Theodore Roosevelt Dam, Power Plant
Salt River
Phoenix Vicinity
Maricopa County
Arizona

HAER No. AZ-6-A

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Western Region
Department of the Interior
San Francisco, California 94102

United States Department of the Interior

BUREAU OF RECLAMATION
Phoenix Area Office
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To: All Interested Persons, Organizations, and Agencies

From: Thomas G. Burbey
Assistant Area Manager-Resources Management

Subject: Distribution of Final Report, Historic American Engineering Record (HAER) for the Theodore Roosevelt Dam, Power Plant HAER No. AZ-6-A.

I am pleased to provide you with the above report. This volume was produced by Ms. Chris Pfaff, Architectural Historian, Reclamation's Denver Technical Center. If you have any questions, please contact Mr. Thomas Lincoln at 602-870-6761.

Thomas G. Burbey

Attachment

HISTORIC AMERICAN ENGINEERING RECORD
THEODORE ROOSEVELT DAM, POWER PLANT
HAER NO. AZ-6-A

Location: Immediately below Roosevelt Dam on the south side of the Salt River. Approximately 60 miles east of Phoenix, at the junction of State Highway 88 and State Highway 188, near the confluence of Tonto Creek and the Salt River.

Construction Date: Power Plant 1906-1908
Transformer House 1908

Engineers: U.S. Reclamation Service

Present Owner: Bureau of Reclamation

Present Use: Power Plant: Operating equipment and controls for new power plant
Transformer House: Vacant

Significance: The power generating facilities at Roosevelt Dam, beginning with the 1906 temporary plant, were the first ever built by the Bureau of Reclamation. The Roosevelt power plant and transformer house, which are both addressed in this report, contribute to the significance of Roosevelt Dam for their role in Reclamation power development. The power plant also contributes to the history of the evolution and ever-expanding power system of the Salt River Project, now the second largest utility in Arizona.

Historian: Christine Pfaff
Denver Technical Services Center
Bureau of Reclamation
June, 1996

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I. INTRODUCTION

As the key structure in one of the first major federally sponsored reclamation projects in the West, Theodore Roosevelt Dam (Roosevelt Dam) has achieved both historical and engineering significance at a national level. The design and construction history of the dam, and its technological significance, are detailed in the Historic American Engineering Record (HAER) report on "Theodore Roosevelt Dam" prepared by Donald C. Jackson (see HAER No. AZ-6). The document was prepared for the Bureau of Reclamation in 1992 as partial cultural resources mitigation for major alterations to the dam. Raising the crest and encasing the masonry structure in concrete were undertaken to meet safety concerns during floods or earthquakes.

As part of the mitigation, Reclamation also agreed to record to HAER standards the power plant and transformer house associated with Roosevelt Dam. These features contribute additional significance to the dam in that they represent Reclamation's first installation of power generating facilities.[1] At Roosevelt Dam, hydropower generating equipment can be traced from the pioneer stages of development up to the present. The Roosevelt power plant has also been vital to the evolution and ever-expanding power system of the Salt River Project and to the transformation of Phoenix from a small agricultural center to a booming metropolitan area. Changes to the Roosevelt power facility from its initial construction up to the present reflect the ever-increasing demand for power to serve the needs of a major western population center.

While information on the development of power at Roosevelt Dam is provided in Jackson's report, it was not intended to include a complete description of the facilities. Another previously completed HAER study, entitled "The Roosevelt Power Canal and Diversion Dam" (see HAER No. AZ-4 by David Introcaso), also addresses the early development of power at Roosevelt Dam. Both previous HAER reports establish the context and background for the subject document. The intent of the report at hand is to utilize and amplify on the previous work to complete Reclamation's HAER documentation responsibilities for the recent Roosevelt Dam modifications.

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[1] Reclamation's other early power plant, located at Minidoka Dam in Idaho, was started in 1908 and began providing power in 1909. The Roosevelt temporary power plant began operation in 1906; construction of the permanent power plant was completed in 1908 and it was placed in service in June 1909.

II. CONSTRUCTION HISTORY OF POWER PLANT AND TRANSFORMER HOUSE

Plans for a permanent hydropower generating facility at the Roosevelt damsite were part of the initial concept for the project, conceived even prior to the formal creation of the United States Reclamation Service (Reclamation Service). In a study entitled "Water Storage on Salt River, Arizona" published by the United States Geological Survey in 1903, Arthur P. Davis outlined preliminary plans for a major dam at the Roosevelt site. The study was based on results obtained primarily from work conducted in 1901, a year prior to the passage of the Reclamation Act. Davis, who was Chief of the Division of Hydrography for the Geological Survey and later rose to become head of the Reclamation Service, discussed the desirability of utilizing water power in the construction of the dam due to the excessive cost of hauling in other types of fuel over great distances. He described the method for developing hydropower as well as the amount of power needed and the location of the facility. He went so far as to suggest that the windows of the power plant should be ten feet above the bed of the river. Davis also proposed that "after the construction of the reservoir this power can be utilized for other purposes..."[2] Final plans for the Roosevelt project, published in the Third Annual Report of the Reclamation Service (1905), adhered closely to those outlined in Davis's 1903 report and included construction of a hydropower plant.

The method developed for producing hydropower involved the construction of a low diversion dam on the Salt River about nineteen miles upstream from the Roosevelt dam site. Water was diverted there into a canal which fed into a seven-foot diameter, steel-lined penstock initially connected to a temporary power plant. The 620-foot long penstock was cut through solid rock to reach the plant. For a detailed description of the Roosevelt power canal and diversion dam, see HAER AZ-4. Originally, the temporary power plant was to be built about one-half mile upstream from the damsite inside the reservoir and construction of a permanent plant would be delayed until later. By the end of 1904, however, project engineers G.Y. Wisner, W.H. Sanders, O.H. Ensign, and L.C. Hill, had opted for a temporary plant just south and below the damsite in a shallow cave excavated in the canyon wall. This would allow the excavated area and the power canal penstock to be incorporated into a permanent plant at the same site. The temporary plant was to be equipped with a 1300 horsepower water turbine connected to a 950 kilowatt generator.

Excavation for the temporary power plant was started in January, 1905, the machinery was installed in the fall, and work was completed in March 1906. That same month the power canal began operation. By June of 1906, the plant was operating twenty-four hours a day. For the next three years, until the permanent power house was completed, the temporary facility provided electricity for the operation of the project cement mill, for equipment used in the construction of

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[2] U.S. Department of Interior, Geological Survey. Water Storage on Salt River Project. by Arthur P. Davis. Washington, DC: Government Printing Office, 1903. p. 47.

the dam, and for lighting the construction camp.[3]

Plans for the permanent power plant were prepared under the direction of O.H. Ensign, chief electrical engineer of the Reclamation Service.[4] Located on the south side of the river immediately below the dam, the structure was built on a rock foundation up against the vertical cliff. The latter formed part of the back wall and incorporated the cave excavated for the temporary plant. The rectangular plan building measured about 125 feet long by 36 feet wide and was of solid construction. Exterior walls were of reinforced concrete faced with thick blocks of cut "sandstone".[5] Heavy steel trusses supported the slightly pitched roof made of reinforced concrete. Five feet of gravel were placed on the roof to "stop the career of any heavy stone that might possibly roll off the canyon wall in the years to come."[6] Two rows of evenly spaced windows punctured the river face of the structure. Large arched entrances were located in the southwest and northeast ends. Windows and doors were placed well above the ground to prevent any damage to the plant in the event of flooding.

Original plans provided for the installation of six turbine/generator units of which three would receive water from the power canal penstock. To supplement power obtained from the canal, three other units would be supplied by a ten-foot diameter steel penstock running through the dam with an intake 165 feet below the top of the dam. These units would not be of great value when the reservoir was low, placing additional importance on the power canal.

Owing to a lack of space adjacent to the power plant, the transformer house was located about six hundred feet downriver, also on the south side. It was of the same sturdy construction--reinforced concrete walls faced with sandstone quarried from the site and a flat concrete roof. The rectangular plan structure measured 80 feet long by 30 feet wide. It was to contain eighteen transformers, three for each generator in the power plant, as well as other equipment necessary for the control and distribution of electricity.

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[3] Even prior to completion of the temporary hydropower plant, a 150-horsepower steam power plant, fueled by wood, was in use. It furnished power for hoisting, for grinding material for fire brick, and for the machines and wood shops. (Third Annual Report of the Reclamation Service. p. 140) It was located within the reservoir area and presumably was dismantled prior to flooding.

[4] Gaylord, James M. Power and Pumping System of the Salt River Project, Arizona. Report dated January 1, 1914. p.26.

[5] Gaylord's 1914 report refers to the power plant as being constructed of sandstone. Analysis has shown that the stone is in reality dolomite limestone, which matches the dam.

[6] "Work at Roosevelt and on Tonto Road." The Arizona Republican. April 11, 1907. p. 4.

Excavation for the power plant foundation began in October, 1906 and work on the building continued until it reached completion in the spring of 1908. Construction was done by government force. Total cost of the building, including labor and materials was $102,710.. It was not until 1909 that the plant was up and running.

On January 15, 1906, the government had signed a contract with the S. Morgan Smith Company of York, Pennsylvania, for three constant-head vertical hydraulic turbines that were to connect with the power canal penstock. Vertical generators to be mounted on top of the turbines were ordered from the General Electric Company under a contract dated December 10, 1905. Working together, the turbines and 1000 kw generators were to produce three-phase alternating current (AC) at a potential of 2300 volts and a frequency of 25 cycles. As explained in the Roosevelt Dam HAER document, "Because they produced 25-cycle current, the generators at Roosevelt were clearly geared toward use in powering irrigation pumps and large motors. For more general electric power markets, 60-cycle current was typically used, because 60-cycle current did not produce as much flickering in electric lights as did 25-cycle currrent."[7]

Delays in developing final designs and unanticipated conditions slowed the installation of the equipment. The first unit was placed in service on an experimental basis in the summer of 1907 but did not function satisfactorily. Numerous corrections were made in the design and finally in June 1909, Units 2 and 3 were put in operation. Unit 1, after having been returned to the manufacturers for reconstruction, was placed in service in August, 1909. Thereafter, the temporary power unit was dismantled.[8]

By fall of 1910, the extension of the 10-foot diameter riveted steel penstock through the dam and into the power plant was underway. Originally, the penstock was to connect with three generator/turbine units similar in generating capacity to the first three. Units 4 and 5, which became operational in June and July 1912, respectively, were of the same type although the turbines operated under variable head. They were designed for heads varying from 112 to 228 feet, depending on the elevation of the reservoir surface.[9] These machines were furnished by

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[7] Jackson, Donald. Theodore Roosevelt Dam. Historic American Engineering Record No. AZ-6. June, 1992. p. 88.

[8] There is some discrepancy as to when the first three units were all placed in service. The U.S. Reclamation Service Ninth Annual Report report states that one unit was placed in service in June, 1909 and the other two in August. Gaylord's report states that units 2 and 3 were put in operation in June, and that shortly after that unit 1 was returned to the manufacturer for reconstruction. The May 10, 1910 Reclamation Record records that unit 1 was placed in operation that month.

[9] Bureau of Reclamation. Dams and Control Works. Washington: Government Printing Office, February, 1938. p. 47.

S. Morgan Smith Company, the generators by the General Electric Company.

By the time Units 4 and 5 were in operation, it had become apparent that power demands would exceed the planned generating capacity of the plant. Therefore, it was decided to install a larger sixth unit with a capacity of 5000 horsepower versus the 1200 horsepower of the other five units.[10] It would be another few years before the sixth unit was finally installed. Authorization to purchase the new machinery was slow in coming.

A good description of the power plant with the first five units in place is provided in James Gaylord's 1914 report on the Power and Pumping System of the Salt River Project, Arizona. The layout consisted of one large main generator room containing the five vertical turbines with draft tubes excavated through the rock foundation and connecting with the tailrace tunnels. The three units connected to the power canal were located at the southwest end of the building; the two connected to the 10 foot-penstock were located towards the center of the building. Generators were mounted on top of the turbines. Other equipment included two 100-kw exciter generators connected to exciter turbines. These units were arranged to receive water from either the power canal or reservoir. They were mounted on a raised reinforced concrete platform on the southeast side of the generator room and reached by a short flight of iron steps. A second gallery, also reached by a set of iron stairs, was located at the rear of the powerhouse in the area once used as the temporary plant. This niche contained the 2,300 volt bus-bars and control switches for the plant.

A 15-ton Maris Brothers hand-operated crane suspended from the ceiling moved the length of the generator room. Large tungsten lamps attached to the roof trusses illuminated the building, with supplementary smaller incandescent lights placed in poorly lit areas. Interior bare concrete walls had not been finished with plaster as intended; seepage through the canyon side was a problem. In Gaylord's opinion, the plant presented an "unfinished and unsatisfactory appearance" due to the seepage, the unplastered walls, the unfinished floor, and the temporary installation of machinery tools in the generator room.[11]

From a tower on the roof of the power plant, copper cable carried electricity to the nearby transformer house. Its purpose was to raise the voltage from 2300 generated in the power plant to 45,000 for more economical transmission to the Salt River Valley sixty miles away. Construction of the three-story transformer house began early in 1908 and was completed late that

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[10] Capacity of the turbines is given as about 1200 hp in Gaylord's Power and Pumping System, 1914, and in Reclamation's Dams and Control Works., 1938. A.P. Davis cites a capacity of 1800 hp for the three power canal turbines in Irrigation Works, 1917.

[11] Gaylord, James M. Power and Pumping System. p. 66. One other interesting feature of the plant, mentioned only once in a January 3, 1908 article in The Arizona Republican, was the use of hot springs under the dam to be piped to the power plant for bathing water.

year at a cost of $46,465. including labor and materials.[12] Like the power plant, government employees built the transformer house. The permanent electric equipment was installed later and placed in operation with some temporary connections by August 1909.[13]

Transformers, high-tension buses and switches occupied the three story building. The first floor contained eighteen water-cooled transformers made by the Wagner Electric Manufacturing Company. They were divided into six groups of three, each group being separated into a fire-proof compartment with concrete partition walls. Casters attached to the transformers allowed them to be wheeled to a separate repair and maintenance area also on the first floor.

The second floor of the transformer house contained bus-bars and disconnecting switches enclosed in a double row of concrete compartments. On the third floor were the solenoid-operated oil switches and outgoing line accessories. The building was also equipped with lightening arresters for both the incoming 2300 volt lines and the outgoing 45,000 volt lines.

