

COMPLETION REPORT
CANTONMENT CONSTRUCTION
FORT HUACHUCA, ARIZONA
May 10, 1941

maps filed with Mrs. Carter 12-11-41

HEADMAN, FERGUSON & CAROLLO
ARCHITECT - ENGINEERS

S. S. HEADMAN

PREFACE

PREFACE

250 p 1/2

The construction program covered by this project entails the erection of a cantonment at the army post located at Fort Huachuca, Arizona, as authorized by Procurement Authority No. QM 7616 P1-3211A.

The work was supervised by Col. Joseph L. Brooks, Constructing Quartermaster, assisted by Architect-Engineers and Contractors employed on a Fixed-Fee form of Contract negotiated during the month of October, 1940.

Architect-Engineer -- Headman, Ferguson & Carollo
Consulting Engineers
Phoenix, Arizona

Contractors -- Del E. Webb Construction Company
Phoenix, Arizona
and
White & Miller, Contractors, Inc.
Tucson, Arizona

The contractors operated as a joint organization, with Del Webb acting as senior members.

The original project comprised housing for 5240 men and officers, assuming that part of the organizations would be maintained in permanent buildings on the Post.

Studies of personnel housing and cantonment site layout had been made during the year prior to the start of actual construction by the War Department, resulting in a definite location of site with reference to the established Post and the well water supply.

Fort Huachuca, being an isolated area, has been served by its own utility units, as no outside source of such service was available until recently when natural gas and electric power came within the economic reach of the cantonment.

Prior to the start of construction the Post had installed and was operating the following utility service:

Electric power was supplied from a local central generating station consisting of five diesel engine driven units of rather small capacity.

250 p 1/2

Natural gas was twenty-two miles distant, and negotiations were under way to extend service to the Post for heating and fuel. This contract was consummated in the latter part of 1940 and the Post and Cantonment supplied with gas as a part of the construction program. The Reception Center (Tent City) was also equipped with gas equipment and served with gas to replace the cannon stoves originally installed.

The sewer system for the Post discharged into two cess-pools which were entirely inadequate and overrunning on the surface of the ground, thereby causing a nuisance and a menace to health. The military and United States Health Board, as well as the Arizona State Sanitary Engineer, condemned this situation; this resulted in the extension of the outfall sewer main of the Post to enable all sanitary sewage to be delivered to the sewage disposal plant constructed under this project.

Water was being supplied to the Post by gravity supply from sources located in the mountains above the Post elevation. These sources were inadequate during summer months and a new well had been drilled at the east gate along the road to Bisbee. This well established a hitherto unbelievable water source (or well field) that has proven to be sufficient to supply the needs of any size cantonment that might be considered at this location.

19
we

A second well was in process of being drilled when this project was gotten under way and tentative drawings were prepared by the officer of the Quartermaster General setting forth the pumping layout, piping to the new cantonment site and a gridwork of mains for the area.

No deviation was to be permitted from this plan which called for a twelve inch distribution system and booster pumps arranged for both series and parallel operation. When it was found, however, that pump manufacturers could not meet these requirements, permission was obtained to change the characteristics of the second booster pump to operate as a dual standby for either of the booster pumps at each well location.

The wells have deep well turbine pumping units direct connected to vertical motors. The pumps deliver 500 and 700 GPM respectively. Each well pump has a booster pump having a like capacity against 320 lb./sq.in. for the 500 GPM unit and 120 lb./sq.in.

PART I

GENERAL

SECTION 1

Engineering Report

ENGINEERING REPORT

Reports on Annual Rainfall

Records of rainfall have been kept in various U.S. Weather Bureau recording stations located throughout Arizona; they date as far back as 1875. Studies of these records indicate that the rainfall in the same locality varies with the elevation as does the maximum and minimum temperature during the different months of the year.

The Southwest has experienced the effects of the drought which has prevailed in the United States during the past years. Plotted rainfall data indicates that the high and low cycles of rainfall vary on periods of approximately eleven year cycles. The present period is on the rising portion of the precipitation cycle; this is evident in the increased rainfall of the present season over past seasons.

The following tabulation sets forth the average annual rainfall data for Weather Bureau stations in the vicinity of Fort Huachuca based on a record from 1875 to 1928:

Average Annual Rainfall

| Month | Fairbanks Elev. 3900 | Lewis Springs Elev. 4027 | Tombstone Elev. 4500 | Tucson U.A. Elev. 2423 | Ft. Huachuca* Elev. 5000 |
|--------------|-------------------------|-----------------------------|-------------------------|---------------------------|-----------------------------|
| Jan | .61 | .54 | .84 | .84 | .95 |
| Feb | .56 | .62 | .87 | .86 | 1.20 |
| Mar | .51 | .39 | .79 | .81 | .86 |
| Apr | .26 | .16 | .34 | .36 | .27 |
| May | .13 | .12 | .24 | .17 | .21 |
| Jun | .62 | .63 | .46 | .25 | 1.78 |
| Jul | 4.22 | 3.33 | 3.52 | 2.40 | 2.07 |
| Aug | 2.54 | 2.61 | 3.41 | 2.23 | 3.68 |
| Sep | 1.10 | 1.22 | 1.69 | 1.08 | 1.63 |
| Oct | .48 | .50 | .66 | .60 | 1.47 |
| Nov | .60 | .90 | .78 | .80 | 1.03 |
| Dec | .60 | 1.17 | .88 | 1.11 | 1.52 |
| TOTAL | 12.23 | 8.96 | 14.48 | 11.51 | 16.66 |

*The last column shows the average rainfall for Fort Huachuca as measured at the Post for the years 1936-40, inclusive.

The following tabulation sets forth the precipitation by months from 1936-40 at Fort Huachuca:

Precipitation by Months

| Year | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|------|------|------|------|------|-----|------|------|------|------|------|------|------|
| 1936 | | | | | | | 2.12 | 4.46 | 2.55 | | 1.70 | 1.15 |
| 1937 | 1.50 | .12 | 1.50 | | | 1.21 | 2.94 | 4.22 | 1.95 | 1.51 | | 1.62 |
| 1938 | .73 | .81 | 1.39 | .12 | .12 | 1.05 | 1.60 | 2.21 | .57 | 1.07 | | 1.81 |
| 1939 | .46 | 1.01 | .46 | .18 | | | 1.63 | 4.81 | .36 | 1.67 | .50 | .18 |
| 1940 | 1.10 | 2.85 | .10 | .52 | .31 | 3.07 | 2.08 | 2.80 | 2.73 | .17 | .90 | 2.80 |
| AVE. | .95 | 1.20 | .86 | .27 | .22 | 1.76 | 2.07 | 3.68 | 2.63 | 1.47 | 1.03 | 1.51 |

Reports on Wind Velocities and Direction of Prevailing Winds

The following tabulation has been compiled from records kept by the Signal Corps at Fort Huachuca during the past year. The normal wind velocity ranges from six to nine miles per hour with a very short period of velocities ranging up to twenty-five miles per hour.

Wind Velocity
and
Prevailing Direction

| Month | 1939 | | | Month | 1940 | | |
|-------|---------------|------|-----------|-------|---------------|------|-----------|
| | Wind Velocity | | Direction | | Wind Velocity | | Direction |
| | Max. | Ave. | | | Max. | Ave. | |
| | | | | Jan | 12 | 7 | S |
| | | | | Feb | 10 | 7 | S |
| Mar | 15 | 6 | S | Mar | 12 | 8 | S |
| Apr | 25 | 8 | SE | Apr | 15 | 9 | N-S |
| May | 25 | 6 | SE | May | 15 | 8 | S |
| Jun | 15 | 7 | none | Jun | 15 | 7 | S |
| Jul | 15 | 6 | S | Jul | 13 | 6 | none |
| Aug | 10 | 6 | NE-SE | Aug | 20 | 9 | S |
| Sep | 12 | 8 | E | Sep | 20 | 8 | S |
| Oct | 12 | 6 | S | Oct | 27 | 9 | S |
| Nov | 10 | 6 | NE | Nov | 22 | 8 | S |
| Dec | 15 | 7 | S | Dec | 15 | 8 | S |

Reports on Temperature Variations

The following tabulation sets forth readings taken at the Fort Huachuca Power Plant, located on the Post; these cover a period from 1936 to 1940, inclusive.

Temperature Readings
1936-1940

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------|--------|------|------|------|------|------|------|------|------|------|------|------|
| 1936 | High | | | | | | 101 | 96 | 90 | 88 | 76 | 72 |
| | Low | | | | | | 62 | 51 | 50 | 41 | 30 | 23 |
| | Ave. H | | | | | | 92.3 | 88.6 | 82.8 | 77.5 | 64.9 | 59.0 |
| | Ave. L | | | | | | 69.3 | 66.9 | 68.2 | 57.7 | 46.6 | 36.6 |
| 1937 | High | 64 | 76 | 74 | 90 | 94 | 101 | 101 | 98 | 90 | 88 | 78 |
| | Low | 10 | 24 | 28 | 38 | 44 | 55 | 58 | 62 | 57 | 48 | 38 |
| | Ave. H | 52.4 | 62.8 | 65.4 | 76.2 | 84.1 | 91.0 | 92.6 | 90.0 | 84.7 | 79.0 | 71.8 |
| | Ave. L | 29.6 | 37.9 | 40.6 | 48.2 | 56.4 | 63.4 | 68.9 | 66.6 | 62.6 | 55.9 | 44.8 |
| 1938 | High | 72 | 71 | 80 | 87 | 96 | 100 | 100 | 99 | 90 | 90 | 78 |
| | Low | 28 | 31 | 32 | 34 | 41 | 60 | 62 | 60 | 58 | 42 | 32 |
| | Ave. H | 60.5 | 62.4 | 67.2 | 75.1 | 82.5 | 89.5 | 89.5 | 88.7 | 84.1 | 70.7 | 66.0 |
| | Ave. L | 36.5 | 39.3 | 41.1 | 44.5 | 56.6 | 62.9 | 67.0 | 66.2 | 63.1 | 56.0 | 39.4 |
| 1939 | High | 70 | 70 | 80 | 84 | 94 | 102 | 96 | 96 | 98 | 85 | 74 |
| | Low | 28 | 17 | 32 | 36 | 49 | 56 | 62 | 61 | 62 | 42 | 24 |
| | Ave. H | 57.4 | 50.3 | 69.6 | 78.1 | 85.7 | 93.4 | 91.0 | 88.4 | 85.7 | 75.5 | 60.7 |
| | Ave. L | 35.2 | 30.2 | 42.8 | 50.7 | 57.8 | 67.0 | 67.1 | 65.6 | 62.2 | 52.3 | 42.9 |
| 1940 | High | 70 | 80 | 88 | 90 | 96 | 105 | 103 | 98 | 95 | 85 | 78 |
| | Low | 26 | 27 | 26 | 37 | 46 | 52 | 56 | 60 | 54 | 38 | 28 |
| | Ave. H | 60.1 | 60.5 | 69.3 | 75.6 | 86.6 | 92.3 | 93.4 | 89.1 | 85.7 | 75.7 | 69.4 |
| | Ave. L | 35.3 | 37.0 | 43.2 | 47.8 | 59.8 | 64.7 | 67.3 | 65.1 | 61.9 | 52.6 | 38.9 |

Records for twenty-seven years for the City of Tombstone, which is at the same elevation as Fort Huachuca and only twenty-six miles distant, show the following as average temperatures for the above mentioned period:

Temperature Readings
Tombstone, Arizona

| | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep | Oct | Nov | Dec |
|----------------------|------|------|------|------|------|-------|-------|------|------|------|-----|-----|
| Ext. Max. | 84 | 85 | 92 | 93 | 100 | 106 | 107 | 104 | 106 | 100 | 90 | 80 |
| Ext. Min. | 9 | 14 | 20 | 28 | 31 | 26 | 52 | 53 | 43 | 30 | 19 | 12 |
| Mean. Ext Max | 72.4 | 75.0 | 81.7 | 87.4 | 94.3 | 101.9 | 101.0 | 97.0 | 95.3 | 89.4 | 79 | 71 |
| Mean. Ext Min | 20.8 | 24.8 | 28.6 | 33.8 | 40.8 | 50.4 | 58.7 | 58.0 | 51.6 | 37.9 | 30 | 23 |
| Annual Ext. Max. 107 | | | | | | | | | | | | |
| Annual Ext. Min. 9 | | | | | | | | | | | | |

Regulations on Sewage Disposal

The State of Arizona does not have any prescribed regulations for sewage disposal. The State Sanitary Engineer acts in an advisory capacity only and has no police power.

