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Manhattan District History

Book II - Gaseous Diffusion [K-25] Project

Vol - 4 - Construction

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MANHATTAN DISTRICT HISTORY

BOOK II - GASEOUS DIFFUSION (K-25) PROJECT

VOLUME 4 - CONSTRUCTION

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FOREWORD

Volume 4 presents an account of the construction of the gaseous diffusion plant. The purpose, administration, and contractual arrangements are described, followed by a discussion of scheduling, site development, and construction activities. The volume concludes with an account of safety and security aspects, personnel procurement and industrial relations, costs, organization, and personnel. Other phases of the K-25 Project are dealt with in separate volumes of Book II as follows:

Volume 1 - General Features
Volume 2 - Research
Volume 3 - Design
Volume 5 - Operation

Activities described extend from the selection of the principal construction contractor in May 1943, to 31 December 1946, by which time the construction of the gaseous diffusion plant was complete, and administrative responsibility passed from the Manhattan District to the United States Atomic Energy Commission.

A number of appendices are attached to illustrate the text by means of maps, charts, graphs, tabulations, photographs, file references, and a glossary. References indicated by parentheses, as (App. B1), (App. C12), etc., refer to Item 1 of Appendix B, Item 12 of Appendix C, etc. Reference to the Glossary, Appendix G, is made by means of an asterisk.

The Summary contains an abstract of every major subject treated in Volume 4. Paragraph numbers in the Summary correspond to section numbers in the main text.

19 May 1947

MANHATTAN DISTRICT HISTORY

BOOK II - GASEOUS DIFFUSION (K-25) PROJECT

VOLUME 4 - CONSTRUCTION

TABLE OF CONTENTS

SUMMARY

1. Introduction. - The goal of the work described in this volume was the construction of a completely equipped gaseous diffusion plant consisting principally of a 2892 stage main cascade, a 540 stage side feed annex cascade, a 126 stage purge cascade, an extensive equipment conditioning plant, and a number of sizeable auxiliary plants for the production of electrical power, process and heating steam, and fluorine conditioning gas.

2. Contractual Arrangements. - Engineering, supervision, and overall job progress direction were provided by the Kellex Corporation. The two principal prime construction contractors also served in a supervisory and management capacity in connection with the work of the subcontractors and other prime contractors. The J. A. Jones Construction Company, Inc., with its own forces and subcontractors, and in cooperation with the William A. Pope Company, the A. S. Schulman Electric Company, and the Combustion Engineering Company, Inc., built the facilities in the power plant area. The Jones Company also erected the facilities in the process area, awarding 64 subcontracts during the course of the overall program. Ford, Bacon, and Davis, Inc. constructed the facilities of the conditioning area, during the course of which work 12 subcontracts were awarded. Jones was originally authorized to construct the power plant by letter contract W-7421-eng-11, dated 18 May 1943; construction of the main process area was subsequently authorized by Supplement No. 3, dated 30 August 1943. The formal contract was executed on 2 March 1944, and construction of the K-27 plant was authorized on 31 March 1945 by

Supplement No. 5. The final fee was set at $1,171,043. Ford, Bacon, and Davis were authorized to proceed with conditioning area construction by letter contract W-7407-eng-19, dated 9 July 1943; the final contract was executed on 16 June 1944, and the final fee was set at $227,000. The William A. Pope Company acted under contract W-7405-eng-100, the A. S. Schulman Electric Company under contract W-7405-eng-101, and the Combustion Engineering Company, Inc., under contract W-7405-eng-104. The Tennessee Valley Authority built auxiliary power lines into the Project area under contracts W-7418-eng-6, and W-7418-eng-183. All construction contracts were administered for the District Engineer by the Unit Chief, K-25 Project, through the K-25 Construction Officer.

3. <u>Construction of Facilities.</u>

3-1. <u>Scheduling.</u> - Construction scheduling for the entire K-25 Project was based upon the contemplated dates and methods of bringing the plant into operation. The critical urgency of the Project dictated severe time schedules, and it was decided to follow the policy of operating each separate section and area at the earliest possible moment. The first three objectives became the completion of one cell of the main cascade, the completion of an entire process building, and the completion of a part of the plant large enough to produce 0.9 per cent material.

In August 1943, Kellex submitted the first comprehensive completion schedule, calling for initial production of 5 per cent material on 1 June 1945, 15 per cent material on 15 July 1945, and 36 per cent material on 23 August 1945. The schedule was continually revised with the progress of development, design, and engineering, and with changes in contemplated plant operating schedules. One year later production was scheduled to begin as follows: 0.9 per cent material on 1 January 1945, 5 per cent on 10 June 1945, 15 per cent in August 1945, and 23 per cent on 15 September 1945. Since the first operation of a single cell was scheduled for the middle of April 1944, it became desirable to have at least one of the variable frequency generators in operation by 1 March 1944. This date set the schedule for power plant construction. The scheduling of operation of the first cell by April 1944, and the first process building by June 1944, made it imperative that various conditioning area facilities be available by these dates. By its very nature, administration area construction was to span the entire construction program: as the need arose, new structures were designed, and existing structures modified. In order to utilize, to the fullest possible extent, the earlier experience gained during K-25 construction, very carefully integrated schedules were required for K-27, covering both the overall program and detailed individual construction plans.

Practically every item of equipment and material procured, assembled, or erected, at the gaseous diffusion plant, as well as all construction activities, were necessarily subject to an elaborate system of control scheduling. Ultimately, initial production, of 0.9 per cent material, was about two months behind schedule. Higher concentrations were achieved either on, or ahead of, the scheduled dates specified in September 1944.

3-2. Site Development. - The plant is located at the western end of the Clinton Engineer Works reservation, on the Clinch River, and near the mouth of Poplar Creek. The natural ground elevation varies from 750 to 800 feet above sea level. The area was mostly cultivated before being taken over for the Project. Poor transporatation facilities, and the absence of sizeable towns within reasonable proximity, complicated the problems involved in the early site preparation work. The power plant area, covering about 160 acres, is situated about 8800 feet southwest of the process area. The immediate process plant location was chosen for its accessibility and terrain features, which, in comparison with other nearby sites, favored the grading of large areas to a common elevation at about 780 feet. The administration area is situated at the natural entrance of the process plant, and is at the same general elevation. The total area assigned to the K-25 plant comprises about 5,000 acres, of which some 1,000 acres have been developed for construction purposes.

The first surveying party started work in the power house area on 31 May 1943, and road construction was begun on the following day. With rock surface at from 35 to 40 feet below floor and yard level, the power house machinery had to be supported on 40 concrete-filled caissons. In the process area, the fact that complicated and heavy machinery would be operating throughout a set of buildings covering some 1,800,000 square feet, necessitating positive stable foundation, posed a major problem. The foundation was formed by using "compacted fill". The method involves scientific placement of earth fill in uniform layers, and under adjusted conditions of optimum moisture content for good compaction. During the course of Project Construction, some 3,500,000 cubic yards of excavation were required.

3-3. Utilities. - Several of the existing access roads were immediately improved, and a continuous road maintance and improvement program was then set up. Three principal new roads were also constructed, in addition to the Gallaher and White Wing Bridges. Within the plant area, 15 miles of first class roads, 19 miles of second class roads, 38 miles of third class roads, and 10 miles of temporary roads were constructed. On 11 June 1943 the Jones Company began work on railroad construction. The work involved moving 265,000 cubic yards of earth, the re-location of 800 feet of creek channel, the laying of 23.6 miles of trackage, and erection of eight structures between Blair and K-25, in addition to ~~yard construction and~~ construction of operating facilities.

Drinking water for the original 500 man construction camp was hauled by truck from Oak Ridge; water for bathing, etc., was obtained from Poplar Creek with rough purification. A new 5000 man camp was opened in November 1943; by May 1944 an additional temporary filtration plant was set up. The 18 million gallon per day (MGD) water pumping system of the abandoned Lake Ontario Ordance works was procured and fitted into the design of a 3 MGD water systembuilt by the Jones Company. It was increased during the summer of 1945 to a capacity of 4 MGD. Construction of a fire protection water system in the process area was begun on 4 December 1943; the system was placed in operation on 12 May 1944. In 1945 a loop was constructed to include the K-27 area. In the camp and power plant areas, water for fire protection is supplied from the sanitary water lines.

The original power plant area and construction camp sewage treatment plant was a large septic tank. When the camp for the process area construction was started, a 1 MGD Imhoff tank was designed to accommodate the flow from both camps. The plant storm sewer system includes two trunk outfall lines in the power plant area, ten in the process area, and one in the conditioning area. Storm sewage in the camp housing areas was handled by local drainage.

The first source of electric power within the K-25 area was a 13,800 volt wood pole transmission line from the Elza No. 1 Substation. On 8 October 1943 the construction switch yard (K-714) was energized. Thereafter power was derived from a 154,000 volt pole line from the Elza No. 2 Substation, until the main switch house was energized, after which time power was supplied from that point by underground cable, and the 154,000 volt line was connected to the permanent K-25 switch yard (K-709).

3-4. Power Plant Area. - The K-25 power plant comprises a complete modern power generating station, was built in record time, and is believed to be the largest steam-electric power production plant constructed to date in a single operation. Work began on 2 June 1943, the first steam-generating unit went on the line on 15 April 1944, and construction was completed in mid-July 1945. The principal building in the area is the boiler house (K-701), which is a steel frame structure with brick walls and pre-cast Haydite slab roof with built-up roofing cover and slag topping. It is 197 feet long, 123 feet wide, and 144 feet high, and is surmounted by three steel stacks rising to a height of 103 feet above the roof. Structural work and installation of machinery was done by the Jones Company; piping was installed by the William A. Pope Company; the boilers were furnished and installed by the Combustion Engineering Company, Inc.

The turbine room (K-702) adjoins the boiler house, and rests on a clay foundation without caissons. Foundations for the condensers, turbines, and generators are of heavy mass concrete. The building is composed of a structural steel frame, brick walls, and a reinforced concrete slab roof supported on a steel truss. It is 585 feet long, 87 feet wide, and 71 feet high. Adjoining the southwest side of the turbine room and the southeast side of the boiler room, a service building (K-703), of reinforced concrete frame and slab construction with brick enclosing walls, houses storerooms, offices, a laboratory, and three 75,000 gallon make-up water storage tanks.

The main switch house (K-704) is a three-story reinforced concrete frame structure with outside walls of brick, and interior tile partitions. A reinforced concrete crib house (K-705) with wood side walls includes a trash rack and four revolving screens for straining river water. Of similar construction, the power plant pump house (K-706) connects with the intake by way of a 10 foot by 10 foot concrete tunnel.

Most of the switching and control equipment for power distribution to the power plant and auxiliaries is located in the auxiliary switch house (K-707), which is a three-story building with a concrete basement. The superstructure is a reinforced concrete frame with concrete slab floors and built-up concrete roof, brick walls, and tile partitions. The main K-25 switch yard (K-709) is of wood pole construction, and is set on earth foundation. It connects with the main switch house by means of 13,800 volt underground cables, with the Fort Loudon station of the T.V.A. system and with the K-27 switch yard (K-732) by means of 154,000 volt steel tower transmission lines, and with the Elza No. 2 Substation by means of a wood pole line. Power is transmitted at various frequencies from the main switch house to the process plant by way of an underground cable run, including 58 separate circuits having an average length of approximately two miles.

3-5. <u>Main Process Area.</u> - The main process buildings are built under a common roof, and are not separated by walls above the ground floor. Individual buildings are approximately 100 feet in width, and vary from 300 to 400 feet in length. The first foundation concrete was placed on 21 October 1943; erection of structual steel was begun on 19 January 1944; the first process building (K-303-2) was accepted for operation on 20 October 1944; and construction was substantially complete by 1 ~~October~~ August 1945. The buildings contain a basement, cell floor, pipe gallery, and operating floor. Up to, and including, the ground floor, the building frame is of reinforced concrete, with outside walls of pre-cast concrete blocks. Above the ground floor, the frame is of structural steel with side walls of white Transite. The roof consists of steel framing fitted with sheets of plaster board, over which is poured a three inch layer of reinforced gypsum cement. The roof is finished with a four-ply built-up covering with slag topping. The purge cascade buildings (K-312-1,-2, and -3) are erected contiguously with the process "U". They are of the same general construction as Building K-306-7.

The feed purification building (K-101) consists of a foundation, frame, and roof of reinforced concrete, with walls of pre-cast concrete blocks. The surge and waste building (K-601) is composed of two adjoining units, the northern portion consisting of a concrete frame with concrete block walls, and the southern portion comprising a steel frame with Transite walls. Together, the two units form a single three-story structure. Floors are of concrete; the roof is of concrete slab with built-up covering topped with slag.

The make-up pump house (K-801) is a one-story wood frame structure covered with corrugated asbestos Transite siding. The recirculating pump house (K-802) is constructed with a reinforced concrete frame and roof, and pre-cast concrete block walls. The two cooling towers (H-801, H-802) are built over concrete water tanks. The fans, redwood cooling baffles, and overhead spray assemblies are supported on a reinforced concrete frame.

The dry air plant (K-1101) houses one of the largest air drying installations ever constructed. It is of steel frame construction, with foundation, footings, and floor of reinforced concrete. Walls are of corrugated Transite sheets, the flat roof is of poured-in-place Pyrofil covered with built-up roofing and topped with slag. The compressed air plant (K-1201) is of one-story steel frame construction with foundations, footings, and floor of reinforced concrete, walls of Transite, and flat roof of poured-in-place gypsum covered with built-up roofing and slag. The carbon mixing plant (K-1410) is a single-story hipped roof structure. Foundations, floor, and frame are of reinforced concrete; the sides are covered with corrugated Transite; the roof is covered with corrugated galvanized steel sheet.