Work to install the large sixth unit in the power plant and connect it to the 10-foot penstock began in 1914. A reinforced concrete foundation was built to support the heavy machinery. This required considerable rock excavation and the removal of part of the concrete floor of the power plant. By November 1915, the contractor for the job had hauled 128 tons of machine parts from Mesa, Arizona to the site. The sixth unit consisted of a variable head turbine with a vertical generator designed to deliver 3-phase, 25-cycle alternating current at 2300 volts. Installation was completed in January 1916, nearly doubling the generating capacity of the plant. No sooner had the work been finished than a disastrous flood occurred which poured nine feet of water into the powerhouse. This was followed by a second, less serious flood in February. The necessary repairs were made and power production resumed.[14]

Flooding had caused other problems in the power system which led to a design change. Both the diversion dam and power canal suffered damages from floods which shut down the operation of the three turbines connected to the power canal penstock. To alleviate this situation, a by-pass connecting the south sluicing tunnel to the power canal penstock was constructed between 1915-

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[12] An article in The Arizona Republican dated January 3, 1908 discusses plans being made for the transformer house. Zarbin in Roosevelt Dam: A History to 1911 states that construction of the transformer house began on February 12, 1908. Gaylord in Power and Pumping System describes construction of the power house beginning in the summer of 1907 which doesn't seem likely given the later newspaper article. Photographs show the building under construction in 1908.

[13] Gaylord, James. Power and Pumping System. p. 61.

[14] Cone, William. "Revenue from Power System, Salt River Project". Reclamation Record. January, 1917. p.38.

17.[15] This made it possible to operate the three power canal units with reservoir water when necessary. To operate under the reservoir head, the three units were converted to variable head machines. This work was completed in 1919. Due to ample water supplies in the reservoir, the power canal was not put into use again until 1925.[16]

Another alteration made to the powerhouse in 1917 was intended to reduce future flood damage. A two story 18-foot by 17-foot concrete storehouse and washroom was built at the northeast end.[17] This enclosed the northeast door thereby eliminating the possible entry of surging floodwaters.

The next major change to the power plant occurred in the early 1920's. It was prompted by the desire of the Salt River Valley Water Users Association (SRVWUA) to both increase power development on the Salt River and augment the available supply of irrigation water.[18] By that time, the SRVWUA was operating five hydro-electric power plants with a total capacity of 27,000 horsepower. Four of the plants were located in the Salt River Valley and operated under a low head, utilizing the fall in the canal system. The fifth plant was that at Roosevelt.

A report on the potential of developing additional hydroelectric power on the Salt River was prepared by C.C. Cragin for the SRVWUA in 1922.[19] He observed that large quantities of untapped power potential existed between Roosevelt Dam and the lower lands in the valley.Furthermore, he noted that additional power could be generated by increasing the storage capacity of Roosevelt Reservoir and augmenting the generating capacity at the Roosevelt power plant. He provided a set of recommendations which included constructing Mormon Flat Dam and power plant on the Salt River, adding gates to the Roosevelt Dam spillways to increase the reservoir storage capacity and usable head, and modifying the Roosevelt power facility.

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[15] Introcaso, David. The Roosevelt Power Canal and Diversion Dam. Historic American Engineering Record, No. AZ-4. Salt River Project, Phoenix. p. 23.

[16] The power canal operated intermittently thereafter until 1952 when its' use was completely discontinued. In the modifications to the Roosevelt power plant which occurred in the early 1970's, the power canal penstock was plugged with concrete.

[17] U.S. Dept. of Interior. Reclamation Service. Salt River Project, Early History to 1917 and Annual Project History, 1917. p. 49.

[18] The Salt River Water Users Association took over the operation and maintenance of the Salt River Project from the Reclamation Service in 1917.

[19] Cragin, C.C. Report on Proposed Additional Hydro-Electric Power Development of the Salt River. Phoenix, Arizona. February, 1922. Cragin was the General Superintendent and Chief Engineer for the SRVWUA.

With regard to the latter, he suggested the addition of a new 10,000 horsepower generating unit at the north end of the power plant to be connected to a new penstock. He also proposed building a new transformer house as an addition to the power house. This offered solutions to a number of problems, one of which was the frequent interruptions in power due to spray from the spillways hitting the 2300 volt cables strung between the power house and transformer house. The addition would contain the existing and new 45,000 volt transformers, as well as other updated equipment. The new 45,000 volt outgoing lines would run from the addition to a transformer station to be built at the top of the hill on the south side. The lines would be out of the path of the spillway spray. The new transformer station would raise the 45,000 volts to 110,000 volts.

In November, 1922, the SRVWUA authorities approved the construction of the additional power development project designated "Mormon Flat Development No. 1". An election held in January by the shareholders authorized a bond issue for the construction. The project included the modifications to the Roosevelt power facility proposed by Cragin, as well as the construction of a storage dam at Mormon Flat, and the addition of spillway gates to Roosevelt Dam.

Construction of a 14-foot diameter tunnel for a new 10-foot penstock was started in October, 1923 and finished in February, 1924. The penstock took off from the south sluicing tunnel and entered the north end of the powerhouse. The installation of the penstock was completed in June, 1924 and by the end of September that same year, generating unit No. 7 was in operation.

During that same time, construction of the new addition to the power plant took place and radically altered the appearance of the stone building. The height of the old structure was raised by one story at the front and two stories at the rear. The new concrete addition with evenly spaced windows along the river facade was completed May 24, 1924. The 45,000 volt equipment from the transformer house was moved over in units to the new space, thereby allowing the plant to remain in at least partial service the entire time. The original transformer house, upon being taken out of service, was converted to a storehouse.[20]

During the renovations, the opportunity was used to overhaul Units 1, 2, and 3 as well as some other machinery. In addition, a small 600 horse power unit, designated No. 8, was installed for plant use. It was connected to the new 10-foot penstock. The purchase of unit No. 8 was not part of the Mormon Flat bond issue.

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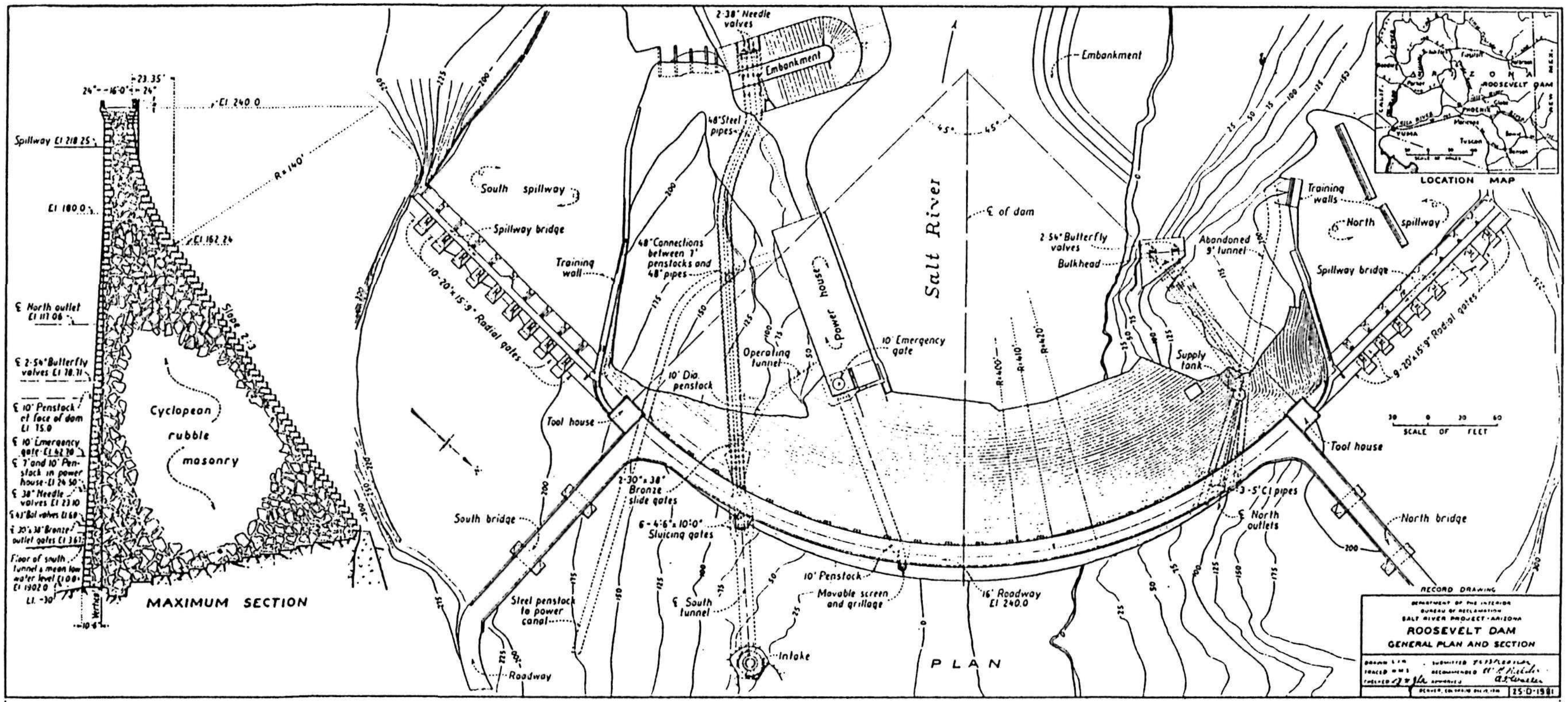
[20] A description of the alterations is provided in the SRVWUA Annual Project History, 1923-24 in the overview section (no page numbers) and in Chapter VI, p. 3.



General plan and section.

Source: Dams and Control Works, 1938

The revamped Roosevelt power system operated effectively for several decades as part of the larger Salt River Project hydro-generation system and underwent no further significant changes. Over time, the only real drawback to the system was that it provided power at a frequency of 25 cycles. As explained by Donald Jackson in the Roosevelt Dam HAER study, 25-cycle current is well suited to operating large pumps and motors, but is not ideal for domestic usage. Plans to convert the old 25-cycle system over to the more desirable and modern 60-cycles were formulated in the early 1940's and work on the tremendous task began later that decade.

It was not until the early 70's, however, that the facilities at Roosevelt were upgraded as the last phase of the Hydroelectric Expansion and Frequncy Unification Project (HEFU). Initiated in 1969, this $39 million project was directed at expanding hydroelectric power capability and converting the old 25-cycle current at the SRVWUA's upper three Salt River dams. The program included the installation of two pumped-storage generating systems, one at Mormon Flat Dam, the other at Horse Mesa Dam; the conversion of the generators at Mormon Flat and Horse Mesa from 25 cycles to 60 cycles; and the replacement of the existing generators at Roosevelt Dam with one 60-cycle unit.[21]

The work scheduled for Roosevelt resulted in signficant alterations to the powerhouse. All of the turbines and generators at the plant were removed and replaced with a single 36mw modern unit located in an all new reinforced concrete power house attached to the northeast end of the powerhouse. A substantial portion of the lower level of the stone structure was obscured by the construction which included a new access ramp in front of the building. An 11-foot 6-inch diameter penstock through the dam was constructed to serve the new unit. This major reconfiguration of the power plant was completed in 1973.

Yet even more dramatic changes were soon to occur. In the early 1980's feasibility studies were conducted for modifying and enlarging Roosevelt Dam to meet safety concerns during floods or earthquakes. Analyses conducted by Reclamation staff concluded that the dam could fail during such events. To increase flood storage capacity, the height of the dam would be raised by 77 feet, and to allow for greater releases during emergencies, a new river outlet works would be constructed in the south abutment. The appearance of the masonry dam would be radically altered by encasing the entire upstream and downstream faces in concrete and building new spillways. Since the pressure parts (turbine, penstock etc) of the existing 36 mw hydroelectric plant at the dam would not withstand the higher operating heads resulting from the increased height of the dam, they would need to be replaced. The extensive modifications were started in 1989 and are nearly completed at this time.

Plans developed for the power plant called for replacing the 1970's Francis turbine with a new, smaller diameter 49,500 horsepower Francis turbine in the same location. This was done and the 36mw Westinghouse generator installed in the early 1970's was overhauled. An entirely new 16-

[21] SRVWUA. Salt River Project 1970 Annual Report. p. 8.

foot diameter penstock was constructed that skirts the dam on the south side and terminates at the new river outlet works downstream from the existing ones. A smaller 12.5-foot diameter, 408-foot long penstock extends from the 16-foot diameter penstock through the northeast end of the old powerhouse to the new turbine. The 1970's penstock was removed and the original 10-foot diameter penstock through the dam was plugged as was the south sluicing tunnel, and part of the original power canal penstock.

Transformers for the single power unit are installed next to it on a massive concrete platform. This eliminated the need for the transformer addition on top of the power house. As part of the recent modifications, the 1920's concrete addition was taken down and the original roofline and parapet wall are in the process of being restored. Removal of the addition allowed access for installation of the new power penstock and a 150-inch butterfly guard valve. A further change to the exterior appearance of the power house was the relocation of the main entrance to what was formerly a window on the second level.

The original transformer house, converted to a storehouse in the 1920's, was used as a construction field office up until major flooding occurred in January 1993. Thereafter the building was abandoned and it now sits vacant except for bats that occupy it as a roosting site. This unusual adaptive use has been realized in cooperation with the Arizona Division of Wildlife.

III. OVERVIEW OF POWER DEVELOPMENT AND DISTRIBUTION

As described above, from the very outset, plans for the Roosevelt project included not only temporary power production during the construction phase but also permanent power generation.

Project engineers hailed power production for the additional benefits it would bring to the Salt River Project. Two purposes would be served: first, power could be used to operate irrigation pumps in the Salt River Valley's expanding agricultural development. Surveys indicated that surface water from the river flows was insufficient to irrigate all of the Salt River Project land area. Secondly, excess power could be made available for commercial sale generating revenues that would offset project operating expenses.[22]

The plan which evolved during the original phase of project construction included the development of power at Roosevelt Dam and at three drops in canals in the valley, and the transmission of this power to various sub-stations and pumping plants. A number of parties were involved. Reclamation would construct the power plant at Roosevelt Dam, and the main transmission lines and substations. Under a contract with the Reclamation Service dated August 30, 1910, the SRVWUA agreed to build three power plants (South Consolidated, Arizona Falls, and Crosscut) to be located on the canal system in the valley. The Association also committed to installing certain transmission lines. The Reclamation Service agreed to develop the plans and specifications for the SRVWUA plants and to provide the services of engineers to oversee the construction.[23] In a contract dated August 22, 1912, the Highline Canal Construction Company committed to the construction of the Highline Pumping Plant.[24] Lastly, the Indian Irrigation Service received Reclamation assistance in developing groundwater pumping to irrigate 10,000 acres on the water-short Gila River Indian Reservation.[25]

The main transmission line constructed by Reclamation stretched from the downstream end of

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[22] Under an act passed April 16, 1906 (34 Stat. 116, ch.1631), Congress authorized Reclamation to sell surplus power not needed for irrigation purposes.

[23] Salt River Project. "Salt River Project, First Project Organized Under the Reclamation Act of 1902, Major Facts in Brief, 1869-1951". August 20, 1951. n.p.

[24] Gaylord, James. Power and Pumping System. p. 9-11.

[25] The project to irrigate 10,000 acres on the north side of the Gila River on the Gila River Indian Reservation was known as the Sacaton Project. It involved the construction of a flood-water canal and a line of wells and pumping plants connected by a ditch. For a variety of reasons the project was not successful and the Indians continued to use their old system of ditches.

the transformer house at Roosevelt Dam to Phoenix, a distance of about 65 miles. The line, which carried current at 45,000 volts, consisted of two circuits of three wires each. It was supported on galvanized steel towers spaced 360 feet apart in the rugged mountain terrain, and 400 feet apart in the valley.