Stream Flow Data

There are no streams other than minor creeks flowing from the Huachuca Mountains and these do not flow all year around.

The only large stream flow within a range of twelve miles from Fort Huachuca is the San Pedro River. Stream flow gaugings on this stream are attached.

Topographic and run off Data of Water Shed

Fort Huachuca lies at the foot of the Huachuca Mountains on the north slope. It is located at the mouth of what is known as Post Canyon from which the original fort obtained its gravity water supply. The mountain peaks directly south of the Post rise to a precipitous elevation of 8500 feet. During the winter months the mountains are usually covered with snow which feeds the springs which supply water to Fort Huachuca and the City of Tombstone thirty miles distant.

During the summer months when the rainfall is heaviest the streams carry off water for a period of approximately six weeks during which time there may be flash floods of minor proportions.

(Drainage area - 1,440 square miles)

| Year | W.S.P (No. and Page) | Water Year ending Sept. 30 | | | Run-Off in Acres-Feet | | | Calendar Year | | |
|--------|----------------------------|----------------------------|----------------|------|-----------------------------|----------------|------|----------------|----------------|------|
| | | Maximum Day | Minimum Day | Mean | Maximum Day | Minimum Day | Mean | Maximum Day | Minimum Day | Mean |
| 1913 | 359-230 | 846 | 1.7 | 32.8 | 1,120 | 1.7 | 35.2 | 1,120 | 1.7 | 35.2 |
| 1914 | 389-169 | 12,300 | 2 | 205 | 1,760 | 2 | 49.7 | 1,760 | 2 | 49.7 |
| *1915 | 409-199 | | | | 5,180 | 2 | 120 | 5,180 | 2 | 120 |
| 1916 | 439-166 | 1,760 | 2 | 47.2 | 34,200 | 2 | 128 | 34,200 | 2 | 128 |
| 1917 | 459-158 | 5,180 | 2 | 125 | 90,200 | 2 | 49.7 | 90,200 | 2 | 49.7 |
| 1918 | 479-153 | 920 | 1 | 28.0 | 20,300 | 1 | 29.5 | 20,300 | 1 | 29.5 |
| 1919 | 509-220 | 6,050 | 1 | 129 | 93,500 | 1 | 147 | 93,500 | 1 | 147 |
| 1920 | 509-220 | 860 | 2 | 57.5 | 41,800 | 2 | 38.3 | 41,800 | 2 | 38.3 |
| 1921 | 529-157 | 6,700 | 1.5 | 140 | 102,000 | 1.5 | 141 | 102,000 | 1.5 | 141 |
| 1922 | 549-152 | 1,900 | 1 | 50.4 | 36,500 | 1 | 48.6 | 36,500 | 1 | 48.6 |
| 1923 | 569-147 | 3,080 | .5 | 58.3 | 41,200 | .5 | 67.4 | 41,200 | .5 | 67.4 |
| 1924 | 589-145 | 562 | 1 | 34.8 | 25,300 | 1 | 24.3 | 25,300 | 1 | 24.3 |
| 1925 | 609-131 | 2,400 | 1 | 50.8 | 36,800 | 1 | 53.3 | 36,800 | 1 | 53.3 |
| **1926 | 629-127 | 28,800 | 2 | 170 | 122,000 | 2 | 189 | 122,000 | 2 | 189 |
| **1927 | 649-89 | 2,100 | 10 | 71.4 | 51,700 | 10 | 53.7 | 51,700 | 10 | 53.7 |
| **1928 | 669-87 | 350 | 4 | 27.7 | 20,000 | 4 | 35.6 | 20,000 | 4 | 35.6 |
| 1929 | 689-95 | 3,650 | 6 | 74.7 | 54,100 | 6 | 66.1 | 54,100 | 6 | 66.1 |
| 1930 | 704-103 | 3,590 | 6 | 73.9 | 53,500 | 6 | 73.8 | 53,500 | 6 | 73.8 |
| 1931 | 719-106 | 4,090 | 3 | 89.7 | 64,900 | 3 | 100 | 64,900 | 3 | 100 |
| 1932 | 734-114 | 1,720 | 6 | 63.3 | 45,900 | 6 | 52.0 | 45,900 | 6 | 52.0 |
| 1933 | 749-96 | 1,430 | 4 | 38.9 | 28,200 | 4 | 39.9 | 28,200 | 4 | 39.9 |
| 1936 | 809-159 | 3,400 | 3 | 61.6 | 44,600 | 3 | 58.3 | 44,600 | 3 | 58.3 |
| 1937 | 829-171 | 3,880 | 5 | 77.3 | 55,960 | 5 | 78.1 | 55,960 | 5 | 78.1 |
| 1938 | 859-250 | 2,290 | 3 | 47.8 | 34,600 | 3 | 47.3 | 34,600 | 3 | 47.3 |
| 1939 | 879- | 3,080 | 2 | 68.8 | 49,800 | 2 | 47.3 | 49,800 | 2 | 47.3 |

* Published as "San Pedro River near Fairbank, Arizona" 1913 to Sept. 30, 1926; as "San Pedro River at Fairbank, Arizona" Oct. 1, 1926 to Sept. 30, 1928.

** Computed by using unpublished estimates for January 1-21 and 31.
 ** Record Oct. 1, 1926 to Sept. 30, 1928, from station below mouth of Babocomari River published as "San Pedro River at Fairbank, Arizona".

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey - Water Resources Branch

File No. _____

Summary of yearly discharge, in second-feet, for
San Pedro River at Charleston, Arizona *

(Drainage area - 1,440 square miles)

| Year | W.S.P. (No. and Page) | Water Year ending Sept. 30 | | | Run-Off in Acre-Feet | | | Calendar Year | | | Run-Off in Acre-Feet |
|--------|-----------------------------|----------------------------|----------------|------|----------------------------|----------------|------|----------------|----------------|------|----------------------------|
| | | Maximum Day | Minimum Day | Mean | Maximum Day | Minimum Day | Mean | Maximum Day | Minimum Day | Mean | |
| 1913 | 359-230 | 846 | 1.7 | 32.8 | 23,800 | 1.7 | 35.2 | 1,120 | 1.7 | 35.2 | 25,500 |
| 1914 | 389-169 | 12,300 | 2 | 205 | 148,000 | | | | | | |
| #1915 | 409-199 | | | | | | | | | | |
| 1916 | 439-166 | 1,760 | 2 | 47.2 | 34,200 | 2 | 128 | 1,760 | 2 | 49.7 | 93,000 |
| 1917 | 459-158 | 5,180 | 2 | 125 | 90,200 | 2 | 120 | 5,180 | 2 | 120 | 87,000 |
| 1918 | 479-153 | 920 | 1 | 28.0 | 20,300 | 1 | 29.5 | 920 | 1 | 29.5 | 21,400 |
| 1919 | 509-220 | 6,050 | 1 | 129 | 93,500 | 1 | 147 | 6,050 | 1 | 147 | 106,000 |
| 1920 | 509-220 | 860 | 2 | 57.5 | 41,800 | 2 | 38.3 | 860 | 2 | 38.3 | 27,800 |
| 1921 | 529-157 | 6,700 | 1.5 | 140 | 102,000 | 1.5 | 141 | 8,700 | 1.5 | 141 | 102,000 |
| 1922 | 549-152 | 1,900 | 1 | 50.4 | 36,500 | 1 | 48.6 | 1,900 | 1 | 48.6 | 35,200 |
| 1923 | 569-147 | 3,080 | .5 | 58.3 | 41,200 | .5 | 67.4 | 3,080 | .5 | 67.4 | 48,800 |
| 1924 | 589-145 | 562 | 1 | 34.8 | 25,300 | 1 | 24.3 | 524 | 1 | 24.3 | 17,700 |
| 1925 | 609-131 | 2,400 | 1 | 50.8 | 36,800 | 1 | 53.3 | 2,400 | 1 | 53.3 | 38,600 |
| **1926 | 629-127 | 28,800 | 2 | 170 | 122,000 | 2 | 189 | 28,800 | 2 | 189 | 137,000 |
| **1927 | 649-89 | 2,100 | 10 | 71.4 | 51,700 | 10 | 53.7 | 2,050 | 10 | 53.7 | 38,900 |
| **1928 | 669-87 | 350 | 4 | 27.7 | 20,000 | 4 | 35.6 | 1,480 | 4 | 35.6 | 25,900 |
| 1929 | 689-95 | 3,650 | 6 | 74.7 | 54,100 | 6 | 66.1 | 3,650 | 6 | 66.1 | 47,900 |
| 1930 | 704-103 | 3,590 | 6 | 73.9 | 53,500 | 6 | 73.8 | 3,590 | 6 | 73.8 | 53,500 |
| 1931 | 719-106 | 4,090 | 3 | 89.7 | 64,900 | 3 | 100 | 4,900 | 3 | 100 | 72,600 |
| 1932 | 734-114 | 1,720 | 6 | 63.3 | 45,900 | 6 | 52.0 | 1,720 | 6 | 52.0 | 37,800 |
| 1933 | 749-96 | 1,430 | 4 | 38.9 | 28,200 | 4 | 39.9 | 1,430 | 4 | 39.9 | 28,900 |
| 1936 | 809-159 | 3,400 | 3 | 61.6 | 44,600 | 3 | 58.3 | 3,400 | 3 | 58.3 | 42,320 |
| 1937 | 829-171 | 3,880 | 5 | 77.3 | 55,960 | 5 | 78.1 | 3,880 | 5 | 78.1 | 56,500 |
| 1938 | 859-250 | 2,290 | 3 | 47.8 | 34,600 | 3 | 47.3 | 2,290 | 3 | 47.3 | 34,250 |
| 1939 | 879- | 3,080 | 2 | 68.8 | 48,800 | 2 | | | 2 | | |

* Published as "San Pedro River near Fairbank, Arizona" 1913 to Sept. 30, 1926; as "San Pedro River at Fairbank, Arizona" Oct. 1, 1926 to Sept. 30, 1928.

** Computed by using unpublished estimates for January 1-21 and 31.
** Record Oct. 1, 1926 to Sept. 30, 1928, from station below mouth of Babocomari River published as "San Pedro River at Fairbank, Arizona".