8-6. K-27 Area. - In the work on the K-27 plant extension, the J. A. Jones Company performed functions analogous to those in K-25. About three acres were cleared and grubbed; vegetation and top soil were stripped from approximately 80 acres. Total earth moved in the area was about 750,000 cubic yards. Ground was broken in the K-27 area on 3 April 1945, and the work went forward on, or ahead of, schedule at all times.

The nine main process buildings of K-27 were erected contiguously in a single row, southwest of the main process "U". The buildings are essentially similar to Buildings K-302-2,-3, and -4 of the K-25 process area. Each contains 10 six-stage process cells, and rests on undisturbed sandy clay in excavation.

The K-27 feed and purification building (K-131) is a five-story building with foundation and floors of reinforced concrete, frame of structural steel, walls of concrete block, and flat roof of Pyrofil with built-up covering and slag topping. The absorption system building (K-132) is connected with K-131 by way of a pipe bridge. It is comprised of a single room with foundation of reinforced concrete, and frame and roof of corrugated Transite. The purge and product building (K-413) is of single-story steel frame construction with a reinforced concrete floor, Transite walls, and Pyrofil roof. The surge and waste building (K-631) has a foundation and floor slabs of reinforced concrete, with flooring of steel grating, steel frame, concrete block walls, and Pyrofil roof.

The K-27 switch house (K-731) controls power routed to K-27. Underground cables run from the switch yard to the switch house, and from the switch house to the various load center points in the K-27 area. Building K-731 is a two-story air conditioned building. The basement and foundation are of reinforced concrete; the superstructure is a steel frame with reinforced concrete floors and roof, brick walls, and interior tile partitions. One of the largest and most modern switch yards in the country, the K-27 switch yard (K-732) is of permanent steel construction. It connects, by means of steel tower lines, with the Watts Bar Station of the T.V.A. system, with the K-25 switch yard, and with the Elza No. 1 Substation.

The K-27 recirculating pump house (K-831) is a one-story "tee"-shaped building with duplicate wet wells running underneath the full length of the building. Wells, foundations, and building frame are of reinforced concrete; walls are of concrete block, roof of Pyrofil. The K-27 cooling tower (K-832) is structurally similar to the K-25 cooling towers. Building K-1131 was originally planned as an air-drying plant similar to K-1101. When the facility was found to be unnecessary, construction was halted in favor of more pressing work in the area. It was later finished as a storage and maintenance building. It contains a reinforced concrete floor, steel frame, walls or corrugated asbestos siding, and Pyrofil roof. Building K-1231 houses air compression equipment, and consists of a steel frame, reinforced concrete foundations and floor, Transite walls and Pyrofil roof.

3-7. <u>Conditioning Area.</u> - The conditioning plant and auxiliaries were constructed by Ford, Bacon, and Davis, Inc., with the aid of ten subcontractors. Construction was begun on 18 September 1943; the first portion of the conditioning building was placed in operation on 21 March 1944; the first conditioning gas was generated on 27 June 1944. The conditioning building is a 400,000 square foot one-story building with a 68,000 square foot basement. The foundation and floor are of reinforced concrete; framework is structural steel. Outside walls are largely devoted to windows, the balance being pre-cast cinder concrete blocks. The roof consists of pre-cast concrete slabs covered with 1 1/2 inches of Celotex insulation and a built-up covering topped with slag.

The fluorine generating building (K-1301) is a one-story structure for the most part, but with a small second floor housing rectifiers, ventilating equipment, and an emergency stack fan. The foundations, frame, floors, and roof are of reinforced concrete. Walls, interior partitions, and the exhaust stack are of tile. The fluorine storage building (K-1302) is a one-story structure with a flat sloping roof. Three walls and the interior partitions are of reinforced concrete, while the roof and back side are covered with black corrugated steel sheets. The fluorine bottling building contains a foundation, floor, frame, and roof of reinforced concrete. Walls are of brick. An emergency chimney is provided for handling rupture disc discharges.

The fluorine disposal plant includes Building K-1405, an alkaline scrubbing tower, and a 70 foot vent stack. The central and east wings of the building are of two-story wood frame construction with Transite siding and roofing. The west wing is of wood frame with brick and tile walls. The acid neutralizing and nitrogen generating plants are small wood frame structures.

The auxiliary steam plant was erected in two distinct operations. The original plant (K-1501) contained three boilers and one chimney. In order to carry the additional steam load of K-27, the capacity was increased from 120,000 to 270,000 pounds per hour by adding three boilers, a second chimney, and the necessary accessory equipment. The basement, foundation, floor, and roof are of reinforced concrete. The superstructure is of steel frame with walls of corrugated asbestos siding, and built-up roof covering topped with slag. The installation was designed and engineered by Sargentand Lundy; construction work was managed by the Jones Company, with the Combustion Engineering Company furnishing and installing the boiler equipment.

5-8. <u>Administration Area.</u> - The administration area includes the majority of buildings serving administrative, personnel service, and miscellaneous functions. Located southeast of the process area, it contains some 21 sizeable buildings plus a number of minor structures. Construction of all buildings was done by the Jones Company, with the exception of the four K-1008 change houses, which were built by Ford, Bacon, and Davis.

The administration building (K-1001) is a two-story wood frame structure resting on reinforced concrete foundation piers. It consists of four double wings connected by a central corridor. Exterior walls are of wood siding, interior walls are of plaster board with wood trim. The roof is covered with composition shingles. There are six brick-walled, concrete base, fire proof vaults opening into the building.

The three service laboratory buildings (K-1004-A,-B,-C) are interconnected y corridors, and are air-conditioned. They are of permanent, fireproof, rectangular construction, with flat roofs, one floor, and a basement. The basements, foundations, and floors are of reinforced concrete; the framework is of structural steel, the walls of pre-cast concrete blocks, roof of Pyrofil, covered with built-up tar and felt, and topped with slag.

The telephone exchange building (K-1039) is a small, one-story reinforced concrete structure with outside walls of brick. Other buildings included in the administration group (all of temporary, wood frame construction) are the cafeteria, dispensary, works laboratory, payroll and safety building, change houses, laundry, gate house and guard building, fire house and ambulance garage, bus terminal, bus repair shop, field office building, industrial relations building, and process area administration building.

3-9. Construction Plant Facilities. - Subcontracts were let for furnishing crushed stone from quarries both on and off the site, and for furnishing and truck delivery of mixed concrete by the yard. Transportation of materials involved a large truck fleet with adequate repair and maintenance facilities. A total of about 180,000 square feet of temporary shops, and 147,000 square feet of construction warehousing facilities were set up.

3-10. Construction Camp Facilities. - The two principal construction contracts provided for the construction and operation of temporary housing facilities. The Jones Camp ultimately included 8 dormitories, 17 barracks, 1,590 hutments, 1,153 trailers, 100 Victory Houses, a school, a commercial center, 8 cafeterias, a bakery, post office, camp storehouses, a refrigerator and cold storage plant, a theater, 3 recreation halls, a camp warehouse, a sterilization plant, and the camp operations office. Population reached a peak of approximately 15,000. The Ford, Bacon, and Davis camp was organized along similar lines, and accommodated approximately 2,100 persons.

3-11. Construction Features. - The erection of the main process buildings is distinguished principally by the magnitude of the job, and by the severe time scheduling of the work. Approximately 30,000 tons of structural steel and 200,000 cubic yards of concrete were used. Practically all structural steel was pre-fabricated. All concrete was dry batched into transit mix trucks, and most was placed by means of pumpcrete machines. 13,000 tons of sheet and plate steel were used in the dry air equipment enclosure system, which involved unusual construction and extraordinary tightness specifications. For the 100 mile main process piping system, tightness specifications were much more severe than any previously encountered in construction work. Nearly 3,500 diffusion converters and 7,000 stage pumps were installed in K-25 and K-27, with a negligible amount of damage during installation. The ~~300,000~~ 238,000 KW K-25 electrical generation and utilization system is notable for its size, its complexity, and the requirement for operation at a variety of frequencies. Temporary electrical installation, required during construction, included 45,000 lamps in the main process buildings alone. The peak temporary light and power load was served by 10,500 KVA of temporary transformer capacity. The installation of about 1000 permanent air-cooled transformers in K-25 and K-27, which must be kept free of dust and moisture, involved obvious difficulties resulting from the tight construction schedule, which made it desirable to set transformers before the vault construction, and other building erection, had progressed far enough to eliminate all possibility of contamination. The instrumentation system at the gaseous diffusion plant is probably the largest, and certainly the most diversified, ever installed.

Practically the entire process system is operated at sub-atmospheric pressure. The attainment of K-25 vacuum tightness specification proved to be an immense task from a construction standpoint. Unique methods of vacuum testing had to be developed and applied on enormous scale. All hope of successful operation of the gaseous diffusion system was predicated upon essentially perfect attainment of a "clean" plant. It became necessary to clean all parts of the process equipment system, and to maintain it in a condition of controlled cleanliness without subsequent contamination during installation. Cleanliness control, applied to a building or portion of a building in which process piping or equipment was being connected, involved complete isolation of the area, pressure ventilation with filtered air, regulation of entry of personnel and material, and continuous cleaning by vacuum cleaners and mopping.

4. Safety and Security. - The Manhattan District has maintained a resident Safety Engineer at the Project site since the start of construction, to supervise and assist the safety departments set up by contractors. The safety program was based on standard District policies and principles. In January 1944, the Jones Company set up a special department with responsibility for instituting and directing a fire protection program. Responsibility for fire protection was transferred to Carbide in June 1944. Fire losses were held to a mimumum during the construction period. The development of the Jones security organization followed general policies laid down by the District Intelligence Office. No major violations of security are known to have occurred.

5. Personnel Procurement and Industrial Relations. - From the beginning of construction in June 1943, the various contractors actively recruited personnel of all classifications required for the job. The bulk of the recruiting was done by the Jones Company by means of travelling recruiting agents and newspaper advertising, and with the cooperation of the United States Employment Service, the United States Engineer Office,

and various labor unions. The total amount of construction labor consumed at the K-25 site through 31 December 1946 is estimated at 110,048,961 man-hours, which can be separated in to 104,381,938 for Kellex, Jones, subcontractors, and prime contractors under Jones supervision, and 5,667,023 for Ford, Bacon, and Davis and subcontractors. No serious work stoppages occurred during the progress of construction, and labor relations have been excellent. Both Jones and Ford, Bacon, and Davis operated Government-owned equipment to and from the near-by towns in order to provide employee transportation. In addition, "Share-the-Ride" clubs, for private vehicles, were organized and encouraged by every possible means, and a gasoline and tire rationing board was opened at the site.

6. Costs. - As of the end of the fiscal year 1946, total K-25 construction contract costs amounted to $205,101,533; the total construction cost at completion of contracts was estimated at $207,004,739.

7. Organization and Personnel. - In order to provide direct supervision over all phases of construction, authority was delegated to the K-25 Construction Officer, who reported to the Unit Chief, and acted for the District Engineer, in all matters pertaining to administration of the various construction contracts. From the outset until November 1943, all construction work was under the supervision of Lt. Colonel Warren George, Chief, Construction Division, Clinton Engineer Works. Thereafter, Lt. Colonel W. P. Cornelius was designated Construction Officer in charge of all construction for the K-25 plant. Mr. J. J. Allinson headed the Kellex Field organization as Chief Resident Engineer. Mr. Edwin L. Jones was General Manager for the

Jones Company, and Mr. C. C. Whittelsey acted as Project Manager for Ford, Bacon, and Davis.

MANHATTAN DISTRICT HISTORY

BOOK II - GASEOUS DIFFUSION (K-25) PROJECT

VOLUME 4 - CONSTRUCTION

SECTION 1 - INTRODUCTION

1-1. Purpose. - The goal of the work described in this volume was the construction of a completely equipped gaseous diffusion plant, based on the research, engineering, and design discussed in previous volumes, and capable of greatly enriching the isotopic concentration of Uranium-235 in a process gas consisting of uranium hexafluoride.

1-2. Scope. - The scope of the construction phase of the K-25 Project includes all plant site preparation, temporary and permanent building erection, and equipment installation activities required to achieve a fully self-contained U-235 production plant, consisting principally of a 2892 stage main diffusion cascade, a 540 stage side feed annex cascade, a 126 stage purge cascade, a 238,000 KW steam-electric power generating station, a fluorine generating plant, a 468,000 square foot equipment conditioning and maintenance plant, a 270,000 pound per hour steam generating plant, and all necessary auxiliaries, accessories, and utilities, as well as storage, service, laboratory, administrative, personnel, and miscellaneous facilities.

1-3. Authorization. - Authorization of construction was handled similarly to other phases of the K-25 Project as mentioned in Volume 1 of this book, and described more fully in Volume 1 of Book I.

1-4. Administration. - Construction was accomplished principally by the J. A. Jones Construction Company, Inc., under contract W-7421-eng-11, and Ford, Bacon, and Davis, Inc., under contract W-7407-eng-19, each assisted by numerous subcontractors (App. A2, A3). Three other prime contractors (App. A1) were also involved; their activities were coordinated by the J. A. Jones Construction Company. Responsibility for overall supervision and coordination was vested in the design contractor, The Kellex Corporation (Vol. 3). All construction contracts were administered for the District Engineer by the Unit Chief, K-25 Project, through the K-25 Construction Officer (Sect. 7).