Forty miles from Phoenix, at a switching station outside the town of Mesa, a branch line built by Reclamation took off to the south and terminated at Substation No.2 near Sacaton on the Gila River Indian Reservation.[26] Another substation, identified as the Chandler substation or Substation No.1, was constructed about seven and a half miles south of the Mesa switching station, and a mile to the west of the branch line. The purpose of the substations was to transform the 45,000 volt current to 10,000 volts for distribution on secondary lines to various pumping stations.

Surveys for the main transmission line were conducted in the spring of 1907. Contracts for furnishing the towers and poles were executed in the spring of 1908 and by May 1909, the line was just about completed.[27] Substation No.1, including installation of its equipment, was finished in November, 1909. Substation No.2 had been completed the month prior.

In Phoenix, the main line terminated at the power station of the Pacific Gas & Electric Company, predecessor of the Arizona Public Service Company. Reclamation had signed a contract with the Pacific Gas & Electric Company on June 22, 1907 to deliver power to it for a period of ten years at a cost of one and one-half cents per kilowatt hour. In return the company agreed to give up its rights for twenty years to power generated along the Arizona Canal. Other stipulations in the contract specified the amount of power to be delivered and limited the ability of Reclamation to sell power only to certain users in Phoenix. Objections and complaints by others with potential power interests led to an investigation by the Arizona legislature into the contract. Reclamation countered that revenues generated from the sale of power would offset the operating expenses of the project and that the one and a half cent rate was exceedingly good for the service. Despite the charges of a monopoly and trust favoring the Pacific Gas & Electric Company, the contract was not invalidated.[28]

The first official delivery of power from the permanent plant at Roosevelt occurred on September 30, 1909 when the line between the plant and the Pacific Gas & Electric Company substation was

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[26] Davis, A.P. Irrigation Works Constructed by the United States Government. New York: John Wiley &Sons, Inc. 1917. p.19.

[27] U.S. Department of Interior. Reclamation Service. Ninth Annual Report. p. 65.

[28] For more information on this subject, see Early History to 1917 and Annual Project History, 1917, p. 121. Also Gaylord, James. Power and Pumping System, p. 174-75. Zarbin, Roosevelt Dam: A History to 1911 also provides details on the controversy.

placed in regular service. The new source of power was used to light the City of Phoenix. Amidst the excitement of the big event, readers of The Arizona Republican were given stern warnings about the dangers of charged electric lines.[29] A few instances of vandalism to insulators prompted a reminder that anyone caught would be seriously punished.

In June 1910, power was first used to operate pumps on the Gila River Indian Reservation. Initially only two out of ten proposed pumps were put in operation.

When electrical service first started, a number of short-circuits occurred along the valley line due to large hawks sitting on the towers and touching the wires with their wings or bodies. Wooden spikes designed to prevent birds from landing on the towers were installed but did not completely solve the problem. After studying other transmission systems, a number of successful design changes were made. Alternate towers were eliminated and those remaining were built 12 feet higher. Suspended insulators were substituted for the original insulators, removing the favorite landing place for birds.[30]

By 1914, the Salt River power system had proven itself successful financially as well as physically. Power not used for irrigation was being sold by the government for commercial use and revenues collected were exceeding the operating costs of the entire power system. Almost all surplus power had been purchased.[31]

The SRVWUA had completed the South Consolidated Power Plant, the Arizona Falls Power Plant, and the Crosscut Power Plant was under construction. In addition to the Phoenix, Sacaton, and Chandler substations, others had been built at Glendale and Miami. The expanding power system was transforming the area. In Phoenix, all the electric power in the vicinity was supplied by the government and was used for lighting the city, operating the street railway, ice plants, alfalfa mills, and a cement mill. At Sacaton, power was used to operate ten irrigation pumps, for the domestic water supply and for lights at the Indian School and Agency buildings. At Chandler, the power was used almost exclusively for groundwater pumping. At Glendale, the government provided power for lighting the city of Glendale, as well as for pumping irrigation water in the Marinette district. At Miami, the Consolidated Copper Company was developinga large mill complex that would be operated with power furnished by the government.[32]

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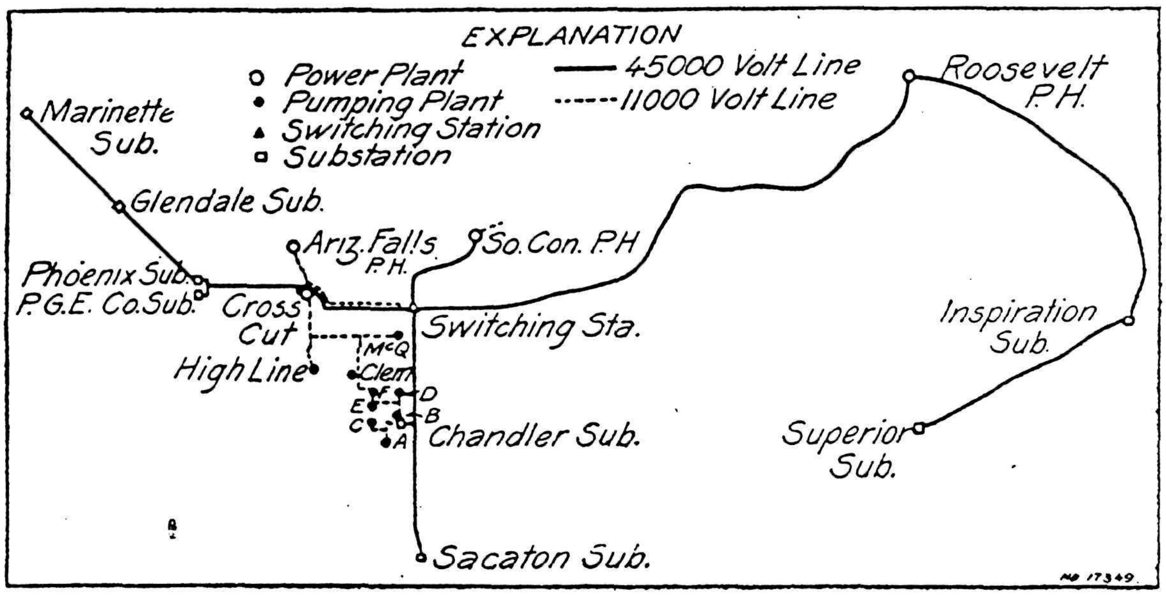
[29] "Roosevelt Power for Phoenix Today". The Arizona Republican. September 29, 1909. p. 4.

[30] Davis, A.P. Irrigation Works Constructed by the United States Government. p. 20.

[31] Gaylord, James. Power and Pumping System. p. 6.

[32] Cone, Wm. S. "The Salt River Valley Power Situation." Reclamation Record. May, 1914. p. 175.



Power lines and system, Salt River Project.

Source: <u>Reclamation Record</u>, January 1917, p. 38.

The 1920's was a period of major expansion for the Salt River Project to satisfy an ever increasing demand for both irrigation water and power. With the construction of Mormon Flat Dam and powerplant, and the revamping of the Roosevelt power plant in the early 1920's under "Mormon Flat Development No. 1", additional power development was made possible. By then, the demand for electricity exceeded the output of the five plants in operation (a fifth plant near Mesa, known as the Chandler Plant, had been added by the SRVWUA shortly after they assumed operation of the Project). Two other dams with associated power plants, Horse Mesa and Stewart Mountain, were built by the SRVWUA on the Salt River in the latter half of the decade. The four Salt River power plants had a combined output of 94,500 horse power. An additional 12,000 horse power was produced by the four hydro-electric plants located on the canal system in the Salt River Valley. During the late twenties, the sale of electricity became increasingly important to the Salt River Project. The sorely-needed revenues helped to offset the growing operating expenses, as well as provided a means to finance improvements to the irrigation distribution system.

Growth of the Salt River Project power facilities continued through the 1930's and into the 1940's to keep up with the diversified needs of expanding agricultural and industrial production and an increasing population. Although no significant changes occurred to the Roosevelt plant during this time, the SRVWUA added a 13,500 horse power diesel plant to the Crosscut facilities near Tempe in 1937-38. In 1940 power from the Colorado River became available through construction by Reclamation of a 140-mile high tension power line from Parker Dam to Phoenix. The following year, a standby steam plant of 37,500 horse power capacity was constructed at Crosscut to assure firm power and continued service to the Project in case of failure by any of the hydro-electric units. The eight hydro-electric plants, together with the Diesel and steam plants, had a combined generating capacity of 157,500 horse power.[33] Every available foot of head from Roosevelt Dam on down to the secondary canal system in the Salt River valley had been utilized for power development. An impressive transmission and distribution system consisted of 1,850 miles of power lines and 27 sub-stations.

By the early 1940's, the Salt River Project was touted as "one of the few districts in the United States with electric service available for all rural homes".[34] From the modest amount of electricity originally produced at Roosevelt had grown a modern and expansive electric utility system. Excess power generated was sold to mining companies; various public utilities, which served the towns in three counties; and to many irrigation districts which depended on pumped water to transform desert lands to irrigated fields. Customers included the Inspiration Consolidated Copper Company, the largest user of power in Arizona, as well as the Nevada Consolidated Copper Company and Magma Copper Company. Electricity for the City of Phoenix

[33] Salt River Project. "The Salt River Project of Arizona Identical with the Salt River Project Agricultural Improvement and Power District". pamphlet, ca. 1941. n.p.

[34] Ibid. n.p.

and town of Mesa was furnished by the project. The array of irrigation districts benefiting from the power system included Roosevelt Irrigation, Roosevelt Water Conservation, Marinette, Goodyear, Arcadia, Casa Grande and Eloy.

With the increasing complexity, size, and expense of the Salt River Project, changes were made to the organizational structure of the operating entity. In 1937, the Salt River Project Agricultural Improvement and Power District was created with the same boundaries and interests as the SRVWUA.[35] Under contract with the Association, all Association properties were transferred to the District with the Association continuing to operate the Project as agent. The advantage of being a Power District was that it created a tax-exempt governmental entity with the right to tax its shareholders. It also meant that the District could refinance outstanding bonds at a lower rate with tax-exempt, municipal-type bonds. In 1949, by an amendment to their earlier contract, the District took over operation of the power system and the Association continued to operate the irrigation system.[36] Although legally two separate entitites, the SRVWUA and Power District continued to function as one, known as the Salt River Project.

A boom in Phoenix's population following World War II translated into an ever increasing demand for electricity. Between 1947 and 1953, the number of customers served by the Salt River Power District doubled. The tremendous influx of people to the hot desert climate could enjoy the comfort offered by a modern innovation, electric air conditioning.[37] The growth in residential areas was accompanied by similar development of commercial and business centers. Agricultural pumping also continued to increase. To keep up with the fast paced growth into previously undeveloped areas, new transmission and distribution lines and substations were continually added to the power system. The electric generating capabilities of the District were increased with the expansion of the Crosscut Steam Plant in the late 1940's (see HAER No. AZ-20, "Crosscut Steam Plant" by Barbara Behan), the completion of the Kyrene Steam Plant in south Tempe in the early 1950's, and the construction of the Agua Fria Generating Station, west of Glendale, beginning in 1957.

Expansion of the Salt River Project's power delivery capabilities continued over the following decades with the purchase of power generated at sources as far away as Hayden, Colorado and Hoover Dam, among others. To maximize the efficiency of its own system, the Salt River Project undertook the tremendous task of changing the old 25-cycle current to the more modern

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[35] Authority to create the district was granted under the Agricultural Improvement District Act passed by the Arizona legislature in 1937.

[36] Salt River Project. "Salt River Project, First Project Organized under the Reclamation Act of 1902, Major Facts in Brief 1869 to 1951". Pamphlet, August 20, 1951. n.p.

[37] The number of homes with air-conditioning had increased 80% between 1952 and 1953. Salt River Project. Salt River Project 1953 Annual Report. p. 5.

60-cycle current. As previously described, the facilities at Roosevelt were upgraded in the early 1970's with the construction of a new powerhouse.

By 1990, about 520,000 electric customers in and around Phoenix received power from the vast network of facilities owned all or in part by the Salt River Project. These now include 17 electric generating stations in the Southwest, of which six are hydroelectric plants. They are Roosevelt, Horse Mesa, Mormon Flat and Stewart Mountain dams on the Salt River, and the smaller South Consolidated Canal and Crosscut Canal facilities. The Salt River Project also purchases power from federal dams along the Colorado River. Hydroelectric power accounts for only about nine percent of the Salt River Project's generating capacity.[38]

The most recent changes at Roosevelt Dam and powerplant add yet another chapter to the story of power development on the Salt River Project and insure that the facilities will continue to provide major benefits to electric customers in and around Phoenix.

[38] Salt River Project. "Questions & Answers about the Salt River Project." pamphlet published in March, 1990.

IV. CURRENT PHYSICAL DESCRIPTION

POWER PLANT

The original power plant is a rectangular plan building measuring approximately 126 feet long by 36 feet wide and 51 feet high. The rear or southeast wall abuts the side of the canyon. The roof slopes slightly up towards the rear and is concealed behind a stone parapet wall along the river (northwest) facade. The parapet wall removed during the 1920's remodelling is in the process of being restored. With the exception of the southeast wall, exterior walls are constructed of reinforced concrete faced with square-cut dolomite limestone blocks laid in regular courses. Stones are quarry-faced and separated by tooled concave joints. The canyon wall of the building is all exposed formed concrete; there is no stone facing.

The building's appearance has been dramatically altered by the addition of the exterior generator/turbine unit and transformer station in the early 1970's. The new powerplant was installed in front of the old structure in a massive concrete pad which conceals the lower portion of the original power house and much of the rest of the facade. The original entrance in the lower level of the southwest elevation has been totally obscured and blocked off. During the recent modifications, the new primary entrance was relocated to what was originally a window on the second level of the northwest facade. The opening is one of a row of five evenly-spaced large segmental-arched windows that all originally contained multi-paned wood sash panels. Two of the windows with original sash are still visible from the interior of the building. Stone belt courses originally delineated each level of the building. Today, only the beltcourses between the second and third levels and at the roofline are clearly visible.

Above the arched windows on the northwest facade are fourteen evenly-spaced square windows with stone sills and splayed lintels. Each window contains a 9-pane steel sash. A single 12-pane steel sash window exists in the third level of the northeast facade; a similar window in the southwest elevation has been infilled.

The interior of the power house is one large space open to the ceiling. Walls are of concrete and the steel roof truss system is exposed. Suspended from the ceiling is the original overhead 40-ton bridge crane. A supplementary 3-ton jib hoist was recently added to handle equipment. The hoist is located on a new service bay platform constructed 16 feet above the original floor at the southwest end of the building. At the opposite end of the building a new enclosed control room with concrete block walls has recently been completed. At the lower level of the northeast end of the building the new penstock cuts through the building (a hatch in the roof was used to lower pieces of the penstock in place). On the northeast end wall the circular penetration of the removed 1970's penstock is visible.

Various original interior galleries or platforms that housed different equipment are reached by flights of metal steps. Along the rear of the powerhouse in the area originally occupied by the temporary generating unit was located the original control room. The original control panel is still in place as are old wires on wooden insulators. Behind the original control room and separating it from the canyon wall is an access corridor.