The terrain of the mesa at the foot of the mountains has a uniform slope of approximately three feet per hundred, which is interspersed with arroyos eroded during the past years.

Floods and flood Control

There is no record of floods in this territory and no flood control works have ever been contemplated.

Geological Data

The Huachuca Mountains are a protrusion of granite and limestone extended up through the bed of the valley; they form a southern out-off wall for water in the underground reaches of the San Pedro water shed. No water has been developed in the limestone or granite canyons except for the few springs which have been used in years past for surface water supply. These water sources are limited in their capacity and during the summer months have proven entirely inadequate.

The San Pedro Valley consists of a deposit of sedimentary erosion sand, decomposed granite boulders, and clays of various consistency, all of which are of a porous nature and permit the percolation of water.

This area extends from the Huachuca Mountains north to the Tombstone Hills and from Bisbee in the Mule Mountains west to St. David in the Whetstone Mountains.

Well Records and Logs

Well records indicate that the water level in the entire San Pedro Valley is at a hydraulic gradient equal to the flow line of water flowing through gravel to the San Pedro surface water level. The depth to water at each different well location is, in most cases, equal to the differences in elevation at the site of the well to the river channel less the hydraulic gradient necessary for the water to flow through the underground channel to the stream at its nearest point. The wells at Fort Huachuca verify this situation. (See logs attached)

WELL LOGS

Well No. 1

| Date | Depth Drilled | Total Depth | Character of Ground |
|---------|---------------|-------------|--|
| 12/5/38 | 20' | 20' | 0'-8' Adobe, 8'-20' Boulder |
| 6 | 22 | 42 | 20-27 Boulder, 27-42 Adobe and boulders |
| 7 | 23 | 65 | 42-65 Adobe and boulders |
| 8 | 19 | 84 | 65-84 Adobe and boulders |
| 9 | 21 | 105 | 84-88 Adobe and boulders, |
| | | | 88-105 Sand Gravel & boulders |
| 12 | 25 | 130 | 105-112 Sand Gravel & boulders |
| | | | 112-130 Adobe with boulders |
| 13 | 24 | 154 | 130-154 Adobe and boulders |
| 14 | 19 | 173 | 154-170 Adobe and boulders |
| | | | 170-173 Loose Boulders, Hard |
| 15 | 18 | 191 | 173-191 Loose Boulders, Hard |
| 16 | 17 | 208 | 191-208 Loose Boulders, Hard |
| 19 | 19 | 227 | 208-227 Loose Boulders, Hard |
| 20 | 21 | 248 | 227-248 Loose Boulders, Hard |
| 21 | 24 | 272 | 248-272 Loose Boulders, Hard |
| | | | Adobe, Gravel boulders |
| 22 | 26 | 298 | 272-298 Adobe, Sand, Gravel, and boulders mixed |
| 23 | 19 | 317 | 298-317 Adobe, Sand, Gravel, and boulders mixed |
| 26 | 18 | 335 | 317-319 ditto, 319-335 boulders, hard, and clay |
| 27 | 20 | 355 | 335-355 Boulders, Hard, Clay |
| 28 | 22 | 377 | 355-365 Boulders, Hard, Clay |
| | | | 365-377 Adobe Gravel |
| 29 | 21 | 398 | 377-398 Adobe with Gravel embedded |
| 30 | 23 | 421 | 398-417 Adobe and Gravel, 417-421 Hard Sand and Gravel cemented |
| 1/2/39 | 25 | 446 | 421-426 Hard Sand and Gravel cemented, 426-446 Adobe Sand |
| | | 460 | Water raised to this level measured 2/4/39, 446-465 Adobe Sand and Gravel, 465-469 Hard Sand |

| Date | Depth Drilled | Total Depth | Character of Ground |
|--------|---------------|-------------|--|
| 1/3/39 | 26' | 472' | 469-470 Water Gravel and sand showing water at 470 470-472 Sand and gravel compacted |
| 4 | 25 | 497 | 472-488 Compacted sand and gravel, 488-497 Loose gravel and sand - water showing strong at 488 |
| 5 | 25 | 522 | 497-522 Loose Gravel and sand |
| 6 | 18 | 540 | 522-524 Loose gravel and sand, 524-540 Hard sand, gravel, boulders |
| 9 | 25 | 565 | 540-545 Hard sand, gravel, boulders, 545-565 Loose sand and gravel |
| 10 | | | Reaming |
| 11 | | | Reaming |
| 12 | 5 | 570 | 565-570 Loose sand and gravel |
| 13 | 13 | 583 | 570-580 Loose sand and gravel, 580-588 Loose boulders |
| 16 | 16 | 599 | 583-590 Loose boulders, 591-599 Loose Water sand and gravel |
| 17 | 8 | 607 | 599-607 Loose water sand and gravel |
| 18 | 13 | 620 | 607-615 Loose water sand and gravel, 615-620 Loose boulders sand and gravel |
| 19 | 10 | 630 | 620-629 Hard Boulders, 629-630 Loose sand and boulders |
| 20 | 10 | 640 | 630-640 Loose sand and boulders |
| 23 | 15 | 655 | 640-645 Loose sand and boulders 645-655 Hard sand |
| 24 | 19 | 674 | 655-674 Loose sand and boulders |
| 25 | 6 | 680 | 674-680 Loose sand and gravel |
| 26 | 12 | 692 | 680-692 Adobe |
| 27 | 9 | 701 | 692-701 Apparent drilling in rock, Hard drilling |

Well No. 2

| Depth Drilled | Total Depth | Character of Ground |
|---------------|-------------|--|
| 40' | 40' | Conglomerate medium hard |
| 20 | 60 | Clay and gravel |
| 70 | 130 | Sandstone and conglomerate medium hard |
| 70 | 200 | Conglomerate medium hard |
| 70 | 270 | Conglomerate with hard strata |
| 25 | 295 | Conglomerate medium |
| 15 | 310 | Conglomerate with soft strata |
| 30 | 340 | Conglomerate medium |
| 30 | 370 | Sand |
| 40 | 410 | Large Boulders |
| 30 | 440 | Sand and gravel |
| 37 | 477 | Water and conglomerate |
| 43 | 520 | Conglomerate with lots of water |
| 30 | 550 | Hard conglomerate |
| 50 | 600 | Sand conglomerate with water |
| 30 | 630 | Conglomerate Medium with hard strata |
| 20 | 650 | Gravel carrying water |
| 40 | 690 | Hard conglomerate |
| 20 | 710 | Rock |

A History of the mines in this territory shows that all abandoned mines in the area have ceased operations because of inability to stand the cost of pumping underground water below the hydraulic gradient above mentioned.

Soil Characteristics

The character of the soil varies from a deposit of boulders cemented with clay and silt to a sandy clay soil. Tests on bearings of this soil indicate the four thousand bearing strength as a safe factor.

When the ground is dry, it is extremely hard and impervious to moisture. When the soil is once saturated, however, the strength greatly diminishes and is not considered satisfactory for roads without a suitable stabilizing material. Suitable decomposed stabilizing material is available at the reservation and is used for all road construction work.

Character of Sand and Gravel

Most of the arroyos on the Post carry large quantities of sand, which is suitable for concrete construction. The gravel in the creek bed is not used for this purpose, but crushed limestone is shipped in from a quarry located in the vicinity of Bisbee. This material is admirably suited for road construction and concrete work.

Location of Sand and Gravel Pits

The nearest crushed stone plant is at Paul's Quarry on the S.P. Railroad between Bisbee and Douglas. The cost of all grades of crushed limestone is ninety cents (90¢) a yard, f.o.b. quarry. The freight from Paul's Quarry siding to Fort Huachuca is \$1.48, making a total cost per yard delivered to the Post of \$2.38

Sand and gravel is procured from the local washes at a cost comparable with rock delivered from Paul's Quarry.

General Land Values

The land adjacent to Fort Huachuca is mostly held by large hold-

ings for grazing purposes and was originally purchased at grazing land values of approximately \$3.00 per acre. This land is held by several large interests and could most likely be valued at from \$5.00 to \$15.00 per acre.

Terrain

Natural drainage is established through years of erosion along definite channels which have formed arroyos cutting across the area in irregular patterns. These washes are not abrupt, but rather of a rolling character with enough width to allow for treatment of landscaping whereby roadways can follow these courses at comparatively easy grades.

The general "over-lot" grading is nominal and should not exceed cuts of over two feet at any point.

Clearing required is negligible since this is mesa land covered with stubble, dry grass, and scattered cactus plants.

There are no swamps or mosquito breeding areas near the vicinity of Fort Huachuca.

Flash floods along the creek bed are experienced during the summer rainy periods, but high land along the creek is available throughout the area. Because of the rapid slope of the ground, there is rapid run-off. High water stages seldom last over periods of more than a few hours.

The area is underlaid with depository material eroded from the mountain crevases. The high ground upon which the cantonment was started encountered cemented conglomerate with large nigger-heads interspersed throughout; this made trenching very expensive. The lower areas which are to be enshrouded by the extension are on deposits almost free of boulders.

Land has been leased during past years at one dollar per day for approximately seventeen landowners which takes in the whole area from the Fort to Tombstone. Added charges for water and wood privileges may run as high as \$5.00 to \$15.00 per day.

There are not any towns of any consequence within range of twenty miles of the Post. Hence, small liability of infringement of rights or objection to sewer or water encroachments by others.

Transportation

The Post is served by the Southern Pacific Railroad Company over a branch line known as the Lewis Springs Branch. This branch is a single line track serving the Post and Garden Canyon. It is approximately eleven miles long. Lewis Springs is on the main line of the Southern Pacific twenty-five miles west of Naco, Arizona.

State Highway 92 is a paved oil macadam road from Bisbee to Fort Huachuca. This road runs through the Fort proper to the junction point eleven miles north of the Post to Highway 62 which is a gravel road between Nogales and Tombstone. The section from Tombstone to the Fort is being prepared for oiling by the State Highway Department and will soon be completed. U. S. Highway 80 passes through Bisbee, Tombstone, and Tucson.

Labor

Local labor is available through labor union headquarters. This labor is not proficient in all the various trades and lack of skilled mechanics is evident in performance records of work accomplished.

No housing facilities were available for construction organizations, nor were good mechanics available in numbers sufficient to expedite the project except at normal schedules.

Housing facilities for construction organization did not exist prior to the start of the original cantonment project. A complete camp including administrative buildings, for both government officers, architect-engineer, and contractor overhead personnel, and mess hall for four hundred men and barracks for two hundred fifty men were built.

Use of nine barracks in the cantonment was made to house seven hundred fifty men; also four company storehouses and administration buildings and three mess halls care for men on the construction.

Lack of accommodations limited the number of men that could be employed. It also tended to divert the best craftsmen to more comfortable centers.