SECTION 2 - CONTRACTUAL ARRANGEMENTS

2-1. General. - Construction for the Project was accomplished by private contractors operating under direction of the Manhattan District. The method of organization and control of the work is indicated by Appendix C16, which shows lines of authority from the District Engineer through the District administrative organization to the prime contractors, and subcontractors. A summary of pertinent data for individual contracts and subcontracts is presented in Appendix A.

a. Contractual Plan.

(1) Supervision. - Engineering, supervision, and overall job progress direction were provided by the Kellex Corporation. The two principal cost-plus-fixed-fee prime contractors also served in a supervisory and management capacity in connection with the work of the subcontractors and the other prime contractors.

(2) Activities. - The J. A. Jones Construction Company with their own forces and subcontractors, and in cooperation with the William A. Pope Company, the A. S. Schulman Electric Company, and the Combustion Engineering Company, Inc., built the facilities in the power plant area. The Jones Company also erected the facilities in the process area. During the course of the program, the Jones Company awarded five cost-plus-fixed-fee subcontracts, 51 unit price subcontracts, 17 lump sum subcontracts, 10 concession agreements, and 1 service subcontract. Ford, Bacon, and Davis, Inc., constructed the facilities of the conditioning area, during the course of which work, 2 cost-plus-fixed-fee subcontracts, 6 unit price subcontracts, and 4

lump sum subcontracts were awarded.

2-2. The Kellex Corporation.

a. Selection and History of Negotiations. - As discussed in Volume 3, The M. W. Kellogg Company had been selected to do preliminary research work on the gaseous diffusion process under contract OEMsr-406 with the Office of Scientific Research and Development, and was subsequently awarded Manhattan District contract W-7405-eng-23 for architect-engineer-supervisory services in connection with the design and supervision of construction of the plant. The subsidiary Kellex Corporation was then organized for the sole purpose of prosecuting this assignment.

b. Scope of Contract. - Under the terms of contract W-7405-eng-23, The Kellex Corporation was responsible, in so far as construction was concerned, for:

1. Preparation of schedules for construction of the plant.
2. Scheduling and expediting of special process equipment purchased by the War Department and Kellex under separate procurement contracts.
3. General technical direction and supervision of the work of all construction contractors.
4. Field and laboratory tests of construction materials.
5. Inspection of workmanship and materials entering into construction, and preparation of reports to the Contracting Officer denoting their conformity or non-conformity with specifications.
6. Preparation of construction progress reports.

7. Supervision of process equipment testing.

8. Performance of all other architectural, engineering, and supervisory services within the scope of the contract, as required by the Contracting Officer.

e. Functions. - Under the construction clause of its contract, the Kellex Corporation provided control engineering services for interpretation of specifications, technical advice, and spot checks of important construction results, and made final recommendations to the Contracting Officer for acceptance of the facilities constructed. Allocation of responsibility between Kellex and the two managing contractors was made on the basis that the latter contractors were capable of managing the construction work, but were dependent upon Kellex engineering and technical supervision to obtain desired results in all matters pertaining to process equipment and piping. Personnel to supervise the more involved technical phases of the work, and a force of qualified senior engineers and technical specialists, necessary to assure required operating conditions, were furnished by Kellex. The Kellex Corporation also coordinated, in so far as necessary, the activities of the two principal contractors.

2-3. The J. A. Jones Construction Company, Inc.

a. Selection. - Consideration was given to the organization and performance records of the Turner Construction Company, Stone and Webster Engineering Corporation, Ford, Bacon, and Davis, Inc., and the M. W. Kellogg Company. The first two companies were already engaged in other projects of the Manhattan District, Kellogg had been assigned responsibilities as discussed above, Ford, Bacon, and Davis was awarded the contract for conditioning area construction, and the Jones Company was selected by the District Engineer with the approval of Major General L. R. Groves, to construct the facilities in the power plant area, and to furnish required management services. The Jones Company was also subsequently selected, by contract modification, to construct the process area facilities.

b. <u>History of Negotiations.</u> - The Jones Company was originally authorized to construct the facilities in the power plant area by letter contract dated 18 May 1943 (App. F1). Construction of the facilities in the process and administration areas was authorized by supplement No. 3, to the letter contract, dated 30 August 1943 (App. F2). A formal contract W-7421-eng-11, effective 18 May 1943, was executed on 2 March 1944, authorizing construction in all three areas, in accordance with plans and specifications prepared by the Kellex Corporation. Construction of the K-27 extension of the process area was authorized on 31 March 1945 by Supplement No. 5 (App. F7).

c. <u>Scope of Contract.</u> - Under the terms of their contract, the Jones Company was required to furnish labor, materials, and all equipment and supplies not furnished by the government or the Kellex Corporation; to make site improvements; and to construct the power plant, the main process plant, an extension of the main process plant, certain auxiliary facilities, roads, rail connections, and plant railroad, utilities and construction facilities. The contractor was also required to do all things necessary for the construction, maintenance, and operation of commissaries, housing, camp, hospital, cafeterias, recreational, and other allied facilities. Management services specified in the contract included scheduling and purchasing of materials. During the process of construction, the Jones Company was also directed to coordinate and supervise the activities of the other prime contractors in the power plant area.

d. Functions. - The J. A. Jones Construction Company, Inc., acted, throughout the course of the program, as the principal construction contractor. Whereas the activities of Ford, Bacon, and Davis, Inc. were confined to the conditioning area (see below) the Jones Company functioned throughout the Project, and also built access roads and railroads outside the reservation, to provide necessary transportation facilities. Management by the Jones Company included procurement of all ordinary construction materials, procurement and supervision of all construction and administrative personnel, and operation of temporary housing and service facilities. With prior approval of the Construction Officer, the Jones Company purchased all material and supplies not furnished by the Government or purchased by the Kellex Corporation, negotiated subcontracts, and exercised all normal management functions, paying all costs and presenting properly receipted bills to the District Engineer for reimbursement. The Jones Company also furnished detailed inspection service for their own work, utilizing a large force of engineering inspectors for this purpose.

e. Fee. - In the original contract, a fee of $963,393 was specified. Subsequent contract modifications resulted in changes as follows:

1. Under Modification No. 2, which called for changes and additions in the power plant (Vol. 3), to provide for

furnishing steam to the S-50 Project, the fee was increased by $250.

2. Under Modification No. 5, which authorized construction of the K-27 plant facilities, the fee was increased by $200,000.

3. In connection with construction of the S-50 boiler house and tank farm (Book VI), an additional fee of $5,000 was authorized under Modification No. 6.

4. A further payment of $2,400 was authorized under Modification No. 8, which provided for the construction of a new intake structure for the power plant crib house. This brought the fee to a final total of $1,171,045.

2-4. Ford, Bacon, and Davis, Inc.

a. Selection and History of Negotiations. - Ford, Bacon, and Davis, Inc. was selected by the District Engineer, with the approval of Major General L. R. Groves, to provide detailed structural design, and to construct the facilities in the conditioning area. Ford, Bacon, and Davis was recommended for this work by the operating contractor, the Carbide and Carbon Chemicals Corporation, Carbide having previously employed Ford, Bacon, and Davis to design, build, and begin operation of certain of their other plants, Carbide subsequently taking over operation, and using operators trained by Ford, Bacon and Davis. Letter contract W-7407-eng-19 (App. F3), dated 9 July 1943, authorized work to proceed. A formal contract, of the same effective date, was executed on 16 June 1944. Ford, Bacon, and Davis were also later selected as the initial operating contractor in the conditioning area under contract

b. Scope of Contract. - Under the terms of contract W-7407-eng-19, Ford, Bacon, and Davis, Inc. was required to furnish architect-engineer-construction-management services in connection with design, construction, inspection, and supervision of facilities in the conditioning area. The design of these facilities was based upon preliminary sketches and general requirements for the work, prepared by the Kellex Corporation, from which detailed drawings were developed by Ford, Bacon, and Davis. Their work also included the architectrual and engineering services required in connection with the construction and operation of temporary construction facilities.

c. Functions. - Ford, Bacon, and Davis, with prior approval of the Contracting Officer, purchased all building materials and supplies, including mechanical equipment of standard design which could be procured on the open market. Special process equipment and supplies were procured by the Kellex Corporation, and installed by Ford, Bacon, and Davis. They also negotiated subcontracts and exercised all normal management functions, paying all costs and presenting properly receipted bills to the District Engineer for reimbursement, and prepared plans and specifications for all structures erected by them. Process equipment and piping plans were prepared by the Kellex Corporation.

d. Fee. - The original contract fee specification was $222,500. Under Modification No. 1, the scope of the work was restated, and the fee changed to $227,600.

2-5. Other Prime Contractors. - A summary of the contracts awarded to the William A. Pope Company (W-7405-eng-100), A. S. Schulman

Electric Company (W-7405-eng-101), and Combustion Engineering Company, Inc. (W-7405-eng-104) is presented in Appendix A1. The work of these contractors was confined for the most part, to the power plant area. The Research Corporation (App. C16) supplied and installed the electrical fly ash precipitation equipment required in the power plant area. This work is discussed in Volume 5. Electrical power lines into the Project area were constructed by the Tennessee Valley Authority under contracts W-7418-eng-6 and W-7418-eng-163 supervised by the K-25 Construction Officer, which contracts were set up on the basis of cost plus a nominal fee of $1.00. These lines served as an auxiliary source of power, and are discussed in Book I, Volume 12.

SECTION 3 - CONSTRUCTION OF FACILITIES

3-1. Scheduling. - Construction scheduling for the entire K-25 Project was based upon the contemplated dates and methods of bringing the plant into operation. Very early in the program it became apparent, from the nature of the process, that there was no reason to delay the start of operations until such time as the entire plant should be structurally complete, or even approximately so. Thus, a considerable amount of equipment testing, vacuum leak detection, conditioning, and trial operation was required for all process units (Vol. 5, Sect. 3). This work could be started well in advance of the time when it would be possible to begin processing of uranium hexafluoride. Moreover, the step-wise character of the diffusion process makes it possible to begin production operation in isolated or interconnected segments of the cascade as fast as various portions become ready, and without waiting for the completion of other parts. The critical urgency of the Project dictated severe time schedules for bringing the plant into production, and it was decided to follow the policy of operating each separate section and area at the earliest possible moment. The first objective became the completion of one cell of the main cascade, containing six typical stages. It was desirable and important to test one of these units mechanically at the earliest possible date, in order that any design changes, which might prove necessary or desirable as a result of such a test, could be incorporated into the largest possible number of succeeding units, and with a minimum of dismantling and reconstruction work. The second objective was to complete an entire building, so that it could be given a trial mechanical run under simulated process conditions. Such a run would provide information analogous to that obtained in the single cell test. Furthermore, it would afford an opportunity for gaining familiarity with methods of cascade operation, and characteristics of the equipment systems, an immensely important condideration in view of the extreme novelty of gaseous diffusion as an industrial operation. The third object was the completion of a part of the diffusion plant large enough to produce 0.9 per cent material. This part of the plant came to be known as Case I. The remainder was divided for scheduling purposes into four separate parts, addition of each new part to the operating plant constituting a new case. The subject of case determination, and production scheduling by cases, is further discussed in Volume 5, Paragraph 8-4. Construction scheduling for the entire Project was then based upon the contemplated starting dates for operation of the various cases.

a. Original Schedule. - In August 1943, the Kellex Corporation prepared the first comprehensive schedules for construction and initial operation of the gaseous diffusion plant, and an overall completion schedule was submitted to the New York Area Engineer (App. F4, F5) calling for initial production of material containing 5 per cent U-235 on 1 June 1945, 15 per cent on 15 July 1945, and 36 per cent on 23 August 1945.

b. Revisions. - The schedule was continually revised with the progress of development, design, and engineering, and with changes in contemplated plant operating schedules. One year later the dates for initial production of various concentrations were specified as follows (App. F8):

1 January 1945	0.9 per cent
10 June 1945	5
August 1945	15
15 September 1945	25

c. Scheduling of Auxiliaries. - The process area comprises the heart of the plant; the fundamental aim of construction scheduling was to bring this area into earliest possible operation, first in part, and finally in toto. However, process area operations were dependent upon operations to be performed in the other areas of the plant. Thus, power production was necessary in order to provide energy for operation of the electric motors of the process plant, facilities for equipment preparation, cleaning, and conditioning were necessary before installation of much of the process equipment in the process area, and administration, personnel, and miscellaneous facilities were required, not only during production operations, but throughout the course of the construction program, itself. Consequently, the scheduling of these auxiliary portions of the plant assumed a role of importance equal to that of the main cascade buildings.

(1) Power Plant Scheduling. - It was required that the power plant be available to supply the necessary power for the various step-wise operations of the main cascade discussed above. The first operation of a single six-stage process cell was scheduled for the middle of April 1944. It therefore became desirable to have at least one of the variable frequency generators in operation by 1 March 1944. This date set the schedule for power plant construction.

(2) Conditioning Area Scheduling. - The scheduling

of operation of the first cell by April 1944, and the first process building by June 1944, made it imperative that facilities for the supply of dry nitrogen, and for the supply and disposal of fluorine, be available prior to these dates. Similarly, the conditioning building itself, containing the essential facilities for preparation of process equipment for service, had to be in operation before that equipment could be installed in the process area. The speed at which the conditioning building was constructed was an important factor in determining the time schedule for construction of the entire process area.