TRANSFORMER HOUSE

The transformer house is a three-story rectangular plan building measuring approximately 30 feet wide by 82 feet long. A flat concrete roof encloses the 53-foot high structure which sits on a concrete foundation. Exterior walls are of reinforced concrete faced with random-laid rough-cut sandstone blocks. Convex tooled joints separate the stones. A beltcourse below the first, second and third story windows and at the roofline add definition to the flat building surface. Corners are accentuated by stone quoins.

The main entrance to the building is through a segmental-arched doorway located off-center in the north or riverfront elevation. A pair of non-original flush wood doors are set back in the entryway. Above the doors the transom has been filled in with board and batten siding. A short flight of concrete steps leads up to the entrance. A second entry door is located in the center of the east elevation.

The type and arrangement of windows varies by floor. Tall rectangular multi-paned steel sash windows puncture the north, south and west elevations at the first floor. On the south facade, several of the windows have been boarded over and ductwork to an exterior mechanical unit has been installed in one of the eight windows. At the second floor, a pair of 6-over-6 wood windows exists at both the east and west ends; the other elevations are without windows. At the third floor, six 6-over-6 wood windows are evenly spaced on the north and south facades. The west elevation contains six round window openings; the east elevation has no windows. All but the round windows have cut sandstone block surrounds.

Other exterior features include a concrete platform with a simple metal railing at the west end of the building. Originally, lightning arresters for the Valley line were placed here. Metal bolts and plates embedded in the wall above once held electric wires in place. On the north elevation, a fire escape leads from a third floor window up to the roof. Two small gable-roofed bat roosts now sit on top of the building.

The interior of the building is vacant except for the bats occupying the second and third floors. The first floor consists of an open area at the west end inside the entrance. This was originally the shop space. A center corridor flanked on both sides by a row of bays separated by concrete walls occupies the rest of the floor. These bays originally contained transformers but were later used for storage and offices. Doors and windows have been added along the corridor face of the bays. A non-original dropped ceiling exists throughout the floor. Interior walls are concrete as is the floor. Due to the thickness of the walls, there are deep window recesses.

A simple staircase along the south wall at the west end of the building leads to the second floor. From a concrete landing at the top of the stairs, a corridor extends from the west to east end of the building. Evenly spaced along both sides of the corridor are a series of numbered and labelled concrete bays. These were originally the bus compartments. The stairs to the third floor are located on the north wall. The upper floor is one undivided space with a concrete floor and concrete ceiling. Along the south wall is a row of concrete compartments. The upper floor originally contained the oil switches. The equipment has since been removed.

V. BIBLIOGRAPHY

I. Manuscript and Archival Collections

Arizona, Phoenix. Arizona State University, Hayden Library.

Arizona, Tempe. Research Archives, Salt River Project.

Colorado, Denver. Bureau of Reclamation Library.

Colorado, Denver. Denver Public Library.

Colorado, Denver. National Archives and Records Administration. Record Group 115, Bureau of Reclamation.

II. U.S. Government Documents

Contract between Secretary of Interior E.A. Hitchcock and S. Morgan Smith Company, dated January 15th, 1906. National Archives, Denver, RG 115, Entry 3, Box 876.

U. S. Department of Interior. Bureau of Reclamation. Dams and Control Works. Washington, D.C.: Government Printing Office, February, 1938. p. 44-48.

U.S. Department of Interior. Bureau of Reclamation. Dams and Control Works. Washington, DC: Government Printing Office, 1954. p 56-60.

U.S. Department of Interior. Bureau of Reclamation. Design Summary: Theodore Roosevelt Dam Modification, Salt River Project, Arizona. Denver, Colorado, September, 1983.

U.S. Department of Interior. Bureau of Reclamation. Salt River Project History, 1939. RG 115, Entry 10, Box 500. National Archives, Denver.

U.S. Department of Interior. Bureau of Reclamation. Salt River Project, 1916 Final Project History RG 115, Box 142. National Archives, Denver.

U.S. Department of Interior. Bureau of Reclamation. Salt River Project, Early History to 1917 and Annual Project History, 1917. RG 115, Box 142. National Archives, Denver.

U.S. Department of Interior. Geological Survey. Water Storage on Salt River Project by Arthur P. Davis. Washington, D.C.: Government Printing Office, 1903.

U.S. Department of Interior. Reclamation Service. Annual Reports of the U.S. Reclamation Service 1902-11. Washington: Government Printing Office.

III. Articles and Reports

Blanchard, C.J. "The Dedication of the Roosevelt Dam." Scientific American, Vol. CIV, No. 11. (March 18, 1911), p. 272.

Brandow, Glenn. "Historical Documents Pertaining to Power Contracts and Agreements of the Salt River Project." unpublished report, 1961. (SRP Inventory Box 101, #1887)

Cragin, C.C. Report on Proposed Additional Hydro-Electric Power Development of the Salt River. Phoenix: Salt River Valley Water Users Association, February, 1922.

"Building of the Big Dam." The Arizona Republican, March 19, 1911, p. 4-5.

Cone, William S. "Revenue from Power System, Salt River Project." Reclamation Record, (January 1917), p. 37-39.

Cone, William. S. "The Salt River Valley Power Situation." Reclamation Record, (May, 1914) p. 175.

"Electrical Arrangements, Which Are Well Underway at Roosevelt." The Arizona Republican, January 3, 1908, p. 7.

Gaylord, James M. Power and Pumping System of the Salt River Project, Arizona. Report on file at Salt River Project, Tempe, January 1, 1914.

Hepler, Tom and Daniel M. Drake. "Raising Roosevelt Dam: Protection Against Floods, Earthquakes." Hydro-Review, (July 1995), p. 40-48.

Introcaso, David. The Roosevelt Power Canal and Diversion Dam. Historic American Engineering Record, No. AZ-4. Salt River Project, Phoenix. 1984.

Jackson, Donald. Theodore Roosevelt Dam. Historic American Engineering Record, No. AZ-6. Submitted to Bureau of Reclamation, Arizona Projects Office, Phoenix. June 1992.

Kinyon, Edmund. "The Roosevelt Dam: Water and Power Development at Salt River." Scientific American Supplement, No. 179 (May 21, 1910), p. 322.

Lawson, H.J. "Rural Electrification on Salt River Project". Reclamation Era, (December, 1938), p. 243.

Progress of Work articles. Reclamation Record. 1908-1921.

"Roosevelt Power for Phoenix Today." The Arizona Republican, September 29, 1909, p. 4.

"Roosevelt Power to Phoenix." The Arizona Republican, September 30, 1909, p. 8.

"Rushing Work on Big Power Plant." The Arizona Republican, December 30, 1910, p.5.

Sanford, George. "Power Development on Federal Reclamation Projects." Reclamation Era, (May 1937), p. 102-105.

"Work at Roosevelt and on Tonto Road." The Arizona Republican, April 11, 1907, p.4.

IV. Books

Davis, Arthur Powell. Irrigation Works Constructed by the United States Government. New York: John Wiley & Sons, Inc. 1917. p. 18-20.

Zarbin, Earl. Roosevelt Dam: A History to 1911. Phoenix: Salt River Project, 1984.

V. Miscellaneous

Letter from the Secretary of the Interior to the Auditor for the Interior Department dated April 17, 1908 regarding contract for water-wheel apparatus at Roosevelt power plant. RG 115, National Archives, Entry 3, Box 876.

Salt River Project. A Valley Reborn: The Story of the Salt River Project. Brochure, Phoenix, Arizona. ca. 1984. (ASU govt. documents)

Salt River Project. Major Facts in Brief About the Salt River Project. Brochure, Phoenix, Arizona. ca. 1969. (ASU govt documents)

Salt River Project. Salt River Project Annual Reports, 1953, 1970, 1971, 1973, 1981-82. Phoenix, Arizona. (ASU govt.documents)

Salt River Project. The Salt River Project of Arizona Identical with the Salt River Project Agricultural Improvement District. Pamphlet, c. 1941. (ASU government documents)

Salt River Project. Salt River Project, First Project Organized Under the Reclamation Act of 1902, Major Facts in Brief 1869-1951. Brochure, August 20, 1951. (ASU govt. documents)

Salt River Project. Questions and Answers about the Salt River Project. Pamphlet, March, 1990.

Salt River Valley Water Users Association. Salt River Project, Annual Project Histories, 1922-25.

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Phoenix Vicinity
Maricopa County
Arizona

HAER No. AZ-6-A

AZ-6-A-1 Photographic copy of photograph (Source: Salt River Project Archives, Tempe, Arizona, Lubken collection, #R-187) POWER PLANT UNDER CONSTRUCTION. APRIL 18, 1907.

AZ-6-A-2 Photographic copy of photograph (Source: Salt River Project Archives, Lubken collection, #R-228) ROOF OF POWER PLANT UNDER CONSTRUCTION. NOVEMBER 16, 1907.

AZ-6-A-3 Photographic copy of photograph (Source: Salt River Project Archives, Box 8039, File 26) POWER PLANT UNDER CONSTRUCTION. LOOKING SOUTH. FEBRUARY 29, 1908.

AZ-6-A-4 Photographic copy of photograph (Source: Salt River Project Archives, Lubken collection, #R-366) VIEW LOOKING NORTH AT POWER PLANT AND TRANSFORMER HOUSE. DECEMBER 1, 1909.

AZ-6-A-5 Photographic copy of photograph (Source: Salt River Project Archives, Lubken collection #R-511) INTERIOR OF POWER PLANT PRIOR TO INSTALLATION OF 10' PENSTOCK GENERATORS. CA. 1911.

AZ-6-A-6 Photographic copy of photograph (Source: Salt River Project Archives, Box 8041, File 1) INTERIOR OF POWER PLANT. POWER CANAL AND 10' PENSTOCK UNITS IN PLACE. NO DATE.

AZ-6-A-7 Photographic copy of photograph (Source: National Archives, Rocky Mountain Region, Denver, Salt River Project History, Final History to 1916. p. 504) INSIDE OF ROOSEVELT POWER PLANT SHOWING SIZE OF VALVE. CA. 1916.

AZ-6-A-8 Photographic copy of photograph (Source: Salt River Project Archives, Box 8040, File 29) POWER PLANT ADDITION UNDER CONSTRUCTION. VIEW LOOKING SOUTHWEST. NO DATE. CA. 1923-24.

AZ-6-A-9 Photographic copy of photograph (Source: Salt River Project Archives, Box 8040, File 31) INTERIOR OF HIGH TENSION 45,000 VOLTS ROOM, ROOSEVELT POWER PLANT. NO DATE. POST 1924.

AZ-6-A-10 Photographic copy of photograph (Source: Salt River Project Archives, Box 8046, File 13) VIEW OF POWER PLANT AND TRANSFORMER HOUSE. LOOKING NORTHEAST. NO DATE. POST 1924.

AZ-6-A-11 Photographic copy of drawing dated October 1906 (Source: Salt River Project) POWER HOUSE AT ROOSEVELT

AZ-6-A-12 Photographic copy of drawing dated April 6, 1917 (Source: Salt River Project) STORE ROOM ROOSEVELT POWER HOUSE

AZ-6-A-13 Photographic copy of drawing dated 2/1922, revised 9-7-50 (Source:Salt River Project) ROOSEVELT POWER PLANT, PRESENT LAYOUT AND CHANGES AND ADDITIONS

AZ-6-A-14 Photographic copy of drawing dated 10-13-1970 (Source: Salt River Project) THEODORE ROOSEVELT POWERHOUSE, GENERAL ARRANGEMENT, SHEET NO. 1

AZ-6-A-15 Photographic copy of drawing dated 10-14-70 (Source: Salt River Project) THEODORE ROOSEVELT POWERHOUSE #2, GENERAL ARRANGEMENT, SHEET NO. 3

NOTE: Additional drawings and photographs of the Roosevelt power plant are included in Theodore Roosevelt Dam HAER No. AZ-6.

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Arizona

HAER NO. AZ-6-B

Joe Madrigal, Photographer, December 1995

AZ-6-B-1 VIEW LOOKING NORTHEAST AT TRANSFORMER HOUSE.

AZ-6-B-2 VIEW OF FIRST FLOOR INTERIOR OF TRANSFORMER HOUSE, SHOP AREA.

AZ-6-B-3 VIEW OF FIRST FLOOR INTERIOR OF TRANSFORMER HOUSE, TRANSFORMER BAYS.

AZ-6-B-4 VIEW OF SECOND FLOOR INTERIOR OF TRANSFORMER HOUSE.

AZ-6-B-5 Photographic copy of photograph (Source: Salt River Project Archives, Tempe, Lubken collection, #R-273) TRANSFORMER HOUSE UNDER CONSTRUCTION. VIEW LOOKING NORTH. JULY 1, 1908.

AZ-6-B-6 Photographic copy of photograph (Source: Salt River Project Archives, Tempe, Lubken collection, #R-295) TRANSFORMER HOUSE UNDER CONSTRUCTION. VIEW LOOKING NORTH. OCTOBER 5, 1908.

AZ-6-B-7 Photographic copy of photograph (Source: National Archives, Rocky Mountain Region, Denver, Salt River Project History, Final Project History to 1916. p. 506.) INTERIOR VIEW OF TRANSFORMER HOUSE. NO DATE. CA. 1916.

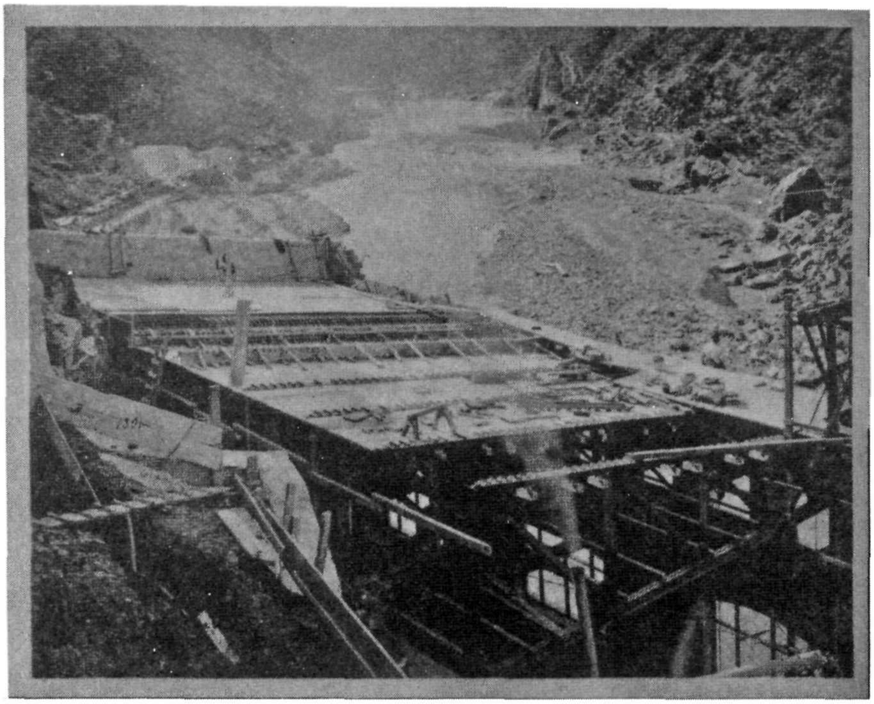
AZ-6-B-8 Photographic copy of photograph (Source: Salt River Project Archives, Tempe, Box 8040, File 29) VIEW OF TRANSFORMER HOUSE LOOKING NORTH. NO DATE. CA. 1920.