The scale of wages established for this area is the same as for the whole state of Arizona. (See schedule attached)

WAGES UNDER THE DAVIS-BACON ACT

| | |
|---|--------------------|
| Asbestos workers | \$1.25 hr. |
| Blacksmiths | 1.20 |
| Boilermakers | 1.37 $\frac{1}{2}$ |
| Bricklayers | 1.50 |
| Carpenters, journeymen | 1.25 |
| Cement finishers | 1.25 |
| Electricians | 1.12 $\frac{1}{2}$ |
| Helpers, 1st and 2nd years | .62 $\frac{1}{2}$ |
| 3rd and 4th years | .75 |
| Elevator constructors | 1.25 |
| Helpers | .87 $\frac{1}{2}$ |
| Firemen, portable boiler | .87 $\frac{1}{2}$ |
| Form builders | 1.12 $\frac{1}{2}$ |
| Glaziers | 1.00 |
| Jackhammermen | .75 |
| Laborers, unskilled | .75 |
| Lathers, metal | 1.25 |
| Machinists | 1.20 |
| Helpers | .85 |
| Marble setters | 1.50 |
| Helpers | .87 $\frac{1}{2}$ |
| Mason tenders | .75 |
| Mortor mixers | 1.00 |
| Operators of power equipment: | |
| Air compressors | 1.00 |
| Blade graders | 1.25 |
| Cranes or derricks | 1.25 |
| Distributors (bituminous surface) | .75 |
| Finishing machines (cement concrete pavement) | 1.12 $\frac{1}{2}$ |
| Hoists | 1.25 |
| Mixers (10-S or smaller) | .75 |
| Mixers (larger than 10-S) | 1.25 |
| Motor graders | 1.00 |
| Pumps | 1.00 |
| Rollers | 1.25 |
| Scrapers | .75 |
| Shovels | 1.50 |
| Stone spreaders | 1.75 |
| Tractors, 20 HP or less | .65 |
| " over 20 HP but less than 50 HP | .75 |
| " 50 HP or more | 1.25 |
| Trenching machines | 1.25 |

| | |
|--|--------------------|
| Painters | \$1.00 hr. |
| Pipe layers, concrete and clay | .75 |
| Plasterers | 1.50 |
| " tenders | 1.00 |
| Plumbers | 1.50 |
| Reinforcing rodsetters | 1.25 |
| Roofers, composition: 1st hand | 1.00 |
| 2nd hand | .87 $\frac{1}{2}$ |
| slate and tile | 1.00 |
| Sheetmetal workers | 1.12 $\frac{1}{2}$ |
| Soft floor layers | 1.25 |
| Steamfitters | 1.25 |
| Stonemasons | 1.25 |
| Structural iron workers | 1.37 $\frac{1}{2}$ |
| " finishers | 1.37 $\frac{1}{2}$ |
| Terrazzo workers | 1.25 |
| Helpers | .87 $\frac{1}{2}$ |
| Tile setters | 1.50 |
| Helpers | .87 $\frac{1}{2}$ |
| Truck drivers, 1 $\frac{1}{2}$ tons or less | .68- $\frac{3}{4}$ |
| over 1 $\frac{1}{2}$ tons but less than 7 cu. yds. | .75 |
| 7 cu. yd. but less than 13 cu. yd. | 1.00 |
| 13 cu. yd. | 1.00 |
| 13 cu. yd. or over | 1.12 $\frac{1}{2}$ |
| Well drillers | 1.00 |
| Helpers | .62 $\frac{1}{2}$ |
| Welders | 1.37 $\frac{1}{2}$ |

NOTE: Wages for all classes of labor have been increased from ten to twelve percent as of February 10, 1941.

PART II

DESCRIPTION OF COMPLETED PROJECT

SECTION I

Buildings

BUILDINGS

| No. | Building Description | Type | Plan No. | Dimensions | Capacity |
|-------------------------------|------------------------|-------|----------|------------|-------------|
| <u>TEMPORARY CONSTRUCTION</u> | | | | | |
| 700- | | | | | |
| 80 | Barracks w/Lav. | Std. | 1165 | 29-6x80-0 | 63 man |
| 26 | Mess | " | 1127 | 25-4x93-2 | 170 man |
| 27 | Day Room | A-5 | 378 | 25-4x45-2 | 1 company |
| 27 | Storehouse & Co. Adm. | SA-2 | 376 | 25-4x51-2 | 1 company |
| 5 | Officers Qtrs w/o Mess | OQ-40 | 1257 | 29-6x130-0 | 40 officers |
| 2 | Officers Mess | Std. | 1127 | 25-4x78-10 | 118 Offrs. |
| 1 | Adm. Bldg. (Regt.) | A-10 | 251 | 25-4x90-2 | 2 of 45 Cl. |
| 1 | Guard House (Regt.) | GH-2 | 260.1 | 25-4x66-2 | 24 prisoner |
| 2 | Infirmary | I-2 | 279 | 25-4x90-2 | 3000 man |
| 1 | Fire Station, Brig. | F-2 | 277 | 44-2x97-2 | 5V.18M |
| 1 | Tel. and Tel. | TT-1 | 330 | 25-4x78-2 | 25000 man |
| 1 | Post Officer | PO-1 | 298 | 25-4x87-2 | 5000 man |
| 1 | Post Exchange | E-3 | 297 | 99-0x37-0 | 3000 man |
| 1 | Recreation Bldg. | RB-1 | 310 | 99-0x37-0 | Regt. |
| 1 | Theatre | TH-2 | 1211 | 37-0x99-0 | 364 man |
| 1 | Service Club | SC-3 | 1275 | 99-8x163-8 | 1 Division |
| 1 | Guest House | HH-1 | 1290 | 29-6x130-0 | 30 guests |
| 1 | Storehouse | SH-9 | 322 | 25-4x108-2 | 2740 sq.ft. |
| 2 | Warehouse--non-insul. | SH-13 | 324 | 60-6x153-2 | 9190 sq.ft. |
| 1 | Warehouse--insulated | SH-18 | 326 | 60-6x153-2 | 9190 sq.ft. |
| 1 | Motor Repair Shop | SP-2 | 314 | 84-0x37-0 | 4 stall |
| 1 | Gas Station | GOS-2 | 365 | 9-0x16-0 | 12,000 gal. |
| 1 | Laundry | LDY-3 | 1400 | 72-0x216-6 | |

TEMPORARY CONSTRUCTION * HOSPITAL
(190-Beds on a 250-Bed Plan)

| | | | | | |
|---|-------------------|-------|------|------------|-------------|
| 1 | Adm. Bldg. | A-1 | 430 | 25-4x147-2 | |
| 1 | Nurses Qtrs. | HQ-24 | 1240 | 29-6x150-0 | 24 nurses |
| 1 | E.M. Mess | M-12 | 444 | 37-0x144-0 | 338 man |
| 2 | Wards, Std. | W-1 | 462 | 25-4x150-6 | 33 man |
| 4 | Wards, Comb. Std. | W-2 | 463 | 25-4x150-6 | 26 man |
| 1 | Infirmary | I-2 | 279 | 25-4x90-2 | 3000 man |
| 1 | Storehouse M. D. | SH-7 | 461 | 25-4x126-2 | 3196 sq.ft. |
| 1 | Dental Clinic | DC-2 | 472 | 25-4x111-2 | |
| 1 | Officers Qtrs. | HQ-17 | 1252 | 29-6x140-0 | 17 officer |

| No. | Building Description | Type | Plan No. | Dimensions | Capacity |
|-----|----------------------|-------|----------|------------|-------------|
| | | | 700- | | |
| 2 | Barracks w/Lav. | HB-54 | 1204 | 29-6x150-0 | 54 man |
| 1 | Adm. Co. | A-5 | 396 | 25-4x45-2 | 208 man |
| 1 | Boiler House | HB-11 | 1515 | 36-0x47-0 | |
| 1 | Barracks, Med. Detn. | HB-31 | 1203 | 29-6x90-0 | 31 man |
| 1 | Ward, Comb. | W-5 | 463 | 25-4x150-6 | 25 man |
| 1 | Storehouse | SH-5 | 460 | 25-4x126-2 | 3196 sq.ft. |
| 1 | Recreation Bldg. | A-5 | 378 | 25-4x45-2 | 1 company |

TEMPORARY CONSTRUCTION

| | | | | | |
|---|------------------------|-------|------|-----------|-------------|
| 1 | Mess Hall | Std. | 1127 | 25-4x93-2 | 170 man |
| 1 | Adm. Bldg. (Regt) | A-10 | 251 | 25-4x90-2 | 2 of 45 Cl. |
| 1 | Boiler House (Laundry) | HB-11 | 1515 | 36-0x47-0 | |

PERMANENT CONSTRUCTION

| | | | | | |
|---|------------------|-------|---------|------------|--------|
| | | | 6203- | | |
| 1 | Finance Building | A-12 | 1100x | 35-0x40-0 | |
| 1 | Bakery | BAK-1 | 700-254 | 38-0x56-0 | |
| 1 | Cold Storage | CS-1 | 1265 | 72-4x90-0 | |
| 1 | Ice Plant | Std. | 1315 | 72-4x120-0 | 40-ton |

LIST OF BUILDINGS

The following tabulation sets forth by serial number, the type and the identification drawing numbers of the temporary and permanent buildings constructed under this project; the block number refers to the regimental area in which the building may be found:

TEMPORARY BUILDINGS

New Cantonment
Fort Huachuca, Arizona

Group 1

| Serial No. | Block No. | Building Description | Type | Plan No. | System of Heating |
|------------|-----------|----------------------|--------|----------|-------------------|
| | | | | 700- | |
| T-1 | D | Administration | A-10 | 251 | Gas |
| T-2 | B | Administration | A-10 | 251 | Gas |
| T-3 | 1 | Str. Hse. & Co. Adm. | SA-2 | 376 | Gas |
| T-4 | 1 | Ditto | " | " | " |
| T-5 | 2 | " | " | " | " |
| T-6 | 2 | " | " | " | " |
| T-7 | 2 | " | " | " | " |
| T-8 | 2 | " | " | " | " |
| T-9 | 1 | " | " | " | " |
| T-10 | 1 | " | " | " | " |
| T-11 | 13 | " | " | " | " |
| T-12 | 13 | " | " | " | " |
| T-13 | 13 | " | " | " | " |
| T-14 | 13 | " | " | " | " |
| T-19 | 6 | " | " | " | " |
| T-20 | | | FUTURE | | |
| T-21 | 7 | " | " | " | " |
| T-22 | 7 | " | " | " | " |
| T-23 | 7 | " | " | " | " |
| T-24 | 7 | " | " | " | " |
| T-25 | 6 | " | " | " | " |
| T-26 | 6 | " | " | " | " |
| T-27 | 9 | " | " | " | " |
| T-28 | 9 | " | " | " | " |
| T-29 | 8 | " | " | " | " |

| Serial No. | Block No. | Building Description | Type | Plan No. | System of Heating |
|------------|-----------|----------------------|------|----------|-------------------|
| | | | | 700- | |
| T-30 | 8 | Str. Hse. & Co. Adm. | SA-2 | 376 | Gas |
| T-31 | 8 | Ditto | " | " | " |
| T-32 | 8 | " | " | " | " |
| T-33 | 9 | " | " | " | " |
| T-34 | 9 | " | " | " | " |
| T-35 | 5 | Infirmary | I-2 | 279 | " |
| T-36 | 12 | Infirmary | I-2 | 279 | " |
| T-37 | 5 | Post Office | PO-1 | 299 | " |
| T-38 | 10 | Tel. & Tel. | TT-1 | 330 | " |
| T-39 | 10 | Fire Station | F-2 | 277 | " |
| T-40 | E | Guest House | HH-1 | 1290 | " |

(NOTE: Numbers T-15 to T-18, Inclusive, Reserved for Future
T-41 to T-299 ditto)

