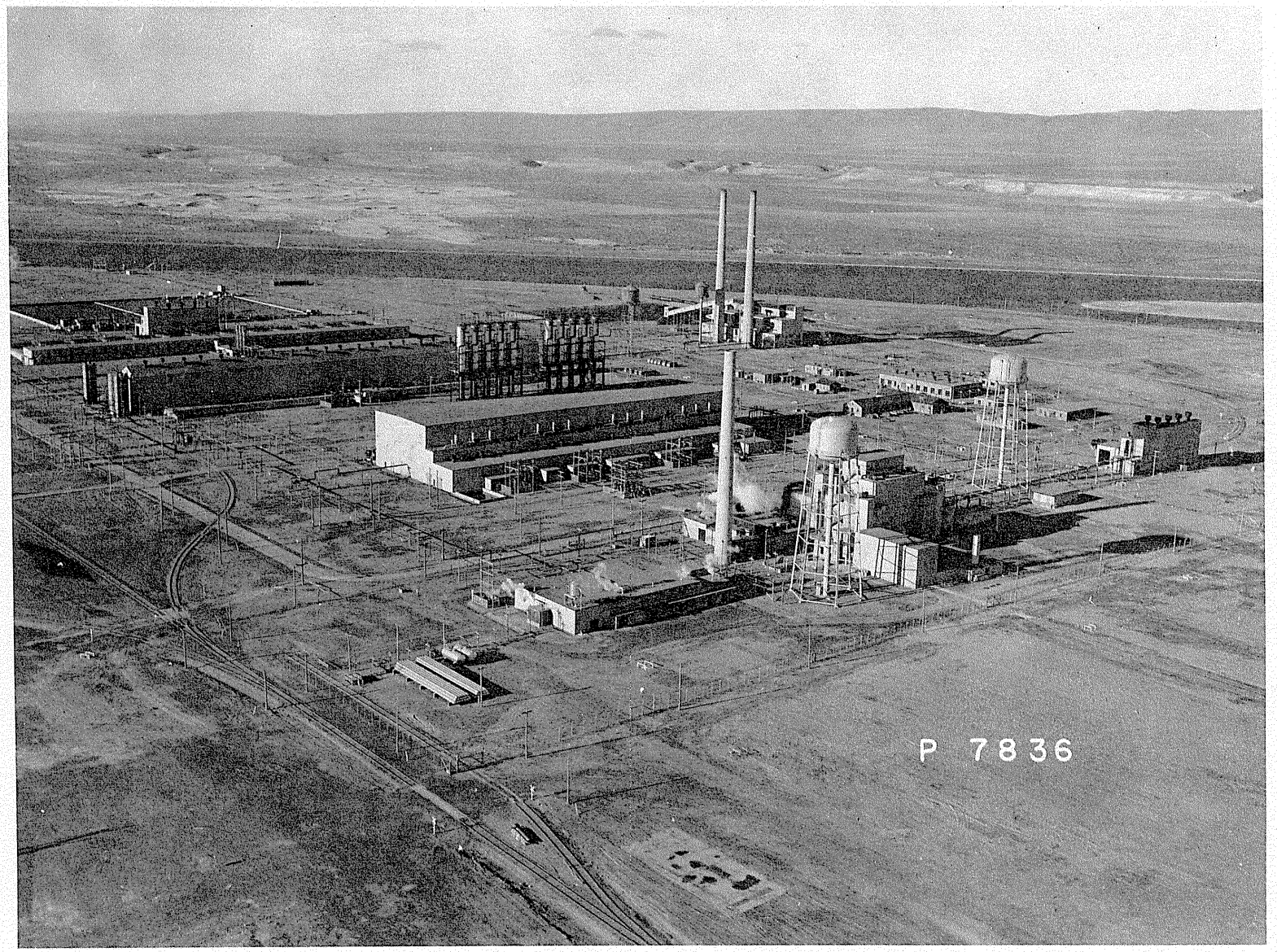

100-D AREA
Aerial View Looking Northwest

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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.

This building contains the following material quantities:

Material	Quantity
Framing	377 f.b.m.
5" Concrete Flooring	1,290 Sq. Ft.
Reinforcing Steel Bars	9 Tons
Reinforcing Steel Mesh	2,128 Sq. Ft.
Concrete	107 Cu. Yds.
Roofing Squares	14.4 Squares
Concrete Block	912 Blocks

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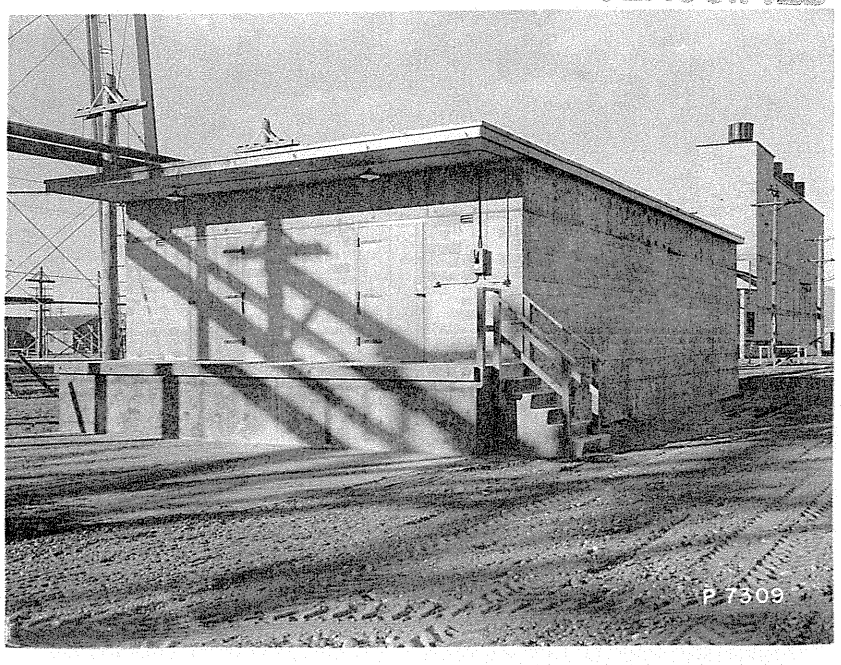

103-D - FRESH METAL STORAGE
Looking Northeast

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187-B2 - ELEVATED PROCESS WATER TANK
Looking Northeast

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107 RETENTION BASIN

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.

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The building houses the following equipment:

Number	Type	Size - Capacity - Power
2	Centrifugal Suction Pumps	2,000 GPM - 25 HP - 440 V. Electric Motors
1	Nash Hytor Vacuum Pump	22 c.f.m. - 3 HP - 440 V. Electric Motor
3	Water-Sample Pumps	3 GPM - 110 V. Electric Motor
2	Sluice Gates and Mechanism	48" x 48"
1	Lead Laboratory Test Table	3' x 6'

This building contains the following material quantities:

Material	Quantity
Framing	1,600 f.b.m.
Heavy Timber	21,000 f.b.m.
Siding	572 Sq. Ft.
Sheathing	1,232 Sq. Ft.
Reinforcing Steel Bars	117 Tons
Reinforcing Steel Mesh	64,000 Sq. Ft.
Concrete	6,111 Cu. Yds.
Roofing	6.6 Squares
Concrete Blocks	18,000 Blocks

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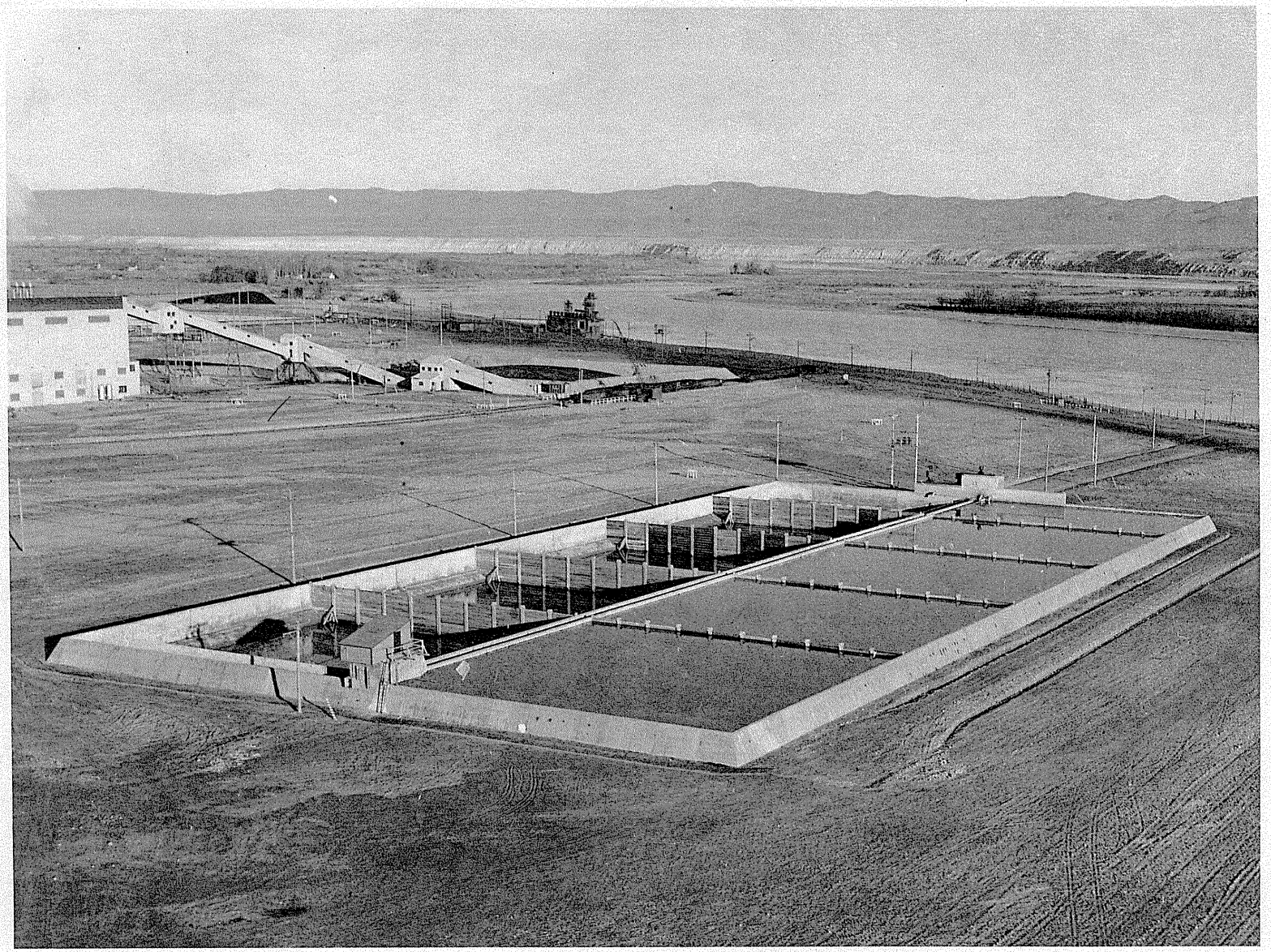

107-F - RETENTION BASIN
Aerial View Looking Northwest

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108 CHEMICAL PUMP HOUSE

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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'x32'x58'	4,816 Sq. Ft.	232,400 Cu. Ft.
Loading Platform and Car Spot	37'x31½'x30'	1,166 Sq. Ft.	34,980 Cu. Ft.

This building houses the following major equipment:

Ground Floor

Number	Type	Size - Capacity - Power
1	Lime Pump Head Tank	4' diam. x 4' high

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Ground Floor (continued)

Number	Type	Size - Capacity - Power
2	Lime Slurry Pumps	100 GPM - 10 HP - 440 V. Electric Motor
1	Solids Pump Head Tank	5' diam. x 5' high
3	Solids Transfer Pumps	125 GPM - 5 HP - 440 V. Electric Motor
1	Solids Mixing Tank	5' diam. x 5' high
1	Oxalic Acid Mixing Tank	8' diam. x 7' high
2	Oxalic Acid Pumps	20 GPM - 15 HP - 440 V. Electric Motor
2	Sodium Dichromate Transfer Pumps	100 GPM - 10 HP - 440 V. Electric Motor
2	Sodium Silicate Solution Pumps	100 GPM - 10 HP - 440 V. Electric Motor
1	Air Compressor & Receiver	185 c.f.m. - 40 HP - 440 V. Elec. Motor
1	Buffalo Forge Fan	18,000 c.f.m. - 7½ HP - 440 V. Electric Motor
1	Hot Water Tank	4' diam. x 6' long

Chemical Floor

1	Solids Feed Hopper	5½' x 5' x 11'
1	Solids Settling Tank	10' diam. x 6' high
1	Solids Gravimetric Feeder	2½' x 2' x 5' - 25 to 700 lbs./hour
3	Lime Feed Hoppers	5½' x 5' x 11'
3	Lime Gravimetric Feeders	2½' x 2' x 5' - 25 to 700 lbs./hour
2	Sodium Silicate Mixing Tanks	10' diam. x 6' high
2	Disp. Agent Mixing Tanks	2½' x 3' high

Chemical Storage Floor

3	Lime Storage Bins	9½' diam. x 15' high
1	Sodium Silicate Head Tank	5' diam. x 15' long
1	Sodium Dichromate Mixing Tank	5½' diam. x 5' high

Material Handling Equipment

1	Track and Car Hopper	14' x 6'
1	Redler Conveyor System	7" to 9" - 7½ to 10 tons per hour
1	Bag and Barrel Elevator	200 Bags or Bbls. per hour - 3 HP - 440 V. Electric Motor
1	Car Unloader Power Shovel	3 HP - 440 V. Electric Motor
2	Barrel Handling Trucks	7' high - 500 lbs.

Outside

2	H_2SO_4 Elevated Storage Tanks	9' diam. x 36' long
2	LaBour H_2SO_4 Unloading Pumps	50 GPM - 10 HP - 440 V. Electric Motor

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Outside (continued)

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Number	Type	Size - Capacity - Power
2	Sodium Silicate Storage Tanks	20' diam. x 15' high - 40,000 Gals.
2	Sodium Silicate Unloading Pumps	50 GPM - 10 HP - 440 V. Elec. Motor

This building contains the following material quantities:

Material	Quantity
Structural Steel	47 Tons
Reinforcing Steel Bars	59 Tons
Reinforcing Steel Mesh	6,000 Sq. Ft.
Concrete	337 Cu. Yds.
Concrete Blocks	15,135 Blocks

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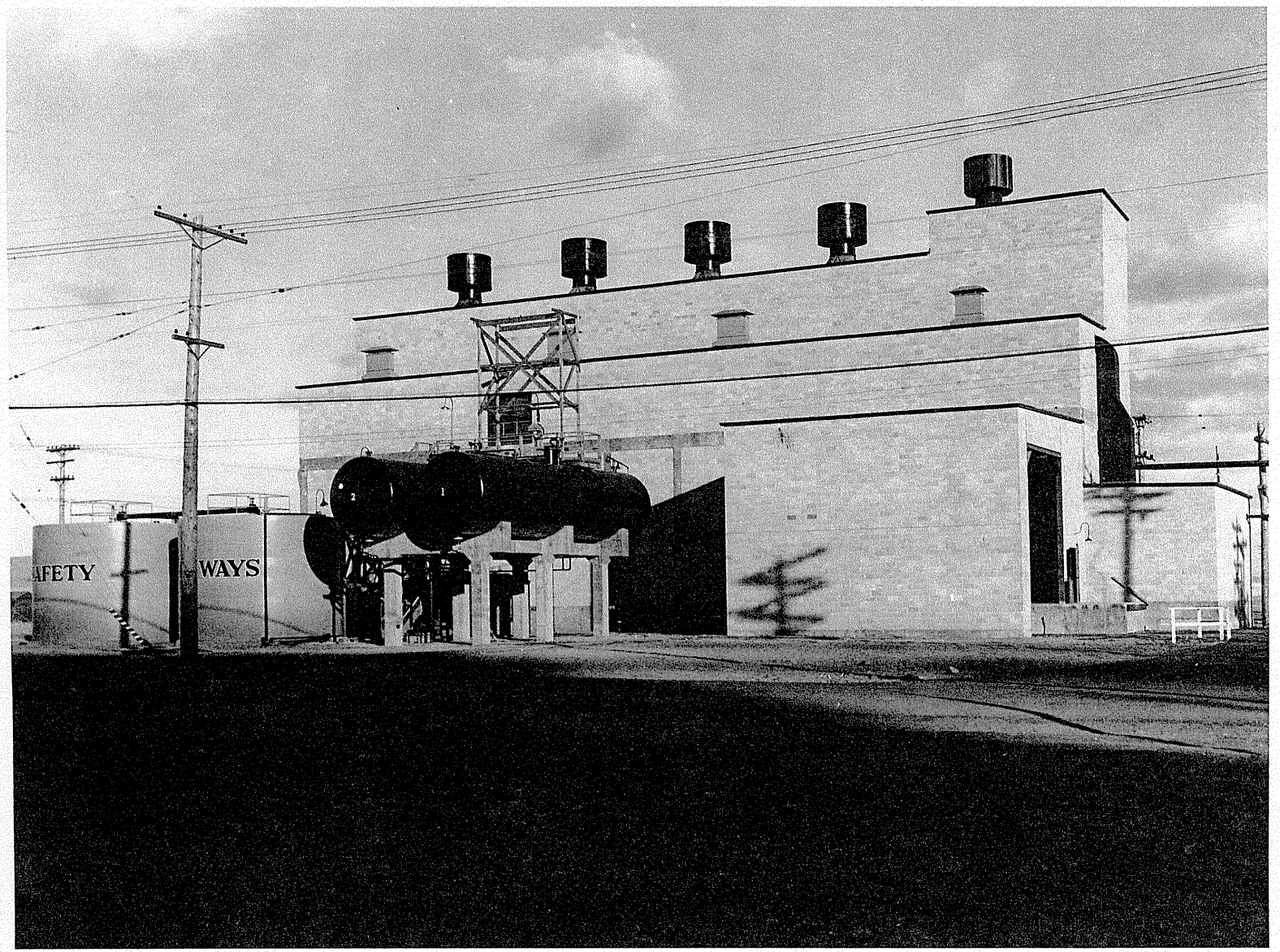

108-D - CHEMICAL PUMP HOUSE
Looking Northeast

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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.

This Tank Farm consists of the following equipment:

Number	Type	Size - Capacity - Power
2	Low Pressure Storage Tanks	8' diam. x 20' long - 1,000 Cu.Ft. - 50 psi. pressure
33	High Pressure Storage Tanks	2' diam. x 80' long - 250 Cu. Ft. - 700 psi. pressure

Material	Quantity
Concrete	54.4 Cu. Yds.

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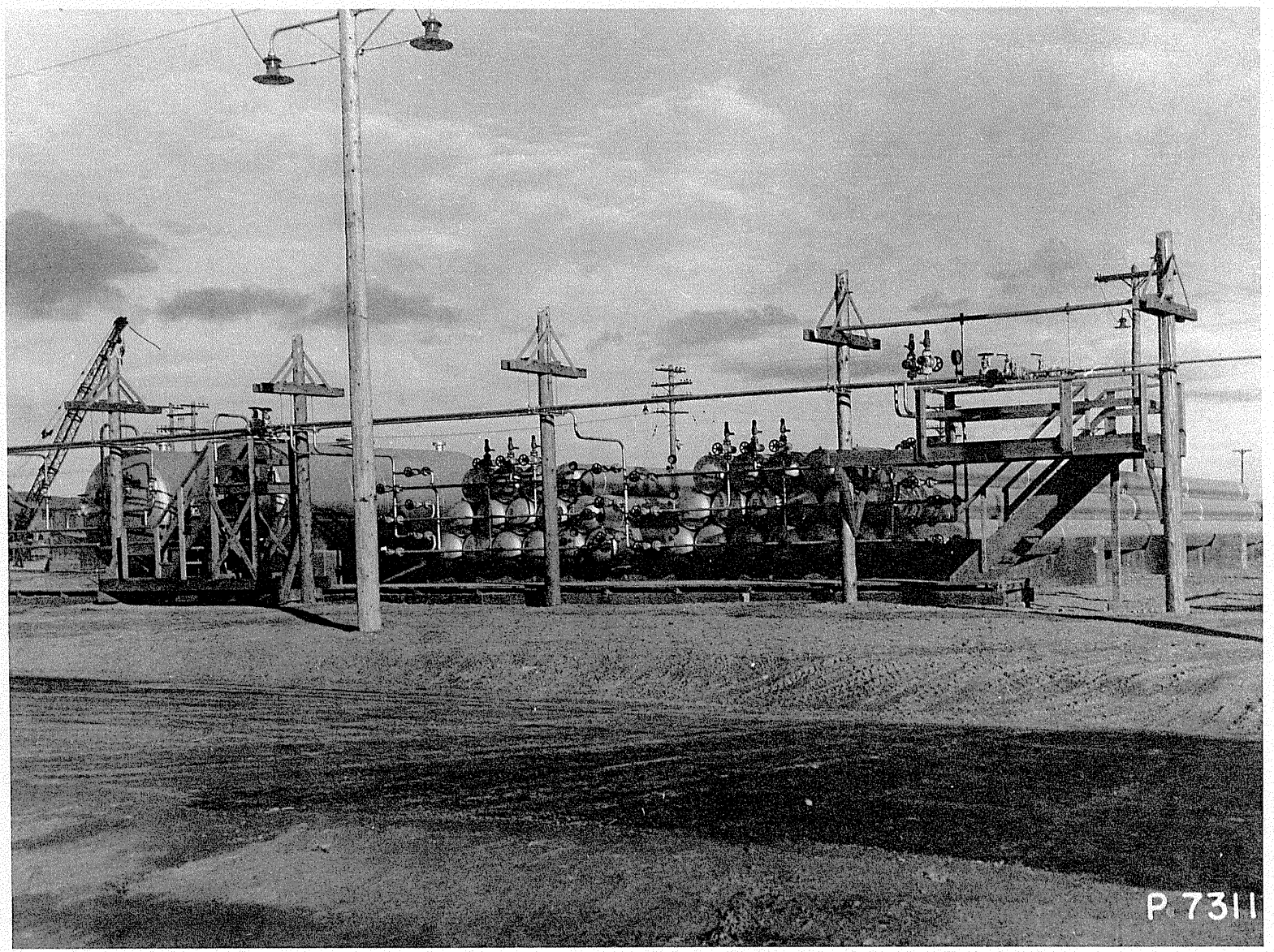

110-D - GAS STORAGE TANKS
Looking Northeast

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111 TEST BUILDING

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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 foundations 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.

The following are the materials required for this building:

Material	Quantity
Framing	6,752 f.b.m.
Siding	3,848 Sq. Ft.
4" Concrete Flooring	800 Sq. Ft.
Sheathing	5,929 Sq. Ft.
Reinforcing Steel Bars	0.2 Tons
Reinforcing Steel Mesh	800 Sq. Ft.
Concrete	72 Cu. Yds.
Roofing (Built-up)	21 Squares

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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.

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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.

This building houses the following major equipment:

Number	Type	Size - Capacity - Power
2	Main Blowers	1800 CFM - 15 HP - Steam Turbine
2	Main Gas Coolers	1800 CFM - from 212°F to 85°F
3	Silica Gel Absorptive Drying Systems	1800 CFM
3	Blowers for Drying System	1800 CFM - 15 HP - Steam Turbine
2	Purification Compressors	3 Stage - 118 CFM at 690 RPM - 60 HP - 440 V - Electric Motors
2	Refrigeration Units	9120 BTU/Hr. - 2 HP - 440 V. Elec. Motor
2	Vacuum Pumps	225 CFM - 5 HP - 440 V. Electric Motors
2	Purge Blowers	200 CFM - 3 HP - 440 V. Electric Motors
1	Air Compressor & Receiver	30" diam. x 7' - 100 CFM at 80 psi - 25 HP - 440 V. Electric Motor
1	Air Compressor	100 CFM at 80 psi - 25 HP - Steam Turbine
2	Gas Sample Blowers & Pumps	2 CFM - 1 HP - 440 V. Electric Motors
1	Ventilation Supply Fan and Heater	50,000 CFM - 60 HP - 440 V. Elec. Motor
1	Ventilation Supply Fan and Heater	50,000 CFM - Turbine Drive
1	Pressure Seal Tank	6' diam. x 14' long
1	Vacuum Seal Tank	6' diam. x 14' long
5	Oil Storage Tanks and Separators	16" diam. x 5' long
1	Steel Water Storage Tank	8' diam. x 10' high
8	Coolers	20" diam. x 4' to 6' long

The building contains the following material quantities:

Material	Quantity
Structural Steel	20.6 Tons
Reinforcing Steel Bars	250 Tons
Reinforcing Steel Mesh	11,000 Sq. Ft.
Concrete	5,006 Cu. Yds.
Roofing (Built-up)	148.1 Squares
Concrete Blocks	31,000 Blocks
Blanket Insulation	2,081 Sq. Ft.