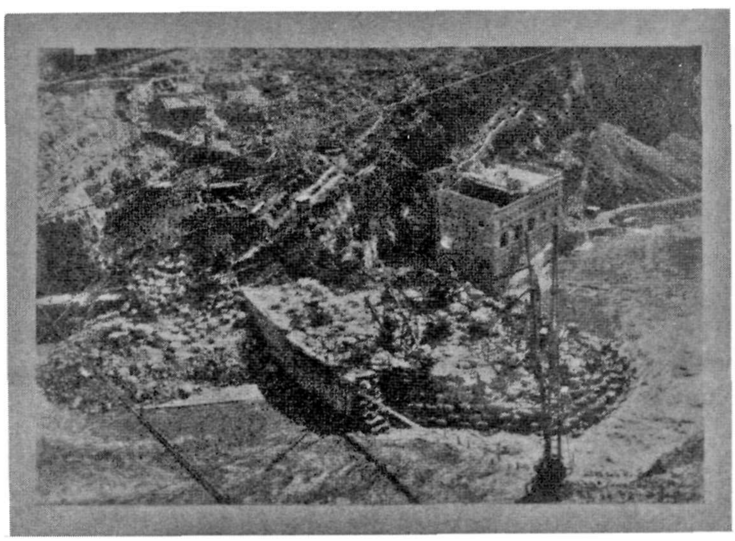
AZ-6-B-9 Photographic copy of drawing dated June 24, 1908 (Source: Salt River Project) TRANSFORMER HOUSE, GENERAL DRAWING

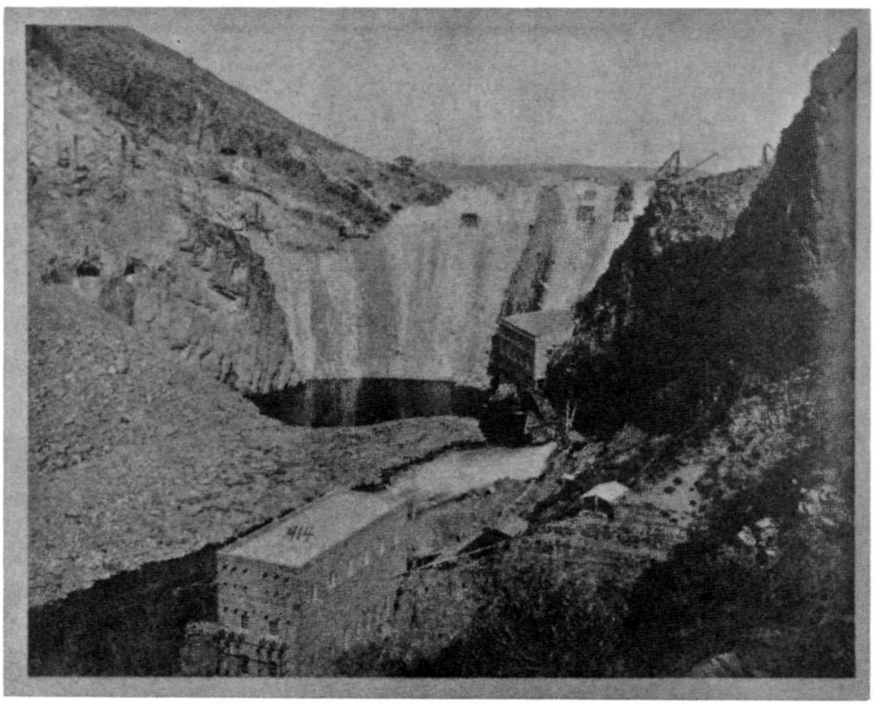
AZ-6-B-10 Photographic copy of drawing dated January 22, 1908 (Source: Salt River Project) GENERAL PLANS, INDEX TO DETAIL PLANS AND SECTIONS, TRANSFORMER HOUSE

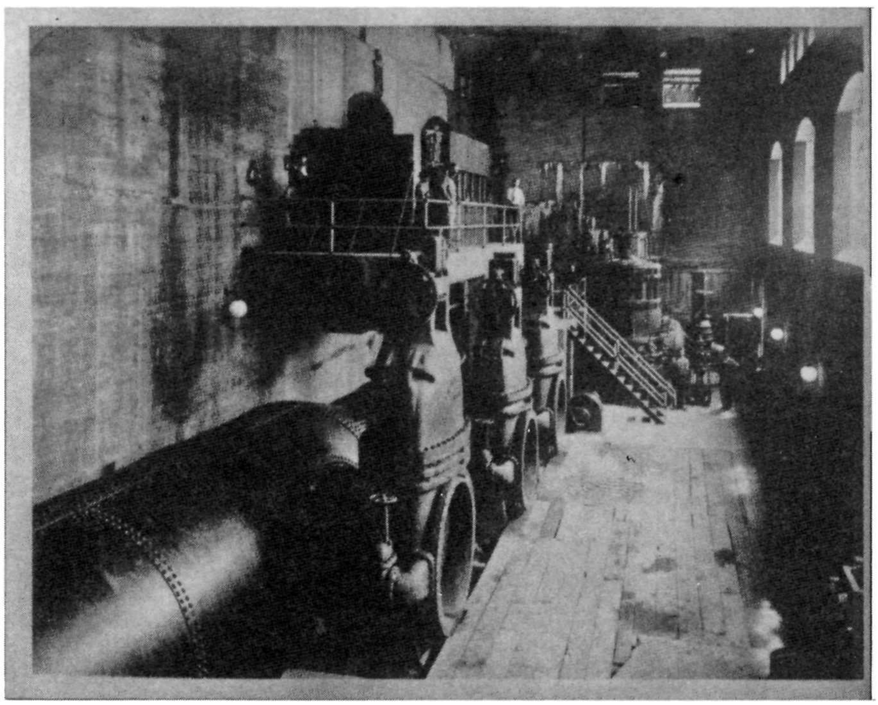
AZ-6-B-11 Photographic copy of drawing dated February 17, 1908 (Source: Salt River Project) TRANSFORMER BUILDING, FIRST FLOOR PLAN AND SECTIONS (TRANSFORMER FLOOR)

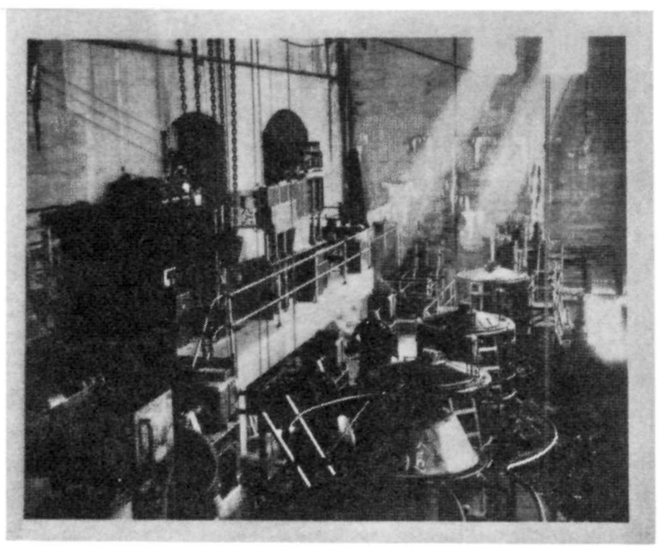
NOTE: Additional photographs of the Roosevelt transformer house can be found in HAER No. AZ-6, Theodore Roosevelt Dam. Historical and descriptive information can be found in the HAER report for the Theodore Roosevelt Dam, Power Plant, HAER No. AZ-6-A.