Hospital Group

| | | | | | |
|-------|----|-------------------|--------|------|-------|
| T-300 | 16 | Administration | A-1 | 430 | Steam |
| T-301 | 16 | Administration | A-5 | 396 | Gas |
| T-302 | 16 | Off. Qtrs. & Mess | HQM-17 | 1252 | Steam |
| T-303 | 16 | Nurses' Quarters | HQ-24 | 1240 | " |
| T-304 | 16 | Infirmary | I-2 | 279 | " |
| T-305 | 16 | Ward | W-2 | 463 | " |
| T-306 | 16 | " | W-1 | 462 | " |
| T-307 | 16 | " | W-1 | 462 | " |
| T-308 | 16 | " | W-5 | 463 | " |
| T-309 | 16 | " | W-2 | " | " |
| T-310 | 16 | " | " | " | " |
| T-311 | 16 | " | " | " | " |
| T-312 | 16 | Hospital Barracks | HB-31 | 1203 | " |
| T-313 | 16 | " | HB-50 | 1204 | " |
| T-314 | 16 | " | " | " | " |
| T-315 | 16 | Dental Clinic | DC-2 | 472 | " |
| T-316 | 16 | Store House | SH-7 | 461 | " |
| T-317 | 16 | Store House | SH-5 | 460 | " |
| T-318 | 16 | Mess | M-12 | 444 | " |
| T-319 | 16 | Boiler House | HB-11 | 1515 | " |
| T-320 | 16 | Recreation | A-51 | 396 | Gas |

(NOTE: Numbers T-321 to T-492, Inclusive, Reserved for Future)

Group 3

| Serial No. | Block No. | Building Description | Type | Plan No. | System of Heating |
|------------|-----------|----------------------|-------|----------|-------------------|
| | | | | 700- | |
| T-493 | D | Officers Mess | Std. | 1127 | Gas |
| T-494 | D | " Quarters | OQ-40 | 1257 | " |
| T-495 | D | " " | " | " | " |
| T-496 | B | " " | " | " | " |
| T-497 | A | " Mess | Std. | 1127 | " |
| T-498 | A | " Quarters | OQ-40 | 1257 | " |
| T-499 | A | " " | " | " | " |
| T-500 | 1 | Barracks | Std. | 1165 | " |
| T-501 | 1 | " | " | " | " |
| T-502 | 1 | " | " | " | " |
| T-503 | 1 | " | " | " | " |
| T-504 | 1 | " | " | " | " |
| T-505 | 1 | " | " | " | " |
| T-518 | 1 | " | " | " | " |
| T-519 | 1 | " | " | " | " |
| T-520 | 1 | " | " | " | " |
| T-521 | 1 | " | " | " | " |
| T-522 | 1 | " | " | " | " |
| T-523 | 1 | " | " | " | " |
| T-524 | 2 | " | " | " | " |
| T-525 | 2 | " | " | " | " |
| T-526 | 2 | " | " | " | " |
| T-527 | 2 | " | " | " | " |
| T-528 | 2 | " | " | " | " |
| T-529 | 2 | " | " | " | " |
| T-530 | 13 | " | " | " | " |
| T-531 | 13 | " | " | " | " |
| T-532 | 13 | " | " | " | " |
| T-533 | 13 | " | " | " | " |
| T-534 | 13 | " | " | " | " |
| T-535 | 13 | " | " | " | " |
| T-536 | 13 | " | " | " | " |
| T-537 | 13 | " | " | " | " |
| T-538 | 13 | " | " | " | " |
| T-539 | 13 | " | " | " | " |
| T-540 | 13 | " | " | " | " |
| T-541 | 13 | " | " | " | " |
| T-542 | 2 | " | " | " | " |
| T-543 | 2 | " | " | " | " |
| T-544 | 2 | " | " | " | " |

(NOTE: Numbers T-506 to T-517, Inclusive, Reserved for Future)

| Serial No. | Block No. | Building Description | Type | Plan No. | System of Heating |
|------------|-----------|----------------------|--------|----------|-------------------|
| | | | | 700- | |
| T-545 | 2 | Barracks | Std. | 1165 | Gas |
| T-546 | 2 | " | " | " | " |
| T-547 | 2 | " | " | " | " |
| T-548 | 6 | " | " | " | " |
| T-549 | 6 | " | " | " | " |
| T-550 | 6 | " | " | " | " |
| T-551 | 6 | " | " | " | " |
| T-552 | 6 | " | " | " | " |
| T-553 | 6 | " | " | " | " |
| T-554 | 9 | " | " | " | " |
| T-555 | 9 | " | " | " | " |
| T-556 | | | FUTURE | | |
| T-557 | 9 | " | " | " | " |
| T-558 | 9 | " | " | " | " |
| T-559 | 9 | " | " | " | " |
| T-560 | 9 | " | " | " | " |
| T-561 | 9 | " | " | " | " |
| T-562 | 9 | " | " | " | " |
| T-563 | 9 | " | " | " | " |
| T-564 | 9 | " | " | " | " |
| T-565 | 9 | " | " | " | " |
| T-566 | 6 | " | " | " | " |
| T-567 | 6 | " | " | " | " |
| T-568 | 6 | " | " | " | " |
| T-569 | | | FUTURE | | |
| T-570 | 6 | " | " | " | " |
| T-571 | 6 | " | " | " | " |
| T-572 | 7 | " | " | " | " |
| T-573 | | | FUTURE | | |
| T-574 | 7 | " | " | " | " |
| T-575 | 7 | " | " | " | " |
| T-576 | 7 | " | " | " | " |
| T-577 | 7 | " | " | " | " |
| T-578 | 8 | " | " | " | " |
| T-579 | 8 | " | " | " | " |
| T-580 | | | FUTURE | | |
| T-581 | 8 | " | " | " | " |
| T-582 | 8 | " | " | " | " |
| T-583 | 8 | " | " | " | " |
| T-584 | 8 | " | " | " | " |
| T-585 | 8 | " | " | " | " |
| T-586 | 8 | " | " | " | " |
| T-587 | 8 | " | " | " | " |
| T-588 | 8 | " | " | " | " |
| T-589 | 8 | " | " | " | " |

| Serial No. | Block No. | Building Description | Type | Plan No. | System of Heating |
|------------|-----------|----------------------|--------|----------|-------------------|
| | | | | 700- | |
| T-590 | 7 | Barracks | Std. | 1165 | Gas |
| T-591 | 7 | " | " | " | " |
| T-592 | 7 | " | " | " | " |
| T-593 | 7 | " | " | " | " |
| T-594 | 7 | " | " | " | " |
| T-595 | 7 | " | " | " | " |
| T-596 | 7 | Mess Hall | " | 1127 | " |
| T-597 | 7 | " | " | " | " |
| T-598 | | | FUTURE | | |
| T-599 | 6 | " | " | " | " |
| T-600 | 6 | " | " | " | " |
| T-601 | 6 | " | " | " | " |
| T-602 | 7 | " | " | " | " |
| T-603 | 7 | " | " | " | " |
| T-604 | 8 | " | " | " | " |
| T-605 | 8 | " | " | " | " |
| T-606 | 9 | " | " | " | " |
| T-607 | 9 | " | " | " | " |
| T-608 | 9 | " | " | " | " |
| T-609 | 9 | " | " | " | " |
| T-610 | 8 | " | " | " | " |
| T-611 | 8 | " | " | " | " |
| T-612 | 13 | " | " | " | " |
| T-613 | 13 | " | " | " | " |
| T-614 | 13 | " | " | " | " |
| T-615 | 13 | " | " | " | " |
| T-616 | 2 | " | " | " | " |
| T-617 | 2 | " | " | " | " |
| T-618 | 1 | " | " | " | " |
| T-619 | 1 | " | " | " | " |
| T-620 | 1 | " | " | " | " |
| T-621 | 1 | " | " | " | " |
| T-622 | 2 | " | " | " | " |
| T-623 | 2 | " | " | " | " |

(NOTE: Numbers T-624 to T-1399, Inclusive, Reserved for Future)

Group 4

| | | | | | |
|--------|----|------------------|------|------|-----|
| T-1400 | 10 | Post Exchange | E-3 | 297 | Gas |
| T-1401 | 10 | Recreation Bldg. | RB-1 | 310 | " |
| T-1402 | 10 | Theatre | TH-2 | 1211 | " |

| Serial No. | Block No. | Building Description | Type | Plan No. | System of Heating |
|------------|-----------|----------------------|------|----------|-------------------|
| | | | | 700- | |
| T-1403 | 10 | Guard House | GH-2 | 260.1 | Gas |
| T-1404 | 10 | Service Club | SC-3 | 1275 | Steam |
| T-1405 | 1 | Rec. | A-5 | 378 | Gas |
| T-1406 | 1 | " | " | " | " |
| T-1407 | 2 | " | " | " | " |
| T-1408 | 2 | " | " | " | " |
| T-1409 | 2 | " | " | " | " |
| T-1410 | 2 | " | " | " | " |
| T-1411 | 1 | " | " | " | " |
| T-1412 | 1 | " | " | " | " |
| T-1415 | 13 | " | " | " | " |
| T-1416 | 13 | " | " | " | " |
| T-1417 | 13 | " | " | " | " |
| T-1418 | 13 | " | " | " | " |
| T-1421 | 6 | " | " | " | " |
| T-1423 | 7 | " | " | " | " |
| T-1424 | 7 | " | " | " | " |
| T-1425 | 7 | " | " | " | " |
| T-1426 | 7 | " | " | " | " |
| T-1427 | 6 | " | " | " | " |
| T-1428 | 6 | " | " | " | " |
| T-1429 | 9 | " | " | " | " |
| T-1430 | 9 | " | " | " | " |
| T-1431 | 8 | " | " | " | " |
| T-1432 | 8 | " | " | " | " |
| T-1433 | 8 | " | " | " | " |
| T-1434 | 8 | " | " | " | " |
| T-1435 | 9 | " | " | " | " |
| T-1436 | 9 | " | " | " | " |

(NOTE: Numbers T-1413 & T-1414 Reserved for Future
T-1419 & T-1420 ditto
T-1422 ditto
T-1437 to T-1699, Inclusive, Reserved for Future)

Group 5

| | | | | | |
|--------|----|--------------|-------|------|-----------------|
| T-1700 | | Laundry | LDY-3 | 1400 | Steam |
| T-1701 | | Boiler House | HB-11 | 1515 | " |
| T-1702 | | Motor Repair | SP-2 | 314 | Gas |
| T-1703 | | Gas Station | GOS-2 | 365 | " |
| T-1704 | 11 | Warehouse | SH-13 | 324 | " (Office only) |

| Serial No. | Block No. | Building Description | Type | Plan No. | System of Heating |
|------------|-----------|----------------------|-------|----------|-------------------|
| T-1705 | 4 | Warehouse | | 700- | |
| T-1706 | 4 | " | SH-18 | 326 | Gas |
| T-1707 | 4 | " | SH-13 | 324 | " (Office only) |
| T-1708 | 11 | Gas Tanks | SH-9 | 322 | None |
| T-1709 | 10 | Gas Pump Station | | 6203-611 | " |