(3) Administration Area Scheduling. - Because of its very nature, construction in the administration area was to span the entire construction program. The buildings are, for the most part, of temporary and simple construction. Some were required early in the program, others were not required until the latter stages. As the need arose, new structures were designed, and existing structures were modified to suit expanding demands, or varying requirements.

d. K-27 Scheduling. - In order to utilize to the fullest extent the earlier experience obtained from the work in the main process area, and in order to attain earliest possible operation of the K-27 cascade, very carefully integrated construction schedules were required covering both the overall program and detailed individual construction plans. Consequently, so as to provide thorough coordination and integration, the Kellex Corporation went further in scheduling K-27 than it did in K-25, undertaking the preparation of each detailed building schedule, as well as the overall schedule. The K-27 construction program was authorized on 31 March 1945 (Vol. 3). By 30 April 1945, detailed building schedules for the K-27 process area had been approved and issued. Similar schedules for auxiliary installations were prepared as rapidly as sufficient engineering information became available. An approved schedule for the area was issued on 9 July 1945. Scheduled sequence of the work, and time intervals apportioned, were based on experience with analogous work in the main K-25 process area. The scheduled completion dates in general were controlled by estimated delivery dates for major items of electrical equipment. The schedule was studied in detail with the aim of providing continuous work for personnel already skilled by experience in K-25.

e. Control Scheduling. - Practically every item of equipment and material procured, assembled, or erected, as well as all construction activities, were, of necessity, subject to minute scheduling. A relatively minor item not on hand at the proper moment could block a whole chain of operations. The various phases of control scheduling, accordingly, formed one of the major functions of management. A typical and important example of this was the material control system evolved and operated by the Kellex Corporation. Using identical charts in the field and in the New York office, and keeping each scrupulously up to date, both groups had instant information available as to the requirement for, and the status of manufacture and delivery of, any one of the hundreds of thousands of items required. Thus, the field engineers, by systematic examination of the schedule charts, could detect all delinquent items, and keep the stream of materials flowing in, each item in time for installation at the proper point.

f. Actual Progress. - Actual production dates and product concentrations are discussed in Volume 5. By way of summary, it may be stated that initial production, of 0.9 per cent material (Case I), was about two months behind schedule. Higher concentrations were achieved either on, or ahead of, the scheduled dates specified in September 1944. The first mechanical operation (of a single typical process cell) was started on 19 April 1944; trial operation of the first process building was begun in June 1944. The overall construction progress record is recorded graphically in Appendix C1. Construction progress for individual areas is discussed in succeeding paragraphs.

3-2. Site Development.

a. Prior Condition of the Site. - The plant is located at the western end of the Clinton Engineer Works reservation, on the Clinch River, and near the mouth of Poplar Creek (App. B1). The natural ground elevation varies from 750 to 800 feet above sea level, the plant area being situated between a series of ridges rising to over 1000 feet in elevation (App. B2). The area was mostly cultivated (App. E1) before being taken over for the Project. The only roads passing through were gravel-surfaced country roads. An old hand-propelled ferry across the river, near the present site of the power plant, formed the only road connection to the south. Poor transportation facilities, and the absence of sizeable towns within reasonable proximity, complicated the problem involved in the early preparation work.

(1) Power Plant Site. - The power plant area, covering about 160 acres, is situated approximately 8800 feet southwest of the process area, on the flood plane of the east bank of the Clinch River, which was to furnish the turbine condenser cooling water (App. B12).

After use, the cooling water was to be emptied through a discharge canal into an arm of Poplar Creek, thence flowing back to the river at a point 6100 feet downstream from the intake. With yard and main floor elevation at 750, or five feet above the high-water river level, the power plant lies on a flat area providing ample storage and yard space.

(2) Process and Conditioning Area Site. - The immediate site location was chosen (Vol. 3) for its accessibility and terrain features which, in comparison with other nearby sites, favored the grading of large areas to a common elevation (at about 780 feet). The sandy clay soil over which practically all structures were to be erected, can be graded with relative ease, and with comparatively little required rock excavation.

(3) Administration Area Site. - The administration area is situated at the natural entrance to the process plant, and is at the same general elevation of 780 feet. It is adjacent to, and southeast of, the main plant.

b. Site Improvement. - The area assigned to the K-25 plant comprises about 5,000 acres, of which some 1000 acres have been developed for construction purposes. Approximately 600 acres are actually occupied by permanent operating facilities, the balance by temporary construction facilities. Of the developed areas, approximately 500 acres had to be leveled.

(1) Start of the Work. - The first survey party started work in the power house area on 31 May 1943, and road construction was begun on the following day. Work was started on the access railroad on 11 June 1943. Grading in the power plant area was begun on ~~1~~ 2 June 1943,

in the conditioning area on 20 August 1943, in the administrative area on 7 September 1943, and in the main process area on 2~~1~~0 October 1943. An aerial view of the plant during a latter stage of construction is shown in Appendix E2.

(2) Foundation Work.

(a) Power Plant Area. - With rock surface at from 35 to 40 feet below floor and yard level, the powerhouse machinery had to be supported on 40 concrete-filled caissons, which were pre-cast in sections, and sunk to bedrock by removing the earth below the bottom section while adding sections at the top. These caissons were arranged so that airlocks could be attached to the top section at any time, and airlocks and compressors were provided at the job, but fortunately, the use of compressed air in sinking the caissons did not become necessary. However, considerable pumping was required. An authoritative specialist, The Foundation Company (App. A2), was called in to supervise this operation.

(b) Process Area. - In the process area, an entirely different kind of foundation problem was presented. Here, the enormous area (of about 1,800,000 square feet, or 40 acres) covered by the main process buildings, and the fact that complicated and heavy machinery would be operating throughout the buildings, necessitating positive stable foundation, posed a major problem. Within this area the existing ground surface varied from 46 feet above, to 23.5 feet below, the grade elevation of 780 feet. Two fundamentally different methods of construction could have been employed in preparing the foundation. The conventional method would involve excavating to good foundation material under each wall, and under each major bearing point, and then erecting the building walls, later filling in the low regions within the foundations. This method would require several thousand columns of different lengths, the design and setting of which would entail an enormous amount of time. After serious consideration, this method was discarded in favor of a controlled rolled earth fill or "compacted fill" in the low areas, which would provide a bearing capacity equal to the excavated or undisturbed foundation. This method, in which the earth fill is scientifically placed in uniform layers, under adjusted conditions of optimum moisture content for good compaction, is sometimes subject to delays caused by wet weather. The choice between the two types of construction was a major and serious one, since the whole program could be advanced or retarded, depending on the speed with which the foundation could be prepared. The compacted fill method provided an excellent solution, proving speedier and more economical. About 300,000 cubic yards of this type of fill was placed at six major points over the K-25 area, the maximum depth of fill being 23.6 feet. A suitable foundation at the uniform required elevation greatly speeded up the structural program. The same process was later used in the K-27 area, mostly in connection with the switch yard and switch house structures (Par. 3-6b).

(3) Extent of Excavations. - During the course of Project construction, some 3,500,000 cubic yards of excavation (chiefly earth, with some rock) were required, including more than 2,700,000 cubic yards of earth moved in the 130 acre area containing the main process building "U", and 750,000 cubic yards in the 80 acre site of the K-27 process area extension.

3-3. Utilities.

a. Roads. - The question of transportation in general, and of roads in particular, was critical during the early stages of construction. All communities within a radius of 50 to 60 miles served the area by means of trucks, busses, and cars. This resulted in severely congested conditions. The upkeep of unimproved roads under unaccustomed heavy traffic, and their improvement in use, soon led to the evolution of a sizeable road building and maintenance program.

(1) Access Roads. - Several of the existing roads were immediately improved; a continuous maintenance and improvement program was then set up. The Jones Company also built a permanent access road leading from the K-25 area approximately nine miles eastward, to within two miles of the western limit of the Oak Ridge townsite, at which point the Roane-Anderson Company took over and continued it into the town. In addition, a road 5.1 miles long was built to connect the Project with U. S. Route No. 70, a few miles west of Kingston, Tennessee, and a road about five miles long, to connect with State Highway No. 61 at Blair, Tennessee (App. B1). The two latter roads were constructed by subcontractors, and maintained by Jones. The Ferry mentioned in Paragraph 3-2a could not handle the traffic at the power plant for long, and was replaced by a larger ferry, propelled by cable, and operating between the power house and a parking area on the west bank of the river. This, in turn, was replaced by the Gallaher Bridge, which was completed in December 1943. This bridge is 360 feet long and consists of six piers and two abutments, of concrete below water line and timber above. The seven spans between piers are made up of double plate steel girders.

The floor is of laminated wood covered with an asphalt topping. Early in 1944 an additional route to Knoxville and nearby towns was opened up with the construction of the floating White Wing Bridge, consisting of two barges, 168 feet long by 30 feet wide, and two timber end enclosures.

(2) Intra-Area Roads. - Within the plant area, road construction (App. C2, C12) was the first work to be started; it was continued without diminution until substantial completion of the main process area late in 1944. The plant area roads are shown in the plot plan of Appendix B12. 15 miles of first class roads, 19 miles of second class roads, 38 miles of third class roads, and 10 miles of temporary roads were constructed. To a large extent, stabilized fill was used as a base in the construction of these roads. The mixture consists of graded crushed rock and fines, with mud binder, and a small percentage of calcium chloride. It was plant batched, and wetted or dried for maximum density, bladed, and compacted. About 200,000 square yards were placed, at a thickness of six inches. The same mixture was also used on parking and bus terminal lots. A wearing coat, or topping, of asphalt concrete was placed on the principal roads; others were "shot" with liquid asphalt.

b. Railroads. - When K-25 construction began, the nearest rail stations were at Oliver Springs, 16 miles to the north, and at Harriman, 18 miles to the west. These are on the Knoxville-Harriman Branch of the Southern Railroad. Starting on 25 May 1943, approximately simultaneously with the beginning of other plant site studies, a survey of a spur rail line into the K-25 area was made by the District. This spur leaves the Southern Railroad at Blair (a new station on the Southern

Railroad between Oliver Springs and Harriman), runs south for four miles to K-25, and continues on within the diffusion plant area for a total main track length of 10.7 miles. A three-mile right-of-way, 200 feet wide, was procured from Blair to the reservation boundary. On 11 June 1943, 9 days after the start of construction work on the power plant, the J. A. Jones Company began work on railroad construction (App. C2). The work involved moving 265,000 cubic yards of earth and soil excavation, the re-location of 800 feet of creek channel, and erection of eight structures between Blair and the K-25 site, in addition to yard construction, and the construction of operating facilities. The first carload of freight was moved into the area over this access railroad on 18 September 1943. Construction continued, however, on yards and sidings through November 1944. The railroad was operated by the J. A. Jones Construction Company until 30 September 1946, when the responsibility was assumed by the Southern Railroad. During this period, 56,730 cars of freight were moved into the area. Before the railroad was in operation, 528 cars of freight were trucked in to the site, so that, in all, 57,258 carloads of freight had been received, exclusive of freight hauled by long distance trucks. During the same period, 1637 carloads of freight were shipped out. Facilities making up the railroad consist of the following (App. B10, B12):

Main line trackage	10.7 miles
Yards of sidings	12.9 miles
Total trackage	23.6 miles
Number of turnouts*, #8	67
Number of crossovers*, #8	8

A "Y" connection with the Southern Railroad at Blair.

A small dam, pumphouse, and engine watering tank.

A 5-track yard at Blair.

A 6-track unloading and storage yard at the conditioning area.

A 4-track unloading yard at the main process plant.

A 5-track classification yard with facilities for oiling, cleaning, fueling, and repairing equipment.

Track facilities to serve the power plant.

One 150 foot single track steel bridge with two concrete abutments.

One 100 foot wood trestle.

One 98 foot wood trestle.

Three 25 foot wood trestles.

Two 10 foot by 12 foot concrete culverts.

Materials for the construction of the railroad were obtained mainly by the District from surplus stocks at other installations. All of the rail was second hand and of various weights; the majority was of a standard 80 pound section. Steel for the 150 foot bridge span across Poplar Creek was, on account of the then critical steel supply, obtained second hand from the Chicago and Northwestern Railroad. It had been removed from one of their bridges, and had lain in their Chicago yard for several years. It was sandblasted, repainted, and renovated at the site. Early completion of the railroad was a vital link in construction of the entire Project. It was placed in operation 116 days after the start of surveys.

c. Water.

(1) Potable Water. - The original construction camp for the K-25 power plant area was designed to accommodate 500 men. The

drinking water for this camp and the mess halls was hauled by truck from Oak Ridge. Water for shower baths and toilets was pumped from Poplar Creek, rough filtered, and sterilized with chloride of lime. The camp grew rapidly, and these facilities became inadequate by the time construction of the process area was begun. A new camp, housing 5,000 workers, was opened in November 1943, and by May 1944 an additional temporary filtration plant was set up, consisting of portable U. S. Army pressure filter and chlorinator units. The water supply system of the abandoned Lake Ontario Ordnance Works had been made available by the Army for the K-25 Project. Capacity of this plant was 18 million gallons per day (MGD). During construction, the requirement for treated water at K-25 was 3 MGD (which the K-27 expansion increased to 4 MGD). The equipment and piping available from Ontario was fitted into the design of a 3 MGD water system, which was built by the Jones Company. Construction progress for the sanitary water system is shown in Appendix C3. The system was placed in operation on 12 May 1944, and was transferred to the operating contractor in January 1945. It then supplied all power house and process area construction and operating activities, as well as the still growing construction camp. It was increased during the summer of 1945 (App. C12) to a capacity of 4 MGD without interruption of service. The estimated cost of the system is $1,318,000. Including the addition of 1945, the facility consists of four parts: a river pumping station, a water treatment plant, storage reservoir tanks, and a distribution system (App. B4).