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115-F - PURIFICATION BUILDING
Looking Southeast

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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 the 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.

The following equipment is included in the fenced area and Switch House:

Fenced Area

Number 151-B	151-D	151-F	Type	Size - Capacity - Power
1	2	--	Transformers	20,000 KVA - 230,000 V/13,800 V - 60 Cycle - 3 Phase
1	--	2	Transformers	15,000 KVA - 230,000 V/13,800 V - 60 Cycle - 3 Phase
2	2	2	Transformer Grounding	13,800 Volts - 60 Cycle - 3 Phase
3	3	3	Oil Circuit Breakers	800 Amp. - 230/196 KV
2	2	2	Air Break Switches Grounding	196 KV - 1200 Amp.
6	6	6	Air Break Switches	196 KV - 1200 Amp.

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Switch House

Number			Type
151-B	151-D	151-F	
2 Sets	2 Sets	2 Sets	Switch Gear

This building contains the following material quantities:

Material	Quantities
Concrete	1,935 Cu. Yds.
Structural Steel	5.5 Tons
Reinforcing Steel Bars	23 Tons
Reinforcing Steel Mesh	1,660 Sq. Ft.
Roofing (Built-up)	244.9 Squares
Concrete Block (8"x8"x16")	2,510 Blocks
Concrete Block (8"x4"x16")	338 Blocks

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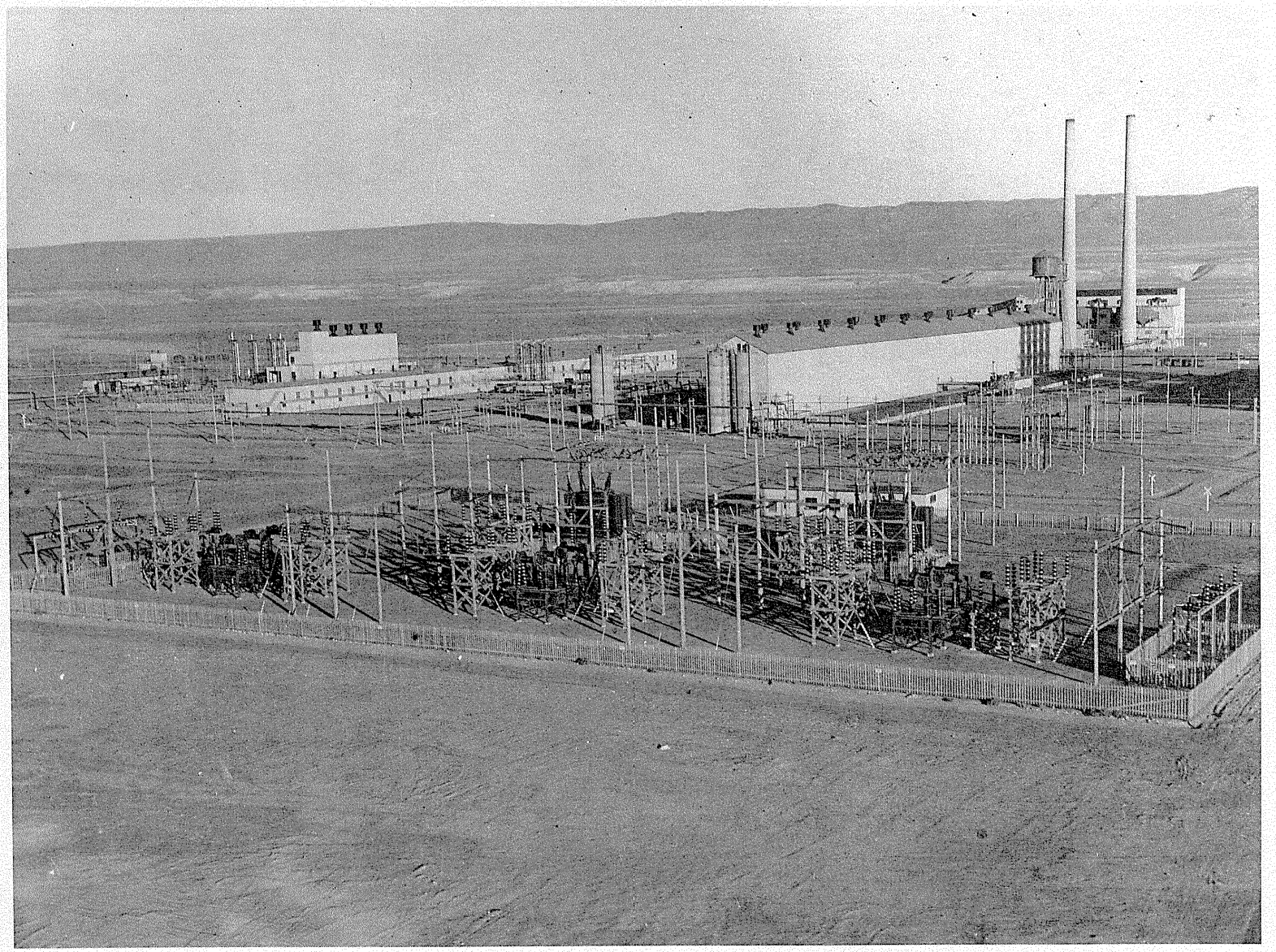

151-D - PRIMARY SUBSTATION
Aerial View Looking Northwest

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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 Substations 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.

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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	183	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.

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153 SUBSTATIONS 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.

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181 RIVER PUMP HOUSE

A River Pump House is provided in each of the three 100-Areas. 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:

	181-B	181-D	181-F
First Section			
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 GPM	152,500 GPM	132,500 GPM

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

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

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	181-B	181-D	181-F
Second Section			
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 GPM	7,500 GPM	27,500 GPM

Outside wooden stairways 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. They 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.

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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 and 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:

	Dimensions	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.

This building houses the following pieces of major equipment:

Number 181-B	Number 181-D	Number 181-F	Type	Size - Capacity - Power
7	13	11	Electric-Driven Pumps	10,000 GPM - 450 HP - 2200 V. Electric Motors
3	3	3	Steam-Driven Pumps	2-Stage - 7,500 GPM - 400 HP - Steam Turbine with 3 to 1 Speed Reducers
3	3	3	Barometric Condensers and Ejectors	30" diam. by 11 ft. in height
2	2	2	Hoists for Pumps	10 Ton
4	6	6	Hoists for Screens	10 Ton
2	3	3	Traveling Screens	60 ft. between centers, 12 ft. wide - 60,000 GPM - 7½ HP - 440 V. Electric Motors

These buildings contain the following material quantities:

Material	Quantities 181-B	181-D	181-F
Structural Steel - Tons	25	31	31
Reinforcing - Tons	254	293	293
Concrete - Cu. Yds.	3,465	4,330	4,580
Concrete Blocks - No.	6,336	7,700	7,700
Roofing - Squares	47	[illegible]	[illegible]

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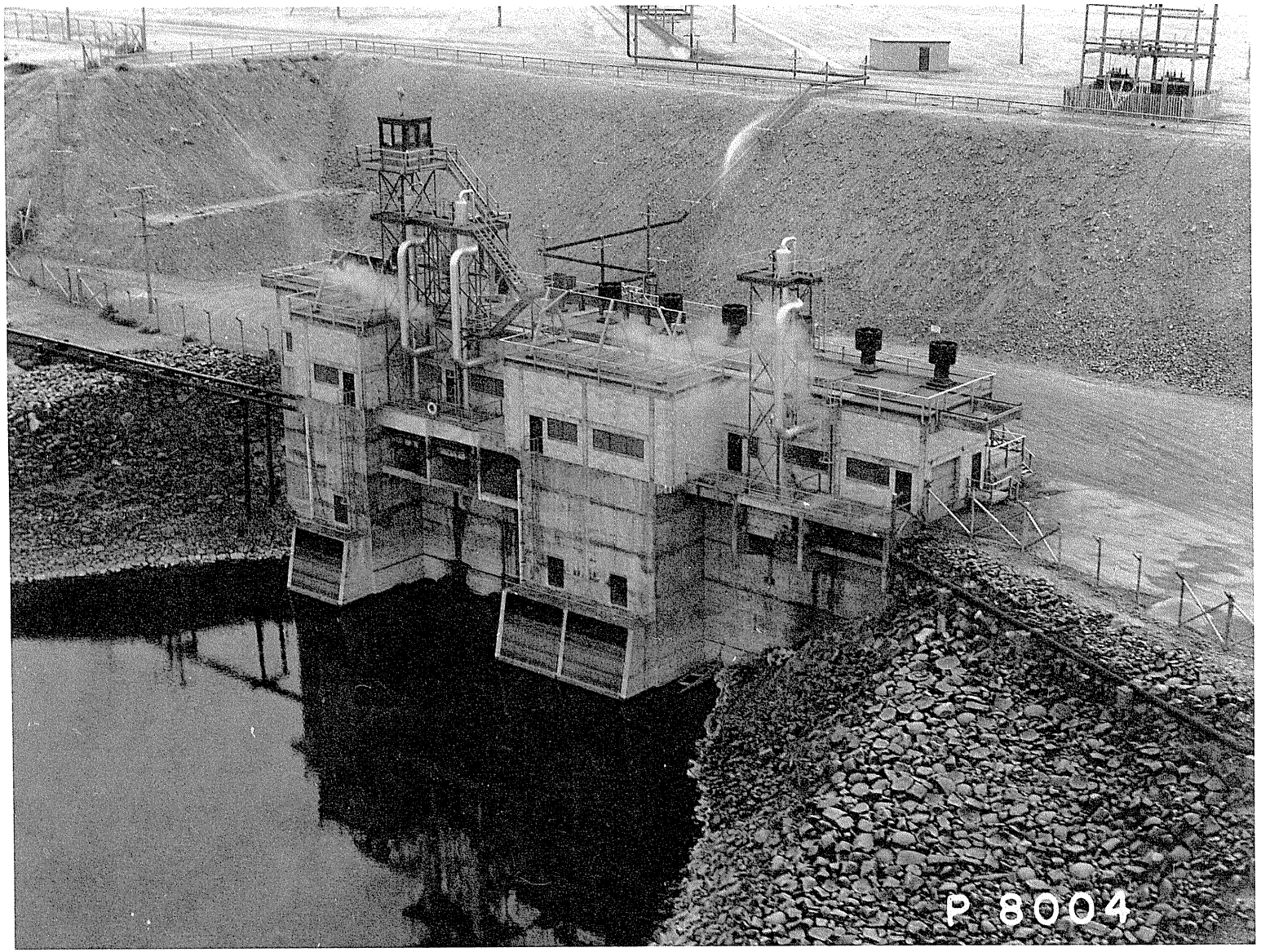

181-D RIVER PUMP HOUSE
Aerial View Looking South

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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 a 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 pumps 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.

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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. from 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 pumps 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 precast 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.

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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.

This building houses the following pieces of major equipment:

Number 182-B Bldg.	182-D Bldg.	182-F Bldg.	Type	Size - Capacity - Power
3	3	3	Reservoir Pumps - Turbine Driven	4,000 GPM - 350 HP - 2,250 RPM Turbines
3	3	3	Condenser Pumps - Turbine Driven	1,000 GPM - 450 HP - 1,200 RPM Turbines
1	1	1	Condenser Pump - Motor Driven	10,000 GPM - 400 HP - 2,200 V. Elec. Motor
1	1	1	Export Pump - Turbine and Reduction Gear Drive	6,000 GPM - 1000 HP - 5000/1780 RPM Turbine
2	2	2	Export Pumps - Motor Driven	6,000 GPM - 1000 HP - 2200 V. Elec. Motors
2	2	-	Export Pumps - Motor Driven	3,000 GPM - 450 HP - 2200 V. Elec. Motors
7	8	7	Reservoir Pumps - Motor Driven	6,000 GPM - 200 HP - 2200 V. Elec. Motors
6	6	6	Barometric Condensers	30" diam. by 11' high
1	1	1	Barometric Condenser	42" diam. by 14' high
7	7	7	Sluice Gates	48" x 48"
1	1	1	Compressed Air Receiver	4' x 12'
1	1	1	Motor-Driven Air Compressor	111 c.f.m. at 100# p.s.i.
1	1	1	Steam-Driven Air Compressor	75 c.f.m. at 100# p.s.i.
3	3	3	Hoists and Monorail Trolleys	6 Tons each

This building contains the following material quantities:

Material	Quantity
Structural Steel	90 Tons
Reinforcing Steel Bars	350 Tons
Reinforcing Steel Mesh	253,568 Sq. Ft.
Concrete	15,546 Cu. Yds.
Concrete Blocks	3,624 Blocks
Roofing	194 Squares

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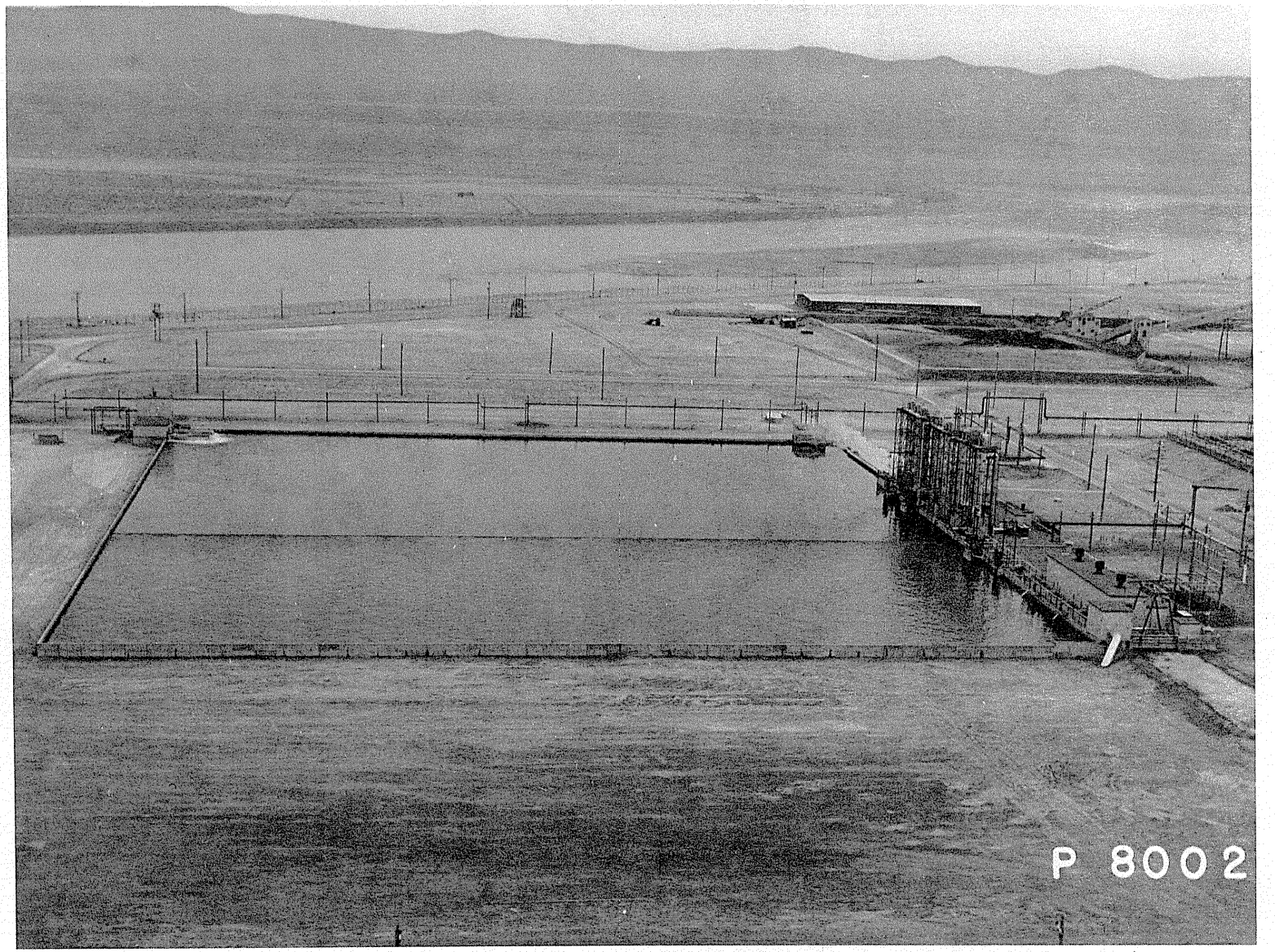

182-D RESERVOIR AND PUMP HOUSE
Aerial View Looking North

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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

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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 183-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.

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The Head House and Chemical Building contains the following pieces of major equipment:

Number	Type	Size - Capacity - Power
4	Storage Bins (Hydrated Lime)	625 cubic feet
4	Storage Bins (Ferrisul)	625 cubic feet
4	Feeders (Dry feed - proportional control) Lime	5 lbs. to 425 lbs. per hour
4	Feeders (Dry feed - proportional control) Ferrisul	5 lbs. to 425 lbs. per hour
3	Feeders (Dry feed) Activated Carbon	5 lbs. to 425 lbs. per hour
3	Chlorinators	Each Chlorinator treats 33,000 GPM with 3 to 4 PPM
4	Mechanical Mixers	4 Speed - Vertical - 5 HP - 440 V. Electric Motors
1	Traveling Crane	5 Ton - 6 HP - 440 V. Elec. Motor
1	Power Shovel	Hand-operated - 3 HP - 440 V. Electric Motor
1	Bag and Barrel Elevator	200 Bags or Barrels per hour - 3 HP - 440 V. Electric Motor
1	Storage Conveyor	7-1/2 Tons per hour - 5 HP - 440 V. Electric Motor
1	Underground Conveyor	7-1/2 Tons per hours - 2 HP - 440 V. Electric Motor
1	Chemical Elevator	7-1/2 Tons per hour - 7½ HP - 440 V. Electric Motor

Flocculation and Subsidence Basins

12	Flocculators	Two Paddle Wheel - 3 HP - 440 V. Electric Motor

Filter Building

24	Half Filter Units (26 Units - 100-D only)	24' x 24' - 1,500 GPM

Pump Room and Electrical Room

2	Pumps (Filtered Water Backwash)	11,000 GPM - 200 HP - 2200 V. Electric Motors
4	Pumps (Filtered Water to Process) (5 Pumps - 100-D only)	10,000 GPM - 700 HP - 2200 V. Electric Motors
3	Pumps (Emergency Process Water to Building 105)	4,000 GPM - 350 HP - Steam Turbines
1	Pump (Filtered Water to Bldg. 184)	1,000 GPM - 60 HP - Non-Cond. Steam Turbine
2	Pumps (Sanitary Water)	600 GPM - 50 HP - Non-Cond. Steam Turbine
2	Pumps (Sanitary Water)	300 GPM - 20 HP - 440 V. Electric Motors
3	Barometric Condensers	30" diam. by 11 ft. in height
1	Monorail and Hoist	6 Tons

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Transformers

Number	Type	Size - Capacity - Power
3	Transformers	75 KVA - 2400/480 Volts
1	Transformer	75 KVA - 2400/240/120 Volts
3	Transformers	50 KVA - 2400/480 Volts
1	Transformer	37½ KVA - 2400/240/120 Volts
1	Transformer (Emergency Lighting)	15 KVA - 2400/240/120 Volts

The building contains the following material quantities:

Material	Quantity
Structural Steel	153 Tons
Reinforcing Steel Bars	1,030 Tons
Reinforcing Steel Mesh	11,400 Sq. Ft.
Concrete	33,312 Cu. Yds.
Concrete Blocks	20,500 Blocks

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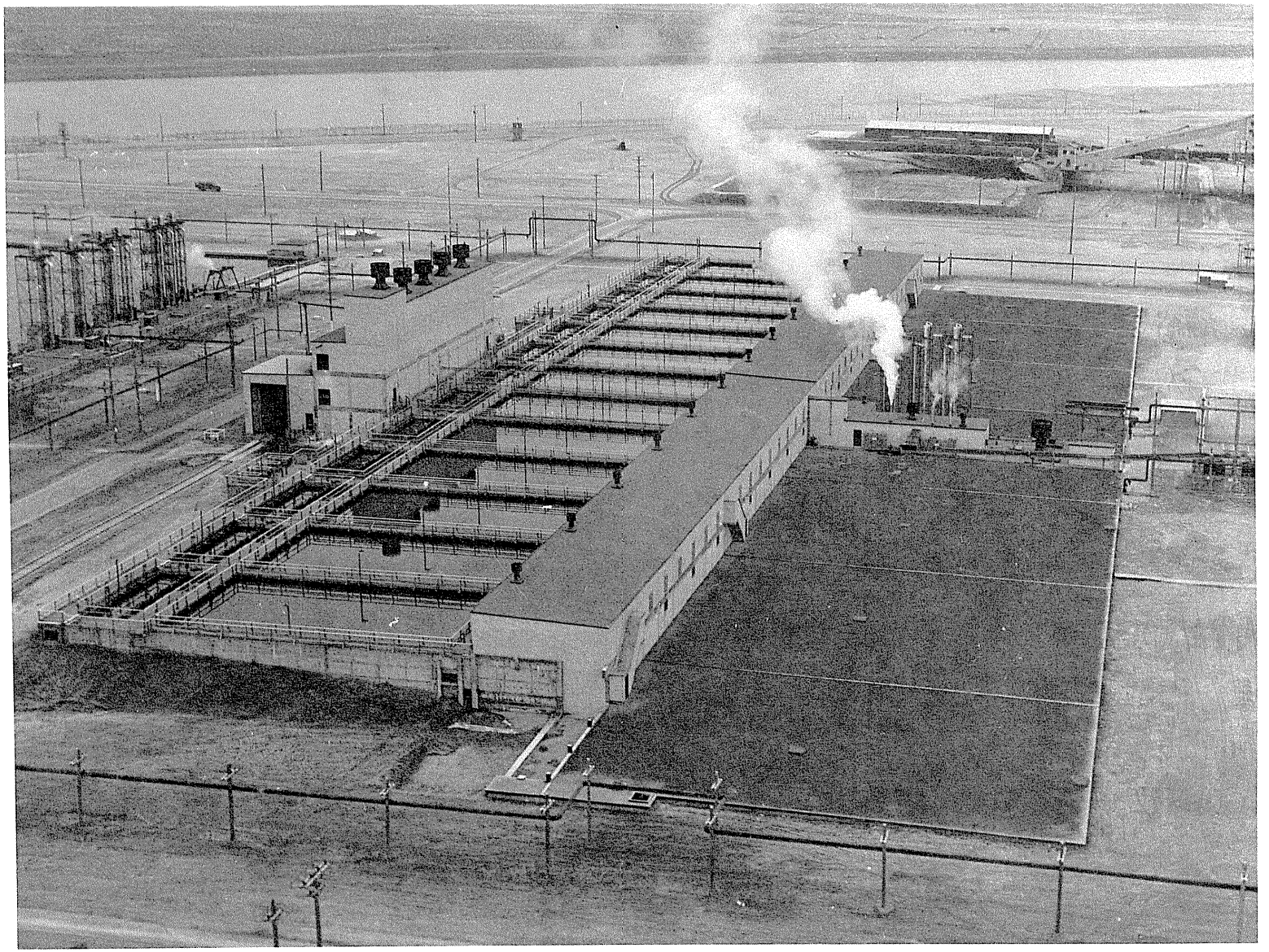

183-D FILTER PLANT
Aerial View
Looking Northwest

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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 in 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

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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.