PERMANENT BUILDINGS

| | | | | | |
|-----------|--|------------------------------|-------|----------|------|
| 174 | | Ice Plant | | 1315 | None |
| 175 | | Cold Storage | | 1265 | " |
| 248 (249) | | Water Tank | | | " |
| 250 | | Sewer Sedimentation Tank | | 6203-633 | |
| | | | | -634-635 | " |
| 251 | | Sewer Pump House | | 6203-641 | |
| | | | | -642 | " |
| 252 | | Sewer Chemical House | | -640 | " |
| 254 | | Sewer Cont. House & Digester | | -638-636 | |
| | | | | -637 | " |
| 255 | | Water Booster Pump Hse. | | -649 | " |
| 256 | | Water Well House | | -646 | " |
| 258 | | Water Chemical House | | -647 | " |
| 259 | | Water Res. Booster Pump | | -648 | " |
| 33 | | Finance Building | | 2 Dwgs. | Gas |
| 23 | | Bakery | BAK-1 | 254 | " |

| Item | Type | Plan No. | Capacity | Housed* |
|--|-------|----------|--------------------------------|---|
| <u>5 Officers' Quarters</u> | 0Q-40 | 700-1257 | 200 | |
| 25th Infantry (Colored) | | | | 74 |
| 368th Infantry (Colored) | | | | 110 |
| <u>Non-Commissioned Officers' Quarters</u> | --- | none | --- | |
| <u>80 Barracks</u> | Std. | 1165 | 5040 | |
| 25th Infantry (Colored) | | | | 1599 |
| 368th Infantry (Colored) | | | | 2660 |
| <u>1 Hospital Unit</u> | | | 190-bed unit on a 250-bed plan | |
| Enlisted men | | | | 131 |
| Officers | | | | 41 |
| <u>Stables</u> | --- | none | --- | |
| <u>Garages, Wagon Sheds and Gun Sheds</u> | --- | none | --- | |
| <u>Storehouses and Storage Sheds</u> | | | | |
| 1 Warehouse (Lined) | SH-5 | 460 | 3196 sq. ft. | |
| 1 Storehouse M. D. | SH-7 | 461 | 3196 sq. ft. | |
| 1 Storehouse | SH-9 | 322 | 2740 sq. ft. | |
| 2 Warehouses- Non-insul. | SH-13 | 324 | 9190 sq. ft. | |
| 1 Warehouse - Insulated | SH-18 | 326 | 9190 sq. ft. | |
| <u>Power and Pumping Plants:</u> | | | | |
| 3 Enterprise Type GSQ-3 convertible gas-Diesel engines, complete with all accessories and Butane standby storage | | | | 700 KW each |
| 1 Wintroath Deep Well Turbine, 22 stage, 8" suction, 12" discharge | | | | 700 GPM at 520 ft. |
| 1 United Iron Works, 6" MS-C, Booster Pump, 2 stage, 8" suction, 6" discharge | | | | 700 GPM at 270 ft. |
| 1 United Iron Works, 4" MS-C, Booster Pump, 4 stage, 6" suction, 4" discharge | | | | 700 GPM at 715 ft. 1070 GPM at 270 ft. |

| Item | Type | Plan No. | Capacity | Housed* |
|------------------------------|-----------------------------------|----------|--------------|---------|
| <u>Tanks and Reservoirs:</u> | | | | |
| 1 | Elevated Storage Tank | | | |
| | 200' NW Int. E Ave. & N R.R. Ave. | | | |
| | 59' diameter x 25' deep | | | |
| | Circular Steel | | 500,000 gal. | |
| Ground Storage Reservoir | | | | |
| | Near Well #2 West of Bisbee Gate | | | |
| | 20'3" x 33'6" x 10'0" | | | |
| | Reinforced Concrete | | 50,000 gal. | |

* As of May 1, 1941

SECTION 2

Utilities

WATER SUPPLY SYSTEM

Fort Huachuca, Arizona

GRAVITY SUPPLY

The original army post in the Huachuca Mountains was established in March, 1877, in the most westerly canyon on the north side of the range. The intent was to locate at the entrance to Center Canyon, which was the largest of all the north water courses; however, as this was not done, the Post was perpetuated as originally settled. The location was dedicated as an Army Post in October, 1881.

Ample water was available in the early days for the small garrison maintained at the Post and on May 23, 1884, the Reservation was defined with boundary lines along the top of the range of the Huachuca Mountains and out on to the mesa land to the north for a distance of approximately seven miles, an area of something like seventy square miles.

For a period of twenty-five years the supply from Huachuca Creek in Post Canyon was sufficient for the needs of the encampment. In 1911, a diversion works and seven mile pipe line was constructed up to the higher elevations in Center Canyon, which now bears the name of Garden Canyon, though shown on the U.S.G.S. maps as Tanner's Canyon. The headworks was built at springs originating at an elevation of about six thousand feet above sea level from which the water was diverted to a box at the mouth of McClure Canyon. An eight inch steel line was constructed to the Post leading to a 200,000 gallon masonry storage reservoir and a small round tank (20' diameter x 10' deep).

In 1926, the water demand had increased to approximately 300,000 gallons per day and the summer flows during the drought years dropped to somewhere in the neighborhood of seventy thousand gallons per day.

WELL SUPPLY

Water investigations were gotten under way and considerable sums were spent in prospecting for water. Many test holes were sunk in Garden Canyon, as well as Post Canyon, to depths up to one thousand feet without success. A small amount of water was found in one eight-inch well in Garden Canyon; this was dug in 1912 and a pump was installed there. Only seventy gallons per minute could be procured from this well, and then for only short periods of time.

In 1936, the water problem again became acute and a new location was investigated. A deep well (6" casing) was sunk near the east boundary of the reservation at the Bisbee gate. At a depth of five hundred feet a water bearing sand was encountered which was able to supply a good, potable water in quantities beyond the capacity of any test pump that could be inserted in the well and without any appreciable drawdown. A plunger type pump was installed in this well in September, 1938.

This new well field was further developed in March, 1940, by sinking a fourteen inch casing to a depth of 718 feet. At the same level an unlimited water supply was encountered and tests showed a seven hundred gallon per minute delivery with a forty-three foot drawdown, which immediately came back to the original level upon the cessation of pumping. A five hundred gallon per minute pump was placed in this well; it delivered water to a concrete surface "clear-well" from which the water was boosted to the Post reservoir through a new ten inch steel high pressure main approximately twenty thousand feet in length to a second new concrete 250,000 gallon reservoir constructed in connection with this development. The elevation of the well field is about 4630 feet above sea level, while the storage reservoir at the Post is at elevation 5270. The pumping head at the booster pumps is approximately 320 pounds per square inch.

In 1940, further development was carried on and December 10, 1940, the second fourteen inch well was tested. This well was dug to a depth of 711 feet. The normal water level stood at 467 feet below the surface of the ground.

The following test data indicate an unlimited water supply at the depth shown:

WELL NUMBER TWO

Fort Huachuca, Arizona

Test - December 10, 1940

| Test No. | Delivery (Gallons per Minute) | Draw Down (Feet) |
|----------|----------------------------------|---------------------|
| 1 | 500 | 23 |
| 2 | 600 | 28 |
| 3 | 700 | 34 |
| 4 | 800 | 40 |
| 5 | 896 | 46 |
| 6 | 937 | 46 |

- NOTE: 1. No draw down value created any change in the static water level in Well No. 1 (500 feet distant).
 2. Water level recovery to static level in nine minutes after test completed.

The present fourteen inch wells can each deliver from nine hundred to twelve hundred gallons per minute. Five hundred and seven hundred gallon per minute deep well, electric driven, pumping units were installed on each well, respectively.

GROUND STORAGE

A second concrete "clear-well" and booster pump house were constructed in March, 1941, to deliver water to the temporary cantonment area. The clear-wells each have fifty thousand gallon storage capacity and are inter-connected with piping and control valves so that either deep well pump can deliver to whichever reservoir is desired.

CHLORINATION

A concrete chlorination house was installed in which was placed Wallace-Tiernan chlorination units arranged to protect both supplies from this common center. Chlorine is fed directly into the suction header to the booster pumps through definite hand control.

A chlorination unit was also installed at the reservoir site on the Post to treat the gravity supply to the reservoir so that all water for domestic consumption could be properly treated.

BOOSTER PUMPS

The new booster pump house is similar in every detail to the one previously constructed except for the addition of a second booster pumping unit. This electrically driven horizontal pumping unit is suitable for standby to either of the other booster pumps in that its characteristics are seven hundred gallons per minute at 715 feet total dynamic head and 1080 gallons per minute at 270 feet total dynamic head.

METERS

Suitable water meters were installed at the booster pumping station to record the delivery of the booster pumps into either of the transmission mains to the Post proper or to the Cantonment area.

A meter was also installed to measure the gravity water supply so that complete records could be maintained at all times.

ELEVATED TANK

The first booster pump for well No. 2 is capable of discharging seven hundred gallons per minute through a twelve inch cast iron line (Class 150) approximately 9,450 feet to the base of the elevated storage tank, located at elevation 4800, which serves the temporary cantonment area.

This elevated tank is steel and has a capacity of five hundred thousand gallons with the water range between 4887 and 4862. The tank is fifty-nine feet in diameter.

The tank is painted in accordance with Army regulations 95-15, Section XI, dated April 21, 1930, covering MARKING OF OBSTRUCTIONS TO FLYING, and has the required marking lights for night illumination.

CROSS CONNECTION

An eight inch cross connection through a pressure reducing valve - suitably connected - allows gravity water to be fed into the Cantonment distribution system when such water is available, or for emergency conditions.

DISTRIBUTION SYSTEM, CANTONMENT

In October, 1940, a plan was prepared by the Office of the Quartermaster General, Construction Division, (marked Preliminary) setting forth the diagrammatic plan and profile of the water distribution system for a new cantonment area at Fort Huachuca. This plat covered, in general, the same camp layout as was finally built.

The entire distribution system, as layed out above, called for twelve inch, Class C, cast iron mains. This was brought to the attention of the department before actual construction was started and suggestions made that a twelve inch loop with ten inch cross ties and eight inch block mains would be adequate; however, telephonic instructions were received to make no mains less than twelve inch in order to insure adequate fire flows. Hence, twelve inch mains were installed throughout the cantonment area.

Original instructions also stated that all distribution mains shall be cast iron. Just prior to calling for bids a new addenda to the water main specifications was received which directed that competitive prices must be received on cast iron and transite pipe for both transmission and distribution systems. (This was confirmed by telephonic conversation). The basis of award was to be made on the following:

1. Price
2. Delivery
3. Salvage

Transite quoted, giving the lowest price and immediate delivery with salvage equal to cast iron, and hence, the order was placed for this material for the water distribution system. Cast iron pipe in the quantity desired could not be promised within three to five months delivery, which was beyond the date of completion for the cantonment proper.

Gate valves were installed at points indicated on the map of the distribution system (See Dwg. 6203-652) which allowed the segregation of the system for testing, maintenance, and operation.

Fire hydrants were installed as shown on the above map. The hydrants were located so as to permit the servicing of any building in a block with two sources of fire protection when using two hundred fifty feet of fire hose from two hydrants. The hydrants have a three foot bury and are of the non-freezing pattern. Each hydrant has two two-and-a-half inch hose connections and a steamer nozzle.

On January 22, 1941, instructions were received to reduce the size of the mains to eight inch and six inch size and to cut out approximately eleven hydrants; however, the materials were already on the ground as outlined above, and were installed as per the original plans.

SERVICES

All services are of galvanized threaded pipe of sizes called for on the drawings for various types of buildings.