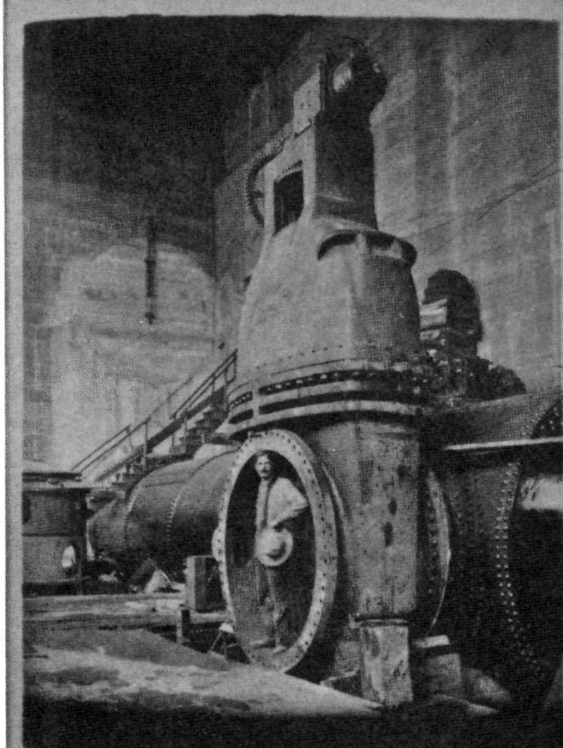




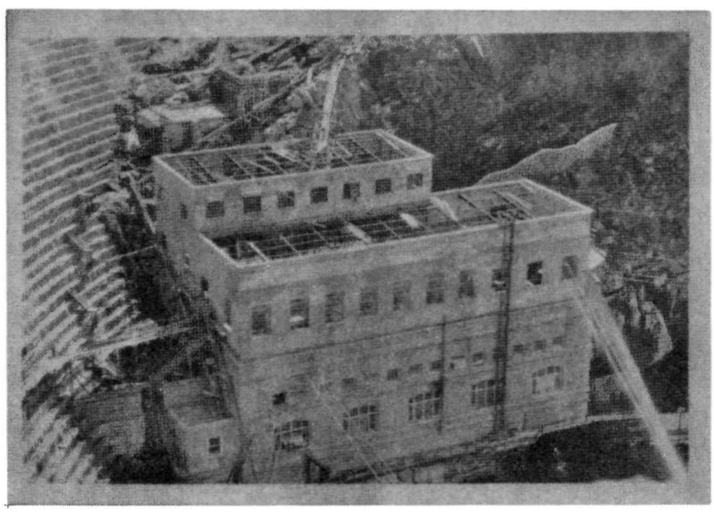


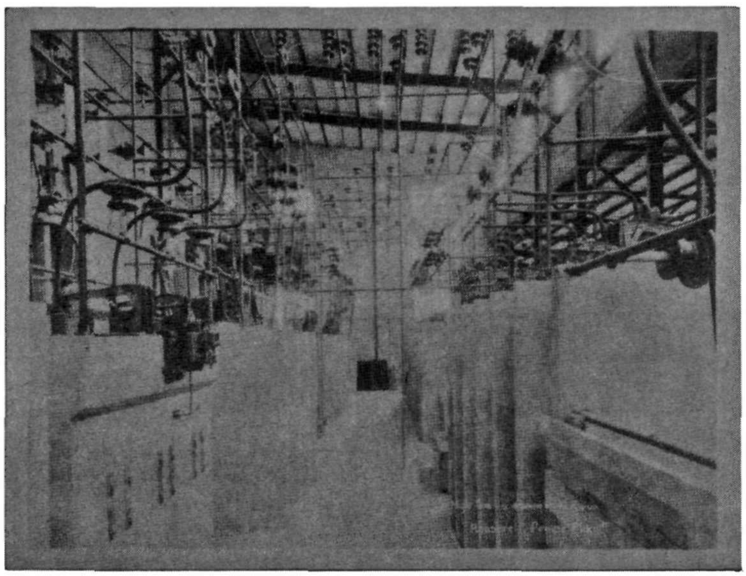


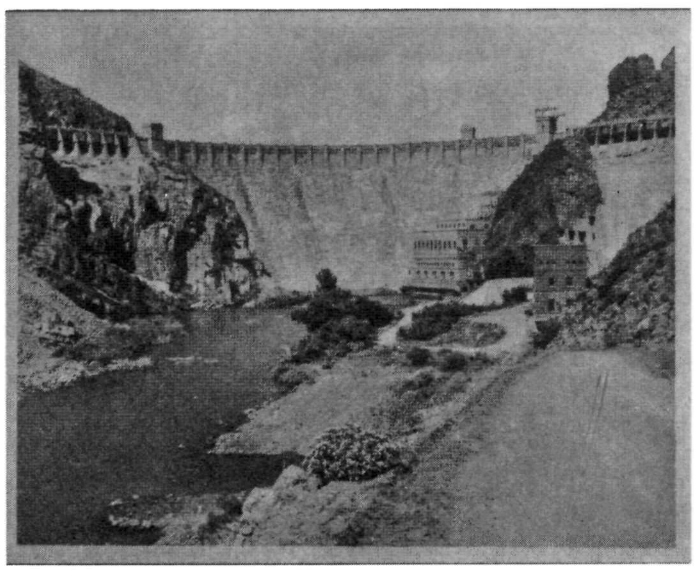


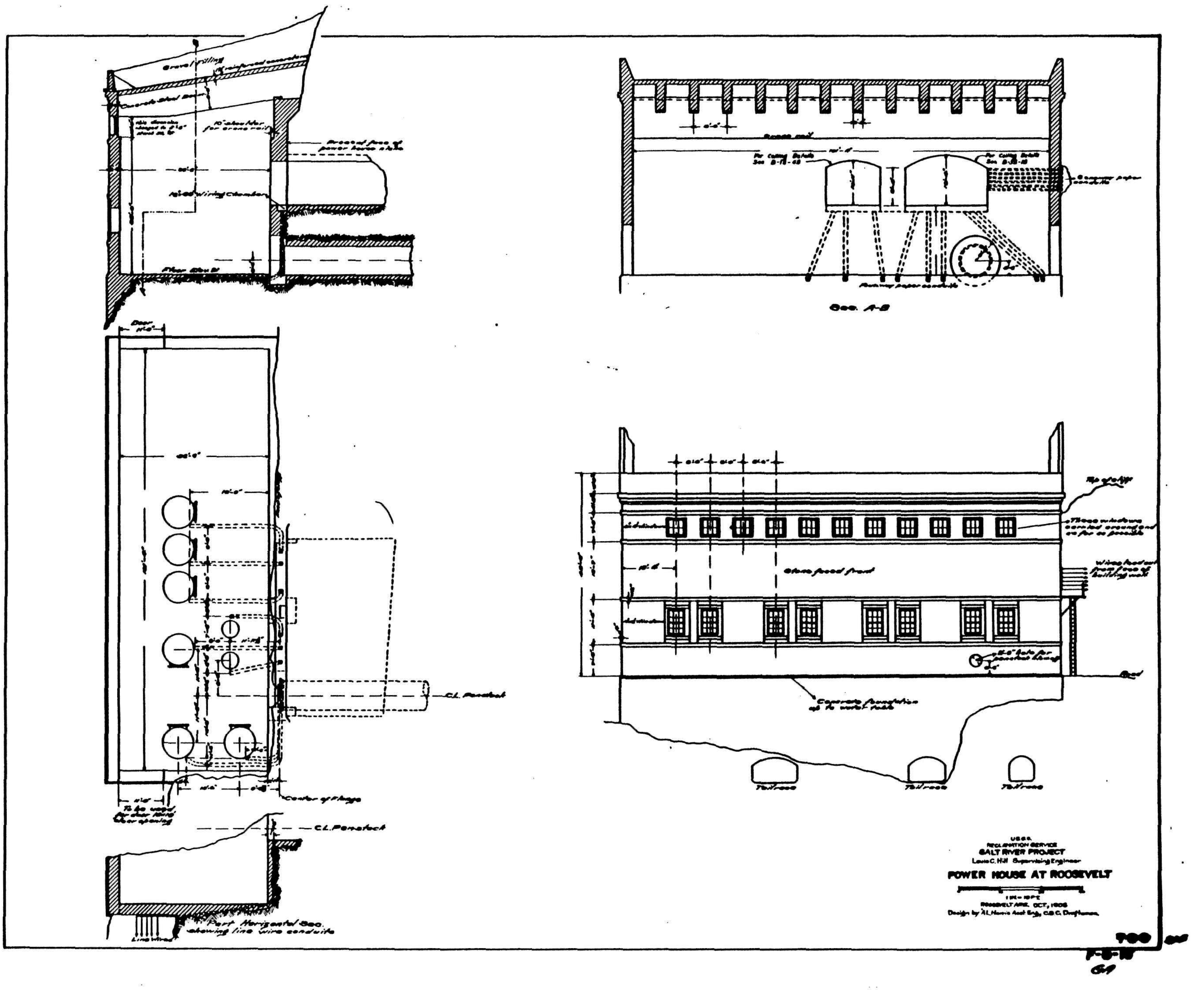


Inside Roosevelt Power House - showing size of valve








Gravel filling
Sec. A-B
C.L. Penstock
Center of flange
Concrete foundation up to water table
Tailrace
Tailrace
Tailrace
Part Horizontal Sec. showing line wire conduits
Line Wires
U.S.G.S.
RECLAMATION SERVICE
SALT RIVER PROJECT
Louis C. Hill Supervising Engineer
POWER HOUSE AT ROOSEVELT
1 IN = 10 FT
ROOSEVELT ARIZ. OCT., 1906
Design by A.L. Harris Asst Eng., C.D.C. Draftsman.
F-5-15
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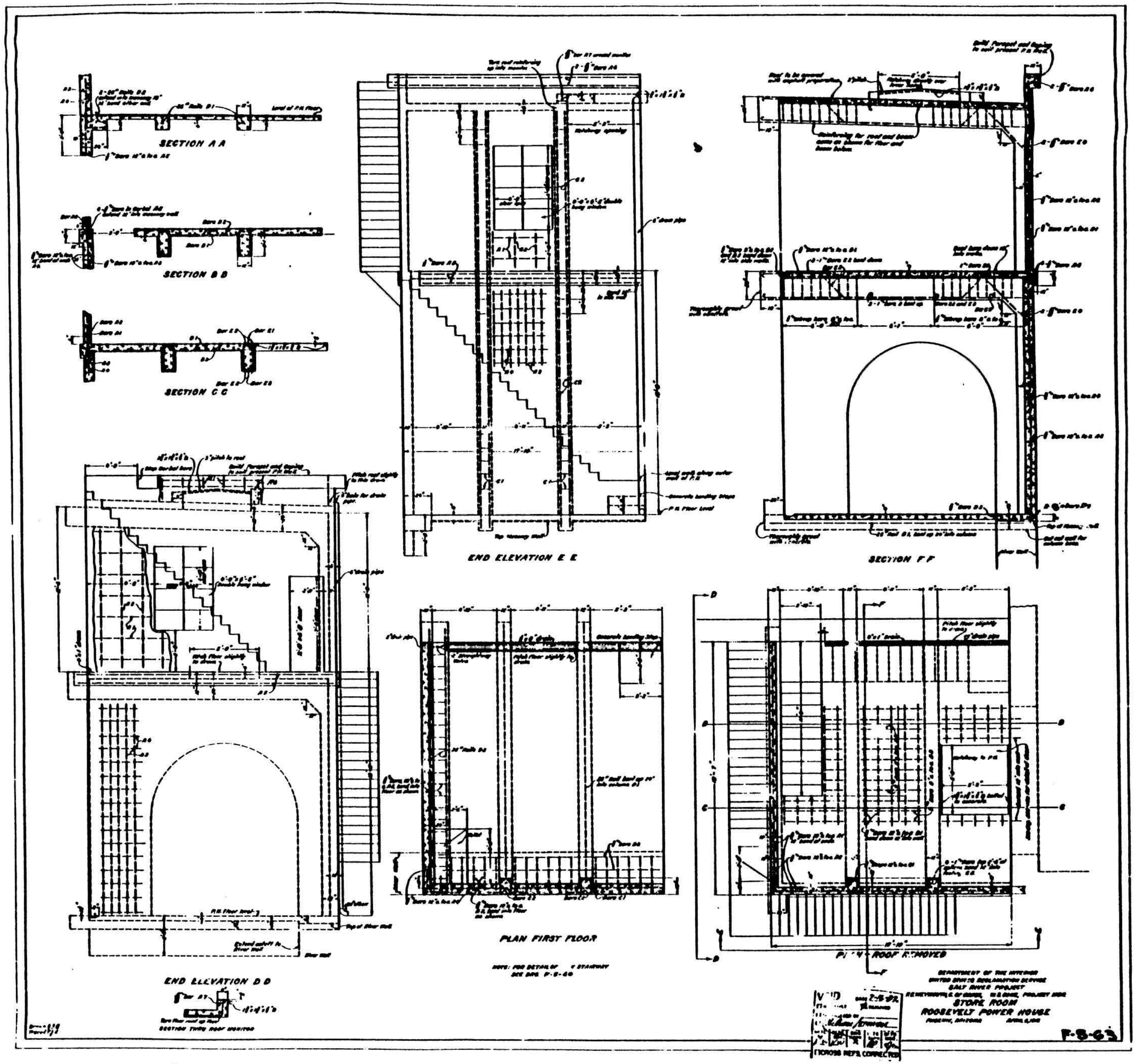

SECTION A A
SECTION B B
SECTION C C
END ELEVATION E E
SECTION F F
END ELEVATION D D
PLAN FIRST FLOOR
ROOF REMOVED
SALT RIVER PROJECT
STORE ROOM
ROOSEVELT POWER HOUSE
F-B-63
CROSS REFS. CORRECTED

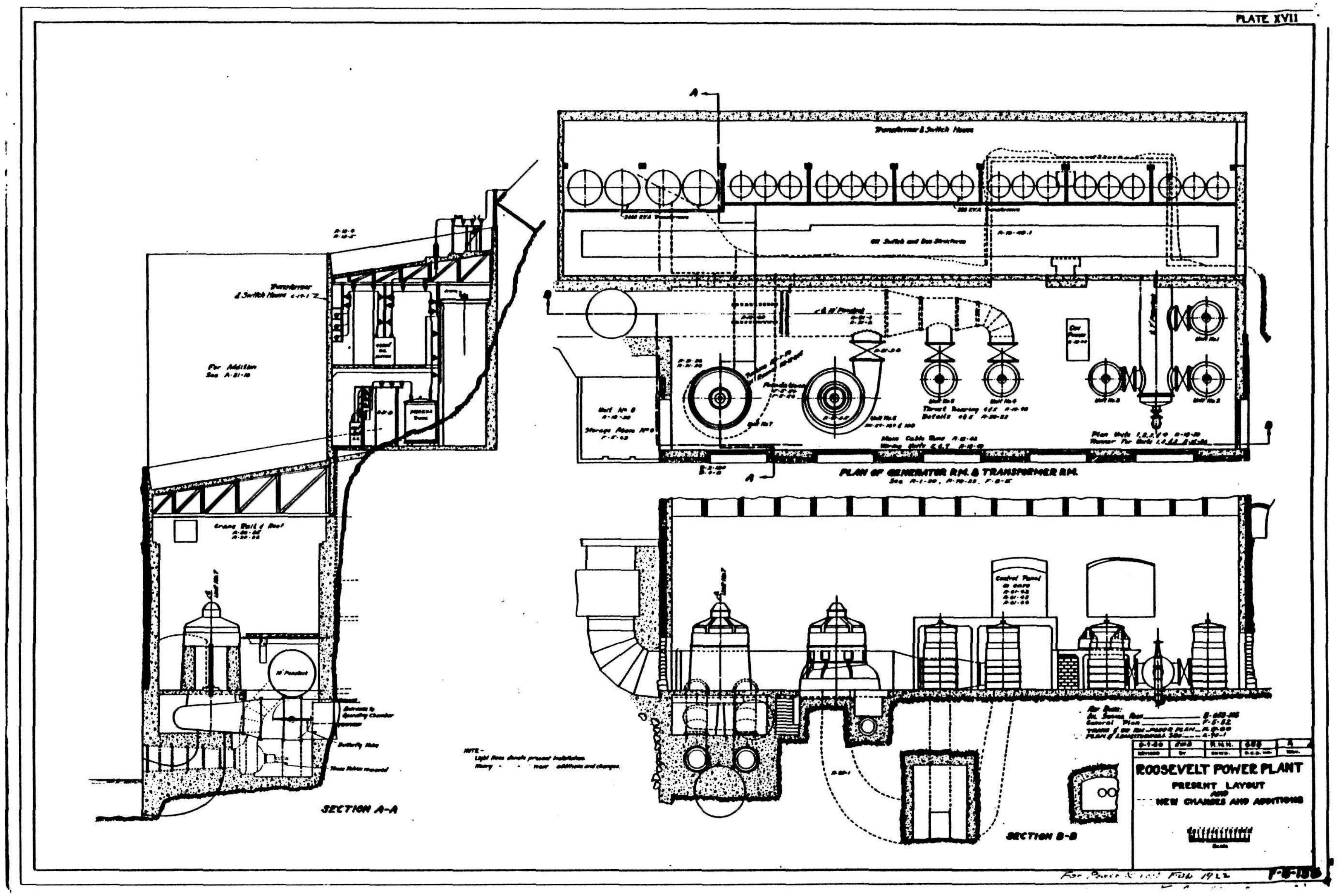
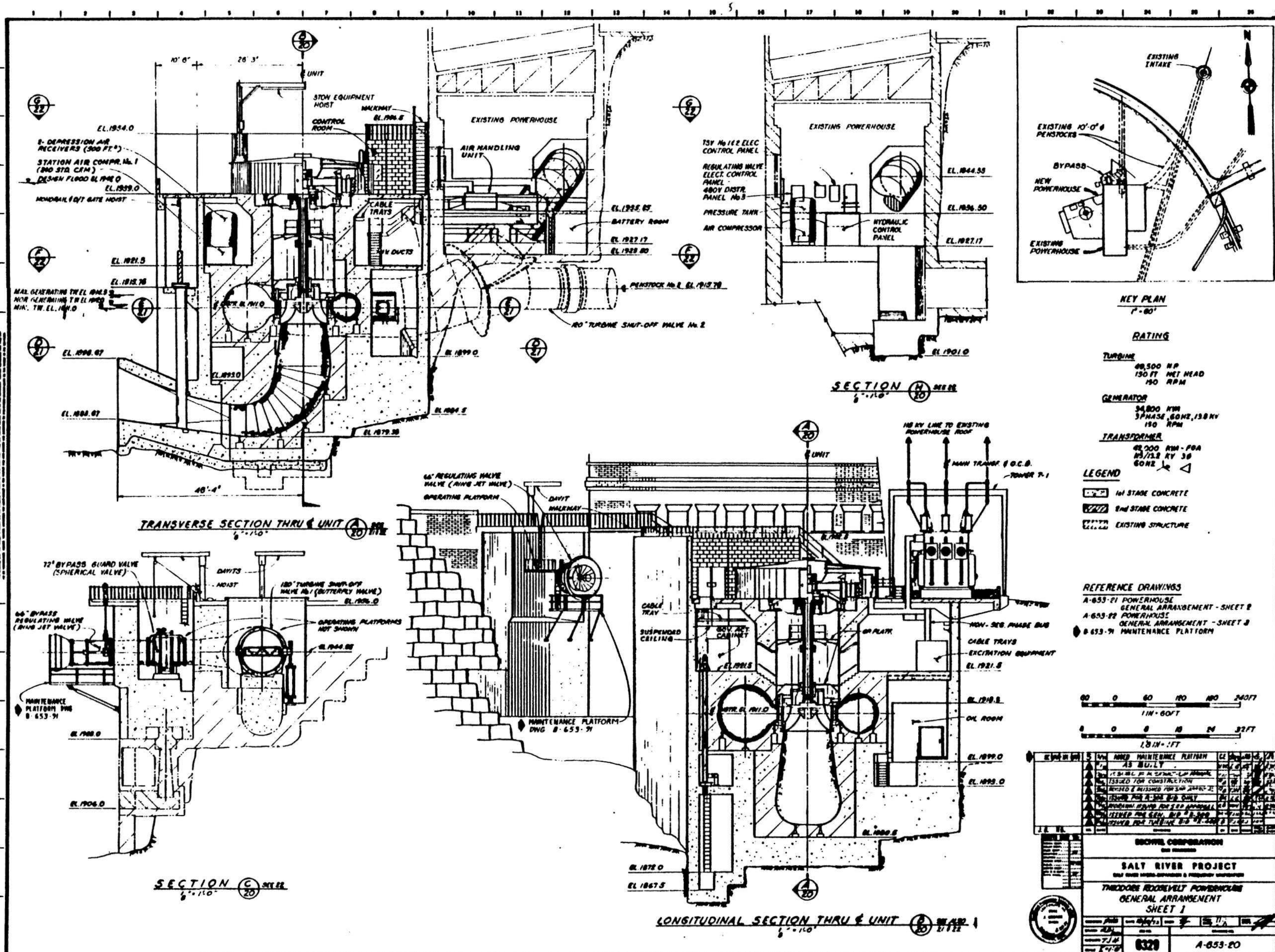
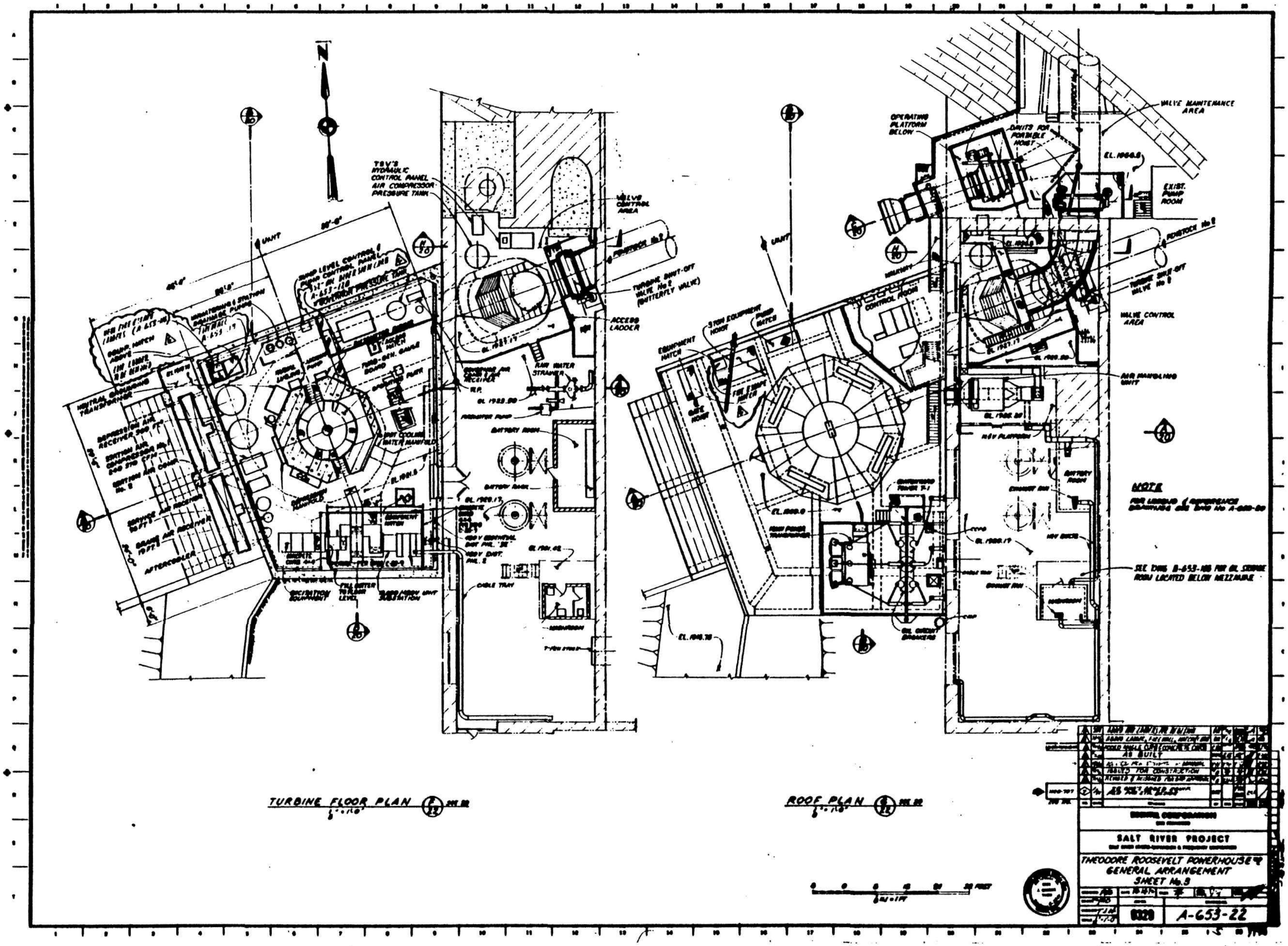
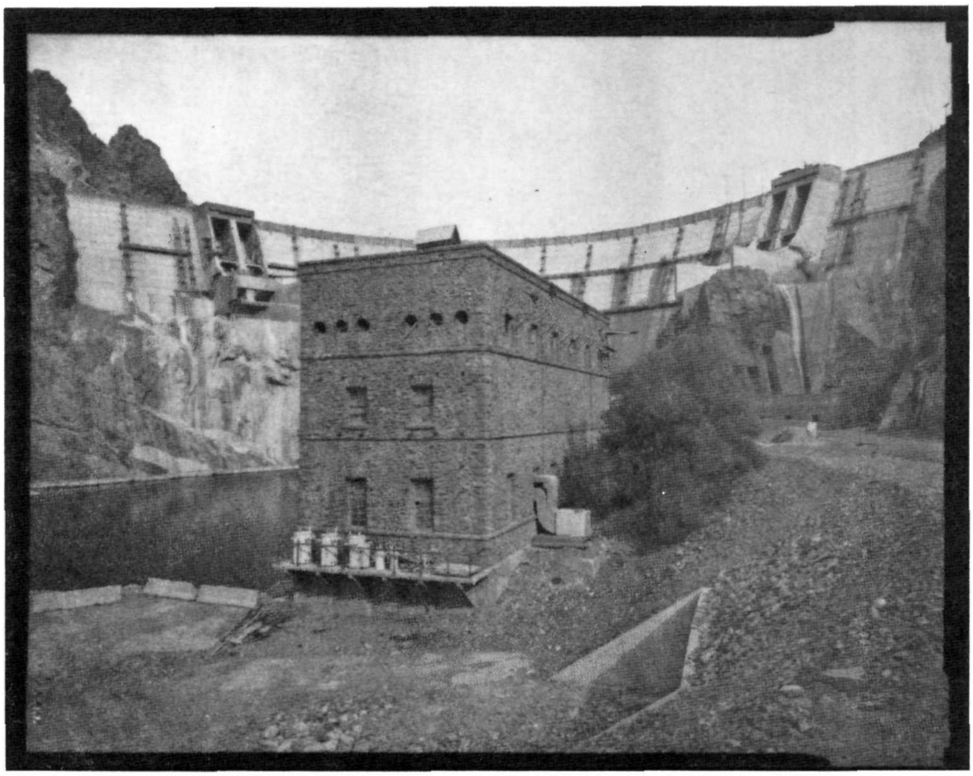
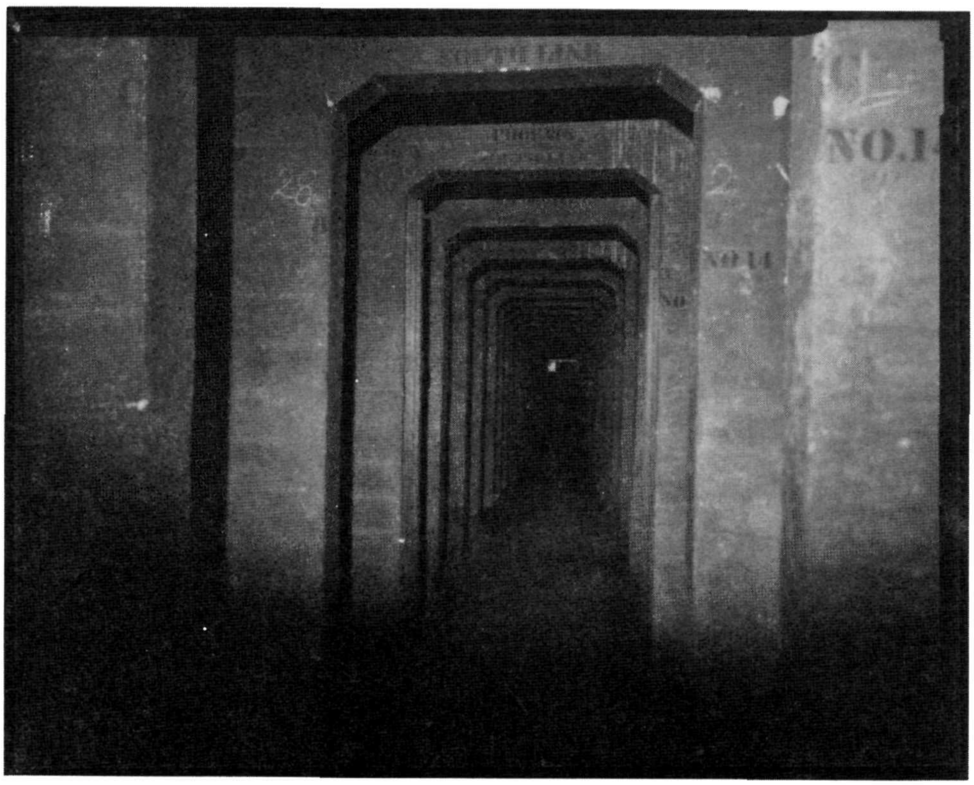