(a) Pumping Station. - The river pumping station is located on the east bank of the Clinch River near the north end of the

Gallaher Bridge. It is an 18 by 25 foot brick building with two reinforced concrete substructures housing two vertical type turbine pumps, each driven by a 200 horsepower motor, and discharging 2,700 GPM against an elevation head of 195 feet. Either of the pumps will supply the requirement for the treatment system. A traveling screen equipped with a back-wash pump removes the larger particles from the river water before it enters the pump well. Operation of the pumps and the screen is by remote control from the treatment plant.

(b) Water Treatment Plant. - The water treatment plant, located 1300 feet north of the pump house, consists of a preliminary sedimentation and aeration tank, separate from the main structure, and a complete rapid sand filtration plant with a mixing basin, two settling basins, and three filters. The filters are surmounted by a 46 by 59 foot frame housing the control equipment. From the clear well of the filtration plant, the treated water is pumped to nine steel reservoir tanks located on a hilltop 4,200 feet away, through twin 12 inch pipes. The capacity of each pump is 2500 GPM or 3.6 MGD.

(c) Storage Tanks. - Water flows throughout the area by gravity from nine steel storage tanks located at the top of Pine Ridge (App. B4), and having a combined capacity of 3,260,000 gallons. Post-chlorination is applied to the water, as required, in a chlorination house near the reservoir tanks.

(d) Distribution System. - Except for the small laterals, the distribution mains are of cast iron pipe. The system includes a total pipe length of 38 miles, of which 23 miles is cast iron, of six inch diameter or greater:

424	feet of 16 inch pipe	
20,087	feet of 12 inch pipe	
34,939	feet of 10 inch pipe	
11,121	feet of 8 inch pipe	
56,172	feet of 6 inch pipe	
14,474	feet of 4 inch pipe	
60,989	feet of laterals, 3 to 3/4 inch pipe	
198,206		

(2) Fire Protection Water System. - Construction progress for the fire protection water system is shown in Appendix C3. The system was placed in operation on 12 May 1944. For the original Project, construction of fire protection facilities was complete by October 1944, and in 1945 a loop was constructed to include the K-27 area. Fire protection was taken over by the operating contractor during the early stages of construction. Facilities included two fire companies completely equipped with modern apparatus. An efficient fire alarm system was installed, composed mainly of equipment available from other projects.

(a) Main Plant Area. - Water for fire protection in the process, conditioning, and administration areas is taken from Poplar Creek, and elevated by means of a pump in the recirculating pump house, Building K-802 (App. B7) to a 150,000 gallon elevated steel storage tank located on a hill one half mile east of the conditioning building. From this point, water flows by gravity to all parts of the system. Additional standby protection is provided by means of an auxiliary high pressure pump in Building K-802, which discharges directly into the mains. Location of mains and hydrants is shown in Appendix B4. 282 hydrants, 90 post indicator valves, and some 18 miles of piping are included in the system, distributed as follows:

4,250	feet	of	16	inch pipe
649	feet	of	14	inch pipe
1,116	feet	of	12	inch pipe
41,422	feet	of	10	inch pipe
35,283	feet	of	8	inch pipe
9,558	feet	of	6	inch pipe
1,472	feet	of	4	inch pipe
2,963	feet	of	smaller sizes	
96,713				

(b) Power Plant Area. - In the construction camp areas and in the power house area, water for fire protection is supplied from the sanitary water lines.

d. Sewers.

(1) Sanitary Sewers. - The original sewage treatment plant was a large septic tank* in the power house area. Operation was unsatisfactory because the impervious soil, on which it was located, would not absorb the required volume of liquid discharge. It was therefore replaced by a treatment plant. The power house sewage treatment plant is located 675 feet southeast of the boiler house (App. B11). It consists of two 25 by 40 foot sludge drying beds, two 11 by 27 by 17 foot deep Imhoff tanks*, and a small operating house. The foundation for the operating house is built over a pump pit 18 feet deep. When the camp for the process area construction was started, an Imhoff tank was designed to accommodage the flow from both camps. This plant is located adjacent to Poplar Creek, just west of the K-27 area (App. B5). It has a capacity of 1,000,000 gallons per day. In order to move the sewage from the old camp into the outfall* to the new Imhoff tank, a sewage lift*was built. Later, three additional lifts were installed. The treatment plant was designed to serve a camp of 7,500 people.

Actually, the camp population reached about 15,000, exclusive of workers living outside the area. This made it necessary to increase the sludge-drying capacity, and to install post-chlorination facilities. The system contains 23 miles of vitrified clay pipe in sizes varying from 18 inches to 8 inches. Construction of sewers in the power house area was started on 10 June 1943, and the permanent treatment plant was placed in operation on 1 April 1944, (App. C3). Sewers in the K-27 area were installed between 15 May and 20 October 1945 (App. C12). Including the contractor's overhead, the approximate outlay for sanitary sewers was $865,000, and for disposal plants $225,000.

(2) Storm Sewers. - The storm sewer system (App. B5) in the power house area includes two trunk outfall lines discharging into the river. In the main process area there are ten outfall lines, each varying in size from 18 to 36 inches, and 1 line varying from 15 to 36 inches, all sloping northward into the drainage basin of Poplar Creek. The one trunk line through the conditioning area varies in size from 15 to 36 inches, and drains northward into Poplar Creek. Storm sewage in the housing areas was handled by local drainage. Materials used include 84,000 feet of concrete pipe in sizes from 10 to 48 inches, 5,460 feet of corrugated metal pipe in sizes from 12 to 60 inches, 1,862 feet of cast iron pipe in sizes from 6 to 15 inches, and 2,457 feet of vitrified clay pipe in sizes from 4 to 24 inches. 618 catch basins and 8 manholes were constructed. Construction extended from September 1943 to September 1944 in the main process area (App. C3), and from 15 May 1945 to 20 October 1945 in the K-27 area (App. C12). Including the contractor's overhead, the approximate outlay for storm

sewers and drainage were $810,000.

e. Electrical Power Distribution. - The first source of electric power within the K-25 area was a 13,800 volt wood pole transmission line from the Elza No. 1 Substation. It was built by the Roane-Anderson Company as an extension of the Oak Ridge distribution system, generally following the Oak Ridge Turnpike to the power house area. Construction of the line was started simultaneously with the work at the power plant; it furnished power for construction activities and camp operation from June until 8 October 1943, when the construction switchyard (K-714) was energized (App. B12). Thereafter, power for all construction work and camp operation was distributed from this switch yard over 13,800 volt pole transmission lines. Power was derived from a 154,000 volt pole line from the Elza No. 1 Substation until the main switch house was energized, after which time power was supplied from the switch house by underground cable, and the 154,000 volt line was connected to the permanent K-25 switch yard (K-709).

3-4. Power Plant Area. - Erection of the power plant was the first major division of K-25 Project construction to be started. The facility comprises a complete modern power generating station, was built in record time, and is believed to be the largest single steam-electric power production plant constructed to date in a single operation. The location of the power station in relation to other portions of the K-25 area is shown in Appendices B3 and B12. A general layout map of the power plant is shown in Appendix B6, a property plat in Appendix B11, and a photographic aerial view in Appendix E18. To supplement the information presented in this and subsequent paragraphs, reference should be made to Appendix D1, which summarizes principal descriptive structural data for each building, presenting type of construction, dates of construction, floor space, cubical content, and estimated costs. The cost figures given represent the best currently available estimates for each building, and are intended to serve as descriptive information, and to provide an approximate measure of the volume of work involved for each unit.

a. Chronology. - Work began on 2 June 1943, the first steam-generating unit went on the line on 15 April 1944, and construction was completed in mid-July 1945. Construction progress for major buildings in the area is traced in Appendix C4. Periods of erection and equipment installation for the individual buildings are shown in Appendix C5.

b. Boiler House (K-701). - The principal building in the area is the boiler house (App. E19), which is a steel frame structure with brick walls and pre-cast Haydite* slab roof with built-up roofing cover and slag topping. It houses three 750,000 pound per hour boilers, together with all the various appurtenances required for steam generation (Vol. 3). The building is 197 feet long, 123 feet wide, and 144 feet high, and is surmounted by three steel stacks 11 feet in inside diameter, and rising to a height of 103 feet above the roof, or 245 feet above grade elevation.

(1) Foundation. - The building rests on an overburden 35 to 40 feet deep composed of clay changing progressively to shale, shattered limestone interspersed with clay seams, a sand layer varying from one to five feet thick, and sandstone bedrock. Supporting

the building and boilers are the 40 caissons mentioned in Paragraph 3-2b.

(2) Construction. - Prior to completion of the railroad spur line, structural steel for the building and boiler frames was trucked for a distance of 13 miles from the nearest siding. The steel was erected mainly by two derricks, aided by crawler cranes*. Concrete was supplied from a central mix plant and delivered in transit mix trucks*. Much of it was placed by means of pumpcrete* machines, which pump the plastic mix to the forms through large hoses. Ground was broken on 2 June 1943. The building was enclosed by 1 December 1943, using tarpaulins to cover windows, which had not yet arrived. The first boiler was fired on 7 April 1944, the second on 14 July 1944, and the third on 2 November 1944. Construction work proper was completed late in September. Structural work and installation of machinery was done by the Jones Company; piping was installed by the William A. Pope Company; electrical work was done by the A. S. Schulman Company; and the boilers were furnished and installed by the Combustion Engineering Company.

(3) S-50 Facilities. - In connection with construction of the adjacent S-50 plant, to be operated on steam to be supplied from K-25, some additional equipment was installed in the boiler house. This work was done by the Jones Company in July and August of 1944 (Vol. 5, Par. 12-9).

c. Turbine House (K-702). - The turbine room adjoins the boiler house, and houses fourteen turbo-generators and auxiliaries (App. E22). The eight larger units are hydrogen-cooled, the six smaller units are air-cooled. A repair shop and a 60 ton crane are included in the equipment. The building rests on a clay foundation, without caissons. Foundations for the condensers, turbines, and generators are of heavy mass concrete. Concrete walls, integral with the foundations, extend from the first floor (elevation 746) up to the generator floor (elevation 769). Above the generator floor, the building is composed of a structural steel frame, brick walls, and a reinforced concrete slab roof supported on a steel truss. The building is 585 feet long by 87 feet wide, and 71 feet high from the ground floor to roof top. Roof area is 51,000 square feet, and volume is 4,427,000 cubic feet. Descriptive data pertaining to the mechanical equipment is given in Volume 3. The units were placed on the line as follows:

Unit No. 1	35,000 KW	25 November 1944
2	25,000 KW	28 October 1944
3	25,000	18 April 1944
4	25,000	16 October 1944
5	20,000	16 October 1944
6	25,000	12 November 1944
7	25,000	20 October 1944
8	25,000	27 October 1944
9	12,500	15 August 1944
10	10,000	26 July 1944
11	1,500	31 January 1944
12	3,000	24 September 1944
13	3,000	11 September 1944
14	3,000	7 July 1945

Erection of structural steel was done by the Bethlehem Steel Company, piping work by the William A. Pope Company, electrical work by the A. S. Schulman Electric Company, and erection of the condensers and turbines by R. Doughty Sons Company, Inc. Construction of the turbine room began in mid-September 1943, and was completed on 26 September 1944.

d. Service Building (K-703). - Adjoining the southwest side of the turbine room and the southeast side of the boiler room, the service building is of reinforced concrete frame and slab construction, with brick enclosing walls. Dimensions are 150 feet by 47 feet by 36 feet high, with a penthouse, 31 feet square by 24 feet high, at the south corner, supporting a coal conveyor belt. The building houses heavy store rooms on the ground floor at elevation 746, locker and wash rooms, offices, and a laboratory on the main floor at elevation 759. The structure includes three steel tanks, part of the boiler make-up water storage, each of 75,000 gallons capacity.

e. Main Switch House (K-704). - All switching and control equipment required for the turbo-generators, the feeders to the process, conditioning, and administration areas, and the connection to the main switch yard are located in the main switch house, which also contains standby switchgear for routing small amounts of power to the X-10 Project (Book IV). A three-story structure without windows, the main switch house is situated parallel to, and 125 feet east of, the turbine room, and is approximately 635 feet long, 46 feet wide, and 54 feet high. Total roof area is about 33,000 square feet. The basement floor serves as a conduit and cable room; the ground floor is used for bus connections, potential transformers, disconnect, and pothead* enclosures; the 13,800 volt switching equipment and the main electrical control room are located on the top floor. The building frame is of reinforced concrete resting on clay foundation, with outside walls of brick, and interior partitions of tile (App. E20). Two air conditioning systems are provided, one for the control room and offices, the other for the balance of the building. Each is housed in a penthouse on the roof. Structural work and installation of equipment was done by the Jones Company, the electrical work by the Schulman Company. Construction was begun on 19 August 1943, installation of equipment was completed on 6 May 1944, final adjustment of electrical work was completed on 1 November 1944.