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This building contains the following pieces of major equipment:

Number	Type	Size - Capacity - Power
4	Steam Boilers (5 Sections)	100,000 lbs./hr. - 225 lbs. steam pressure
4	Boiler Feed Pumps	300 GPM - Back pressure steam turbines
4	Coal Bunkers	260 Tons
4	Forced Draft Fans	45,000 c.f.m. Steam Turbine
4	Coal Stokers	250 r.p.m. - 11 tons/hr. - dual turbine drive
3	Zeo-lite Water Softeners	10' diam. x 9' height
1	Steam Turbine Generator	750 KW - 2300 V Non-condensing
1	Deaerator	9½' diam. x 16' height - 450,000 lbs./hr.
2	Air Receivers	4' diam. x 12' height
1	Motor-Driven Air Compressor	111 c.f.m. at 100# p.s.i. - 25 HP - 440 V. Electric Motor
1	Steam-Driven Air Compressor	75 c.f.m. at 100# p.s.i.
2	Sodium Sulphite Pumps	10 gals./hr. at 100 p.s.i. - 1/4 HP - 110 V. Electric Motors
4	Tri-Sodium Phosphate Pumps	4 gals./hr. at 300 p.s.i. - 1/4 HP - 110 V. Electric Motors
2	Soot Blowers	3600 c.f.m. at 14½ lbs.
2	Ash Pumps	400 GPM - 50 HP - 2200 V. Elec. Motors
2	Sluice Water Pumps	1400 gals./min. - 75 HP - 2200 V. Electric Motors
1	Coal Flight Conveyor	15 tons/hr.
1	Coal Handling System	150 tons/hr. - 15 HP - 440 V. Electric Motor
1	Coal Belt Tripper	24" Belt - 30' per min. - 150 ton/hr.
2	Coal Crushers	75 tons/hr. - 50 HP - 440 V. Electric Motors
2	Brine Pumps	25 GPM - 1 HP - 440 V. Elec. Motors
3	Transformers	100 KVA - 2400/480 Volts
1	Transformer	50 KVA - 2400/240/120 Volts
1	Trolley and Hoist	1/4 Ton

This building contains the following material quantities:

Material	Quantity
Structural Steel	625 Tons
Reinforcing Steel Bars	113 Tons
Concrete	32,096 Cu. Yds.
Concrete Blocks - 8"x8"x16"	29,000 Blocks
Transite Siding	16,800 Sq. Ft.
Concrete Bricks	20,000 Bricks

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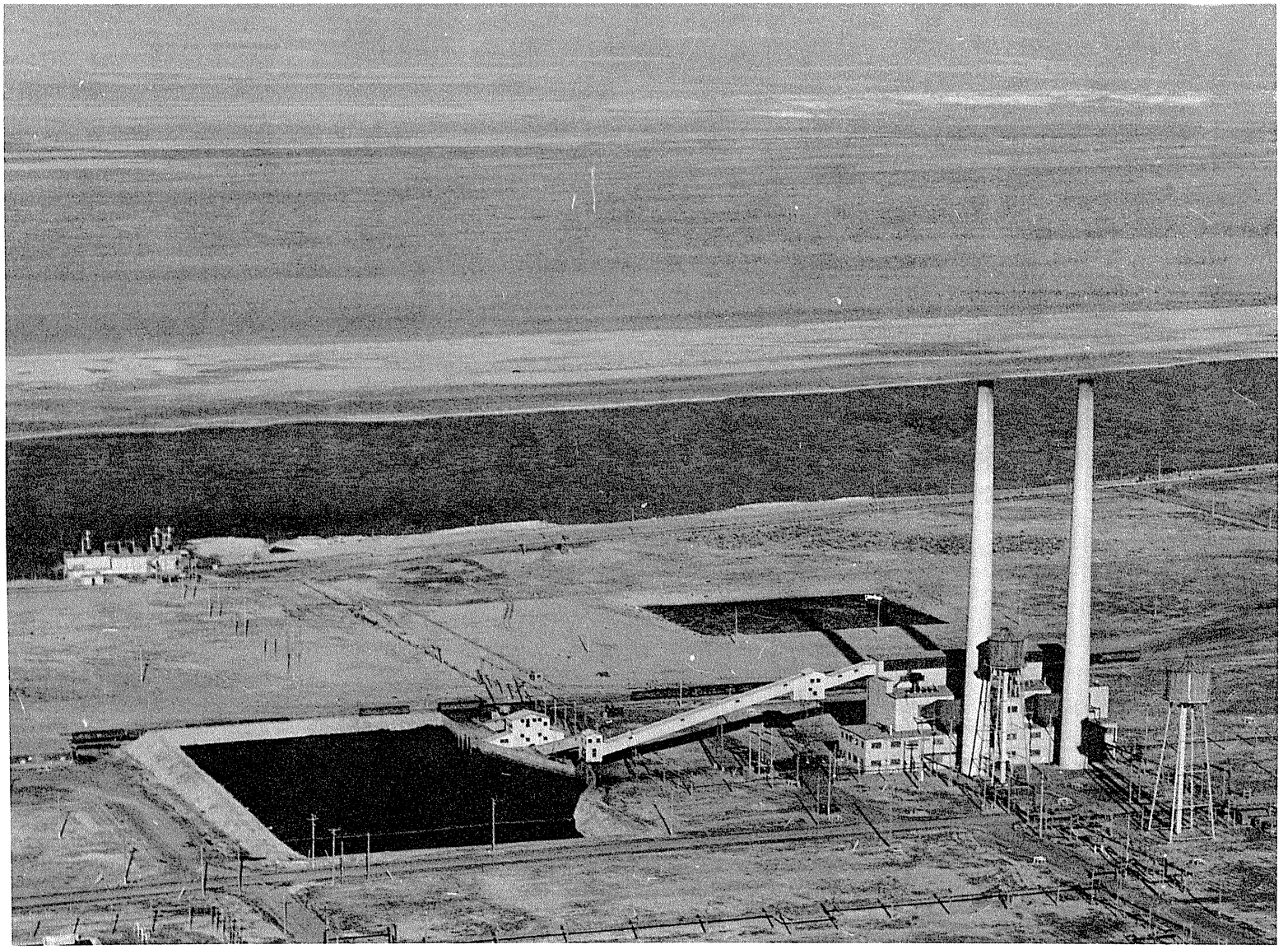

184-B - POWER HOUSE
Aerial View Looking Northeast

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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 an 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.

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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.

This building contains the following pieces of major equipment:

Number	Type	Size - Capacity - Power
10	Deaerators - 4-stage	11' diam. by 56½' height - 3000 GPM
20	Acid Dilution Tank Pumps	10 GPM - 1/4 HP - 110 V. Elec. Motors
2	Sodium Dichromate Storage Tanks	5½' diam. x 8' high
2	Sodium Silicate Storage Tanks	8' diam. x 9' high
10	Sodium Silicate Pumps	100 GPM - 10 HP - 440 V. Elec. Motors
2	Strong Acid Storage Tanks	10' diam. x 35' long - 20,000 Gals.
2	Acid Unloading Pumps	100 GPM - 10 HP - 440 V. Elec. Motors
2	Tank Transfer Pumps	50 GPM at 76' head - 7½ HP - 440 V. Electric Motors
1	Centrifugal Pump	50 GPM - 7½ HP - 440 V. Elec. Motor
1	Proportioner Chemical Mixing Tank	1000 Gals.
1	Recirculating Pump	220 GPM at 11' head - 1 HP - 440 V. Electric Motor
1	Proportioner Food Tank	1000 Gals.
10	Chemical Pumps	1 to 10 GPH - 1/6 HP - 110 V. Electric Motors
1	Transfer Monorail and Hoist	1/2 Ton

This building contains the following material quantities:

Material	Quantity
Structural Steel	500 Tons
Reinforcing Steel Bars	22 Tons
Reinforcing Steel Mesh	10,000 Sq. Ft.
Concrete	936 Cu. Yds.
Concrete Blocks	18,000 Blocks
Roofing	145 Squares

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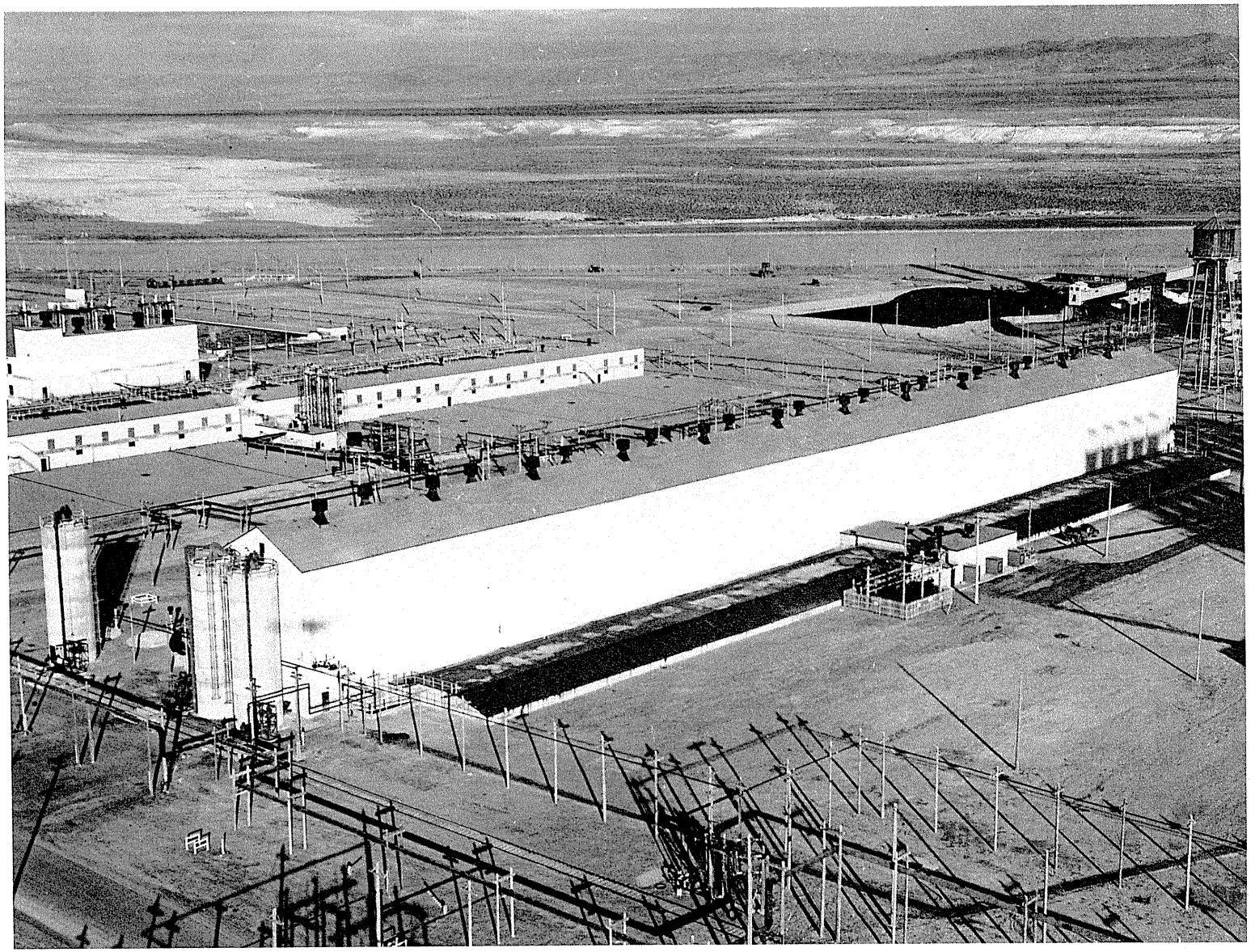

186-D - DEMINERALIZING PLANT
Aerial View Looking Northwest

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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 precast concrete tile slabs. The main axis of the building extends in a north-south direction, paralleling the 189 - 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

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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 gound 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 precast 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.

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This building contains the following pieces of major equipment:

Demineralizing Plant

Number	Type	Size - Capacity - Power
24	Zeo-Karb Tanks	24' diam. x 14' high - 3" fir
4	Acid Reclaiming Tanks	18" diam. x 20' high - 3" fir
2	Soda Reclaiming Tanks	12' diam. x 20' high - lined steel
4	Dilute Acid Tanks	4' diam. x 3' high - lined steel
12	Deacidite Tanks	24' diam. x 20' high - 3" fir
2	Soda Dissolving Tanks	17' diam. x 10' high - lined steel
2	Pneumatic Storage Tanks	4' diam. x 10' high - 50 lbs. pressure
6	Milton Roy Strong Acid Pumps	15 GPM - 2 HP - 440 V. Electric Motors
6	Duriron Dilute Acid Pumps	120 GPM - 7½ HP - 440 V. Electric Motors
6	Reclaimed Acid Pumps	900 GPM - 40 HP - 440 V. Electric Motors
6	Soda Ash Pumps	900 GPM - 15 HP - 440 V. Electric Motors
4	Rinse Recycling Pumps	2700 GPM - 30 HP - 440 V. Electric Motors
4	Strong Acid Pumps	10 GPM - 1½ HP - 440 V. Electric Motors
3	New Soda Pumps	800 GPM - 20 HP - 440 V. Electric Motors
3	Air Receivers and Compressors	20" diam. x 4" long - 20 c.f.m. at 75 p.s.i. 5 HP - 440 V. Electric Motors
1	Steam Syphon Pump	1000 GPM at 100 p.s.i.
2	Hoists and trolleys	3 Tons

Clearwell

12	Demineralized Water Storage Tanks	42' diam. x 16' - 156,000 Gallons - 3" fir
7	Stainless Steel Corrosive Water Pumps	5,000 GPM - 400 HP - 440 V. Electric Motors
6	Labour Corrosive Water Pumps	400 GPM - 15 HP - Steam Turbine
6	Labour Corrosive Water Pumps	400 GPM - 15 HP - 440 V. Electric Motors
1	Steam-Driven Centrifugal Sump Pump	400 GPM - 15 HP - Steam Turbine
1	Vertical Sump Pump	50 GPM - 7½ HP - 440 Electric Motor
1	Vertical Sump Pump	50 GPM - 1½ HP - 440 V. Electric Motor

Outside

2	Soda Ash Storage Silos	16' diam. x 47' high - 9,000 Cu. Ft. prestressed concrete
6	Horizontal Sulphuric Acid Tanks	10' diam. x 33' long - lined steel
2	Acid Neutralizing Tanks	19' diam. x 26½' high - Gunite
2	Agitating Mixing Tanks	13' diam. x 10' high - prestressed concrete - lead lined
2	Wooden Mixing Paddles	7' long - 12' shaft - 7½ HP - 440 V. Electric Motors

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Major Equipment - continued

Outside

Number	Type	Size - Capacity - Power
1	Hydro Lime Storage Silo	16' diam. x 64½' high - Gunite
1	Waste Acid Reservoir	92' x 92' x 14' - 82,700 Cu. Ft. acid-proof, brick lined
1	Labour Strong Acid Pump	100 GPM - 10 HP - 440 V. Electric Motor
1	Labour Acid Transfer Pump	50 GPM - 7½ HP - 440 V. Electric Motor
2	Redler Conveyors (Soda Ash)	9" - 10 Tons per Hour
2	Redler Conveyors (Soda Ash)	5" - 3.3 Tons per Hour
1	Redler Conveyor (Lime)	9" - 10 Tons per Hour
4	Lime Feeders	9" to 14" - 0 to 2500 lbs./hr. range
3	Track Hoppers and Unloading Equipment	10' x 10' - 5.5 Tons per Hour

This building contains the following material quantities:

Material	Quantity
Structural Steel	1,030 Tons
Reinforcing Steel Bars	482 Tons
Reinforcing Steel Mesh	84,000 Sq. Ft.
Concrete	10,814 Cu. Yds.
Concrete Blocks	93,000 Blocks
Roofing	759 Squares
Acid-Proof Tile	69,000 Bricks

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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 indicate 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.

This building contains the following material quantities:

Material	Quantity
Structural Steel	400 Tons
Steel Reinforcing Bars	5.4 Tons
Concrete	211 Cu. Yds.

NOTE: Above quantities for one tank only.

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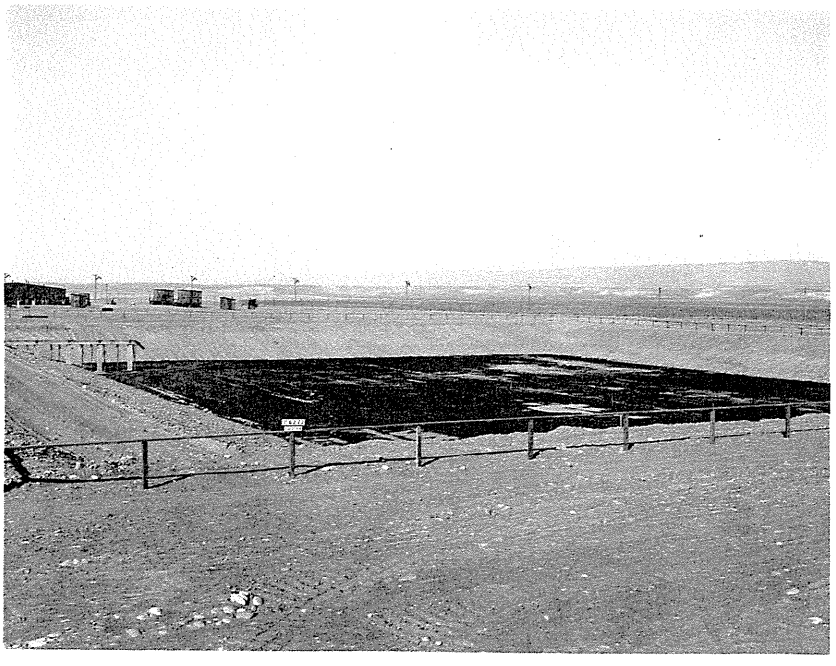
184, 284 - TYPICAL COAL STORAGE PIT



188, 288 - TYPICAL ASH DISPOSAL BASIN

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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 from 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 & 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 and outside dyke slopes of 1½ 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-B	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		

Material	Quantity
Concrete	* 30 Cu. Yds.

* Basin 288-W only.

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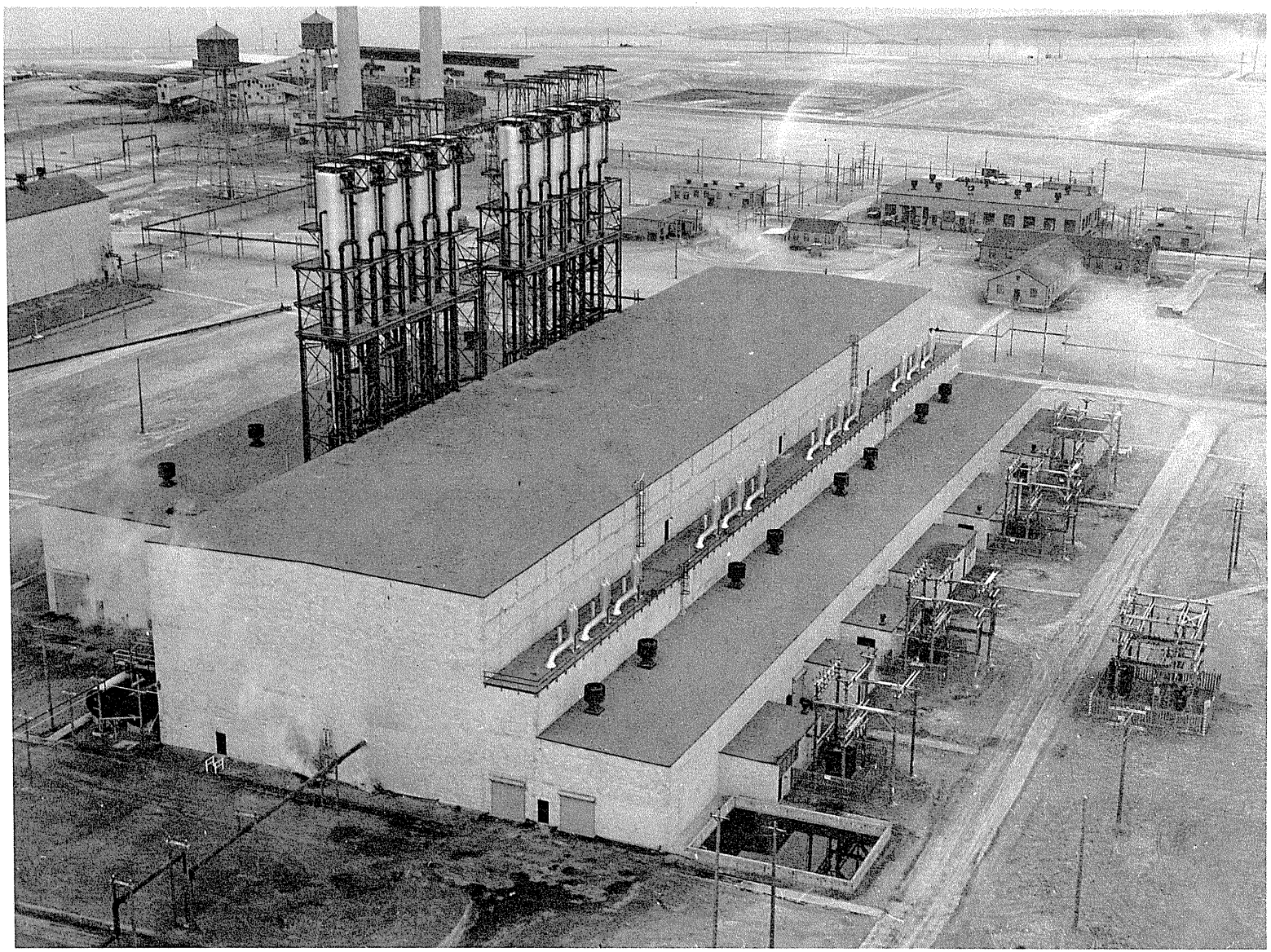

189-D REFRIGERATION BLDG. 185-D DEAERATING BLDG. 190-D MAIN PUMP HOUSE
Aerial View Looking Northwest

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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 per cent 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 precast 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 G.P.M. 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.

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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.

This building contains the following major equipment:

Number 189-D	Number 189-F	Type	Size - Capacity - Power
6	---	York Refrigeration Units	*14,064 Tons Refrigeration - 2000 HP - Synch. Motors
---	4	York Refrigeration Units	**10,200 Tons Refrigeration - 2000 HP - Synch. Motors
6	4	Evaporative Cooling Units	10,000 c.f.m. - 5 HP - 440 V. Synch. Motors
6	6	Cold Water Pumps	10" - 3750 GPM - 75 HP - 440 V. Electric Motors
1	1	Cylinder Lift Tongs	6 ft. long
1	1	Crane with Electric Hoist	25 Ton
1	1	Monorail and Hoist	1 Ton
1	1	Steam Siphon Pumps	1000 GPH at 100 p.s.i.
2	2	Freon Tanks	4' diameter x 16' long

*Total refrigeration of 6 units in 189-D.
**Total refrigeration of 4 units in 189-F.

This building contains the following material quantities:

Material	Quantity 189-D	Quantity 189-F
Structural Steel	191 Tons	151 Tons
Reinforcing Steel Bars	52 Tons	35 Tons
Reinforcing Steel Mesh	13,000 Sq.Ft.	9,000 Sq.Ft.
Concrete	1,945 Cu.Yds.	1,610 Cu.Yds.
Concrete Blocks	41,300 Blocks	34,500 Blocks
Roofing	192 Squares	150 Squares

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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

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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.

A 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.