STATISTICS

Additions to water system:

Elevated Storage Reservoir

200 feet NW Intersection of E Avenue & North R.R. Avenue
59' diameter by 25' water depth
Circular steel
500,000 gallon capacity

Ground Storage Reservoir

Near Well #2, West of Bisbee Gate
20'3" x 33'6" x 10'0"
Reinforced Concrete
50,000 gallon capacity

Well No. 2

Size, 14"
Depth, 701 feet
Static Water Level, 463 feet
Capacity, 900 GPM with 46 feet drawdown

No. 2 Turbine Pump

Wintroath Deep Well Turbine
22 stage
8" suction
12" discharge
Capacity, 700 GPM at 520 feet
Direct connected to one 125 HP, G.E., 60 cycle, 3 phase, 2300 V,
1180 RPM, Type KF, motor, model #12F2488; complete with one
125 HP, Square D Motor Starter, 3 phase, 60 cycle, 2300 V,
Type Spec. Cat. #8754

No. 2 Booster Pump

United Iron Works, 6" MS-C

2 stage

8" suction

6" discharge

Capacity, 700 GPM at 270 feet

Direct connected by flexible coupling to one 75 HP, U S Auto Start, 60 cycle, 3 phase, 2300 V, motor, serial #234161; complete with one 75 HP, Square D Motor Starter, 3 phase, 50-60 cycle, 2300 V, Type KHR1X - Cat. #8759

No. 3 Booster Pump

United Iron Works, 4" MS-C

4 stage

6" suction

4" discharge

Capacity, 700 GPM at 715 feet, guaranteed, and/or 1070 GPM at 270'

Connected by flexible coupling to one 200 HP, U S Auto Start, 60 cycle, 3 phase, 2300 V, motor, serial #234160; complete with one 200 HP, Square D Motor Starter, 3 phase, 50-60 cycle, 2300 V, Type KHR2X - Cat. #8759

One G.E. Circuit Breaker and Trip Coil, Type HC-2, Operating Levers #6158080G3, and Switch Board with Push Button Control for two Booster and One Deep Well Turbine Pump

Meters - Booster Pump House

Sparling, 12" main line, flanged tube, meter, #6469, with indicating, recording, and totalizing receiver, metering flow from Booster Pump No. 2

Sparling, 10" main line, flanged tube, meter, #5496, with indicating, recording, and totalizing receiver, metering flow from Booster Pump No. 3

Sparling, 8" main line, flanged tube, meter, #8485, with totalizing receiver, metering flow to Post Area

Water Treatment

Well Supply

- 2 Type MSVE, Wallace & Tiernan, Manual Visible Vacuum Chlorinators, solution feed, serial #K51 and #K52
- 1 Fairbanks platform scales - 500 pound capacity

Spring Supply

- 1 Type MSVE, Wallace & Tiernan, Manual Visible Vacuum Chlorinator, Solution Feed, Serial #K0176
- 1 Type BR, Westco Pump, connected by flexible coupling to a 3/4 HP Century Motor, single phase, 220 volt, 60 cycle, Serial #T8

Transmission Lines

9450 feet or 1.79 miles 12" C.I. mains
One 12" flanged O.S. & Y. valve

Distribution System (including Hospital Area)

Pipe

| | |
|----------------------|--------------------------|
| 12" mains, transite | 22405 feet - 4.243 miles |
| 8" | 2368 .448 |
| 4" | 768 .145 |
| 12" mains, cast iron | 225 .043 |

Valves

| | |
|----|--------------------------|
| 41 | 12" - Hub End - A.W.W.A. |
| 6 | 8" |
| 71 | 6" |
| 1 | 4" |
| 41 | Valve Manholes |
| 78 | C. I. Valve Boxes |

Fire Hydrants

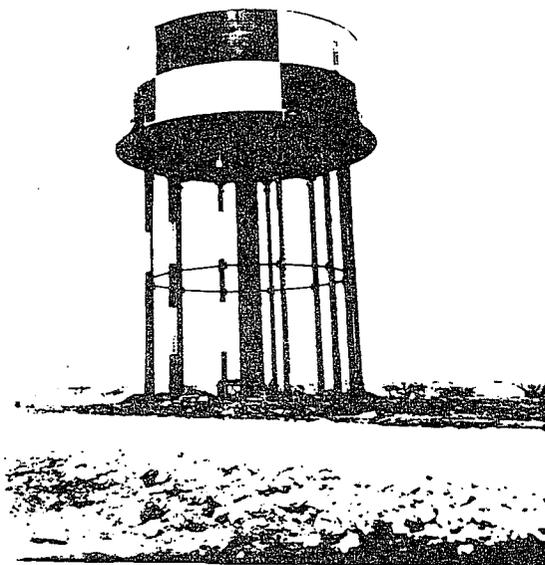
71 John C. Kupferle, No. 75, 5" V.O. with one (1) 1/2" nozzle and two (2) 2 1/2" nozzles

PERMANENT CONSTRUCTION
Fort Huachuca - Arizona

Permanent Construction - Post and Cantonment

Film: CC-204

Date: May 1, 1941



Sub-Contract

Water Tank

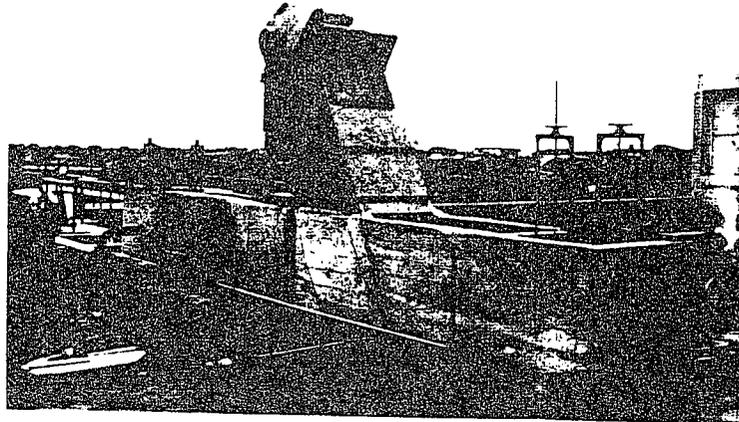
Allison Steel Manufacturing Co.