f. Crib House (K-705). - The crib house includes a trash rack 25 feet high by 50 feet long, and four revolving screens immersed, respectively, in four wet wells, each 9 feet wide by 30 feet deep, for straining particles from the river water. The substructure is of reinforced concrete resting on limestone bedrock. It is 50 feet long by 40 feet wide and 35 feet deep. The floor of the superstructure is at elevation 750, having a reinforced concrete frame and roof, and wood side walls. It measures 19 feet by 50 feet by 29 feet high. Since the crib house rests on rock, 22 feet below low water and 32 feet below high water, a coffer-dam had to be constructed to de-water the site. This was done in a novel way: bulldozers pushed earth out into the river until a dry peninsula was formed, steel sheet piling was then set upright and driven to form a 62 by 57 foot coffer-dam in which the excavation was made and the foundation built. Construction was begun in July 1943, and completed in March 1944.

g. Pump House (K-70[illegible]). - The pump house is situated 250 feet east of the crib house, and connects with the intake by way of a 10 foot by 10 foot concrete tunnel. It houses three vertical shaft propeller pumps, each driven by a 700 horsepower motor, and with a total capacity of about 250,000 GPM. The building also contains five service water pumps and two ash sluice pumps. Overall dimensions are 30 by 115 by 29 feet high above ground, plus 33 feet below ground, to bedrock level. The foundation is of reinforced concrete, the superstructure of concrete frame and slab construction, with outside walls of wood, and built-up roofing of concrete roof slab. The power plant pump house was built between 25 August 1943 and 10 March 1944.

h. Auxiliary Switch House (K-707). - Most of the switching and control equipment for power distribution to the power plant and auxiliaries is located in the auxiliary switch house, which is a three-story building with a concrete basement. It measures 195 feet by 30 feet by 52 feet high from basement floor to roof. The superstructure is a reinforced concrete frame with concrete slab floors and built-up concrete roof, brick walls, and tile partitions. It lies parallel to the southwest wall of the boiler room, with 25 feet between near walls, and with a bridge connecting the top floor of the two buildings. The auxiliary switch house contains no windows, and is air conditioned. The switchgear for the larger auxiliaries is installed on the top floor, the second floor is a control cable room, and the lower floor, at approximately grade elevation, contains the switchgear for the smaller auxiliaries. The basement serves as a cable and conduit room. The building was erected between 1 July 1943 and 1 April 1944.

i. Main Switch Yard (K-709). - The K-25 outdoor switch yard (App. E21) contains three 40,000 KVA forced oil cooled transformers (154,000 to 13,800 volts) together with appurtenant switchgear and operating equipment. It is of wood pole construction, and is set on earth foundation. It connects with the main switch house by 13,800 volt underground cables, with the Fort Loudon Station of the T.V.A. system, and with the K-27 switch yard (K-732) by 154,000 volt steel tower transmission lines, and with the Elza No. 2 Substation by means of a wood pole line. Construction by the J. A. Jones Construction Company, was begun on 20 November 1943, and the yard was placed in operation in April 1944.

j. Dead Storage Warehouse (K-711). - Located 200 feet south of the east end of the turbine room, and along the railroad spur, Building K-711 has been used, since the completion of construction, primarily for spare parts storage. It is a single-story building measuring 165 feet by 38 feet by 18 feet high, with a concrete platform on either side. The foundation and floor slab are of reinforced concrete, and the frame and roof truss are of steel. The hipped roof is covered with corrugated asbestos Transite*. Walls are of concrete blocks.

k. Underground Electrical Transmission Lines. - Power is transmitted at various frequencies (Vol. 3) from the main switch house to the process plant by way of an underground cable run, the construction and installation of which constituted a sizeable project in itself. The cable run includes 58 separate circuits, having an average length of approximately two miles (App. B12; Vol. 3, Figs. 61

and 62). Each circuit consists of three conductors enclosed in a lead-sheathed cable which is threaded through a fiber duct encased in concrete. Including spares, 78 ducts were installed, grouped into thirteen banks of six. Reinforced concrete manholes are spaced at approximately 500 foot intervals. The cables were installed by rodding* the ducts and pulling from one manhole to the next. Prior to completion of the run, individual megger tests* of the cable insulation were made at the various manholes, and each completed run was subjected to a standard high potential test. Cable splicing at the manholes involved a tremendous amount of work, at one time engaging as many as 300 skilled craftsmen. The cable run includes underwater crossings of Poplar Creek at two points. At these crossings, armored submarine cable was used between special manholes on each side of the creek. The cable was drawn across the creek bed by means of a nosing tool attached to a tractor cable, which formed a trench just ahead of the submarine cable. The laying was inspected by divers. Under the water, the cables are not buried, but, above the low water level on either side, the runs are covered with sand, stone, and riprap in order to prevent scouring and mechanical damage from floods or floating objects. A special time-saving expedient adopted in the construction of the underground cable system involved the use of compacted fill over areas where trenching for the cable would otherwise have been in rock. In the compacted fill, the excavation for the concrete runs could be dug with mechanical tools and trimmed by hand. This eliminated the necessity for blasting, effecting rapid and economical completion of the installation. Construction of the cable run involved:

1,196,000 feet of 3 conductor cable
30,000 feet of 3 conductor submarine cable
2,925 ~~feet of~~ splices and potheads
70,000 cubic yards of earth excavation
10,000 cubic yards of concrete

The trenching, filling, and concrete work was done by the J. A. Jones Construction Company; installation of the ducts and cables was done by the A. S. Schulman Electric Company. Construction was begun on 14 September 1943; cable pulling was started on 18 November 1943; splicing was started on 30 November 1943. The first circuit was ready for service on 7 April 1944; the last circuit was placed in service 14 July 1945 (App. C3).

3-5. Main Process Area. - The main process area physically includes those facilities designated by function (Vol. 3) as:

Section 100 - Feed Purification Plant
Section 300 - Main Cascade
Section 600 - Surge and Waste System
Section 800 - Recirculating Cooling Water System
Section 1100 - Dry Air Plant
Section 1200 - Compressed Air Plant

Several of the Section 1000 buildings, and one of the Section 1400 buildings, are also located in the main process area. Structurally and functionally, the main process area is centered around the main K-25 cascade, which forms the heart of the entire gaseous diffusion plant. The 51 main process buildings and the 3 purge cascade buildings are erected contiguously in the shape of a "U" (App. B7). Appendix E3 shows a photographic view of the "U" during construction. Appendix D9 tabulates the principal quantities of material and equipment used in the construction of the process area. Construction dates and progress are shown in Appendices C6, C7, and C8. Construction and equipment installation was done by the Jones Company. Principal subcontractors were the Midwest Piping and Supply Company and the L. K. Comstock and Bryant Electric Companies. Location of structures discussed below is shown in Appendices B3, B7, B12.

a. Main Process Buildings (Section 300). - The main process buildings (App. D1, E6, E7) are built under a common roof, and are not separated by walls above the ground floor. Individual buildings are approximately 100 feet in width, and vary from 300 to 400 feet in length. Total floor area is approximately 5,264,000 square feet; total volume 97,500,000 cubic feet. The buildings contain a basement, a cell floor at ground level, a pipe gallery, and an operating floor.

(1) Chronology. - Construction of buildings and installation of equipment were prosecuted according to schedules so planned that Building K-303-2 could be completed at the earliest possible date, in order that it might be used as an experimental building or "54 stage pilot plant" (Vol. 5, Par. 3-2). The first foundation concrete was placed on 21 October 1943. Erection of structural steel was begun on 19 January 1944. Building K-303-2 was accepted for operation on 20 October 1944. Construction was substantially complete by 1 August 1945. The various contractors and subcontractors are tabulated in Appendices A1 and A2, respectively, together with a statement of the scope of work for each, and costs involved. A tabulation of construction data and estimated costs for each building is presented in Appendix D1, together with size and construction dates for each. Construction progress is charted in Appendices C6 and C7. Appendix C1 of Volume 5 lists, for each building, dates of initial acceptance

for operation, and final transfer to the operating contractor.

(2) Basement. - The basement ~~includes~~ contains transformer vaults, ~~and houses~~ ventilating equipment, and various service pumps, tanks, and miscellaneous items. (A functional description of the process buildings is given in Vol. 3, Sect. 9.)

(3) Cell Floor. - The ground floor, housing the process cells (App. E16), is of reinforced concrete. It contains motor alleys and withdrawal alleys which open toward the inner cascade court. The 452 cells of the main cascade are distributed among the process buildings as shown in Appendix B1 of Volume 3.

(4) Pipe Gallery. - The pipe gallery ~~includes~~ contains process and auxiliary piping, and is equipped with steel grating access runways.

(5) Operating Floor. - The top, or operating, floor (App. E13) is built of pre-cast concrete slabs covered with Cemasco* topping, except in Buildings K-305-8 through K-305-12, and K-306-1 through K-306-7, where reinforced concrete is used.

(6) Frame. - Up to, and including, the ground floor (elevation, 795 feet) the building frame is of reinforced concrete, with outside walls of pre-cast concrete blocks. Above the ground floor, the frame is of structural steel, with side walls of white Transite.

(7) Roof. - The roof consists of steel framing fitted with sheets of plaster board, over which is poured a three inch layer of reinforced gypsum cement. The roof is finished with a four-ply built-up covering with slag topping. Each process building roof supports from 20 to 26 large sheet metal ventilators providing ample

and controllable air removal (App. E3).

b. Purge Cascade Buildings (Section 312). - The purge cascade buildings (K-312-1, -2, and -3) are erected contiguously with, and at the southwest foot of, the process "U". They are of the same general construction as Building K-306-7; they have operating floors of poured-in-place concrete, and are separated from K-306-7 by means of a tile wall. The exposed side of K-312-3 is covered with corrugated asbestos siding. Dimensions are:

K-312-1	319 by 92 by 54 feet
K-312-2	319 by 84 by 54 feet
K-312-3	319 by 95 by 54 feet

c. Feed Purification Building (K-101). - This building houses equipment for vaporizing, purifying, storing, and feeding process gas to the main cascade. It is centrally located within the court of the cascade "U" (App. E7, E10). Plan dimensions are 52 by 27 feet. There are three different roof heights, the highest of which is 55 feet. The frame, roof, and foundation are of reinforced concrete, walls are of pre-cast concrete blocks. Construction proceeded rather slowly because of slow delivery of process equipment, and a considerable number of minor changes in design made during the construction, plans having been made to operate the cascade in conjunction with temporary feed facilities until Building K-101 should be ready for operation (Vol. 5).

d. Coolant Purification and Storage Plant (K-300-C). - The process coolant purification and storage plant comprises three small structures and five 10,000 gallon storage tanks located within the "U" between Buildings K-1101 and K-1024. K-300-0-1, the coolant unloading building, is a single story structure, 12 feet, by 36 feet, by 28 feet high, of wood construction, and covered with Transite. K-300-0-2, the coolant pump building, is a single story structure, 16 feet by 19 feet, by 28 feet high, of wood construction, covered with Transite, and housing two coolant pumps. K-300-C-3, the coolant drying building, consists of an open steel framework on concrete foundations, enclosing drums, heaters, tanks, etc. Overall dimensions are 10 feet by 16 feet in plan, and 31 feet in height. The Midwest Piping and Supply Company furnished the piping for these buildings, and installed it under subcontract 26 with the Jones Company.

e. Surge and Waste Building (K-601). - Building K-601 is located at the south end of the cascade court opposite process building K-311-1, with which it is connected by means of a pipe bridge (App. E11, E14). Structurally, the building is composed of two adjoining units, the northern portion consisting of a concrete frame with concrete block walls, and the southern portion comprising a steel frame with Transite walls. Together, the two units form a single three-story building without basement, measuring 61 feet by 93 feet by 44 feet high. Floors are concrete; the roof is of concrete slab with built-up roof covering topped with slag. Roof area is 5,719 square feet. When the building was designed, the development of its process system was incomplete, and requirements were indefinite. Innumerable revisions of the installed equipment were made during construction, thereby accounting for the apparently slow construction progress. Plans had been formulated for the use of temporary facilities in place of the permanent system during the early stages of process operation (Vol. 5). Building K-601 was built by the Jones Company between 25 March 1944 and 3 March 1945.

f. <u>Recirculating Cooling Water System (Section 800).</u> - The recirculating cooling water system for the K-25 cascade includes an intake pump house, a recirculating pump house, and two cooling towers, together with distribution and collection piping. An aerial view of the pump house and cooling towers is shown in Appendix E5. Construction was done by the Jones Company between December 1943 and September 1944. During the construction of the 800 group considerable rock excavation was necessary, fortunately one of the few cases in the plant construction program where such a condition was encountered.

(1) <u>Make-up Pump House (K-801).</u> - Building K-801 is a one-story wood frame pump house covered with corrugated asbestos transite siding. It is adjoined by a lean-to, housing a revolving screen and a platform covering trash racks and a sluice gate. It houses three vertical deep well pumps with a combined capacity of 6000 GPM, and contains space for one additional unit. The pump house proper measures 14 feet by 20 feet by 18 feet high. The lean-to measures 11 feet by 15 feet, at an average height of 10 feet. K-801 is located on the east bank of Poplar Creek northeast of the Cascade "U".

(2) <u>Recirculating Pump House (K-802).</u> - Building K-802 is constructed with a reinforced concrete frame and roof, and pre-cast concrete block walls. It measures 120 feet by 50 feet by 15 feet in height. Its pumps will circulate 135,000 gallons of water per minute through the various plant heat exchangers. From these

coolers, the water returns to the interconnected cooling towers H-801 and H-802.

(3) Cooling Tower "A" (H-801). - Cooling Tower "A" measures 435 feet by 65 feet by 15 feet high. The foundation consists of a concrete tank for cooled water. A reinforced concrete frame supports eighteen fans, the redwood cooling baffles, and the overhead spray assemblies through which the warm water enters. Cooling Tower "A" is connected, by way of a concrete flume, with Cooling Tower "B" and with the reservoir under the recirculating pump house.