This building contains the following major equipment:

Number	Type	Size - Capacity - Power
12	Process Water Pumps	3000 GPM - 800 HP - 2200 V. Electric Motors
12	Process Water Pumps	3000 GPM - 575 HP - Steam Turbine
12	Barometric Condensers	36" diam. x 12' height
4	Pontoon Roof Neoprene Lined Tanks	90' diam. x 43½' height - 1,750,000 Gals. each

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EQUIPMENT LIST (Continued)

Number	Type	Size - Capacity - Power
4	Curtain Seal Water Pumps	350 GPM - 5 HP - 440 V. Electric Motors
5	Electric Motor Two-Stage Air Compressors	25 CFM at 100# p.s.i.
2	Steam-Driven Air Compressors	75 CFM at 100# p.s.i.
2	Pumps - Purge Tank	1000 GPM - 75 HP - 440 V. Electric Motors
3	Water Re-use Pumps	5000 GPM - 125 HP - 2200 V. Elec. Motors
1	Shaw Box Crane	10 Tons

This building contains the following material quantities:

Material	
Structural Steel	647 Tons
Reinforcing Steel Bars	33 Tons
Reinforcing Steel Mesh	3,360 Sq. Ft.
Concrete	7,756 Cu. Yds.
Concrete Blocks	127,000 Blocks

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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.

The following major equipment is contained in these buildings:

Number	Bldg. 1608-D	Bldg. 1608-F	Type	Size - Capacity Power
2	X		Pumps - Electric-Driven	1,000 GPM
1	X		Pump - Steam-Driven	1,000 GPM
2		X	Pumps - Electric-Driven	3,000 GPM
1		X	Pump - Steam-Driven	3,000 GPM

The following material quantities were required for these buildings:

	Building 1608-D	Building 1608-F
Concrete	675 Cu. Yds.	760 Cu. Yds.
Roofing	4 Squares	12 Squares

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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 ceiled 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 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.

This building houses the following major equipment:

Number	Type	Size - Capacity - Power
1	Carrier Air Conditioning Unit	600 c.f.m. - 1/4 HP - 110 V. Electric Motor
1	Freon Condensing Unit	22,700 BTU/Hr. - 2 HP - 440 V. Electric Motor
1	Air Compressor and Receiver	6.08 c.f.m. - 1 HP - 220 V. Electric Motor
12	Unit Heaters	1.5 KW to 3 KW
1	Transformer	1 KVA

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This building contains the following material quantities:

Material	Quantity
Framing	2465 f.b.m.
Siding	2280 sq.ft.
4" Concrete Flooring (1st Floor)	648 sq.ft.
Wooden Flooring (2nd Floor)	600 sq.ft.
Sheathing	2890 sq.ft.
Concrete	14.3 cu.yds.
Roofing Squares	6.5 squares
Insulation Board	616 sq.ft.
Hard Board	3420 sq.ft.
Gypsum Board	616 sq.ft.

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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.

The building contains the following major equipment:

Number	Type	Size - Capacity - Power
1	Transformer	2 KVA
2	Constant Voltage Transformers	250 KVA
1	Physical Testing Machine	1000 Lbs. - Model K - For 3/8" round material
1	No. 2 Air Compressor	4890 CFM - 1/2 HP - 110 V. Electric Motor
1	Freon Condensing Unit	71,900 BTU/Hr. - 5 HP - 440 V. Electric Motor

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This building contains the following material quantities:

Material	Quantities
Framing	19,364 f.b.m.
Siding	7,440 sq. ft.
Flooring	7,700 sq. ft.
Sheathing	16,840 sq. ft.
Concrete	176 cu. yds.
Roofing	94 squares
Concrete Blocks	2,800 blocks
Reinforcing Steel Bars	1.2 tons
Blanket Insulation	330 sq. ft.
Presdwood	8,330 sq. ft.
Asbestos Board	7,370 sq. ft.
Gypsum Board	7,670 sq. ft.

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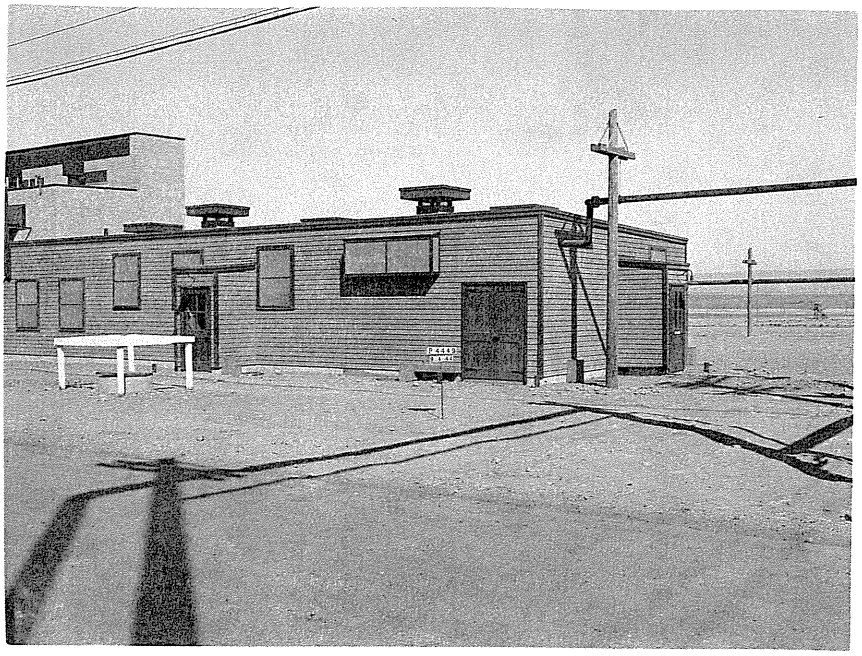
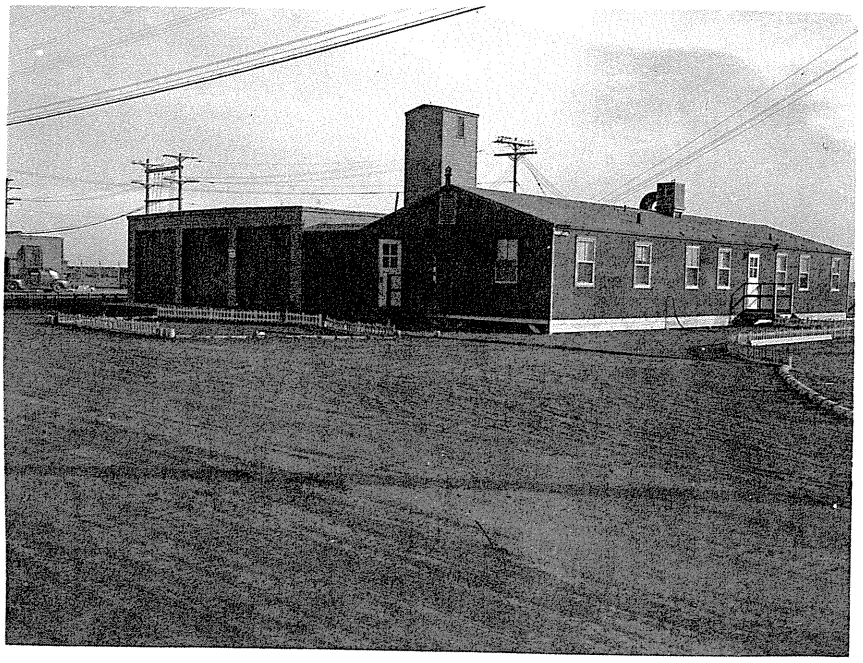


1707 - TYPICAL CHANGE HOUSE



1709, 2709, 3709 - TYPICAL FIRE HEADQUARTERS AND BARRACKS

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CHANGE HOUSE

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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 pf 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.

This building contains the following major equipment:

Number	Type	Size - Capacity - Power
1	Water Heater	42" diam. by 96" - Heat 900 GPH from 40°to 160°F.
90	Wooden Laundry Boxes	12" x 12" x 16"
143	Wooden Lockers	12" x 16" x 72"

This building contains the following Material quantities:

Material	Quantity
Framing	2,234 f.b.m.
Siding	2,680 Sq. Ft.
4" Concrete Flooring	2,000 Sq. Ft.
Sheathing	5,000 Sq. Ft.
Concrete	37 Cu. Yds.
Roofing Squares	22 Squares
Concrete Blocks	643 Blocks
1/4" Presdwood	2,677 Sq. Ft.
Gypsum Board	276 Sq. Ft.
Asbestos Board	4,576 Sq. Ft.

NOTE: Above dimensions and quantities are for one Change House only.

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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.

This building houses the following major equipment:

Number	Type	Size - Capacity - Power
7	Space Heaters	3 KW
3	Space Heaters	4.5 KW

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Number	Type	Size - Capacity - Power
3	Hose Drying Racks	
2	Electric Refrigerators	
1	Electric Stove	

This building contains the following material quantities:

Material	Quantity
Framing	14,670 f.b.m.
Siding	3,655 Sq. Ft.
Wood Flooring	2,310 Sq. Ft.
4" Concrete Flooring	1,830 Sq. Ft.
Sheathing	6,777 Sq. Ft.
Reinforcing Steel Mesh	2,040 Sq. Ft.
Concrete	47.3 Cu. Yds.
Roofing Squares	42.5 Squares
Blanket Insulation	4,360 Sq. Ft.
Gypsum Board	1,830 Sq. Ft.
Asbestos Board	3,533 Sq. Ft.
Celotex	2,763 Sq. Ft.
Linoleum	256 Sq. Yds.

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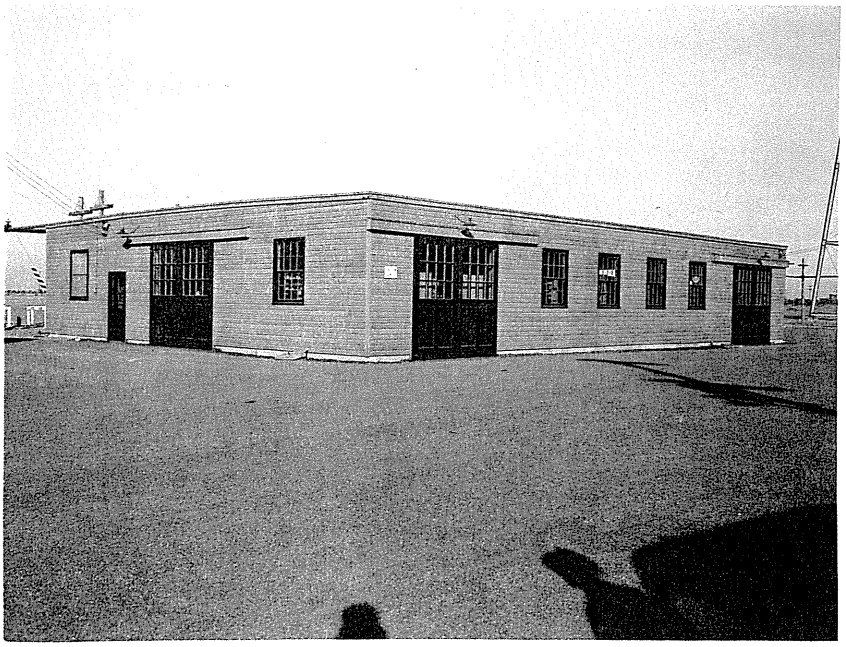
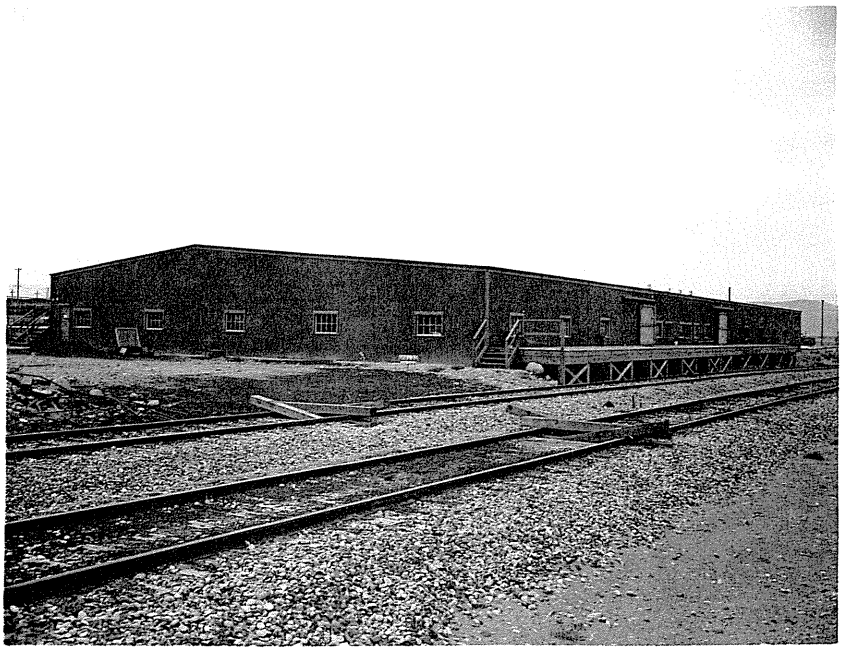


1713, 2713 - TYPICAL STOREROOM



1713-A - TYPICAL STOREHOUSE --
ESSENTIAL MATERIALS

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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' by 54' by 16½', the displacement volume is 68,600 cubic feet, and the cross-sectional area is 4,158 square feet.

The building houses the following major equipment:

Number	Type	Size - Capacity - Power
1	Gasoline Tank	4' diam. by 11' long - 1,000 Gals.
1	Gasoline Tank	
1	Safe	
1	Oil Storage Tank and Pump	120 Gals. - 1 Qt. Pumps

This building contains the following material quantities:

Material	Quantities
Framing	10,723 f.b.m.
Siding	3,144 sq. ft.
4" Concrete Flooring	4,160 sq. ft.
Sheathing	7,344 sq. ft.
Concrete	61.6 cu. yds.
Roofing Squares	42 squares
Concrete Blocks	873 blocks
Celotex Blanket Insulation	168 sq. ft.
1/4" Presdwood Board	1,744 sq. ft.

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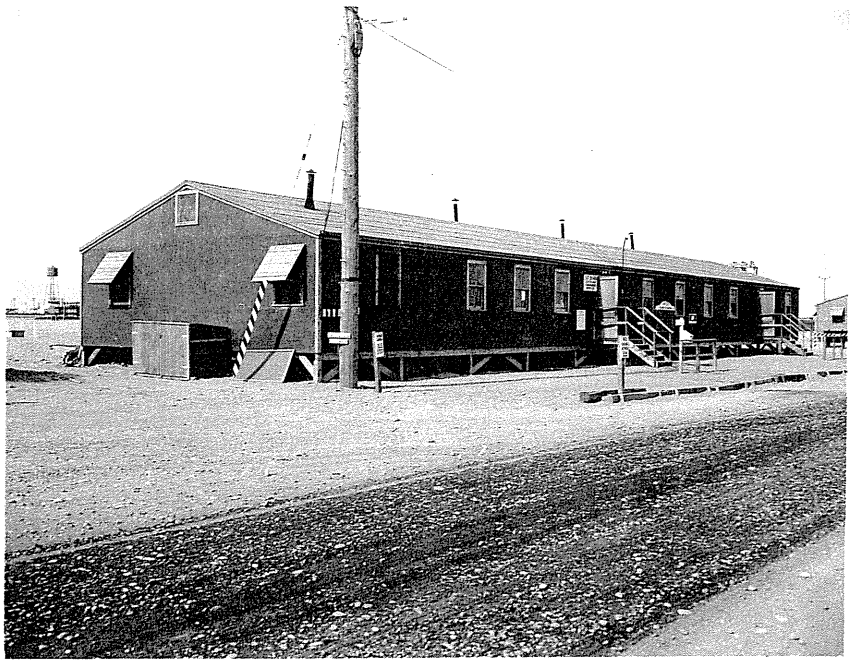
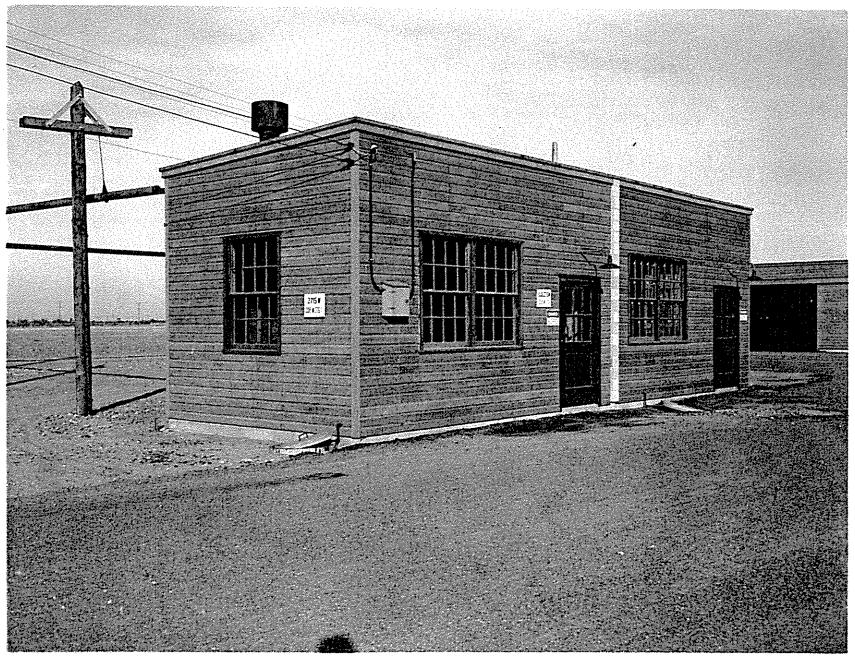


1713-B - TYPICAL STOREHOUSE--
MISCELLANEOUS MATERIALS



1715, 2715 - TYPICAL OIL AND PAINT
STORAGE BUILDING

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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.

This building houses the following major equipment:

Number	Type	Size - Capacity - Power
1	Oil Storage Tank and Pump	120 Gals. - 1 Qt. Pumps
1	Chain Hoist	1/2 Ton

This building contains the following material quantities:

Material	Quantity
Framing	1,028 f.b.m.
Siding	1,320 Sq. Ft.
4" Concrete Flooring	570 Sq. Ft.
Sheathing	1,890 Sq. Ft.
Concrete	4.4 Cu. Yds.
Roofing	5.7 Squares
Concrete Blocks	647 Blocks

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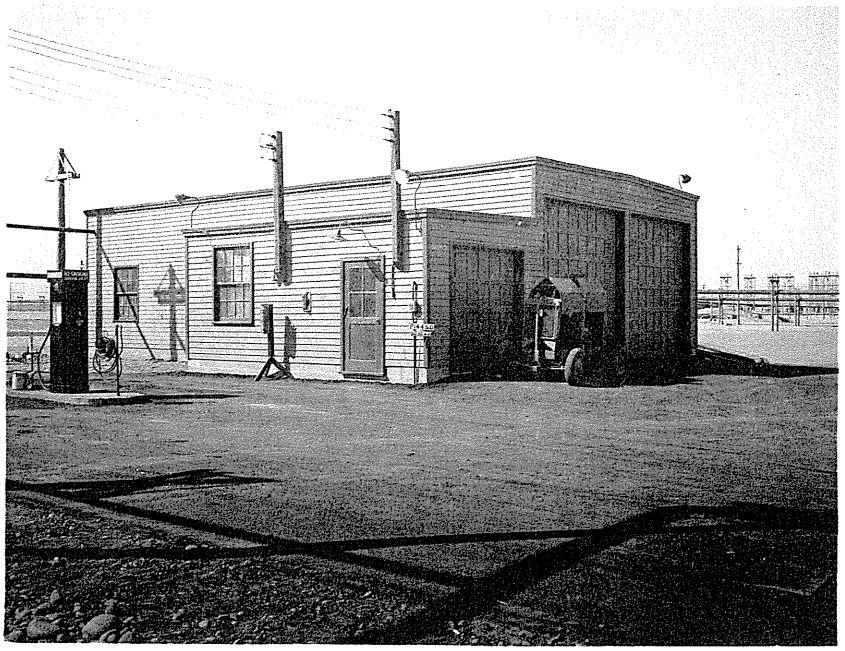

1716-B & D - TYPICAL AUTOMOTIVE REPAIR SHOP

1717 - TYPICAL COMBINED SHOP

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AUTOMOTIVE REPAIR SHOP

1716-B, 1716-D and 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.

This building houses the following major equipment:

Number	Type	Size - Capacity - Power
1	Oil Storage Tank and Dispensing Equipment	120 Gals. - 1 Qt. Pumps

This building contains the following material quantities:

Material	Quantities 1716-B and D	Quantities 1716-F
Framing	5,306 f.b.m.	5,500 f.b.m.
Siding	3,036 Sq. Ft.	3,836 Sq. Ft.
Cinder Flooring	1,762 Sq. Ft.	--
4" Concrete Flooring	--	1,842 Sq. Ft.
Sheathing	4,800 Sq. Ft.	5,600 Sq. Ft.
Concrete	6.8 Cu. Yds.	29.6 Cu. Yds.
Roofing	18 Squares	18.8 Squares
Concrete Blocks	660 Blocks	660 Blocks

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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 ceiled; 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 of 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' by 80' by 25', the cross-sectional area is 12,000 sq. ft., and the displacement volume is 288,000 cu. ft.

This building houses the following major equipment:

Number			Type	Size - Capacity - Power
100-B	100-D	100-F		
Machine Shop				
1	1	1	Lathe	16" - 7½ HP - 440 V. Elec. Motor
1	-	-	Shaper	20" - 3 HP - 440 V. Elec. Motor
1	1	1	Pedestal Grinder	10" Wheels - 1 HP - 440 V. Electric Motor
1	1	1	Pedestal Driller	21" - 2 HP - 440 V. Elec. Motor
1	1	1	Bench Lathe	9" - 1/2 HP - 440 V. Elec. Motor
1	1	1	Bench Drill	16" - 1/3 HP - 110 V. Elec. Motor
1	1	1	Pedestal Tool Grinder	12" - 2 HP - 440 V. Elec. Motor
1	1	1	Tool Room Lathe	10" - 3/4 HP - 440 V. Elec. Motor
1	1	1	Power Hack Saw	9" x 9" - 1 HP - 440 V. Elec. Motor
1	-	-	Milling Machine	Std. 7" - 3 Jaw - 5 HP - 440 V. Electric Motor
1	-	-	Radial Drill	4'-11" - 2 HP - 440 V. Elec. Motor
1	-	-	Hydraulic Press	150 Ton Cap.-3 HP-440 V. Elec. Motor

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Number 100-B	100-D	100-F	Type	Size - Capacity - Power
Machine Shop				
1	1	1	Punch and Shear	Punch Cap. 1/2" to 3/4" - Shear Cap. 3/8" to 1-1/8" - 3 HP - 440 V. Electric Motor
1	1	1	Air Compressor and Receiver	2840 c.f.m. at 100 p.s.i. - 50 HP - 440 V. Electric Motor
-	1	1	Air Compressor	31 c.f.m. - 1 HP - 220/440 V. Elec. Motor
1	1	1	Hydraulic Test Table and Pump	3' by 6' by 5' - 2 HP - 440 V. Electric Motor
1	-	-	Engine Lathe	25" - 15 HP - 440 V. Electric Motor
1	-	-	Universal Grinder Wheel	14" by 30" - 3 HP - 440 V. Elec. Motor
1	-	-	Centerless Grinder Wheel	8" - 15 HP - 440 V. Electric Motor
1	-	-	Heat Treating Furnace	12" by 12" by 24"
1	-	-	Grindstone	
Pipe Shop				
1	1	1	Pipe Threading Machine	8" - 5 HP - 440 V. Electric Motor
1	1	1	Portable Pipe Threader	4" - 1½ HP - 440 V. Electric Motor
1	1	1	Pipe Threading Machine	2" - 1/2 HP - 110 V. Electric Motor
2	2	2	Welding Units	25 HP - 440 V. Electric Motor
1	1	1	Bending Table	5' by 5'
Forge Shop				
1	-	-	Power Hammer	2 HP - 440 V. Electric Motor
1	1	1	Electric Forge and Blower	Heavy Duty - #51 Blower - 1/15 HP - 110 V. Electric Motor
1	1	1	Anvil	250 Pound
Electric Shop				
1	1	1	Coil Winder	Midget & Universal Heads - 110 V. Drive
1	-	-	Drying Oven & Truck	30 KW - 1/4 HP - 440 V. Elec. Motor
1	1	1	Drill Press	16" - 1/3 HP - 110 V. Elec. Motor
Carpenter Shop				
1	-	-	Grinder	30" - 1/2 HP - 110 V. Elec. Motor
1	-	-	Swing Cut-off Saw	14" Diam. - 5 HP - 440 V. Elec. Motor

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Number 100-B	Number 100-D	Number 100-F	Type	Size - Capacity - Power
Carpenter Shop (Continued)				
1	-	-	Band Saw	30" - 3 HP - 440 V. Electric Motor
1	-	-	Lathe	12" - 3/4 HP - 440 V. Electric Motor
1	1	1	Jointer	24 inch
Sheet Metal Shop				
1	1	1	Pedestal Drill	21" - 2 HP - 440 V. Electric Motor
1	-	-	Squaring Shears	72" long - 14 Gauge Capacity - 3 HP - Electric Motor
1	-	-	Bar Folder	3' long - 20 Gauge Cap. - Hand Power
1	-	-	Hand Roll	42" long - 18 Gauge Cap. - Hand Power
1	-	-	Bending Brake	8' Sheet - 12 Gauge Cap. - Hand Power
General				
2	2	2	Trolley and Hoist	2 Tons
1	1	1	Portable Floor Crane	4000 lbs. to 7½' height

This building contains the following material quantities:

Material	Quantity
Framing	36,509 f.b.m.
Siding	9,200 Sq. Ft.
4" Concrete Flooring	12,000 Sq. Ft.
Sheathing	33,200 Sq. Ft.
Structural Steel	1.2 Tons
Reinforcing Steel Mesh	12,000 Sq. Ft.
Concrete	193 Cu. Yds.
Roofing	120 Squares
1/4" Presdwood Board	6,394 Sq. Ft.
1/4" Asbestos Board	3,920 Sq. Ft.