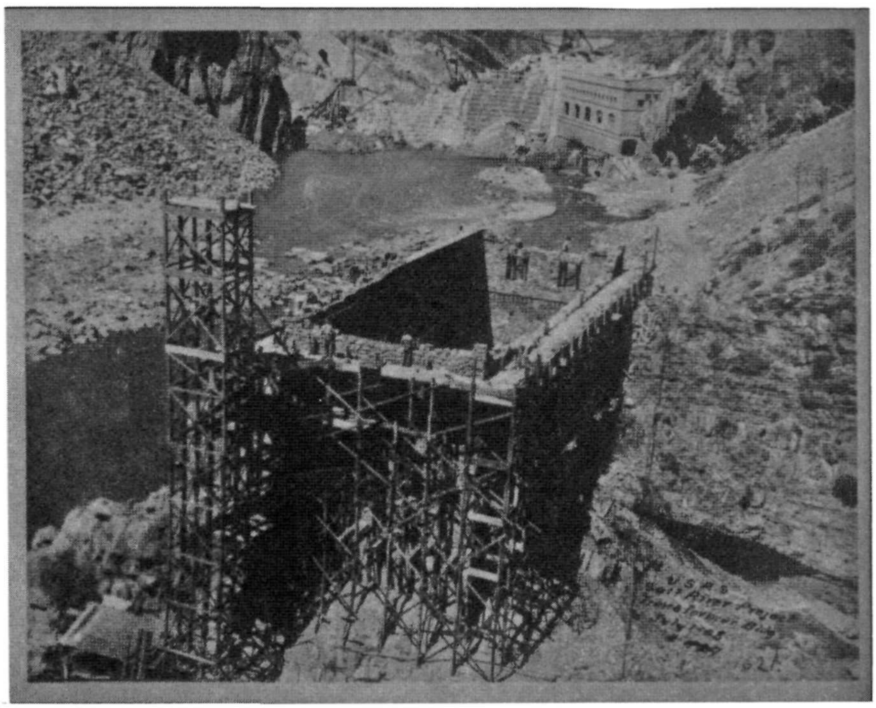
PLATE XVII
SECTION A-A
PLAN OF GENERATOR RM. & TRANSFORMER RM.
SECTION B-B
ROOSEVELT POWER PLANT
PRESENT LAYOUT
AND
NEW CHANGES AND ADDITIONS

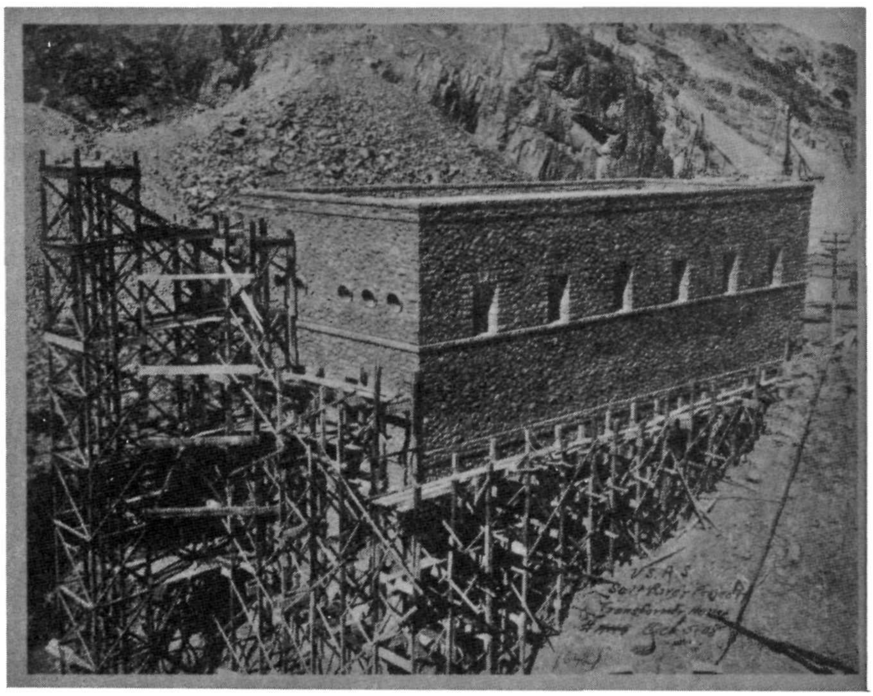

EXISTING POWERHOUSE
AIR HANDLING UNIT
CONTROL ROOM
STATION AIR COMPR. No. 1
CABLE TRAYS
BATTERY ROOM
PENSTOCK No. 2
PRESSURE TANK
AIR COMPRESSOR
HYDRAULIC CONTROL PANEL
TRANSVERSE SECTION THRU ℄ UNIT
SECTION
LONGITUDINAL SECTION THRU ℄ UNIT
72" BYPASS GUARD VALVE (SPHERICAL VALVE)
66" REGULATING VALVE (RING JET VALVE)
OPERATING PLATFORM
DAVIT
WALKWAY
HOIST
MAINTENANCE PLATFORM DWG B-653-71
SUSPENDED CEILING
EXCITATION EQUIPMENT
OIL ROOM
KEY PLAN
EXISTING INTAKE
EXISTING 10'-0" Ø PENSTOCKS
BYPASS
NEW POWERHOUSE
EXISTING POWERHOUSE
RATING
TURBINE
GENERATOR
TRANSFORMER
LEGEND
1st STAGE CONCRETE
2nd STAGE CONCRETE
EXISTING STRUCTURE
REFERENCE DRAWINGS
A-653-21 POWERHOUSE GENERAL ARRANGEMENT - SHEET 2
A-653-22 POWERHOUSE GENERAL ARRANGEMENT - SHEET 3
B-653-71 MAINTENANCE PLATFORM
1 IN = 60 FT
ADDED MAINTENANCE PLATFORM
AS BUILT
ISSUED FOR CONSTRUCTION
BECHTEL CORPORATION
SALT RIVER PROJECT
THEODORE ROOSEVELT POWERHOUSE
GENERAL ARRANGEMENT
SHEET 1
8329
A-653-20

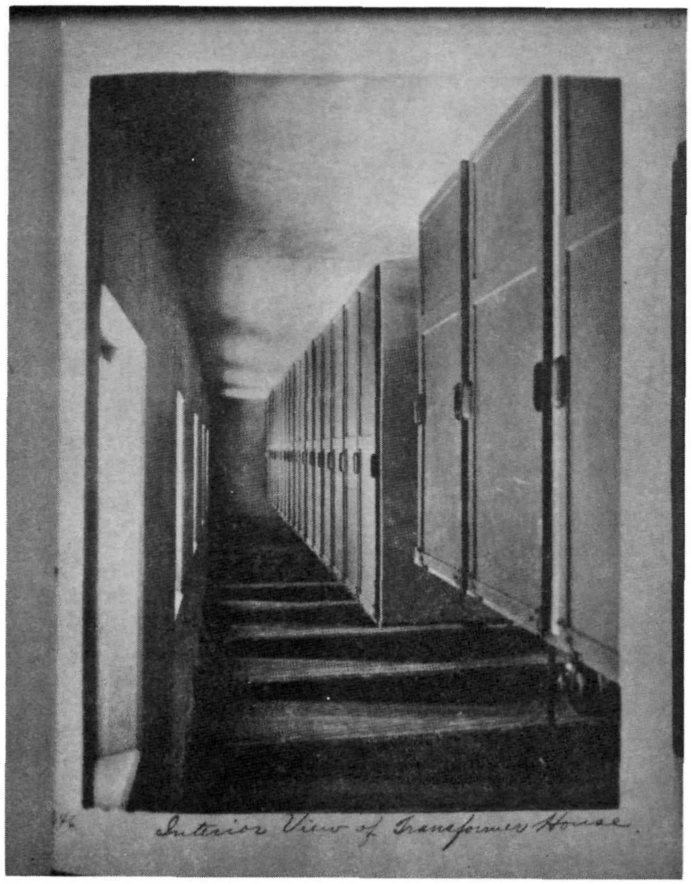

TURBINE FLOOR PLAN
ROOF PLAN
VALVE MAINTENANCE AREA
OPERATING PLATFORM BELOW
EXIST. PUMP ROOM
VALVE CONTROL AREA
ACCESS LADDER
CONTROL ROOM
BATTERY ROOM
NOTE
SALT RIVER PROJECT
THEODORE ROOSEVELT POWERHOUSE
GENERAL ARRANGEMENT
SHEET No.3
A-653-22