(4) Cooling Tower "B" (H-802). - Cooling Tower "B" is a structure similar to H-801, but contains fourteen fans, and measures 339 feet by 65 feet by 15 feet high. Both towers are of open wood baffle construction. Together, they are designed to cool 120,000 gallons of water per minute from 100 to 85°F.

5. Instrument Repair Building (K-1024). - The instrument repair building is located at the center of the cascade court. It is a one-story frame structure with a concrete foundation and a concrete floor. Exterior walls are of wood siding; interior walls and partitions are finished with asbestos board. The flat wood roof has a built-up cover topped with slag. The floor is covered with asphalt tile. It consists of a main section 140 feet by 48 feet by 16 feet high, and two wings extending southward, each 122 feet by 48 feet by 16 feet high. The building is steam-heated, and houses facilities for repair and calibration of mechanical and pneumatic instruments. It was constructed by the Jones Company between 26 May 1944 and 23 March 1945.

h. Electrical Maintenance Building (K-1030). - Building K-1030, located at the north end of the cascade court (App. E9), houses facilities for electrical maintenance service. It consists of a two-story main section, 134 feet long, 69 feet wide, and 28 feet high, and a single story wing, 42 feet wide, 55 feet long, and 17 feet high. The main section consists of a structural steel frame resting on a reinforced concrete foundation integral with the reinforced concrete ground floor. The second floor is of Pyrofil* with a Cemesco finish. Outside walls are of corrugated asbestos. The roof is of Pyrofil with built-up covering. The single-story wing is made up of concrete foundation, floor, and roof, with concrete block walls.

i. Warehouses.

(1) Drum Warehouses (K-1025-A, -B, -C, -D, -E). - The five drum warehouses, all structurally similar, are used for storage of process material. They are located about 150 feet north of the K-303 buildings, and spaced well apart. Each measures 20 feet by 40 feet by 13 feet high, and consists of a single story hipped roof structure. The frame is wood, the walls are covered with corrugated asbestos siding, and the roofs are covered with asphalt shingles. The floor and foundations are of reinforced concrete. Attached to each building is a 12 by 5 foot loading platform. The warehouses were first erected on the site of the present K-27 area, and were moved on a low truck to their current location when K-27 construction was begun. Combined floor area is 4300 square feet, including the platforms, and combined volume is 52,000 cubic feet. The buildings were erected and moved by the Jones Company between 8 June 1944 and 7 September 1945.

(2) General Warehouse (K-1035). - This warehouse is located 500 feet east of the process "U". The building is 382 feet by 125 feet by 37 feet high at the ridge, with a single floor and two platforms, each 406 feet long by 10 feet wide. A railroad siding runs the full length of the west side of the building. The foundation, including the floor and platforms, is of reinforced concrete. The foundation walls were built to a height of approximately 6 feet, and were filled with compacted fill up to floor base level; the concrete floor was then placed. The platforms were built in the same manner. The framework is of structural steel; walls are of concrete blocks; the hipped roof is covered with corrugated asbestos Transite. Two 21 inch brick walls separate the warehouse into three parts. The building is steam-heated. It was erected between 7 April 1945 and 23 August 1945.

(3) Maintenance and Spare Parts Warehouse (K-1036). - The spare parts warehouse is structurally similar to Building K-1035, and is located north of it, with 100 feet between near walls. It contains three 21 inch brick fire walls subdividing it into approximately equal portions. The steel framework, weighing 450 tons, was furnished by the Virginia Bridge Company. The building has two platforms, each 10 feet wide and 662 feet long. A railroad siding runs the full length of the west side, cars unloading at platform floor level. Dimensions are 642 feet by 125 feet by 15 feet high at the sides. It was constructed between 23 April and 23 November 1945.

(4) Equipment Warehouse (K-1037). - The equipment warehouse is located 800 feet east of the steam-heating plant (Section 1500). It is a single story structure measuring 402 feet by 122 feet

by 36 feet high. A 402 by 10 foot concrete unloading platform runs along the north side. A railroad side track runs along the platform (which is at car door height, and the same elevation as the warehouse floor). The foundation and floor slab are of reinforced concrete resting on clay. Within the foundation walls, the clay was built up to floor level with compacted fill. The framework is of structural steel with trussed roof, and is covered with corrugated asbestos siding.

(5) Cylinder and Drum Warehouse (K-1041). - Located 100 feet east of K-27 process building K-402-9, Building K-1041 is a single-story frame structure with hipped roof, concrete floor and foundations, and covered with corrugated asbestos on the outside walls and roof. It was erected as a construction aid in the K-27 program, and was later transferred to operations. Dimensions are 75 feet by 35 feet by 12.5 feet high at sides. It was built between 3 March 1945 and 8 November 1945.

j. Dry Air Plant (K-1101). - Building K-1101 houses one of the largest air drying installations ever constructed. It is located within the cascade court between the K-303 and K-304 Sections, and measures 362 feet by 82 feet by 34 feet high. It is of steel frame construction, with foundation, footings, and floor of reinforced concrete. Walls are of corrugated Transite sheets; the flat roof is of poured-in-place gypsum Pyrofil covered with built-up roofing and topped with slag. Photographic views of the building are shown in Appendices E8 and E12. Construction was accomplished between 28 April 1944 and 23 May 1945. Installation of piping was done by the Poe Piping and

Heating Company under Jones subcontract 27.

k. Compressed Air Plant (K-1201). - Building K-1201, housing facilities for generation of 110 p.s.i. compressed air, is located within the cascade court adjacent to Building K-1101, and opposite process buildings K-303-3 and -4 (App. B8). The building is of one-story steel frame construction, measuring 162 feet by 42 feet by 34 feet high. Foundations, footings, and floor are of reinforced concrete, walls of Transite, and flat roof of poured-in-place gypsum covered with built-up roofing and slag. It was built between 10 April 1944 and 14 October 1944.

l. Carbon Mixing Plant (K-1410). - Building K-1410 is a single-story hipped roof structure, measuring 68 feet by 122 feet by 31 feet to the bottom of the roof truss, and located 250 feet west of building K-306-6. Foundations, floor, and frame are of reinforced concrete. The sides are covered with corrugated Transite. The roof is covered with corrugated galvanized steel sheets. It was built between 5 August 1944 and 12 June 1945. The plant houses blending facilities for carbon and alumina for carbon trap charging (Vol. 3).

3-6. K-27 Area. - The K-27 plant constitutes an extension to the main process area authorized by the District Engineer on 31 March 1945 (Vol. 3). Facilities include principally nine cascade process buildings, and ten auxiliary structures (App. D1), which are discussed below, and shown in Appendices B3, B8, and B12. Principal quantities of equipment and materials used are tabulated in Appendix D9. Construction and installation of equipment was done by the J. A. Jones Construction Company with the aid of its own forces and subcontractors

(App. A2). The construction of the main process area was nearly completed when the work on K-27 was begun, and the existing forces were essentially transferred to the new area. Reference to the chart of daily working forces compared with percentage of completion (App. D6) indicates the interrelationship between K-25 and K-27 forces and construction progress.

a. Role of the Jones Company. - As in the case of the work in the main process area, the J. A. Jones Construction Company coordinated the work of its subcontractors on various specific phases of the job, and handled the following items by means of its own forces:

1. Site grading and drainage.
2. All excavation, borrow, and fill.
3. Structural and mechanical erection and installation.
4. Boiler work.
5. All sheet metal and duct work, exclusive of the process buildings and the K-27 switch house.
6. Outside facilities:
   a. Overhead pipe bridges.
   b. Roads, walks, and parking areas.
   c. Railroads.
   d. Sanitary and storm sewers.
   e. Sanitary, fire, and process water lines.
   f. Underground electrical lines.

b. Site Preparation. - About three acres were cleared and grubbed. Vegetation and top soil ~~was~~ were stripped from approximately 80 acres. 50,000 cubic yards of spoil material from the K-25 area had to be removed, together with 100,000 cubic yards of earth in its original state, which was unsatisfactory for foundation material. For grading purposes, 450,000 cubic yards of material ~~was~~ were moved from point to point within the area, and about 150,000 cubic yards were borrowed from the opposite side of Poplar Creek. Thus, total earth moved in the area was about 750,000 cubic yards. Practically all was handled with tractor-drawn, self-loading scrapers. However, some was excavated with draglines*, back hoes*, and clam shell excavators. 8.5 miles of roads were constructed, of which 2.5 miles were permanent roads around and between buildings (App. B8). A permanent railroad spur was constructed, 2,945 feet long, in addition to 1,400 feet of temporary trackage for construction purposes (App. B10).

c. Chronology. - Ground was broken in the K-27 area on 3 April 1945. By 25 August 1945, work in the K-27 area was 2-1/2 weeks ahead of schedule. Shorter work weeks were invoked after V-J Day, and the rate of progress somewhat diminished correspondingly, but the construction never fell behind schedule. Construction dates and progress are shown in Appendices C1, C11, C12, and C13. Periods of building erection and equipment installation are shown in Appendices C14 and C15. Photographic views taken during construction are shown in Appendices E30, E31, and E32.

d. Process Buildings (Section 402). - The nine process buildings of the K-27 plant are erected contiguously in a single row, and not separated by walls above the basement (App. E23, E24, E26). They are located southwest of the main K-25 cascade "U". The buildings are essentially similar to Buildings K-302-2, -3, and -4 of the K-25 process area, and house process cascade equipment and piping, auxiliary equipment and systems, and utilities. Each contains 10 six-stage process cells. Differing from the K-25 process buildings, the foundations for the K-27 process buildings all rest on undisturbed sandy clay in excavation. The basements open at ground elevation (772 feet) on the south side; the main floors open at ground elevation (787 feet) on the north side. Space has been allowed at the east end for possible future construction of three additional buildings. The combined floor area is 1,104,750 square feet, and total enclosed volume is 21,635,100 cubic feet.

e. Feed and Purification Building (K-131). - Building K-131 (App. E26) is a five-story building consisting of:

1. A basement, 214.5 ~~154.5~~? ~~14.5~~ feet by 61.5 feet by 15 feet high.
2. First floor, east section, 60 feet by 91.5 feet by 20 feet high.
3. First floor, west section, 154.5 feet by 91.5 feet by 15 feet high.
4. Second floor, 90 feet by 61.5 feet by 16 feet high.
5. Third floor, 90 feet by 61.5 feet by 11 feet high.
6. Penthouse tower, 36.5 feet by 22.5 feet by 10 feet high.

Foundation and floors are of reinforced concrete, frame is of structural steel, walls of concrete block, flat roof of Pyrofil covered with a 1-1/2 inch layer of cork insulation and a built-up roof cover topped with slag. Building K-131 is located 120 feet north of process building K-402-3. It was built between 12 July 1945 and 5 February 1946.

(1) Absorption System Building (K-132). - Building K-132 houses two spray towers with circulating tanks and pumps, composing the system used to absorb process gas from relief valve discharges, and off gases from equipment venting and purging operations. It is connected by means of a process pipe bridge with the feed and purification building. Measuring 32 feet by 42 feet by 25 feet high, it is comprised of a single room with floor at elevation of 773 feet. The foundation is reinforced concrete resting on clay, the frame and roof truss are covered with corrugated Transite.

f. Purge and Product Building (K-413). - Located 400 feet west of K-25 purge building K-312-3, the K-27 purge and product building consists of a north section, 40 feet by 83 feet by 14 feet high, and a south section, ~~212~~ 122 feet by 83 feet by 24 feet high. It is of single-story steel frame construction with steel platform runways 12 feet above the floor in a portion of the building. It is made up of reinforced concrete floor, Transite walls, and Pyrofil roof, and was built between 9 July 1945 and 5 February 1946.

g. Surge and Waste Building (K-631). - Located 100 feet north of process building K-402-1, the K-27 surge and waste building (App. E26) comprises a main central, two-story section, measuring 128 feet by 78 feet by 50 feet high, and two one-story wings. The east and west wings each measure 120 feet by 60 feet by 33 feet high. All parts also contain a basement. Foundation and floor slabs are of concrete block, wing flooring is of steel grating, structural framework is of steel, walls of concrete block, and roof of Pyrofil and built-up topping.

h. Power Facilities.

(1) K-27 Switch House (K-731). - The K-27 switch house (App. E27, E29) controls power routed to the K-27 plant, and normally obtained from the K-27 switch yard. It is located 250 feet south of the K-402 process buildings. Underground power cables run from the switch yard to the switch house, and from the switch house to the various load center points in the K-27 area. Building K-731 is a two-story air-conditioned building with basement. The basement and foundation are of reinforced concrete. The superstructure is a steel frame with reinforced concrete floors and roof, brick walls without windows, and interior partitions of tile. The concrete roof is covered with one inch of cork insulation and a 5 ply built-up roof cover topped with slag. The main switchgear, control room, and offices are located on the top floor. Conduit runs are installed on a mezzanine under the control room. Synchronous condensers and miscellaneous switchgear are installed on the ground floor, while the basement is used as a cable and conduit room. The main building measures 50 feet by 402 feet, with three wings projecting 19 feet toward the process buildings. The two corner wings are 30 feet long, and the central wing is 86 feet long. Roof area is 22,868 square feet, floor space is 91,470 square feet, volume is 1,300,000 cubic feet. Installation of the electrical equipment was done by the Schulman Electric Company. The construction was done by the Jones Company between 9 June 1945 and 28 February 1946.