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1719, 2719 - TYPICAL FIRST AID BUILDING

1720 - TYPICAL PATROL HEADQUARTERS BUILDING

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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 conrete 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 volumes of this building:

	Overall Dimensions	Displacement Volume	Cross-Sectional Area
First Aid Bldg.	82' x 25½' x 19½'	13,260 Cu.Ft.	816 Sq.Ft.
Waiting Room	24' x 16' x 12'	4,416 Cu.Ft.	384 Sq.Ft.

This building houses the following major equipment:

Number	Type	
1	Water Heater	20" x 60" - 100 GPH - from 40° to 60°
1	Humidifying Unit	2,500 CFM - 1/4 HP - 110 V. Fan Motor

This building contains the following material quantities:

Material	First Aid Building	Waiting Room
Framing	4,117 f.b.m.	1,370 f.b.m.
Siding	1,160 Sq. Ft.	640 Sq. Ft.
4" Concrete Flooring	826 Sq. Ft.	--
Sheathing	2,342 Sq. Ft.	1,024 Sq. Ft.

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Building Material Quantities (Continued)

Material	First Aid Building	Waiting Room
Concrete	14 Cu. Yds.	--
Roofing	10 Squares	3.9 Squares
Concrete Blocks	390 Blocks	--
Presdwood Board - 1/4"	2,387 Sq. Ft.	--
Gypsum Board	701 Sq. Ft.	--
Asphalt Tile	88 Sq. Yds.	--
Sheet Rock	--	1,024 Sq. Ft.
Wooden T & G Flooring	--	384 Sq. Ft.

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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.

This building houses the following pieces of major equipment:

Number	Type	Size - Capacity - Power
25	Electric Wall Heaters	1.0 to 4.5 KV
1	Electric Water Heater	48" diam. by 72" long
1	Telephone Switchboard	1 position (100-Areas only)

This building contains the following material quantities:

Material	Quantities	
	100-Area	200 Area
Framing	4,718 f.b.m.	4,000 f.b.m.
Siding	3,092 Sq. Ft.	2,804 Sq. Ft.
4" Concrete Flooring	2,528 Sq. Ft.	2,144 Sq. Ft.
Sheathing	5,704 Sq. Ft.	5,032 Sq. Ft.
Concrete	51.3 Cu. Yds.	45.3 Cu. Yds.
Roofing	26.1 Squares	22.1 Squares
Concrete Blocks	830 Squares	740 Squares
1/4" Presdwood Board	4,818 Sq. Ft.	3,600 Sq. Ft.
1/4" Asbestos Board	1,100 Sq. Ft.	1,100 Sq. Ft.

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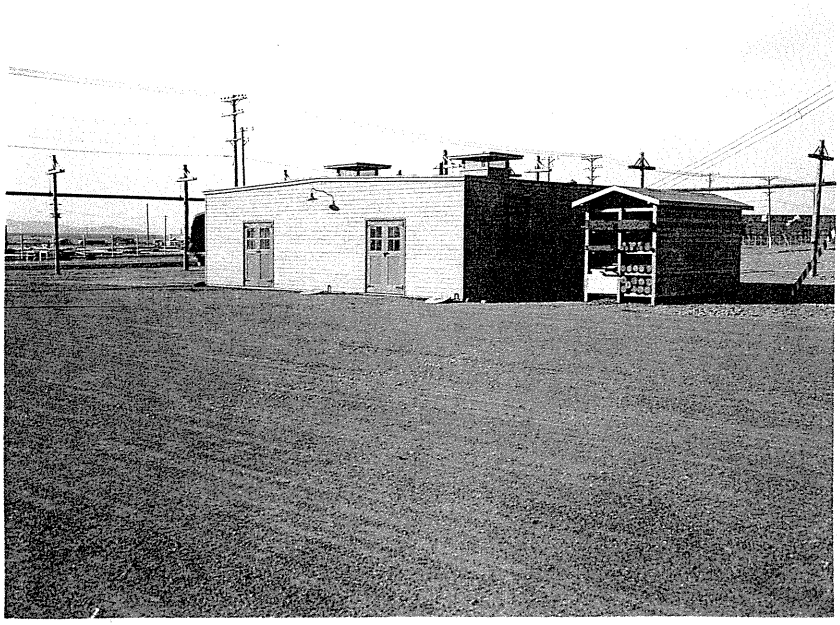
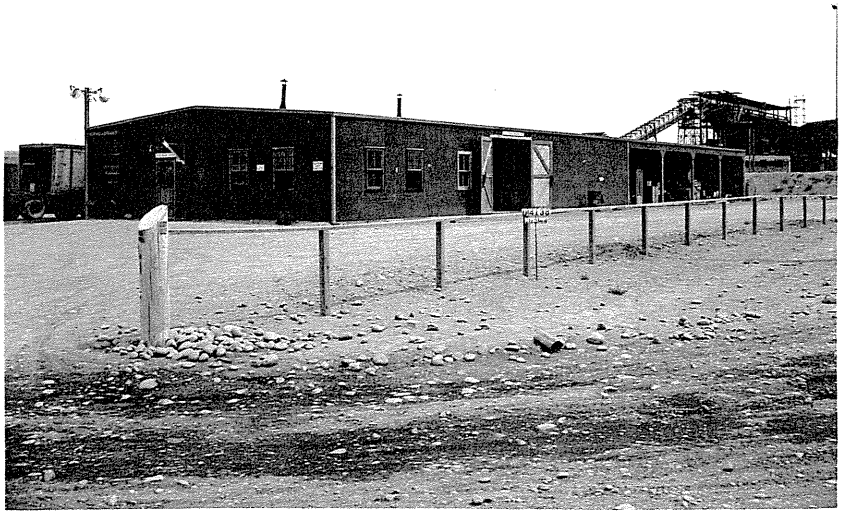


1722, 2722 - AREA SHOP - PAINT & RIGGERS



1722-A - TYPICAL ELECTRICAL SHOP

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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.

This building houses the following major equipment:

Number	Type	Size - Capacity - Power
1	Ventura Exhaust Fan and Motor	1465 c.f.m. - 1/20 HP - 110 V. Electric Motor

This building contains the following material quantities:

Material	Quantity
Framing	3,331 f.b.m.
Siding	1,540 Sq. Ft.
4" Concrete Flooring	1,200 Sq. Ft.
Sheathing	2,740 Sq. Ft.
Concrete	21.2 Cu.Yds.
Roofing	12 Squares
Concrete Blocks	855 Blocks
1/4" Presdwood Board	1,540 Sq. Ft.

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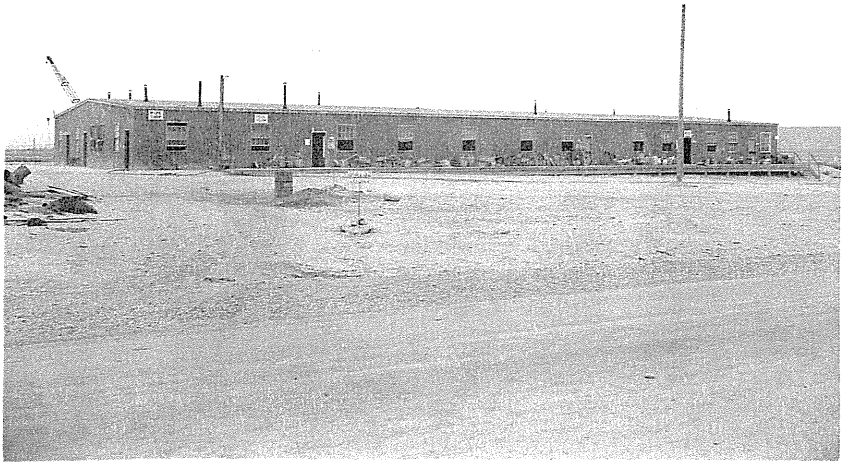
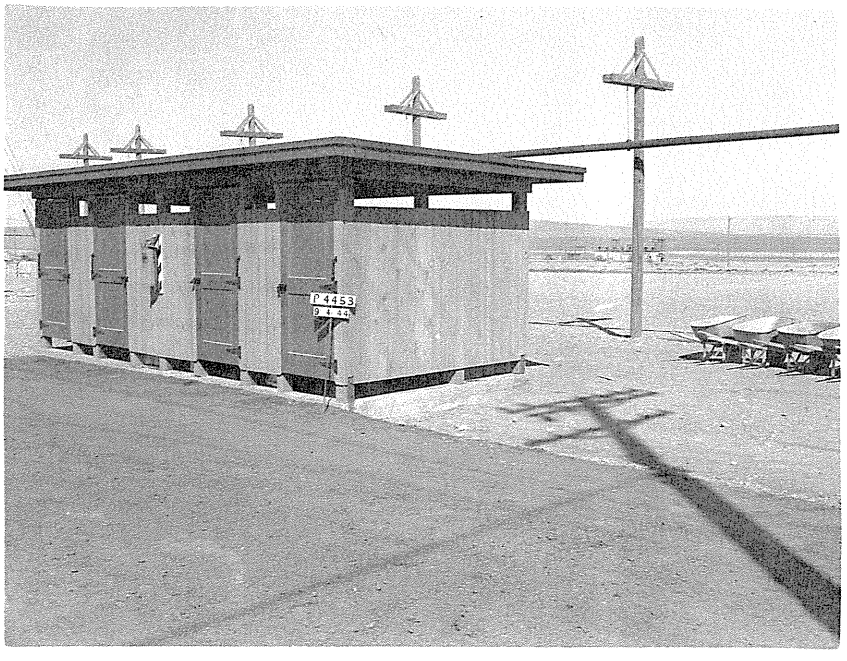


1729 - TYPICAL EXTRA MACHINERY STOREHOUSE



1734, 2734 - TYPICAL CYLINDER STORAGE BUILDING

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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.

The building contains the following material quantities:

Material	Quantity
Framing	935 f.b.m.
4" concrete Flooring	240 sq. ft.
Sheathing	939 sq. ft.
Reinforcing Steel Mesh	240 cu. yds.
Concrete	10 cu. yds.
Roofing	3.5 squares

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c 105 Area

Introduction

Strictly speaking, the term "105 Area" is a misnomer in that the word "Area" implies a distinct geographic or physical location. Actually, the 105 Area is a construction term only used to designate certain buildings in each of the 100 Areas.

Due to the highly specialized and complex type of construction involved in the 105 Buildings, and the need for the maintenance of the utmost secrecy, these buildings were constructed under the supervision of a separate organization known as the "105 Area". This group, headed by a Division Engineer, also handled the construction of the process equipment in the "305 Building", (see 300 Section), as well as the "116 Building" which is simply the stack portion of the 105 Building.

This section covers the history of construction of the "105 Area".

(1) Description of Site

A complete description of the layout, topography, soil conditions, existing buildings and facilities, etc. for the 105 Area has been covered in the sections applying to the 100 and 300 Areas. The 105 Building is located in the eastern portion of the process buildings group in the 100-D and 100-B Areas, and in the southern portion of the process buildings group in the 100-F Area, between the 108 and 115 Buildings.

(2) Preliminary Work

(a) Organization

The Division Engineer for the 105 Area arrived on the project site October 4, 1943. At that time, the building structure for one of the 105 temporary fabrication buildings (TC 101) had already been completed by the 100-B Area Division Engineer. The Division Engineer for the 105 Area maintained offices in this building until the early part of 1945, when transfer was made to the temporary area office for the 105-F Building. This same Division Engineer continued in charge of the 105 Area from its inception through the completion of the 105-F Building.

(b) Layout

All of the preliminary layout, and soil investigation work, pursuant to construction in the three 100 Areas has already been covered. Layout work for the 105-B Building was started on October 9, 1943, when reference points on the center lines of the Process Unit were established. This building was staked out for excavation on October 10, 1943, the 105-D Building on December 6, 1943, and the 105-F on February 15, 1944. Prior to the setting of foundation forms, seven test tables were set for the 105-B Building, five for the 105-D Building, and seven for the 105-F Building. Of these nineteen tests, three failures resulted for the 105-B Building and two for the 105-F Building. In each case, the situation was determined to be a local condition and the

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difficulty was remedied by deepening the excavation of these points and back-filling with lean concrete.

In addition to these test tables, three core borings were made for the 105-B Building, two for the 105-D Building and three for the 105-F Building. The following are the results of these borings:

105-B

Depth	Classification
0' - 7'	Coarse and fine gravel - some cobbles - clay (hard-packed)
7' - 9'	Large Boulders - sand and gravel (hard-packed)
9' - 15'	Coarse gravel - cobbles and sand - (hard-packed)
9' - 4'	Boulders - Coarse and fine gravel and sand
4' - 9'	Coarse and fine gravel - cobbles and sand
9' - 12'	Boulders - coarse gravel and sand
12' - 35'	Coarse and fine gravel - cobbles and sand
0' - 3'	Fine yellow sand - coarse gravel - cobbles and boulders
3' - 35'	Coarse and fine gravel and sand some scattered boulders and cobbles

105-D

0' - 24'	Medium coarse black sand - scattered gravel and small boulders
24' - 30'	Gravel and yellow sand
0' - 26'	Medium coarse black sand - scattered gravel and small boulders
26' - 30'	Gravel and yellow sand

105-F

0' - 33'	Loose medium coarse sand, coarse & medium gravel, scattered cobbles

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Depth	Classification
33' - 35'	Coarse sand
0' - 33'	Loose medium coarse sand - coarse and medium gravel - scattered cobbles
33' - 40'	Stiff sandy clay
0' - 6'	Coarse and medium gravel - cobbles - and sand
6' - 42'	Loose medium coarse sand - coarse and medium gravel - scattered cobbles
42' - 50'	Stiff sandy clay

(c) Establishment of Temporary Construction Facilities

Inasmuch as the 105 Buildings are located within the 100 Areas, all of the temporary facilities established for the 100 Areas, and covered in the section applying to the 100 Areas, were extended to service and supply the 105 Buildings during the construction period. These facilities included electric power, telephones, water, railroads, roads and walks, concrete plants, etc. In addition to these buildings and facilities, a separate group of temporary buildings was erected in each of the 100 Areas for use in the construction of the 105 Buildings. These structures included an engineer's office, warehouse, and various field offices and craft fabrication buildings. A temporary fence was constructed around each of the 105 Buildings and included all of these temporary structures. The primary purpose of this fence was to exclude from the 105 Buildings during the construction period all unauthorized personnel. Under the section of this history applying to "Temporary Construction" is a complete list of the temporary buildings and facilities constructed for each of the 105 Buildings.

During the construction of each 105 Building, a large temporary structure was attached to each. This structure was known as the "air-lock" and was under the same pressure as the 105 Building. There were, in addition, numerous other temporary installations made within each of the 105 Buildings during the construction period. These latter facilities will be discussed in the sections following, applying to "Construction Delays","Construction Expedients", and "Special Construction Methods".

Supplementing the temporary buildings and facilities within the immediate vicinity surrounding each 105 Building, were a group of temporary fabrication and storage buildings northwest of White Bluffs and another group just west of Hanford. The White Bluffs buildings were erected under TC-28, the general 105 Temporary Construction Code, and are discussed under the "Temporary Construction" Section in this History applying to that code. The buildings near Hanford were constructed and operated under a special code, TC-101, and are also discussed in the "Temporary Construction" Section.

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The temporary buildings near White Bluffs were used to fabricate, store, and test various materials for the process unit in the 105 Buildings. These materials included steel plate, masonite, aluminum tubing, various small metal fittings, etc. The TC-101 Buildings, in addition to housing the 105 Area Division Engineer and his staff, were used for fabricating and warehousing the graphite, or packing blocks, going into the process unit of both the 105 and 305 Buildings. The work carried on in these various temporary buildings is covered in the following sections under construction delays, construction expedients, and special construction methods.

(3) Permanent Area Work

As has been previously noted, the term "105 Area" is a construction idiom only. As each of the temporary fences surrounding the 105 Buildings was completed, all individuals not having specific business inside the fence were excluded. Due to the number and size of the temporary buildings and facilities included within each fence, it was necessary for the fence to take in the locations for other permanent structures in addition to the 105 and 116 Buildings. In order that it would be unnecessary for any individuals not directly connected with the 105 Area to enter the fenced enclosures, the construction of these additional structures within the fence was assigned to the 105 Area Division Engineer. These structures included one of the 187 elevated tanks in all three 100 Areas, as well as the 1608 Building in the 100-D and 100-F Areas. However, inasmuch as these structures involved no unusual construction and are so closely connected with the 100 Areas, they have been included in the 100 Area's section.

All of the outside facilities to and from the 105 Buildings, i.e., underground pipe and pipe tunnels, overhead pipe, outside electric lines and transformer banks, etc. were constructed by the Division Engineers for the respective 100 Areas rather than by the Division Engineer for the 105 Area.

When the work within each of the temporary fenced enclosures had reached a sufficiently complete stage of construction, a permanent fence was erected within each 100 Area and the temporary fence was dismantled. This permanent fence surrounded the 103, 105, 110, 116 and 187 Buildings in all three areas, as well as the 111 Building in the 100-B Area and the 1608 Building in the 100-D and 100-F Areas. With the exception of the 105 and 116 (ventilation stack) Buildings, all of these are covered in the section applying to the 100 Areas.

Plot plans and aerial photographs of the three 100 Areas are included in the 100 Area's section. These show the layout and location of the 105 - 116 Buildings and reference should be made to them. The 305 Building is included in the plot plan and aerial photograph of the 300 Area. There is also an individual photograph and description of the 305 Building in the 300 Area's section.

(4) Progress of Construction of 105 Areas

In the planning and scheduling section of this history is a discussion of the overall progress of the Hanford Engineer Works. Included in this section is a chart showing the sequence of start-ups for the various areas as requested by the Operating Department. This chart calls for the completion of the 105-B

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Building on August 15, 1944. The scheduled completion date of the 105-D Building was requested for 60 days after 105-B and the 105-F Building for 120 days after 105-D, or 180 days after 105-B. The Operating Department's scheduled start-up dates coincided with these construction completion dates.

On the page immediately following is a chart showing the actual progress of each of the 105 Buildings at the end of each month and the rate of progress during that month. An inspection of this chart will show that the 105-B Building was complete on August 15, 1944, and the 105-D and 105-F Buildings followed through in their requested pattern. In other words, the 105-D Building was completed 60 days after the 105-B Building while the 105-F Building was completed 90 days after the completion of the 105-D Building or 30 days ahead of the date the sequence chart called for. In addition, the 105-F Building was actually completed on schedule from a calendar standpoint. The 105-B Building was completed as scheduled on August 15, 1944; however, 105-D and 105-F Buildings were actually completed ahead of requested schedules.

Included in this section are bar charts showing the scheduled and actual progress of the Process Units of each of the 105 Buildings. These charts, prepared by the 105 Area Division Engineer, were based on the start-up dates requested by the Operating Department. Inasmuch as the Process Units were the limiting factor, or "king-pin", in the progress of each of the 105 Buildings, the bar charts show only the progress by these units. In other words, the progress of the remaining portion of the building had little effect on the start-up and completion of the building when compared to the Process Units.

Also included in this section is a chart showing the detailed construction progress of each of the 105 Buildings as well as the Process Unit in the 305 Building.