PERMANENT CONSTRUCTION
Fort Huachuca - Arizona

Permanent Construction - Sewage Plant

Film: CC-220

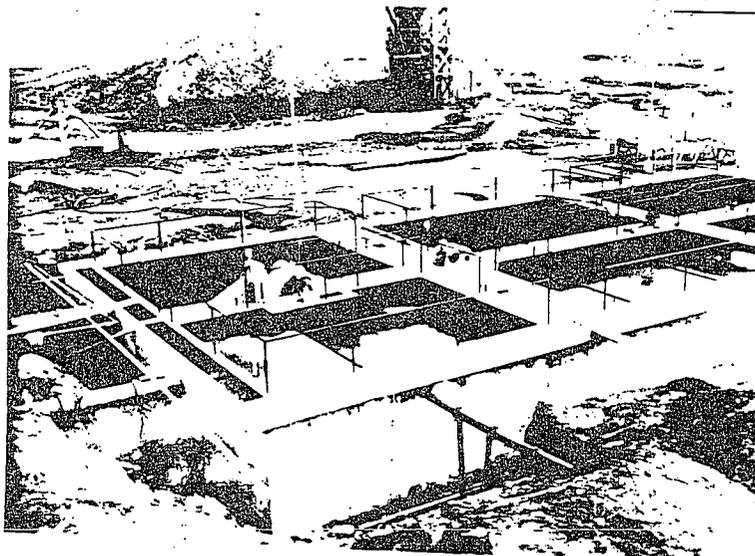
Date: May 1, 1941



Parshall Flume, Screen and Grit Chamber

Film: CC-221

Date: May 1, 1941



Sedimentation Tank

62 63 634 635

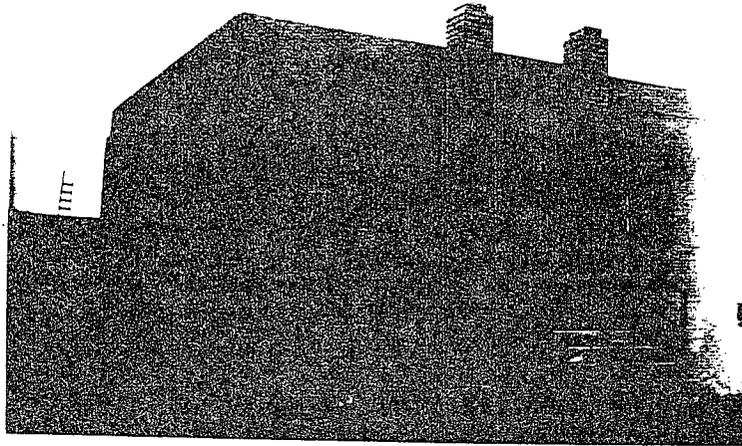
~~CANTONMENT CONSTRUCTION~~

Fort Huachuca - Arizona

Permanent Construction - Sewage Plant

Film: CC-222

Date: May 1, 1941



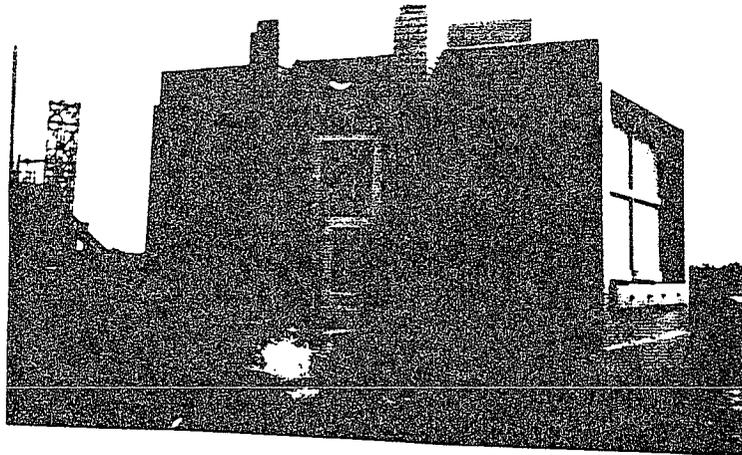
Pump House

Type: ---

Plan Nos.: 6203-641, 642

Film: CC-223

Date: May 1, 1941



Chemical House

Type: ---

Plan No.: 6203-643

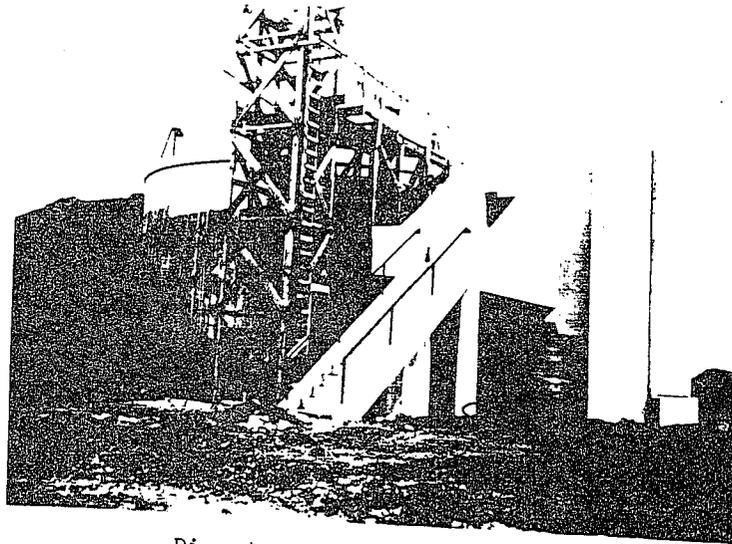
CANTONMENT CONSTRUCTION

Fort Huachuca - Arizona

Permanent Construction - Sewage Plant

Film: CC-224

Date: May 1, 1941



Type: --- Digester and Control House
Plan Nos.: 6203-636, 638

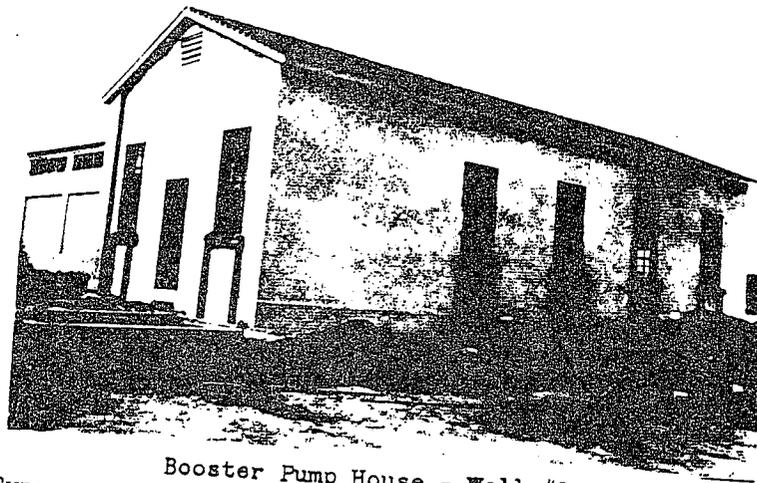
CANTONMENT CONSTRUCTION

Fort Huachuca - Arizona

Permanent Construction - Pumping Plant

Film: CC-240

Date: May 1, 1941



Type: --- Booster Pump House - Well #2

Plan No.: 6203-649

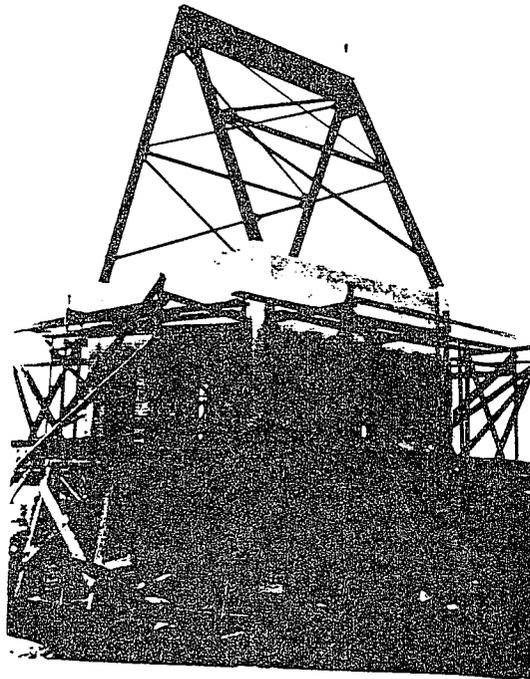
CANTONMENT CONSTRUCTION

Fort Huachuca - Arizona

Permanent Construction - Pumping Plant

Film: CC-241

Date: May 1, 1941



Type: ---

Well House - Well #2

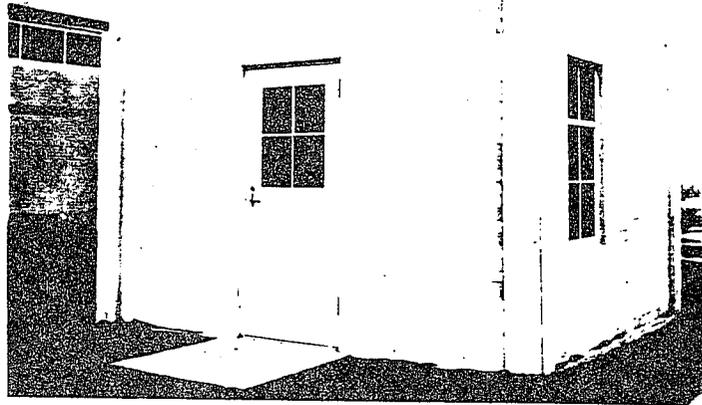
Plan No.: 6203-646

CANTONMENT CONSTRUCTION
Fort Huachuca - Arizona

Permanent Construction - Pumping Plant

Film: CC-242

Date: May 1, 1941



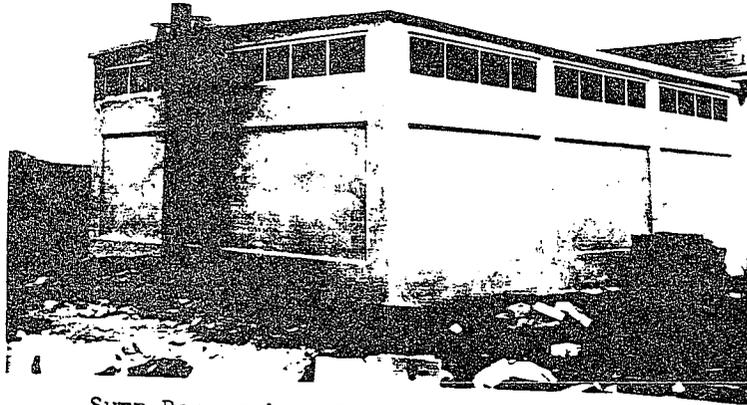
Chemical House - Well #2

Type: ---

Plan No.: 6203-647

Film: CC-243

Date: May 1, 1941



Sump Reservoir - Booster Pump, Well #2

Type: ---

Plan No.: 6203-648

WATER MAIN

SUMMARY

| Item | Amount |
|------------------------------|-----------------------|
| Transmission | 7,105 |
| Distribution - Cantonment | 214,289 |
| Distribution - Hospital Area | <u>33,945</u> |
| TOTAL | <u><u>255,339</u></u> |

WATER SYSTEM

| Item | Unit | Quantity | Unit Cost | Amount |
|----------------------------------|---------|----------|--------------|-------------|
| <u>Supply and Transmission</u> | | | | |
| *Cast Iron Pipe, 12" | lin.ft. | 950 | 3.30 | 3135 |
| Valve - 12" O.S. & Y., F&D, 125# | ea. | 1 | 226.34 | 226 |
| Meter at Post | " | 1 | 430.00 | 430 |
| Lead | cwt. | 6.50 | 17.90 | 116 |
| Oakum | lb. | 13325 | .24 | 3198 |
| | | | TOTAL | <u>7105</u> |

* 8500 feet of 12" C.I. was put in by the CQM

WATER SYSTEM

| Item | Unit | Quantity | Unit Cost | Amount |
|--|---------|----------|-----------|--------|
| <u>Distribution System - Cantonment</u> | | | | |
| Transite Pipe, 12" | lin.ft. | 19717 | 7.53 | 148469 |
| Transite Pipe, 8" | " | 1842 | 5.33 | 9818 |
| Cast Iron Pipe, 12" | " | 225 | 6.12 | 1377 |
| Cast Iron Fittings: | | | | |
| 12"x12" Cross | ea. | 23 | 94.31 | 2169 |
| 12" - 1/8 Bend | " | 5 | 44.14 | 221 |
| 12" - 1/16 Bend | " | 8 | 44.14 | 353 |
| 12" - 1/32 Bend | " | 1 | 41.68 | 42 |
| 12" Plugs | " | 21 | 8.73 | 183 |
| 12"x12" Tees | " | 3 | 76.32 | 229 |
| 12 x 8" Tees | " | 1 | 72.18 | 72 |
| 12" x 8" Cross | " | 1 | 63.26 | 63 |
| 12" - 1/4 Bend | " | 1 | 46.66 | 47 |
| Valves - 12", H.E., AWWA, 150# WWP" | " | 33 | 226.34 | 7469 |
| Valves - 8", H.E., AWWA, 150# WWP" | " | 4 | 88.61 | 354 |
| Valve Manhole | " | 33 | 141.64 | 4674 |
| Valve Boxes - C.I. | " | 4 | 10.39 | 42 |
| Fire Hydrants | " | 63 | 349.15 | 21996 |
| Fire Hydrant Protectors - 4 post | " | 53 | 50.73 | 2689 |
| Fire Hydrant Protectors - 2 post | " | 10 | 19.85 | 199 |
| Oakum | lb. | 120 | .24 | 29 |
| Lead | cwt. | 26 | 17.90 | 465 |
| 8" Cross Connection - Post and Cantonment | ea. | 1 | 2523.50 | 2324 |
| | | | SUB-TOTAL | 203484 |
| <u>Distribution Services - Cantonment</u> | | | | |
| 3" | ea. | 1 | 205.32 | 205 |
| 2" | " | 86 | 88.39 | 7602 |
| 1 1/2" | " | 2 | 83.78 | 168 |
| 1 1/4" | " | 64 | 42.36 | 2711 |
| 3/4" | " | 6 | 19.82 | 119 |
| | | | TOTAL | 214289 |

WATER SYSTEM

| Item | Unit | Quantity | Unit Cost | Amount |
|---|---------|----------|--------------|--------|
| <u>Distribution System - Hospital</u> | | | | |
| Transite Pipe, 12" | lin.ft. | 2688 | 7.53 | 20241 |
| Transite Pipe, 8" | " | 526 | 5.33 | 2804 |
| Transite Pipe, 4" | " | 768 | 3.91 | 3003 |
| C.I. Fittings, 12"x12" Cross | ea. | 1 | 94.31 | 94 |
| Valves, 12" - H.E., AWWA, 150# WWP | " | 8 | 226.34 | 1811 |
| Valves, 8" - H.E., AWWA, 150# WWP | " | 2 | 88.61 | 177 |
| Valves, 4" - H.E., AWWA, 150# WWP | " | 1 | 34.27 | 34 |
| Valve Manhole | " | 8 | 141.64 | 1133 |
| Valve Boxes, C.I. | " | 3 | 10.39 | 31 |
| Fire Hydrants | " | 8 | 349.15 | 2793 |
| Lead | cwt. | 1.68 | 17.90 | 30 |
| Oakum | lb. | 8 | .24 | 2 |
| SUB-TOTAL | | | | 32153 |
| <u>Distribution Services - Hospital</u> | | | | |
| 2 1/2" | ea. | 5 | 128.02 | 640 |
| 2" | " | 9 | 88.39 | 796 |
| 1 1/2" | " | 3 | 83.78 | 251 |
| 1 1/4" | " | 2 | 42.36 | 85 |
| 3/4" | " | 1 | 19.82 | 20 |
| TOTAL | | | | 33945 |

WATER SYSTEM

| Item | Unit | Quantity | Unit Cost | Amount |
|---|------|----------|--------------|--------------|
| <u>Elevated Steel Storage Tank</u> | | | | |
| Capacity: 500,000 gallons | | | | |
| Height to bottom: 50' | | | | |
| Tank erected, including concrete foundations and painting | lot | 1 | 37647.00 | 37647 |
| Connecting piping and fittings | ft. | 50 | 2.00 | 100 |
| Valves, 12" | ea. | 1 | 125.00 | 125 |
| Concrete Valve Box | lot | 1 | 150.00 | 150 |
| Protective Lighting | " | 1 | 175.00 | 175 |
| | | | TOTAL | <u>38197</u> |