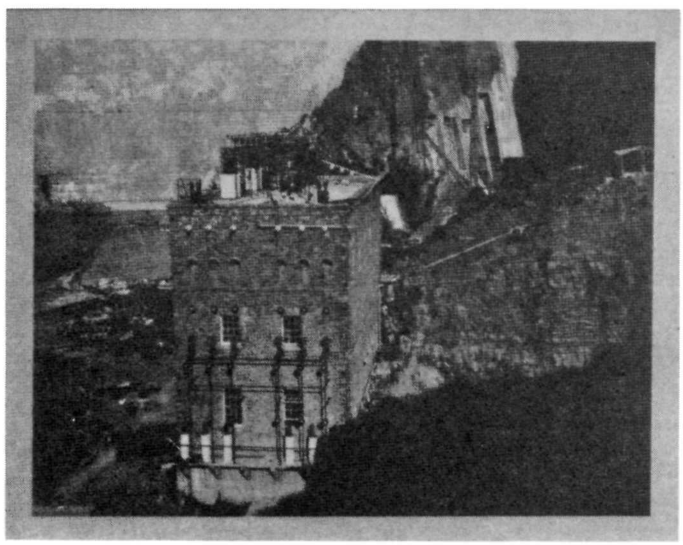

NO.1


U.S.R.S.
Salt River Project
627



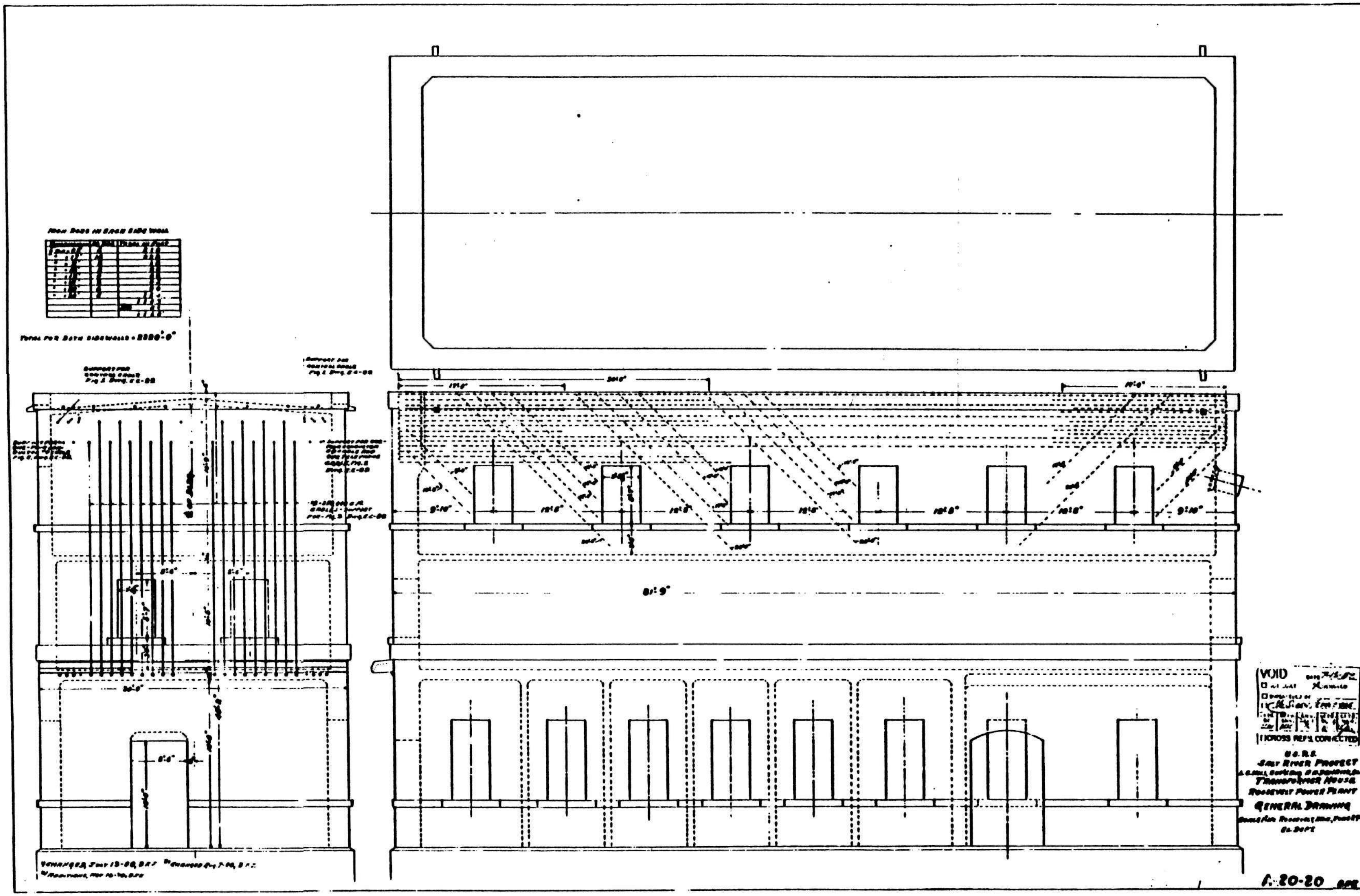


Interior View of Transformer House.

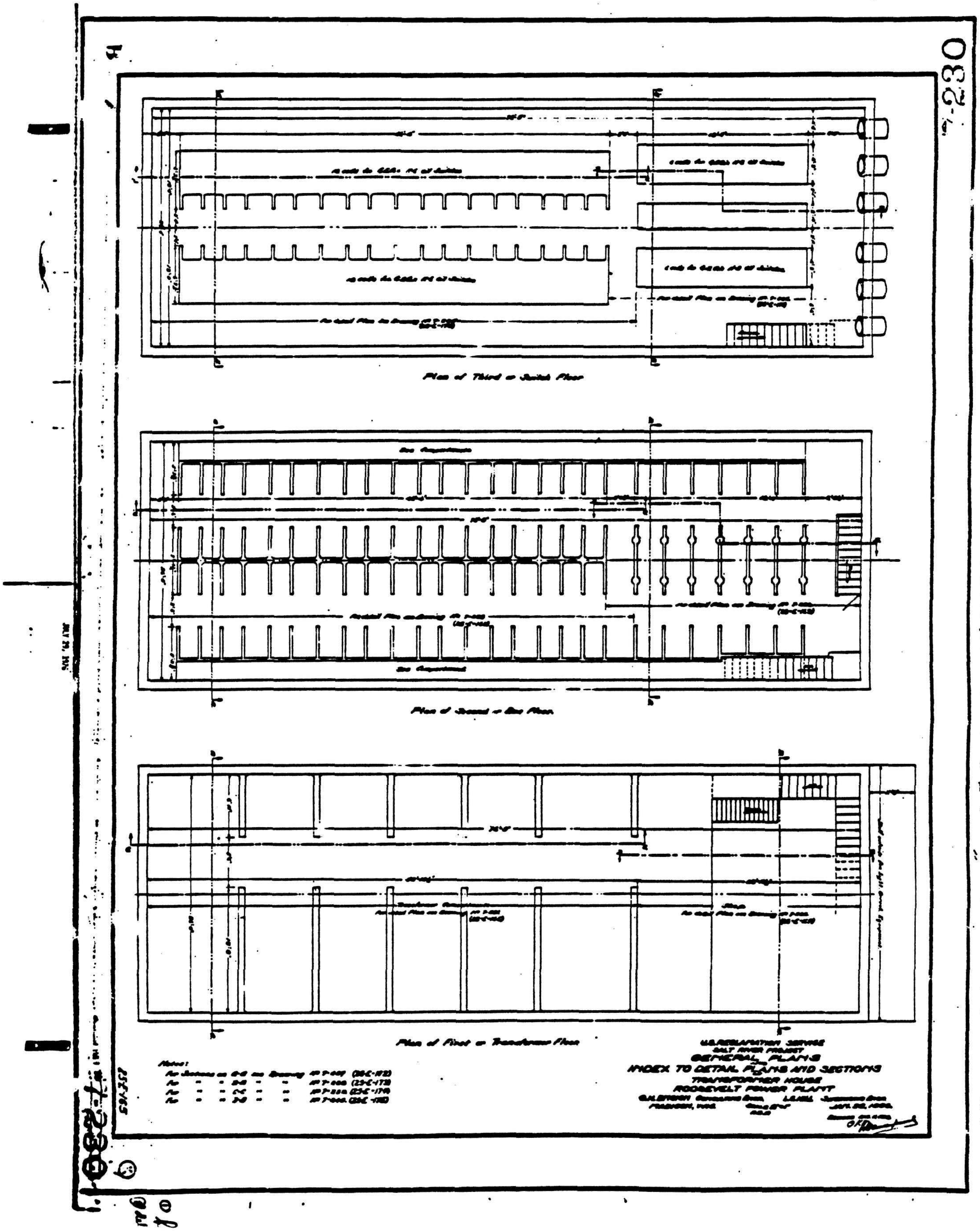


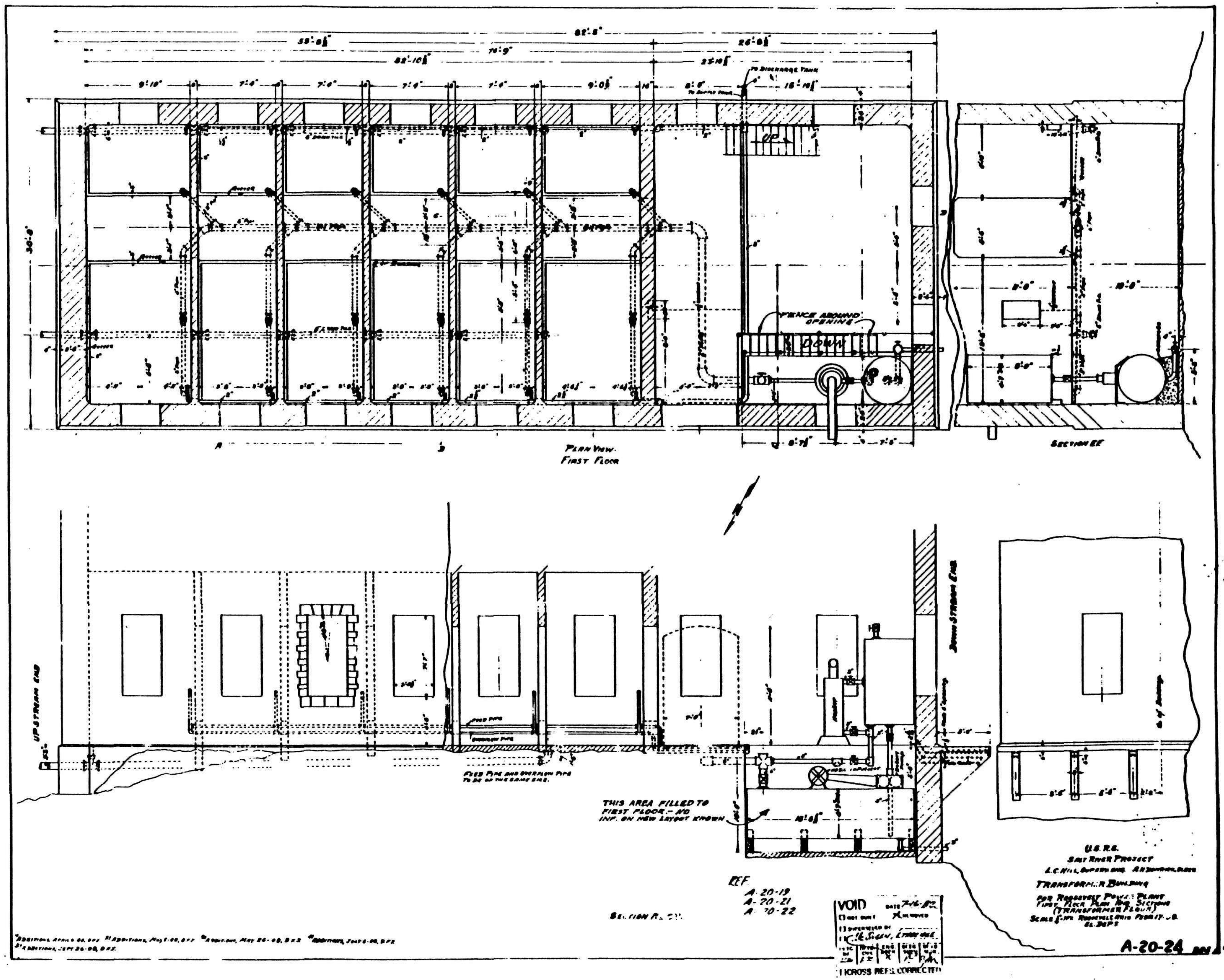
AZ-6-B-9

24



VOID
CROSS REFS CORRECTED
U.S.R.S.
SALT RIVER PROJECT
TRANSFORMER HOUSE
ROOSEVELT POWER PLANT
GENERAL DRAWING
A-20-20


Plan of Third or Switch Floor
Plan of Second or Bus Floor
Plan of First or Transformer Floor
U.S. RECLAMATION SERVICE
SALT RIVER PROJECT
GENERAL PLANS
INDEX TO DETAIL PLANS AND SECTIONS
TRANSFORMER HOUSE
ROOSEVELT POWER PLANT
230


PLAN VIEW
FIRST FLOOR
SECTION EE
SECTION A-B
UP
DOWN
FENCE AROUND OPENING
UPSTREAM END
DOWNSTREAM END
FEED PIPE AND OVERFLOW PIPE TO BE ON THE SAME END.
THIS AREA FILLED TO FIRST FLOOR - NO INF. ON NEW LAYOUT KNOWN
REF.
A-20-19
A-20-21
A-20-22
VOID
CROSS REFS. CORRECTED
U.S.R.S.
SALT RIVER PROJECT
TRANSFORMER BUILDING
FOR ROOSEVELT POWER PLANT
FIRST FLOOR PLAN AND SECTIONS
(TRANSFORMER FLOOR)
A-20-24