Design release date
Start of excavation date
Date of excavation completed
Start of foundation date
Date foundations were completed
Start of superstructure date
Date of superstructure completed
Start of steel erection date
Date steel erection completed
Start of equipment installation date
Date equipment installation completed
Date test runs of equipment started
Date test runs completed
Start-up date
Final completion date
Date building or facility accepted by Operations
Date building or facility accepted by the Government

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105 AREAS

MONTH	105-B PER CENT COMPLETE	105-B RATE PER MONTH	105-D PER CENT COMPLETE	105-D RATE PER MONTH	105-F PER CENT COMPLETE	105-F RATE PER MONTH
September - 1943	0	0				
October	1	1				
November	5	4	0	0		
December	14	9	3	3		
January - 1944	17	3	3	0	0	0
February	27	10	4	1	1	1
March	36	9	17	13	1	0
April	40	4	26	9	1	0
May	63	23	38	12	5	4
June	78	15	46	8	14	9
July	92	14	50	4	18	4
August	94	2	51	1	20	2
September	100	6	67	16	33	13
October			72	5	35	2
November			100	28	49	14
December					85	36
January - 1945					97	12
February					100	3

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P-214

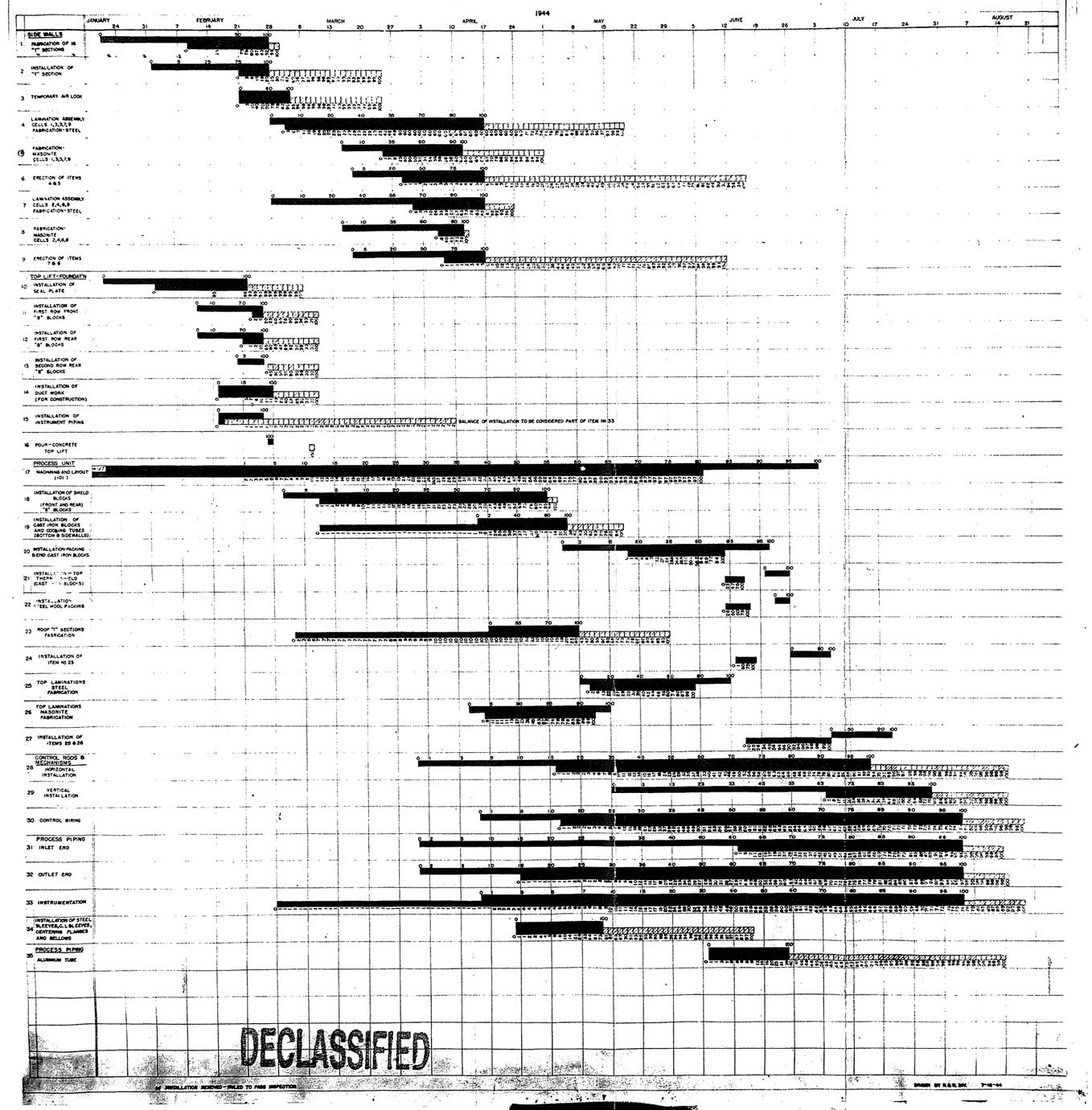
HANFORD ENGINEER WORKS

PROJECT 9536

DAILY CONSTRUCTION PROGRESS

EQUIPMENT INSTALLATION - 105 B BUILDING

ESTIMATED AND ACTUAL % COMPLETE



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HANFORD ENGINEER WORKS
PROJECT—9536

CONSTRUCTION PROGRESS

EQUIPMENT INSTALLATION—105 D BUILDING

ESTIMATED AND ACTUAL PERCENT COMPLETE

SERIES E

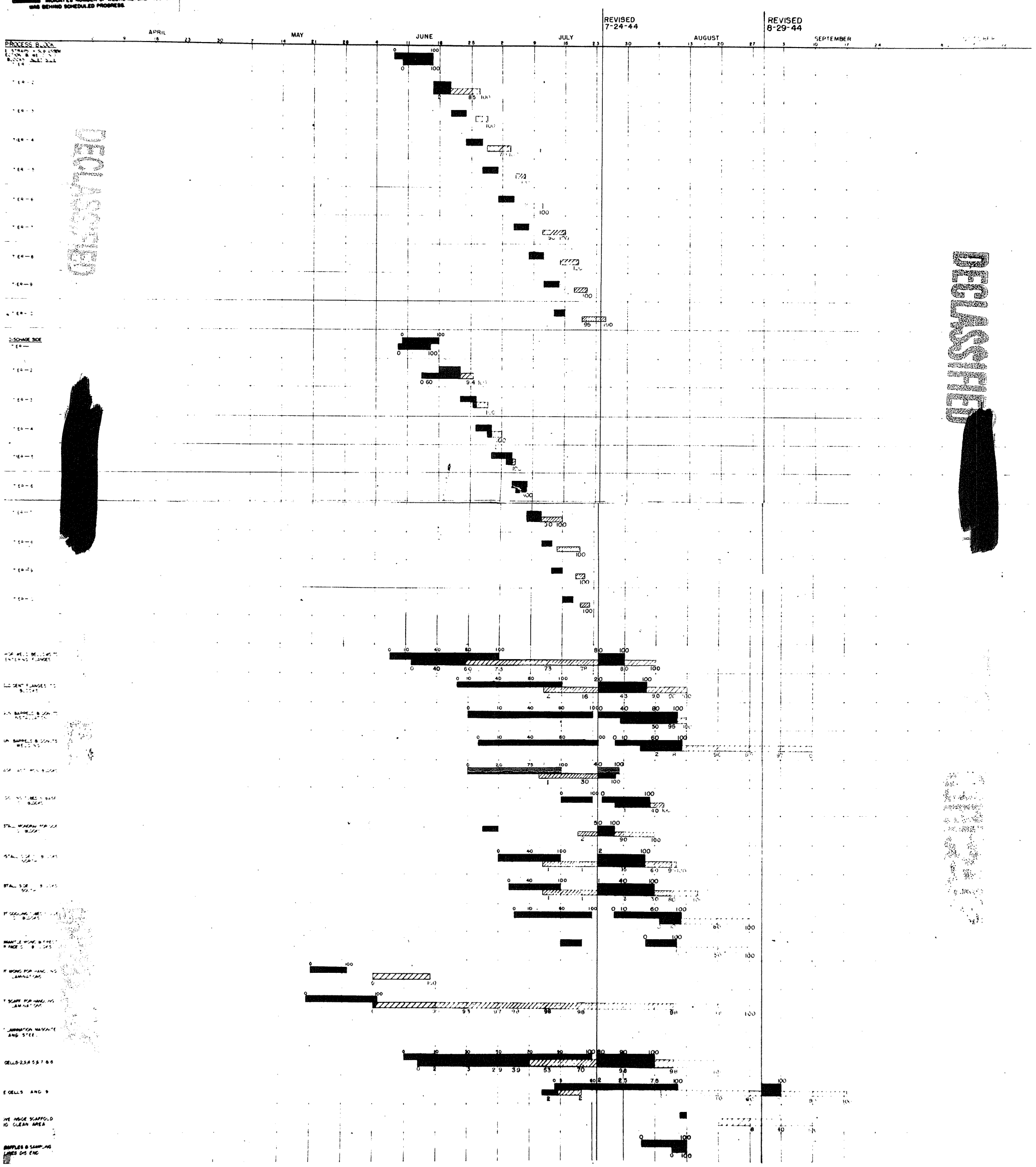
SHEET 1

LEGEND

UPPER BAR AND PERCENTAGE FIGURE INDICATE ESTIMATED CONSTRUCTION SCHEDULE

LOWER BAR AND PERCENTAGE FIGURE INDICATE ACTUAL CONSTRUCTION SCHEDULE

INDICATES NUMBER OF WEEKS ACTUAL PROGRESS WAS BEHIND SCHEDULED PROGRESS.



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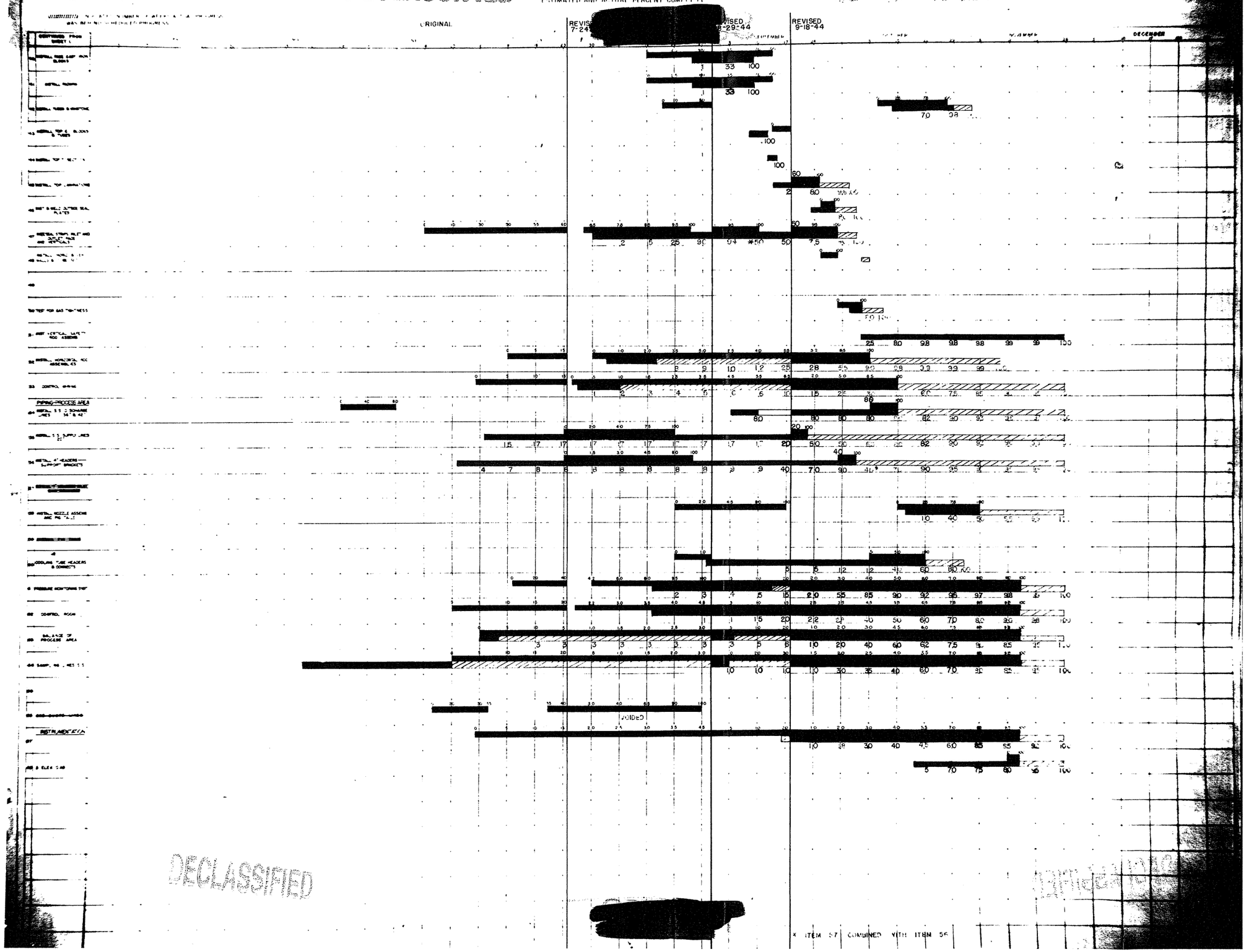
HANFORD ENGINEER WORKS

CONSTRUCTION PROGRESS

EQUIPMENT INSTALLATION-105 D BUILDING

ESTIMATED AND ACTUAL PERCENT COMPLETE

SHEET



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HANFORD ENGINEER WORKS

PROJECT — 9536

CONSTRUCTION PROGRESS

EQUIPMENT INSTALLATION-105-F BLDG.

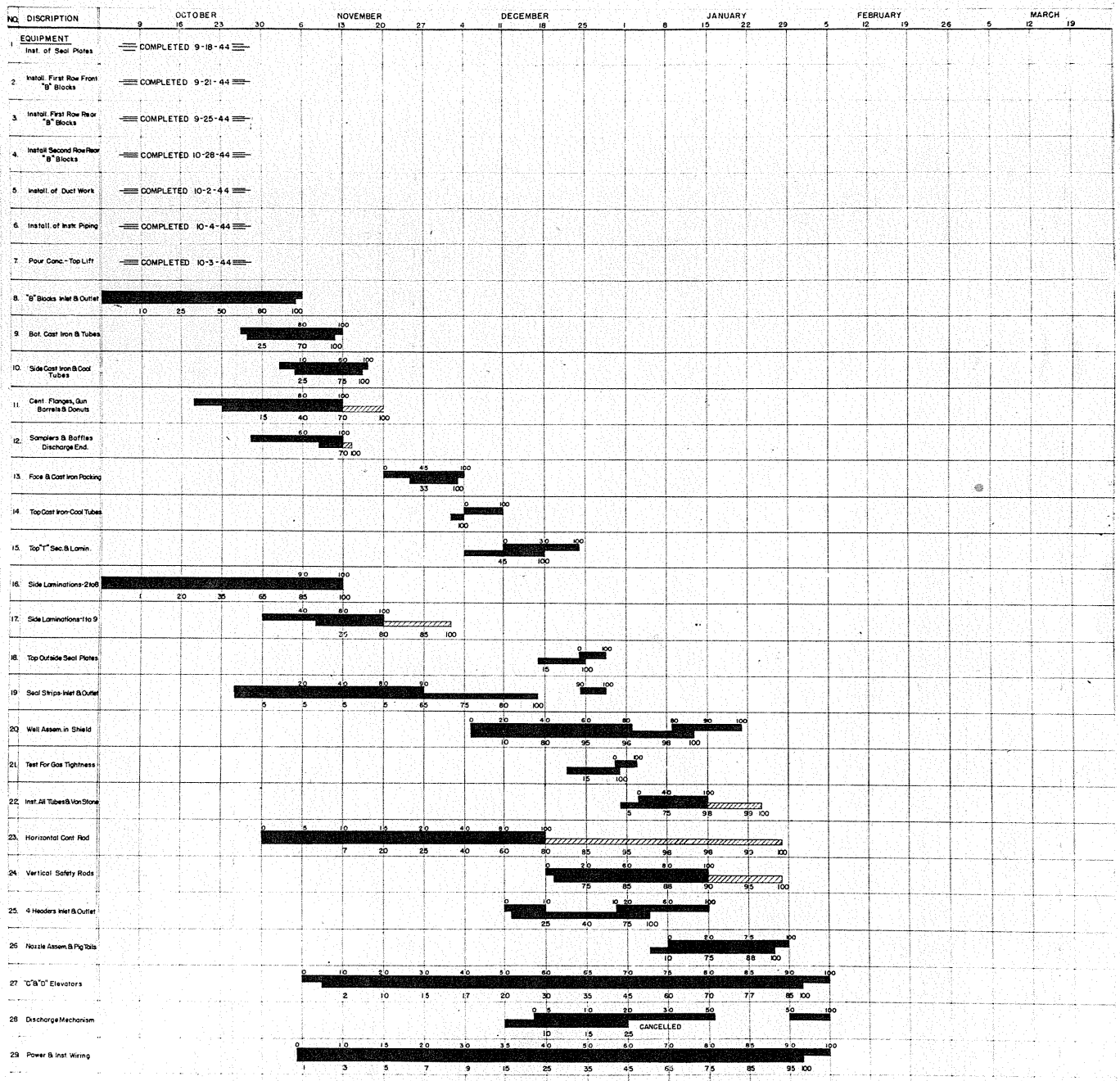
ESTIMATED AND ACTUAL PERCENT COMPL.

LEGEND

UPPER BAR AND PERCENTAGE FIGURE INDICATE ESTIMATED CONSTRUCTION SCHEDULE

LOWER BAR AND PERCENTAGE FIGURE INDICATE ACTUAL CONSTRUCTION SCHEDULE

INDICATES NUMBER OF WEEKS ACTUAL PROGRESS WAS BEHIND SCHEDULED PROGRESS



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(5) Process Unit Construction

In the construction of the Process Units for the three 105 Buildings, somewhat different and unusual methods or techniques were required than in the ordinary type of industrial construction.

The Pile is a cube-like structure approximately 37 ft. by 46 ft. by 41 ft. high consisting of an interior cube of graphite approximately 31 ft. by 40 ft. by 35 ft. surrounded on the top and sides by laminated walls of steel and masonite, the entire structure being supported on concrete approximately 23 ft. thick. Between the graphite and concrete foundation, and between the graphite and laminated walls on the top and sides of the Pile, is a cast-iron layer or thermal shield; this shield is approximately 10" thick on the top, front, back, and bottom and 8" thick on the right and left sides. Horizontally through the Piles are 2088 holes containing aluminum tubes approximately one and one-half inches in diameter. The side of the Pile in which the tubes were inserted is known as the charge or front face of the Pile. The opposite side is known as the discharge or rear face. Facing the charging end, the side to the right, is known as the right side of the Pile and the other the left side. Through the cast-iron thermal shield from the front to the rear of the Piles are 208 holes containing cooling water pipes. Vertically through the graphite are 38 holes for the safety rods. Horizontally through the Pile from left to the right side are 9 holes for the horizontal control rods. Operating on both the charge and discharge faces of the Pile is an elevator. On the charging face of the Pile, the elevator supports a machine for inserting, or placing, charges in each of the aluminum tubes through a stainless steel extension or "nozzle". The discharge elevator, on the other hand, contains a cab or enclosed mechanism for mechanically meeting emergencies in the operation of the discharge face of the Pile. A nozzle is attached to the front and rear end of each aluminum tube. This nozzle, containing a removable bayonet lock cap, diverts process water into the aluminum tubes from headers running along the face of the Pile. In the construction of the Pile base, three separate pours of concrete were made. The first was the rough or foundation pour and the second enclosed the main gas headers and instrument ducts. Between the second and third pours, a steel membrane, or lining, was placed and later tied to the laminated steel walls in order to make the entire Pile gas tight. The third or final pour is the one in which the cast-iron base or the support was grouted. When a portion of the four side walls of the Pile had been completed, the installation of the cast-iron base was begun. The interior portions of the side walls was then completed and the erection of the graphite interior was started. While the graphite was being placed, particular emphasis was placed on keeping this portion of the Pile free from dirt or any other contamination. All men working on the graphite were required to wear special uniforms and only men wearing these uniforms were permitted into that portion of the Pile. As each graphite layer (approximately 4" in thickness) was laid, it was thoroughly vacuum cleaned to insure that no dirt had gotten down in between the blocks.

At the same time the graphite blocks were being laid, the cast-iron thermal shields were placed, as were the instrument thermocouples and steel wool installation. When the graphite installation was completed, the top layers of cast-iron and masonite and steel laminations were placed on the Pile and the installation of the vertical rods was started.

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Concurrent with the installation of the graphite, the front and rear faces of the Pile were made ready for the installation of the aluminum tubes, and when the top of the Pile was completed, the tubes were inserted, nozzles placed on, piping and instrument tubing connected and wiring completed. In the lay-up of the graphite in the 105-B Building, wires and plumb bobs were used to center each layer. In the 105-D Building this method was discarded and miner's transits above the Pile were used instead. This method was further refined so that in the 105-F Building four surveyor's transits were used, one over the center line on the top of each side wall.

In addition to the work involved in the erection of the Piles, there was a large amount of field fabrication work. The work performed on the major items and materials and equipment will be taken up separately.

(a) Graphite

The center portion of the Piles in the 105 and 305 Buildings consists of a number of layers of graphite blocks. These blocks are approximately 40" long by 5" square in cross section with some being half the length. Some of these blocks are solid, some have longitudinal holes drilled in them, some have key-way slots of various kinds, and some have beveled edges. Based on the experience gained at the Clinton Engineer Works, it was decided that the rough graphite would be machined on the Project Site. Consequently, the TC-101 Buildings were constructed for this purpose.

The rough graphite blocks received from the vendor were approximately 40" long and 5" square in cross section. Each bar was plainly marked with the heat and quality numbers, and the blocks were identified by these and additional numbers until installed in the Piles. Prior to receipt of each carload of graphite at the Plant Site, a report was received from the du Pont inspector at the Vendor's plant showing exactly how the car was loaded according to the heats and qualities of the graphite. Thus it could be planned in advance how each car was to be unloaded and what was to be done to the graphite.

Machining of the first 315 tons of graphite, all of which went to the 305 Building, was done on machines temporarily equiped for the job. In order that machining operations in the 101 Buildings might get under way on schedule, such equipment as was available (or could be procured in time to meet the scheduled dates) was placed in service. This original method proved to be entirely too slow, however, so that additional machines were procured and the graphite was then machined on an assembly line basis. Practically all of the equipment used in machining the graphite was converted woodworking machinery, and each machine was set up so that its operation would not require individual settings of the blocks. In other words, the operators simply inserted the blocks in the machines on pre-set guides and jigs and started the operation. It should be noted that the development of the machinery used in the machining of the graphite was accomplished almost entirely on the Project Site by the 105 Area Division Engineer and the 105 Area Craft Superintendent and the Assistant Craft Superintendent. The inspection methods were also developed by the same group.

The most unusual feature in machining this graphite was in the tolerances which were required. A few examples will suffice to show the close work. The

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cross-sectional measurements of the completed blocks had a tolerance of plus or minus .005", the squareness tolerance was plus or minus .004", the length tolerance was plus or minus .006", and longitudinal drilled hole diametral tolerance was plus .003" and minus .000". There were many other tolerances for eccentricity, flatness, key-way dimensions, etc., all comparatively as close as those mentioned above.

Originally, the inspection of the finished blocks was an individual operation. Each block had to be gauged to determine whether or not it met the various tolerances. This procedure was extremely slow and proved to be a serious bottleneck. Consequently, automatic inspection machines were developed and the overall time required for inspection was reduced about 90 per cent. In addition, each inspection machine was checked at intervals for accuracy so that the actual inspection of the blocks was not subject to the errors of individual inspection.

Random samples of graphite blocks for the 105 Building Piles were tested for purity and quality in the 305 Building Test Pile. Approximately 17 per cent of all of the blocks in the 105 Buildings were thus tested. In addition, sample lay-ups of all of the blocks for the three 105 Buildings were made in the 101 Building in order to determine that the cumulative tolerances of the blocks were neither too large nor too small. For this lay-up, a standard cast-iron base was used and the blocks were laid up 25 layers at a time. Upon the completion of each lay-up, the entire 25 layers were carefully checked for all required measurements. Each block was also carefully marked to denote its exact position in the lay-up. This marking, together with the heat and quality designations became the "finger prints" for each block. No two blocks had the same markings. Charts have been made and filed showing exactly the designation of each block in the 105 and 305 Piles. It must be appreciated that a great amount of detailed record keeping was involved in following these blocks from the vendors' shops through machining and lay-up to final installation in the Piles. The difficulties were multiplied in that four different qualities of graphite were installed in the 105 Piles. These different qualities were arranged in concentric circles from the center portion of the Pile.

Below is a tabulation showing the dates on which machining of the graphite for each of the buildings was started and the dates the lay-ups were completed.

Building No.	Starting Date	Completion Date
305	12-15-43	1-5-44
105-B	12-10-43	6-1-44
105-D	5-17-44	6-28-44
105-F	6-21-44	11-18-44

An idea of the scope of the work in the 101 Building can be gathered from the fact that approximately 9,000 rough tons, or 7,000 finished tons, of graphite were machined. All during machining a slight positive air pressure was maintained in the 101 Building and all small particles of machined graphite were removed by exhaust ducts and fans.

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(b) "B" Blocks

The front and rear faces of the 105 Piles consist respectively of 121 and 132 prefabricated laminated blocks of masonite and steel, each approximately 4' x 4' x 4' in size and 10 tons in weight. These blocks are known as "B" Blocks and were shipped to the Project already fabricated. With each carload of blocks, a load report of the car was prepared by the du Pont inspector at the vendor's plant and forwarded to the 105 Area Division Engineer. These diagrams showed not only the locations of the blocks in the car but the exact measurements of each block as well. With these diagrams, the Craft Superintendent for the 105 Area, the Division Engineer, and various other interested personnel determined what position each block would occupy in the Pile. This was done in order that the cumulative dimensional variations would not exceed the allowable tolerances. A review of the erection tolerances of these blocks is given in the section under "difficulties". The only work done on these blocks after receipt on the Project was to roughly clean and buff them, using carbon tetrachloride as the cleaning fluid.

(c) Side and Top Laminations

The right and left sides and the tops of the 105 Piles consist of a series of steel and masonite laminations approximately 4' in thickness. The work of fabricating and installing these laminations was done entirely on the Project Site. The steel was received from the vendor in sheets approximately 1-7/8" thick and the masonite in sheets approximately 1/8" thick. The masonite was pressed and fastened by Chicago screw posts into blocks of 36 layers and was then drilled and/or sawed depending on its location in the Pile. The steel plates also were machined and punched, and the assembling of the steel and masonite took place at the Pile. Each wall contains a total of 26" of steel and 24" of masonite.

(d) Miscellaneous

There were numerous other methods and techniques set up for the 105 Buildings, such as the handling of the 42' thin-wall aluminum tubes, nozzles, cast-iron blocks, elevators and metal hanging equipment, etc. However, the most important materials have been discussed.

Very little has been said in this section concerning the special construction methods for the 305 Pile. This is due principally to the fact that this unit is relatively simple when compared to the 105 Piles. It consists principally of concrete and graphite blocks. The graphite has already been discussed and there was no unusual design involved in the concrete. It should be noted, however, that in this unit the bottom layer of graphite was grouted directly into the concrete, there being no cast-iron base.

(6) Construction Delays

Prior to and during the construction of the three 105 Buildings, a variety of difficulties and delaying factors were encountered. Most of the difficulties and delays covered in the 100 Areas' section applied to the 105 Area as well. Due to the size and complexity of the 105 Buildings, however, and the uniqueness of some of the materials used, additional delays were encountered.

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Since practically all of the specialized, complex and unique construction involved in the 105 Buildings is concentrated in the Process Unit known as the "Pile" or "Block", together with its auxiliary equipment and controlling mechanisms, most of the difficulties and delays discussed concern these Process Units.

(a) Labor

The greatest difficulty encountered in the construction of the three 105 Buildings was the procurement of an adequate supply of qualified labor. This difficulty was amplified due to the fact that the average worker in the various crafts was not sufficiently skilled for work on the fabrication, or assembly, of materials in the Process Units of the 105 Buildings, which was an entirely new type of construction. In addition, all work connected with the 105 Area was of a "classified" nature. As a result, every worker had to be "cleared" (see section on Security) before being permitted to work on the 105 and 305 Buildings or on the fabrication of materials for these Buildings. Unusual methods were necessary in order to secure the required supply of labor.

Early in the construction of the H.E.W., a special group of craftsmen was organized to handle specialized work in the 105 Area. This group, was concerned with the fabrication and assembly of the 105 and 305 Buildings, which included the "Piles", horizontal and vertical control rods, and the charging and discharging equipment, with the exception of the pipe and electrical work on these units. All work in the remainder of the buildings, which included principally the valve pit, storage and transfer sections, control room and the fan house was performed by the standard crafts handling the work in all of the areas.

The procurement of a sufficient number of welders for work on the Pile was particularly difficult for two reasons: (1) the welding technique required was extremely complicated and (2) the welding was of such a nature that the welder himself was more or less responsible for seeing that the work was done according to specifications. It was not possible, in other words, to inspect the welds other than by visual examination. Any weld failures encountered would, in many cases, have been extremely serious and perhaps even impossible to rectify.

Due to these conditions, only the highest type welders were selected. Before a welder was chosen for work on the process equipment in the 105 Building, his background was thoroughly checked from a Security angle (see section on Security). His work record was investigated, in many cases over the past 10 to 15 years, to determine his mental attitude and his reputation for reliability. If he proved satisfactory in this second respect, he was then given a rigid welding test in the field to determine his qualifications as a craftsman. This test was so difficult that only approximately 18% of the welders, all of whom had previously passed the U-69 welding test, qualified. When the welders realized, due to the critical shortage of men in their craft, that they would be employed somewhere on the Project even if they failed the 105 test, they were reluctant to work in the 105 Area due to the additional work, skill, and responsibility which it entailed. Consequently, a special 105 welder's rate was established. In connection with the request by du Pont to the

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Government for this special rate, the following is a quotation in part from the letter:

"The high degree of skill required in this operation (welding) is peculiar to the Project and, to our knowledge, has not been required in any other operation. Because of this condition factual data to support the request is not available. We feel that, for the following reasons, the classification and rate is in order and should receive favorable consideration:

1. Only mechanics (welders) of the highest skill with a long period of welding experience can qualify for the special training required.

a. They must have passed previous qualification tests and possess as evidence a card for any one of the following tests:

(1) A.S.M.E. - U-69 for plate over 3/4" in vertical position.

(2) A.W.S. - Fillet soundness and heavy butt in vertical position.

(3) Navy No. 2 in vertical position or No.4.

2. Those who meet the above requirements must submit to long and rigorous training in order to pass a qualifying test as follows:

(1) Guided root bend from A.W.S. fillet soundness test welded in the vertical position and the horizontal position with a 2" backing plate.

(2) Guided side bend from U groove 1" butt welded upward in the vertical position.

(3) Plug weld soundness test welded in vertical position.

3. The actual work to be done by Specialist Mechanics (special welders) requires the highest degree of skill and accuracy. The work is most tedious and, due to the extreme care which must be constantly exercised, the nature of the work creates an unusual state of tension under which the mechanic must perform. Recognition in the way of a favorable rate will result in necessary increased morale which is important, since results are solely the function of the mechanic's willingness to put forth his best efforts at all times. It is also to be expected that the reduction of turnover among these highly skilled and trained men will be materially reduced."

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This premium rate, coupled with the Project Welding Training School, made it possible to obtain sufficient personnel.

Next in importance to welders, the most critical craft encountered in the construction of the 105 Area was the millwright group, where again it was necessary to select the best men. It was found, however, that there was simply an insufficient supply of millwrights to adequately man the 105 Area. Consequently, a number of carpenters were given special training and schooling and were converted to millwrights. Also, as in the case of the welders, a premium rate was established for all millwright work in connection with the Process Units. The men receiving this rate were known as special material handlers, and special parts makers.

All other craftsmen, and particularly the pipe fitters, who were used in the construction and/or fabrication of materials for the Process Units in the 105 Buildings, had to be thoroughly qualified in their individual crafts. However, the only premium rates established were for the welders and special material handlers.

On the following page is a chart listing all of the critical crafts for the 105 Area, showing the number requested each week by the Division Engineer and the number actually allocated. The special material handlers are included on this chart as part of the millwright group, and the premium rate welders as part of the millwright welders. An inspection of this chart will show that, although for certain periods of time and for certain crafts, there were serious shortages, the overall picture is not bad when compared with those of the 100 and 200 Areas. However, this serves to emphasize that the principal labor difficulty in the 105 Area was one of quality rather than quantity. As a matter of fact, the 105-B Building was given top priority in the construction schedule in the early part of 1944 and retained it until completed. Thus, the 105 Area had relatively little difficulty so far as the quantity of labor allocated to it was concerned.

(b) Material Procurement

There were many difficulties and delays encountered in the procurement of materials for the 105 and 305 Buildings. Due to the unusual type of materials used, however, and the large amount of field fabrication work necessary, these difficulties were somewhat different from those encountered in other process buildings. No attempt will be made in this history to cover the procurement story for the 105 Area inasmuch as it was handled almost entirely by and through the du Pont Company's Wilmington Office. Separate "programs" were set up by Wilmington for each of the different types of material going into the 105 and 305 Buildings. There was a graphite block program, nozzle program, gun barrel program, "B" Block program, aluminum tube program, etc. These programs consisted not only of locating vendors to perform the necessary fabrication work but sources of raw material as well. Each program was planned and developed so as to provide the 105 Area with sufficient quantities of materials at the right times. If more than one fabricator or source of supply was necessary for a particular item or type of material, additional vendors were located. Each program was scheduled so as to fit in with the other programs, as well as with the fabrication work required on the Project Site. Discussion of the major

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items of field fabrication work required for the 105 Area is given in this section under special construction methods.

The 105-B Building was the only building in the 105 Area actually delayed in completion because of material difficulties, and then for only approximately two to three weeks due to late delivery of the material handling equipment. For a time during its construction, the procurement of "B" blocks, aluminum tubes, gun barrels and nozzles appeared critical, but the difficulties were surmounted in sufficient time to prevent delay in the completion of any of the 105 Buildings.

The discharge elevator cabs for both the 105-B and 105-D Buildings were very critical for a time. However, special handling of these cabs, as mentioned under the construction expedients, resulted in their arriving on the Project in sufficient time to prevent delay.

(c) Massive Construction

One of the most important factors tending to impede the construction of the 105 Buildings was the quantity of material installed in the Pile. The following is a tabulation of the larger quantities of materials.

Item	Quantity
Masonite, 1/8" thick	2,500,000 sq. ft.
Steel Plate	4,415 tons
Cast-iron	1,093 tons
Graphite	2,200 tons
Copper tubing	221,000 ft.
Saran tubing	176,700 ft.
Aluminum tubing	86,000 ft.

All of these materials were erected in a space approximately 46' long by 40' wide and 51' high. Approximately 1,200 different drawings not including the additional drawings resulting from revisions, were required for the 105 Buildings.

(d) Close Tolerance

In the construction of the 105 Buildings, very close tolerances were required. A list of the most significant tolerances for the graphite block fabrication is given in this section under Process Units Construction. There were in addition, numerous structural tolerances to contend with during the erection of the Piles. It is not advisable to list all of these tolerances here, but a few of them will suffice to emphasize the close work required. The cast-iron base for the 105 Piles had to be machined within .003", and had a flatness tolerance after grouting in the concrete of plus or minus .005". The steel and masonite laminations on the right and left sides and top of the pile had to fit against the steel webs (or "T" sections) with a gap of less than .005" at any one point. The setting of the gun barrels, bellows and various other metal fittings on the charge and discharge faces of the Piles was to 1/64". The graphite blocks were laid with a tolerance of a plus or

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minus .005" from the center line. The setting of the "B" blocks was at a tolerance varying from a plus or minus .005" for the blocks at the bottom of the Pile to plus or minus .015" for the blocks near the top of the Pile. In making the van stone flanges on the aluminum tube, a tolerance of plus .001" or minus .000" in the thickness of the tube side wall was permitted. These tolerances, and many more, together with the massive size of the structure and the unusual materials used, made the construction of the Piles a difficult and slow process. It was not simply a case of close measurement, but of developing new techniques and methods of handling the materials.

(e) Tests

Prior to and during the construction of the 105 Piles, numerous and varied tests were necessary to insure that the erection of the Piles was proceeding as specified. A discussion of the quantity and purity test for the graphite blocks is given in this section under special construction methods. There were, in addition, a number of tests on the other materials and on the Pile itself during construction. The following are some examples of the more significant tests required. All aluminum tubes were given a 350 lb. hydrostatic test, as well as a thorough visual examination of the exterior of the tubes, at the 105 White Bluffs Fabrication Shops. All bellows were pressure-tested under water. All of the gun barrels were checked for size to insure proper clearance for the aluminum tubes. All "doughnuts" were set on mandrels and checked for eccentricity and size, and the cast-iron base was checked for high spots.

All welds in the steel membrane beneath the cast-iron base were vacuum tested for gas tightness before the final pour of concrete. Numerous pressure tests were made on the welded seams to determine their gas tightness. An air test of 63" of water with an allowable leakage of 1 c.f.m. was made on the entire Pile in the 105-D and 105-F Buildings before the installation of the aluminum tubes. After tube installation, a second test was run on the Pile in all three buildings with an allowable leakage of 1 c.f.m. When the nozzles were installed, each tube was given, first a 50 lb. air test, and then a 350 lb. hydrostatic test, each with a permissible loss of 2 lbs. in 15 minutes. When the Pile was completed, the tubes were subjected to a final 350 lb. hydrostatic test with an allowable drop through all valves, flanges, etc. of 10 lbs. pressure in two hours.

There were numerous other tests of various types required during the construction of the Pile, particularly of the thermocouple and instrument piping installations. Those discussed here will suffice to show how rigidly the construction of the Piles was controlled prior to and during the erection period.

(f) Construction Techniques

Due to the unusual materials used in the Piles in the 105 and 305 Buildings, new techniques had to be developed and old techniques revised to meet the new conditions. In the machining of the graphite blocks, for example, there was practically no previous experience or precedents to draw upon, with the exception of the work done at the Clinton Engineer Works. It was only natural, therefore, that a certain amount of experimental work would be

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required in order to develop suitable techniques. Likewise, methods had to be designed for handling the masonite in the side walls and the top of the Piles. Masonite had been used chiefly as an interior building lining, in this case, new techniques had to be developed, for handling, cutting, and punching (or drilling) holes in the masonite, due to the quantity and close tolerances required and the hardness of the masonite.

Perhaps one of the most striking examples of new methods developed in the construction of the 105 Piles was the welding techniques. On February 4, 1944, a conference took place in Wilmington, attended by members of the Design and Construction Divisions of the du Pont Company and the following welding specialists from the ranks of other organizations: A. J. Moses, Combustion Engineering Corporation; Dr. W. G. Theisinger, Lukens Steel Company; and H. W. Pierce, New York Shipbuilding Corporation.

At this meeting, the various welding problems to be encountered in the construction of the Piles were discussed and a set of welding standards were established. Due to the fact that each Pile required considerably more than 50,000 linear feet of welded joints, the two chief problems were; how to prevent warping, and shrinking. These Piles were constructed with maximum tolerances of only .015" and the welded joints had to correspond. Another problem was the thickness of the plates to be plug-welded.

The standards developed from this meeting were modified slightly in the field as a result of experimentation, but in the main were followed throughout construction. It should be noted that another result of this conference was that the facilities of the Combustion Engineering Corporation at Chattanooga, Tennessee were made available and used for experimental (welding) purposes. The standards developed included the general requirements for the welders; the thoroughness and rigidity of these requirements has already been discussed in the previous section on labor difficulties.

In addition to these standards developed in Wilmington, and modified for experimentations and practice, the following welding experts were on the job to supervise the welding for the Piles and to give the qualifying tests to the welders.

M. D. Stepath, New York Shipbuilding Corporation
A. R. McClone, Combustion Engineering Company

The fact that 100 tons of welding rods were consumed in the construction of each of the 105 Buildings testified that welding in these Buildings was a very important item. The welding difficulties encountered were due not only to the thickness of the plate to be plug-welded, and the fact that no shrinkage or warpage would be allowed, but that there would be no flaws in the welds. The welds provided gas tightness to the Piles as well as structural support. The basic method by which the problem of warpage and shrinkage was met was by "peening" the welds. The weld was deposited in small amounts which was then peened, or hammered, before cooling. Thus the contraction normally taking place during cooling was prevented.

(g) Design Changes

On the whole, there were very few design changes, particularly in the

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DESIGN STATUS

▼105 BUILDING▼

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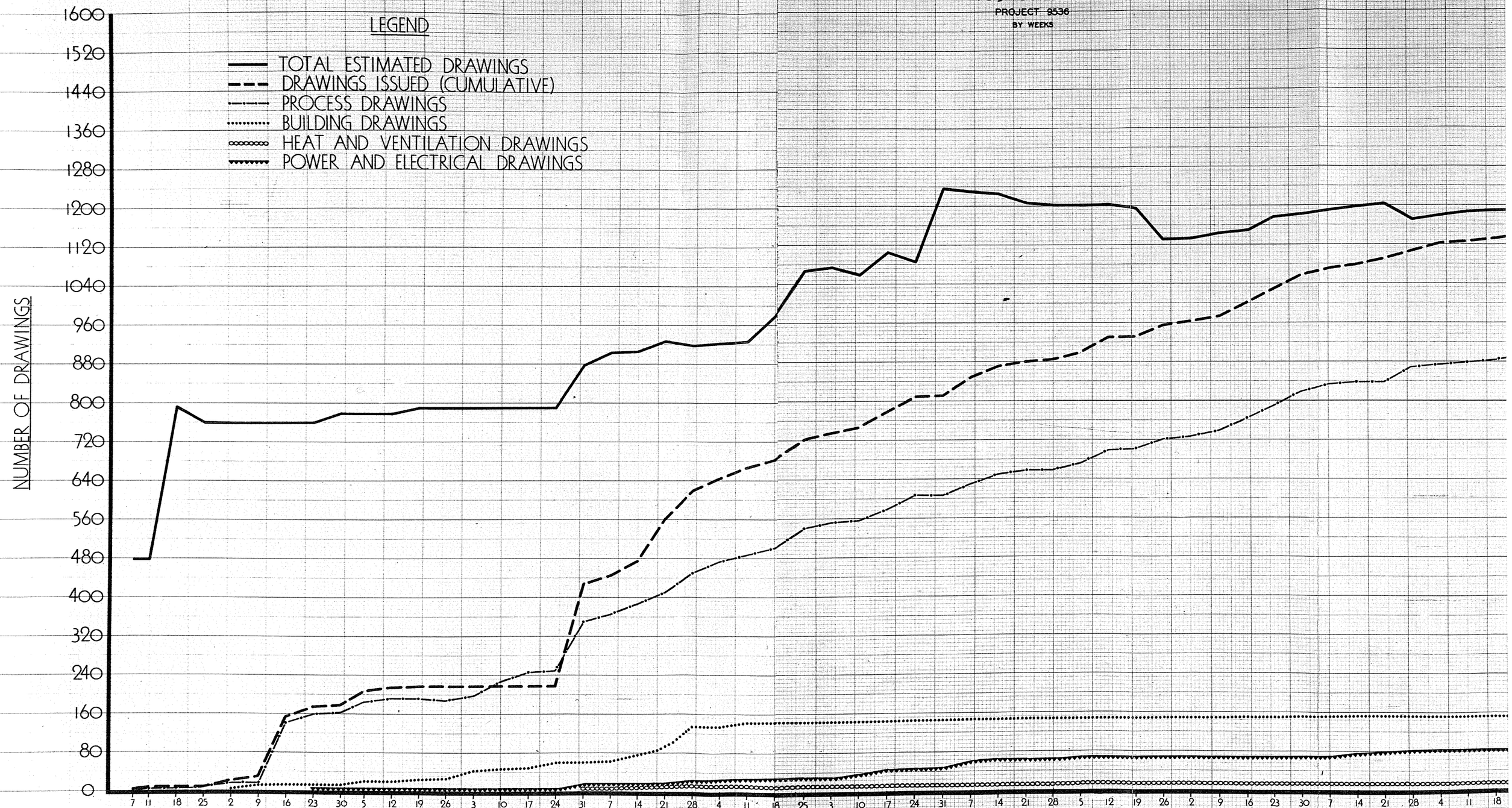
BY WEEKS



[redacted] DECLASSIFIED [redacted]

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DESIGN STATUS

▼105 BUILDING▼

PROJECT 9536

BY WEEKS

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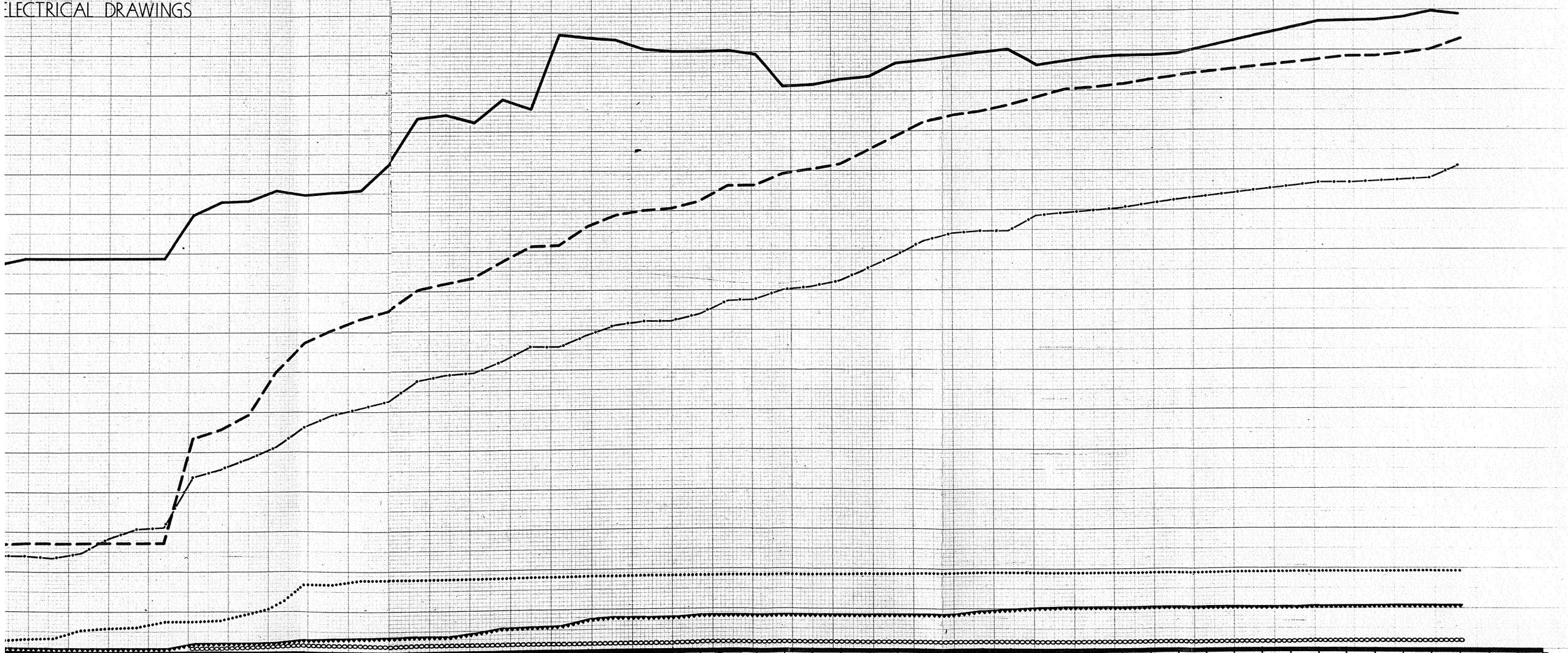
END

ATED DRAWINGS
UED (CUMULATIVE)
WINGS
WINGS
NTILATION DRAWINGS
ELECTRICAL DRAWINGS



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Process Units, made in the 105 Building during construction. Although there were many changes in techniques and methods, the three completed buildings are very much alike.

There were some additions made to the 105-B Building during construction which were incorporated into the 105-D and 105-F Buildings. The valve pit and valve pit laboratory were doubled in size and a small office was added. In addition, for the 105-D and 105-F Buildings, a concrete block enclosed storeroom was added beneath the structural steel framework which was erected adjacent to that portion of the building which housed the horizontal control rod. None of these design changes affected the actual progress of the building inasmuch as the construction of the Pile was the limiting factor in all three buildings. The only major difference in the three 105 Buildings is that the valve pit piping and the water piping to and from the 105-D Building is entirely stainless steel. In the 105-B and 105-F Areas, stainless steel was used only in locations where replacement was either impossible or extremely difficult.

(h) Restricted Area Work

The TC-101 Buildings were the first in the 105 Area to be restricted. As soon as the construction of these buildings had been completed, and fabrication was ready to start, the buildings were classified. A fence was erected around the buildings and only individuals having specific business inside the fence were permitted in.

Similarly, after the foundations and a portion of the superstructure of each of the 105 Buildings had been completed, a fence was erected around each of the buildings and only specifically authorized personnel were permitted inside.

The TC-101 Buildings and the 105 White Bluffs Fabrication Buildings were simply temporary structures for construction purposes and the restrictions on these buildings were removed when the fabrication work had been completed and all 105 materials in the buildings had been removed. The restrictions on the 105 and 305 Buildings were never lifted. When these buildings reached a sufficiently complete stage of construction, a permanent fence was erected to enclose them and the temporary fence was not removed until the permanent fence was completed.

Below is a tabulation listing the dates each of the structures in the 105 Area were restricted; and date restrictions were lifted, or the buildings were turned over to operations:

Temporary Facilities

	Date Restricted	Date Restriction Removed
TC-101	1-18-43	1-10-45
105 White Bluffs Fabrication	3-20-44	1-27-45

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Permanent Construction

Building or Unit	Restricted	* Date Turned Over To Operations
105-B	3-13-44	8-20-44
105-D	6-5-44	11-25-44
105-F	10-2-44	2-2-45
305	12-20-43	10-23-44

* All construction personnel was excluded from the building as of this date.

Although less than half of the prints for the 105 and 305 Buildings were considered "classified", access to the unclassified prints, nevertheless, was not permitted on the same basis as other unclassified prints.

From the foregoing it can readily be seen that the work of the 105 Area was considerably hampered by the restrictive measures. Movement of materials and equipment between the buildings and various fabrication structures was slowed down and the availability of personnel for work in the area was limited. In addition, it was not possible to move workers freely from one job to another within the 105 Area.

(i) Delays

Due to the number and variety of tests required during the construction of the 105 and 305 Buildings, there were no major delays. Minor defects were encountered from time to time as a result of these tests but they were immediately rectified and were simply considered a part of the normal construction routine.

As a result of the new techniques which were necessary there were some material difficulties encountered during construction. The most noteworthy examples of these material difficulties was in the case of the aluminum tubes in the 105-B Building. After tubes had been inserted in the Piles, it was necessary to van stone both ends and to remove the interior tube lands from that portion of the tube which was van stoned. Due to the close tolerances required (as has already been discussed) several hundred tubes fabricated in the 105-B Building were rendered unsuitable for use in the Piles. Consequently special experiments were carried on and techniques tried until a satisfactory method of van stoning the tube had been developed. The method finally decided upon was so satisfactory that practically no difficulty was encountered in the 105-D and 105-F Buildings.

(j) Miscellaneous

There were numerous delaying factors and difficulties (some of which have already been discussed), however the mention of a few will suffice to show their importance.

Winter weather played a large role in increasing construction difficulties. The concrete for the 105-D and 105-F Buildings could be poured with little concern for the weather, however, the 105-B Building required the

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105 AREA

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WEEK ENDING	LABORERS			CARPENTERS			REINF. RODSETTERS			RIGGERS			PIPEFITTERS			PIPE WELDERS			ELECTRICIANS			MILLWRIGHTS			MWT. WELDERS		
	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT
12-19-43	160	160	---	192	192	---	38	38	---	12	12	---	28	10	-18	2	2	---	8	8	---	50	40	-10	4	4	---
12-25-43	250	250	---	256	256	---	49	38	-11	12	12	---	22	19	-3	2	2	---	10	10	---	66	66	---	1	1	---
1-2-44	278	278	---	352	352	---	48	48	---	12	12	---	20	10	-10	2	2	---	14	14	---	66	66	---	1	1	---
1-9-44	278	278	---	560	560	---	64	32	-32	12	12	---	14	14	---	2	2	---	8	8	---	66	66	---	1	1	---
1-16-44	306	306	---	704	560	-144	62	40	-22	12	6	-6	20	20	-20	2	2	---	14	14	---	66	66	---	1	1	---
1-23-44	581	406	-175	926	800	-126	106	70	-36	18	18	---	116	36	-80	6	6	---	26	20	-6	74	74	---	3	3	---
1-30-44	506	381	-125	830	800	-30	115	73	-42	66	18	-48	45	45	---	3	2	-1	27	27	---	94	90	-4			
2-6-44	432	382	-50	590	462	-128	84	70	-14	137	111	-26	101	50	-51	10	2	-8	50	48	-2	160	160	---	27	3	-24
2-13-44	519	376	-143	428	370	-58	58	50	-8	134	99	-35	75	50	-25	10	2	-8	43	32	-11	224	194	-30	34	34	---
2-20-44	643	431	-212	492	396	-96	74	66	-8	161	115	-46	105	59	-46	17	5	-12	71	53	-18	276	166	-110	34	34	---
2-27-44	703	407	-296	586	405	-181	72	67	-5	154	115	-39	103	65	-38	16	6	-10	81	63	-18	274	162	-112	35	35	---
3-5-44	545	358	-187	608	405	-203	56	43	-13	96	84	-12	81	95	+14	9	6	-3	78	54	-24	272	185	-87	29	30	+1
3-12-44	668	335	-333	532	417	-115	44	42	-2	124	92	-32	107	107	---	14	7	-7	94	57	-37	288	191	-97	41	41	---
3-19-44	556	402	-154	430	430	---	42	42	---	106	97	-9	97	97	---	15	10	-5	82	76	-6	213	153	-60	27	27	---
3-25-44	812	432	-380	390	388	-2	68	68	---	109	99	-10	104	125	+21	14	16	+2	85	79	-6	197	187	-8	27	27	---
4-8-44	608	449	-159	466	508	+162	42	42	---	133	115	-18	105	105	---	15	13	-2	99	82	-17	260	232	-28	33	33	---
4-15-44	539	390	-149	372	372	---	30	30	---	164	113	-51	101	101	---	12	12	---	89	50	-39	266	246	-20	46	46	---
4-22-44	496	488	-208	423	401	-22	44	44	---	135	129	-6	105	94	-11	13	13	---	110	68	-42	473	420	-53	99	99	---
4-29-44	766	647	-119	425	425	---	40	40	---	159	105	-54	141	141	---	55	34	-21	134	101	-33	519	462	-57	69	69	---
5-6-44	850	658	-192	426	307	-119	42	42	---	163	123	-40	161	160	-1	54	51	-3	147	101	-46	631	612	-19	130	130	---
5-13-44	720	720	---	446	430	-16	57	57	---	141	141	---	220	159	-61	47	30	-17	143	101	-42	645	595	-50	116	116	---
5-20-44	801	702	-99	430	398	-32	49	34	-15	169	142	-27	200	140	-60	27	23	-4	117	96	-21	676	621	-55	117	117	---
5-27-44	829	755	-74	418	386	-32	50	34	-16	178	142	-36	274	250	-24	27	23	-4	142	97	-45	555	553	-2	92	92	---
6-3-44	785	755	-30	418	392	-26	46	46	---	159	157	-2	233	233	---	19	16	-3	141	104	-37	578	555	-23	76	75	-1
6-10-44	756	756	---	404	364	-40	44	44	---	167	167	---	233	233	---	23	21	-2	137	106	-31	688	670	-18	42	42	---
6-17-44	676	686	+10	400	360	-40	44	44	---	167	167	---	233	233	---	11	11	---	137	112	-25	688	670	-18	42	42	---
6-24-44	701	701	---	442	362	-80	48	48	---	206	167	-39	262	232	-30	11	11	---	142	117	-25	623	614	-9	64	64	---
7-1-44	686	686	---	452	382	-70	57	44	-13	206	175	-31	262	220	-42	11	11	---	152	132	-20	627	590	-37	73	73	---
7-8-44	681	656	-25	432	292	-140	57	34	-23	187	238	+51	282	218	-64	18	9	-9	162	137	-25	570	535	-35	80	65	-15
7-15-44	640	360	-280	358	333	-25	57	44	-13	183	170	-13	385	215	-170	18	5	-13	187	142	-45	584	552	-32	56	56	---
7-22-44	653	615	-38	358	333	-25	57	37	-20	185	162	-23	385	249	-136	25	30	+5	187	162	-25	104	85	-19	49	47	-2
7-29-44	640	585	-55	345	280	-65	52	42	-10	207	182	-25	390	261	-129	40	26	-14	185	172	-13	491	484	-7	40	40	---
8-5-44	555	500	-55	273	256	-17	42	37	-5	181	171	-10	290	239	-51	35	22	-13	207	177	-30	457	452	-5	40	40	---
8-12-44	552	496	-56	271	271	---	37	37	---	196	186	-10	344	244	-100	40	23	-17	207	165	-42	458	433	-25	40	38	-2
8-19-44	426	401	-25	198	198	---	29	29	---	135	135	---	164	139	-25	40	23	-17	145	145	---	357	330	-27	20	20	---
8-26-44	345	345	---	148	148	---	24	24	---	130	130	---	160	135	-25	40	23	-17	120	120	---	345	345	---	18	18	---
9-2-44	277	244	-33	160	160	---	24	24	---	150	150	---	160	135	-25	40	16	-24	125	125	---	329	329	---	18	18	---
9-9-44	400	322	-78	160	160	---	24	24	---	150	150	---	160	135	-25	40	16	-24	125	120	-5	329	305	-24	18	18	---

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WEEK ENDING	LABORERS			CARPENTERS			REINF. RODSETTERS			RIGGERS			PIPEFITTERS			PIPE WELDERS			ELECTRICIANS			MILLWRIGHTS			MWT. WELDERS		
	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT	NO. REQ.	NO. ALLOC.	NO. SHORT
9-16-44	345	287	-58	160	160	---	19	19	---	150	150	---	190	135	-55	40	17	-23	155	140	-15	332	332	---	18	18	---
9-23-44	373	235	-138	160	160	---	19	19	---	150	150	---	215	178	-37	35	17	-18	155	141	-14	309	309	---	18	18	---
9-30-44	328	328	---	120	120	---	14	14	---	150	150	---	225	220	-5	35	17	-18	180	145	-35	319	270	-49	18	18	---
10-7-44	328	328	---	120	120	---	14	14	---	138	138	---	280	275	-5	30	24	-6	200	145	-55	319	278	-41	18	18	---
10-14-44	228	370	+142	120	120	---	14	10	-4	135	113	-22	250	230	-30	26	23	-3	202	145	-57	355	271	-84	6	6	---
10-21-44	288	370	+102	120	120	---	12	12	---	140	108	-32	280	240	-40	28	26	-2	182	165	-17	352	268	-84	51	41	-10
10-28-44	258	350	+92	120	108	-12	12	12	---	130	115	-15	280	218	-62	28	33	+5	182	150	-32	338	279	-59	65	65	---
11-4-44	258	258	---	120	120	---	12	12	---	110	105	-5	300	239	-61	28	23	-5	207	170	-37	310	280	-30	62	50	-12
11-11-44	295	295	---	120	120	---	8	10	+2	120	95	-25	275	238	-37	25	25	---	202	163	-39	297	287	-10	62	59	-3
11-18-44	120	295	+175	120	120	---	8	8	---	120	103	-17	350	259	-91	31	23	-8	182	136	-46	15	222	+207		68	
11-25-44	120	91	-29	120	120	---	8	8	---	120	95	-25	330	248	-82	28	20	-8	187	128	-59	15	15	---		68	
12-2-44	60	58	-2	50	50	---	4	6	+2	70	82	+12	180	201	+21	18	19	+1	122	118	-4	10	10	---	53	53	---
12-9-44	60	55	-5	50	50	---	4	4	---	90	89	-1	200	200	---	18	17	-1	134	120	-14	10	10	---	53	53	---
12-16-44	60	58	-2	50	50	---	4	4	---	75	75	---	220	200	-20	18	18	---	134	120	-14	10	10	---	53	40	-13
12-23-44	60	58	-2	50	45	-5	4	4	---	50	50	---	200	185	-15	18	18	---	130	110	-20	10	10	---	23	23	---
12-30-44	60	50	-10	50	45	-5	4	6	+2	50	50	---	200	185	-15	18	18	---	130	110	-20	10	10	---	23	23	---
1-6-45	60	40	-20	40	40	---	4	6	+2	50	50	---	240	175	-65	24	18	-6	180	120	-60	12	12	---	6	6	---
1-13-45	60	50	-10	40	40	---	2	4	+2	50	40	-10	240	175	-65	24	15	-9	170	130	-40	12	11	-1	6	6	---
1-20-45	60	50	-10	40	35	-5	2	2	---	50	40	-10	240	160	-80	24	15	-9	135	105	-30	12	10	-2	6	6	---
1-27-45	60	45	-15	40	35	-5	2	2	---	15	15	---	200	145	-55	20	20	---	135	105	-30	12	10	-2	6	4	-2
2-3-45	60	30	-30	40	35	-5	2	2	---	15	10	-5	150	135	-15	15	15	---	140	105	-35	12	12	---	6	6	---

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erection of two temporary boilers feeding into steam lines and unit heaters over the entire building. These lines and heaters had to be changed and moved numerous times as work progressed. In addition, tiny enclosures had to be constructed and salamanders placed so the men could work in reasonable comfort.

The design of the 105 Buildings was developed as the construction of 105-B progressed. Thus, it was possible to plan and schedule more carefully and thoroughly the construction of the 105-D and 105-F Buildings. Incomplete design for 105-B resulted in delays at various times. It was necessary that the excavations remain open for longer periods than for the 105-D and 105-F Buildings, thus making it difficult to reach certain parts of the structures. This required the building of bridges, cat-walks, etc.; making it necessary to haul portions of the materials to the buildings by hand, rather than by trucks.

(7) Expedients

In the construction of the 105 Buildings, every attempt was made to employ expedients wherever possible. Most of the general types covered in the 100 Area and 200 Area sections apply also to the 105 Area. This section will discuss principally those which are peculiar to the 105 Buildings and particularly those applicable to the Process Units.

(a) Labor

In the section, immediately preceding, applying to delays and difficulties, two of the more important expedients, necessary for the procurement of an adequate supply of labor, training and premium rates, have already been covered. Also, as has been noted in the previous section, the labor procurement difficulty for the 105 Buildings was one of quality rather than quantity. Consequently, due to the very limited working space in the 105 Buildings, it was not possible to speed up the work simply by increasing the labor force. The only way an augmented labor supply could be used to an advantage was by shift work.

On December 3, 1943, the work on the Process Unit in the 105-B Building was put on two 9-hour shifts, and on January 1, 1944, a third shift was added. This continued through March 1, 1944. Most other crafts in the 105-B Building were placed on a three-shift basis from February 15, 1944 until completion. The 105-D and 105-F Buildings were on two 10-hour shifts throughout practically their entire construction period. The installation of the graphite and pile testing in these two buildings were on a three-shift basis.

The fabrication work in the TC-101 Building was placed on a two-shift basis December 8, 1943 and continued in that manner throughout most of the fabrication period. The 105 White Bluffs Fabrication Buildings were placed on a two-shift basis on April 6, 1944.

In addition to the shift work and extended working periods, Sunday work was utilized whenever necessary, particularly on the 105-B Building.

(b) Subcontracts

A portion of the labor employed and the material used in the construction

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of the three 105 Buildings was done under subcontract. It was found expedient to award 9 subcontracts to 9 different vendors for work on these buildings. With the exception of the two fixed-fee subcontractors, only one of these subcontracts was for work in connection with the Process Units. This subcontract (RPG 1245½) was awarded to the Haughton Elevator Company for the installation of elevators on both the front and rear faces of each of the 3 Piles. In addition to these "formal" subcontracts, requiring labor on the Plant Site, there were a number of purchase orders involving erection supervision. In the case of the 105 Buildings they involved only a small portion of the total work.

In the 100 Areas' section are complete lists of the subcontracts and erection supervision orders for the three 100 Areas, including the 105 Buildings.

(c) Material Procurement

Prior to and during the construction of the three 105 Buildings, the problem of procurement was kept to a minimum through persistent expediting and advance planning. In the previous section on delays and difficulties, separate "programs" were discussed for each of the major items and types of equipment involved in the 105 Buildings. Despite these programs, there were critical points throughout the construction period when the procurement problem threatened to, or actually did, delay completion of the buildings. In several cases, unusual methods were necessary in order to minimize these delays.

Due to the remoteness of the H.E.W. and the lengthy shipping distances from the vendors, air express, rail express, and truck shipments were used wherever necessary. Many other items, particularly for the 105-B Building, were given special handling and were flown direct to the Project by the Air Transport Command of the Army Air Force. One item which was shipped in an unusual manner was the discharge elevator cab for the 105-B Building. Due to the large amount of experimentation and test work required on this cab, it was greatly delayed in being shipped to the Project. Consequently, a request was made, and approved, for shipping the cab to the Project by railway express. Because of this decision it was necessary to convert the wheels, couplings, and hose connections of a freight car enabling it to be hauled in a passenger train. This conversion was made at the Reading Railroad Company's yards at Reading, Pennsylvania and the car was sent to Wilmington for loading. The car was hauled by various passenger trains across country to the Project. To insure that the car would not be side-tracked, and would be given preferential handling, a du Pont expeditor rode the passenger train. This same type of shipment was also required for the elevator cab for the 105-D Building.

(d) Temporary Facilities

A discussion of the temporary buildings and facilities provided for the 105 Buildings is in one of the sections preceding, under preliminary work. There were, in addition, temporary facilities installed within each 105 Building to expedite construction.

Inasmuch as the process requirements for the 105 Buildings necessitated keeping the Process Unit (and adjoining equipment) as free from dirt and contamination as possible, a slight positive air pressure was maintained inside

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using filtered air from the time work started on the erection of the Pile. To accomplish this, temporary air blowers were used. Later, when the permanent ventilation system had reached a sufficiently complete stage, it was put into operation. On the north side of the 105-B and 105-D Buildings, a temporary "air-lock" was erected. This air-lock had a concrete floor and numerous concrete pits, and occupied an area of approximately 10,000 sq. ft. All material for the Process Units was brought in through this air-lock and, if necessary, stored there temporarily. Minor fabrication work such as; cleaning, buffing, etc. was also performed in the air-lock. To bring the materials from the air-lock to the Process Unit, tracks were laid on which small hand cars operated. This track system was not used in the 105-D and 105-F Buildings. Instead, a steel and concrete roadway was laid into the Process Unit and on this roadway a small electrically-driven truck towed small cars carrying materials.

Erected above the Pile was a 15-ton traveling crane which was used throughout the construction period and then was dismantled. Above the work area, in front of the Pile, were a number of air and electrically-operated hoists which were also dismantled at the completion of construction. The cranes and hoists used in the 105-B were dismantled in sufficient time to be used in the 105-F Building. Thus, only two sets of cranes and hoists were necessary.

In order to start Pile erection in the 105-B Building as soon as possible, despite the fact that the building portion of the Pile had not been completed, a temporary cover or section was placed over the Pile. This method was not necessary in the 105-D and 105-F Buildings since the building structure had progressed far enough by the time Pile erection was started.

Attached to one side of the air-lock was a complete change house, including a locker, showers and smoking rooms, etc. During the erection of the Pile, when the graphite blocks were being installed, the men employed on this work were required to wear special uniforms to insure against contaminating the graphite. The change-house was used by the workmen to change into and out of their uniforms.

There were numerous other temporary facilities used within the 105 Buildings such as, jigs, fixtures, rigs, and skids of all sorts, but the more important ones have been discussed. Under the following section of special construction methods, are numerous items which could be considered expedients.

(e) Miscellaneous

For the construction of the 105-B Building, a 105' jib with a 100' boom, anchored by 6 heavy cables to deadmen in concrete, was used for the erection of structural steel and the 15-ton overhead crane. In the erection of the 105-D and 105-F Buildings, a section of concrete and block wall was temporarily left out so as to allow a mobile ground crane to do the same work in much less time.

In the pouring of concrete for the 105-D and 105-F Buildings, a considerable portion of the form work from the 105-B Building was reused. In the fabrication of the graphite blocks for the 105 Building test layup of the blocks was made in the TC-101 Building. A cast-iron base identical to that in the Pile was used. This test layup work was completed in sufficient time for the base in the 101 Building to be pulled out and reused in the 105-F Building.

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• PROGRESS OF CONSTRUCTION •
BUILDINGS & FACILITIES

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105 AREA
PROJECT 9536

BUILDING NUMBER	NAME	DESIGN RELEASED	EXCAVATION		FOUNDATIONS		STRUCTURAL STEEL		SUPERSTRUCTURE		EQUIPMENT INSTALLATION		TEST RUNS MAJOR EQUIPMENT		STARTUP DATE	COMPLETION DATE	DATE ACCEPTED BY	
			STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE	STARTED	COMPLETE			OPERATION	GOV'T.
	TOTAL 105 AREA		10/4/43													1/31/45		
305	File Building		(Building portion constructed by 300 Area Division Engineer)								11/19/43	2/25/44	12/1/43	3/1/44	2/1/44	3/2/44	5/17/44	5/17/44
105-B	File Building	10/4/43	10/10/43	—	10/29/43	3/31/44	1/31/44	7/19/44	1/2/44	7/21/44	2/4/44	8/19/44	7/25/44	8/15/44	8/19/44	8/19/44	9/14/44	9/24/44
105-D	File Building	10/4/43	11/29/43	—	12/3/43	4/28/44	4/8/44	11/11/44	2/18/44	9/22/44	4/14/44	11/17/44	10/15/44	11/15/44	11/25/44	11/25/44	11/29/44	11/29/44
105-F	File Building	10/4/43	2/17/44	—	2/18/44	10/20/44	6/26/44	12/15/44	5/27/44	12/22/44	8/25/44	1/26/45	1/1/45	1/26/45	1/31/45	1/31/45	2/5/45	2/3/45

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(8) Building Descriptions

On the pages following are descriptions of the 105 and 116 Buildings including a photograph of the finished structures. All other building descriptions for the 100 Areas are covered in the 100 Area's sections.

The data used in the building descriptions were secured by concurrent studies of the prints and observations of the buildings as they were being constructed.

The overall dimensions of the building show the longest length and width while the height is taken from the bottom of the foundation to the top of the roof. The area figure given is the cross-section of the building, and the volume figure is the overall displacement calculated from the bottom of the building to the top of the roof.

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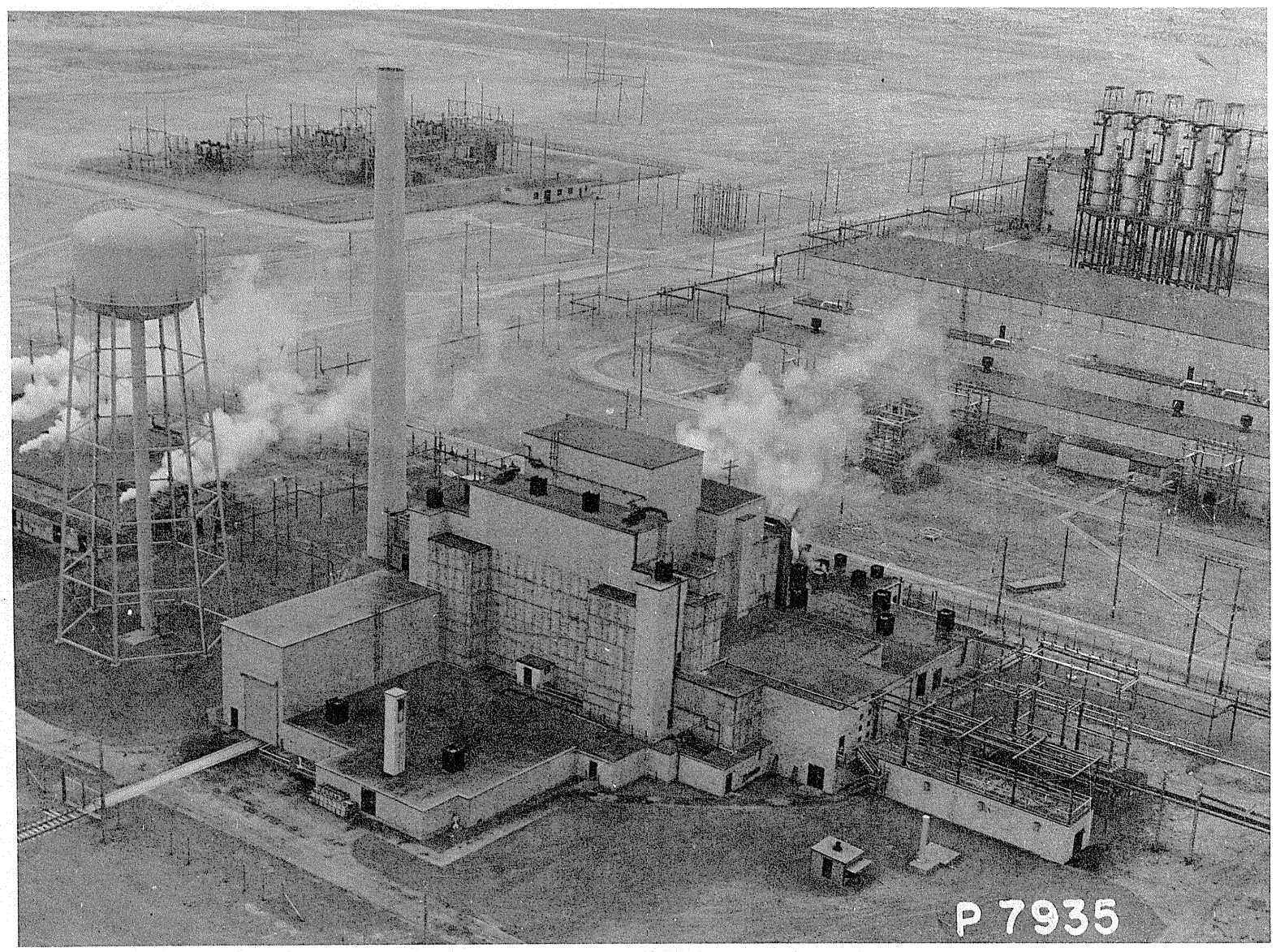

105-D - PILE BUILDING
116-D - STACK
Aerial View Looking Southwest

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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 Streets. 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.

EQUIPMENT LIST

Number	Type	Size - Capacity - Power
2	Gasoline Pumps	Electric-Driven - 1/3 HP - 110 V.
2	Gasoline Storage Tanks	2,000 Gallons
1	Air Compressor & Receiver	15 CFM - 1 HP - 220 V.

Material	Quantity
Lumber (Framing)	10,500 f.b.m.
Lumber (Sheathing)	6,000 f.b.m.
Concrete	110 Cu. Yds.
Exterior Gypsum Board	4,600 Sq. Ft.
Roofing (Roll 65#)	39.13 Squares

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