(2) K-27 Switch Yard (K-732). - One of the largest and most modern switch yards in the country, the K-27 switch yard (App. E27) is located just south of the K-27 switch house. It is of permanent

steel construction, and contains five 40,000 KVA transformers (154,000 to 13,800 volts) and two 25,000 KVA rotary condensers, together with the required switchgear and operating equipment. It connects with the Watts Bar Station of the T.V.A. system by means of a steel tower transmission line; similar lines connect with the K-25 switch yard and the Elza No. 1 Substation. Construction was begun in July 1945, and completed in ~~March~~ February 1946. The K-27 switch yard is located over an old slough from Poplar Creek; a considerable quantity of soft earth had to be removed, and the yard brought up to grade by placing some 200,000 cubic yards of controlled rolled fill. In order to obtain a sufficient amount of satisfactory fill, it was necessary to build a temporary earth embankment across Poplar Creek to provide access to a borrow pit on the west side. Metal culvert pipe was placed in the fill to pass the normal creek flow.

i. Recirculating Cooling Water System (Section 830). - The K-27 recirculating cooling water system removes process heat from Section 400, and supplies cooling water to the various auxiliaries, including the switch yard transformers of Section 750.

(1) Recirculating Pump House (K-832). - The K-27 recirculating pump house (App. E25) is a one-story "tee"-shaped building. The main portion, housing the cooling water circulating pumps, measures 80 feet by 122 feet by 29 feet high. The leg of the "tee" housing auxiliaries, office, and storage space, measures 43 feet by 94 feet by 20 feet high. Two 20 by 20 foot square wings extend back alongside of the main portion of the pump house. Duplicate wet wells run underneath the full length of the building. Roof area is 11,060 square

feet. Wet wells, foundations, and building frame are of reinforced concrete, walls of concrete block, roof of Pyrofil. The building houses three 36 inch 13,600 GPM pumps and three 30 inch 7500 GPM pumps; provision has been allowed for possible expansion by future installation of five additional pumps of each size.

(2) Cooling Tower (H-832). - The K-27 water cooling tower (App. E25) consists of 14 cells with redwood baffles. Each is equipped with a 50 horsepower vertical overhead induced draft fan. The tower dimensions are 63 feet by 337 feet by 31 feet high. It is erected over a 13-1/2 foot deep water storage basin, which connects by flume with the pump house wet wells.

j. Storage and Maintenance Building (K-1131). - Originally planned as a K-27 dry air generating plant, analogous to Building K-1101 for K-25, Building K-1131 was designed to house dehumidification equipment, and was partly constructed. When it was found that the K-25 dry air plant would be capable of handling the additional K-27 load without installation of additional dehumidification facilities, construction of K-1131 was halted. After the completion of other more pressing phases of the K-27 construction, the structure was completed, and converted into a storage and maintenance building. The floor is of reinforced concrete slab resting on clay, with framework of steel, walls of corrugated asbestos siding. The roof is flat and constructed of Pyrofil, built-up roofing, and slag topping. The building is located 200 feet north of process building K-402-8. Dimensions are 567 feet by 82 feet by 34 feet high.

k. Compressor Building (K-1231). - Housing equipment for compressing dehumidified air, from Section 1100, to 55 p.s.i. for instrument use within the K-27 plant, Building K-1251 is located 100 feet north of K-402-9, and measures 162.5 feet by 42.5 by 42 feet high. The structure consists of a steel frame, reinforced concrete foundations and floor slab, Transite walls, and Pyrofil roof.

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a. Chronology. - Construction was begun on 18 September 1943, the first steel was erected on 27 September 1943; the first portion of the conditioning building was placed in operation 21 March 1944; and the first conditioning gas was generated on 27 June 1944. Construction progress is shown in Appendices C9 and C10. Location of structures discussed below is shown in Appendices B5, B9, and B12.

b. Conditioning Building (K-1401). - The conditioning building (App. E33, E35) is an extensive one-story structure with partial basement, situated 300 feet east of the cascade "U". It is 1000 feet long, 400 feet wide, and 25 feet high. The basement is subdivided into four compartments, measuring, respectively: 140 by 60 feet, 200 by 20 feet, 260 by 200 feet, and 60 by 60 feet, making a total basement area of 68,000 square feet. Ground floor area is 400,000 square feet, and total volume is 10,680,000 cubic feet. The foundation and floor are of reinforced concrete; framework is structural steel, Outside walls are largely devoted to windows, the balance being pre-cast cinder concrete blocks. The roof consists of pre-cast concrete slabs covered with 1-1/2 inches of Cellotex insulation and a built-up covering topped with slag. The building is divided by interior walls, partitions, and floors into four main enclosed sections: furnace room, furnace room basement, cleaning and vacuum test area, and open area. The furnace room walls are of cinder block. A central office, with wood and Cellotex walls, 40 feet wide, 280 feet long, and 10 feet high is located in the open area. The office flooring is asphalt tile, the balance of the flooring is finished concrete. Building K-1401 is heated by means of unit heaters suspended from the roof truss, and taking air through the roof from outside.

e. Fluorine Generating Plant (Section 1300).

(1) Fluorine Generating Building (K-1301). - The equipment installed in Building K-1301 consists of seven electrolytic cells with auxiliaries. Space has been allowed for possible future installation of seven additional cells. The building is located 100 feet north of the west wall of the conditioning building. A photographic view is shown in Appendix E34. K-1301 is a one-story structure for the most part, but contains a small second floor, housing rectifiers, ventilating equipment, and an emergency stack fan. Dimensions of the first story are 52 feet by 145 feet by 14 feet high. The second floor measures 15 by 109 feet, with two small additional wings. The foundations, frame, floors, and roof are of reinforced concrete. Walls, interior partitions, and the exhaust stack are of tile. Building K-1301 was erected between November 1943 and June 1944.

(2) Fluorine Storage Building (K-1302). - Located 250 feet north of Building K-1301, the fluorine storage building is a one-story structure with a flat roof sloping from a height of 20

feet on the south side to 12.5 feet on the north side. Plan dimensions are 44 feet by 74 feet. Three walls and the interior partitions are of reinforced concrete, while the roof and back side, as well as the upper portion of one side wall, are covered with black corrugated steel sheets. The floor is a concrete slab, and rests on clay.

(3) Fluorine Bottling Building (K-1303). - The fluorine bottling building is located 325 feet north of the east wall of the conditioning building. It measures 179 feet by 58 feet, by 15 feet high, and is divided into an office, storage room, fan room, twelve 12 foot by 12 foot liquefaction cubicles, and operating corridors which surround, and pass between, the cubicles. The foundation, floor, frame, and roof are of reinforced concrete. Walls are of concrete for three feet (from outside ground level to floor level), and brick above. The roof is of built-up construction with slag topping. An emergency chimney is provided for venting of rupture disc discharges.

d. Fluorine Disposal Building (K-1405). - The fluorine disposal plant is located 310 feet northeast of the conditioning building, and includes Building K-1405, an alkaline scrubbing tower, and a 70 foot high, four-inch diameter, Monel metal vent stack. The central section of Building K-1405 is a two-story wood frame structure, 16 feet long and 50 feet wide, covered with corrugated Transite siding and roofing. An adjoining 11 by 34 foot single-story west wing is of wood frame construction with brick and tile walls and Transite roofing. The east wing is a two-story frame structure of dimensions 33 by 34 feet, with a wood frame, and Transite walls and roof. Tile walls separate the central section from the two wings. The floor slab and foundations are of reinforced concrete; the roof trusses are made up of wood planks.

e. <u>Acid Neutralizing Plant (K-1407).</u> - Building K-1407 is of wood frame construction, 64 feet by 25 feet by 10 feet high, with a partial basement under the north end, measuring 14.5 feet by 25 feet by 12.5 feet in height. Sides and roof of the main floor are covered with Transite; the floor slab of the ground floor and basement is reinforced concrete.

f. <u>Nitrogen Vaporization Plant (K-1408).</u> - Building K-1408 is a small, single-story, frame structure housing vaporization equipment and distribution control apparatus for gaseous nitrogen supplied to the process and conditioning areas. Dimensions are 20 by 31-1/2 feet in plan, and 10 feet in height, to the bottom of the roof truss. The nitrogen plant was designed and constructed by Ford, Bacon, and Davis from basic sketches prepared by the Linde Air Products Company.

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3-8. <u>Administration Area.</u> - The administration area (App. E4, E38) includes the majority of the Section 1000 buildings, which serve administrative, personnel service, and miscellaneous functions. Located southeast of the process area, the administration area includes some 21 sizeable buildings, plus a number of minor structures. Construction was accomplished concurrently with the process area facilities. Construction of all buildings was done by the Jones Company, with the exception of the four K-1008 change houses, which were built by Ford, Bacon, and Davis. Location of structures described below is shown in Appendices B8, B9, and B12. Periods of building erection are charted in Appendix C8.

a. <u>Administration Building (K-1001).</u> - The administration building (App. E39) is located at the main entrance of the diffusion plant area, 2,000 feet southeast of the main process building "U". It is a two-story wood frame building resting on reinforced concrete foundation piers. It consists of four double wings connected by a central corridor, 378 feet long and 37 feet wide. Each of the eight wing-halves measures 96 feet by 40 feet by 22 feet high. Exterior walls are of wood siding, interior walls are of plaster board with wood trim. The roof is covered with composition shingles. There are six brick-walled, concrete base, fireproof vaults opening into the building, 17 feet by 13 feet by 22 feet high. K-1001 was designed and built between September 1943 and June 1944. During plant construction, it was used for engineering and construction offices. It currently houses the central administrative offices of the Carbide and Carbon Chemicals Corporation and the K-25 Division.

b. <u>Cafeteria (K-1002).</u> - The original Carbide cafeteria building was erected between January and August 1944. In the middle of 1945, it was enlarged and re-designed to its present form. Located 800 feet north of the administration building, it is a one-story wood frame structure with hipped roof, containing a main dining room, a small white lunch counter room, a colored lunch room, and a complete modern kitchen including a bake shop, butcher shop, sandwich shop, storage and refrigeration facilities, loading platforms, locker rooms, a private dining room, and a time office. As revamped, the outside squared dimensions are 243 feet by 210 feet by 12 feet high at sides, and 24 feet to the top of the roof ridge. Foundation and floor slab are of reinforced concrete, outside walls of siding, inside walls of sheetrock with wood trim, roof of composition shingles. It is heated by unit heaters ~~ventilators~~.

c. Dispensary (K-1003). - A one-story wood frame building on concrete piers with a hipped roof, Building K-1003 is located 500 feet north of the main administration building, and houses complete facilities for a works dispensary. It consists of a main unit 136 feet by 40 feet by 13 feet high at the wall line, a north wing 106 feet by 40 feet by 13 feet high, and a south wing 113 feet by 40 feet by 13 feet high. It has a wood floor, outside walls of wood siding, and inside partitions of sheet rock with wood trim.

d. Service Laboratories (K-1004-A, -B, -C). - The three service laboratory buildings (App. E38) are interconnected by corridors and air-conditioned. They are of permanent fireproof rectangular construction with flat roofs, one floor, and a basement. The basements, foundations, and floors are of reinforced concrete; the framework is structural steel, walls of pre-cast concrete blocks. The roof is poured-in-place Pyrofil, covered with built-up tar and felt, and topped with slag. Floors are covered with magnesite.

e. Works Laboratory (K-1004-D). - A one-story wood frame building with steep hipped roof and two wings, the works laboratory is located 275 feet north of K-1004-C. It rests on a concrete pier foundation. Outside walls are of wood siding. The building includes a main section 170 feet long and 49 feet wide, two major wings, each 96 feet long and 48 feet wide, and a small central wing 45 feet long and 30 feet wide. Roof height is 12 feet at the eaves, and 27 feet at the ridge.

f. Payroll and Safety Building (K-1005). - Located midway between K-1001 and K-1003, the payroll and safety building is a one-story wood frame structure consisting of a main portion 137 feet long by 40 feet wide, two wings, each measuring 82 feet in length and 40 feet in width, and a 184 by 7 foot screened porch for pay lines. Structural details are similar to the cafeteria and dispensary buildings.

g. Change House (K-1008-A, -B, -C, -D,). - The four K-1008 change houses are structurally identical, although K-1008-D was revamped internally for a cafeteria during construction, and, since that time, for a canteen for conditioning-area workers. Each of the other three change houses consists of two locker rooms and a connecting shower room. They are located about 80 feet south of the conditioning building. Dimensions of each are 167 feet by 68 feet in plan, and 12 feet in height at the eaves, or 24 feet at the ridge. They are similar in mode of construction to foregoing administration area buildings.

h. Laundry Building (K-1015). - The laundry building is a one-story wood frame, flat roof, structure located 100 feet east of the cafeteria. The main section is 99 feet long by 51 feet wide, and the main wing is 89 feet long by 22 feet wide. An addition to the northeast corner of the main wing is 31 feet by 18 feet in plan. Roof height is 12 feet. A 15 foot wide ventilator monitor runs the length of the main portion.

i. Gate House and Guard Building (K-1020). - K-1020 is located 80 feet south of K-1008-A. It is a one-story, hipped roof, frame building on concrete foundations with a concrete floor slab. The original building was 138 feet long by 41 feet wide, and 15 feet high. Five additions were subsequently constructed as follows:

1. 92 by 28 feet.
2. 110 by 28 feet.
3. 27 by 24 feet.
4. 33 by 25 feet.
5. 74 by 41 feet.

j. Fire House and Ambulance Garage (K-1021). - 50 feet south of K-1020, K-1021 is a one-story wood frame structure with a 7 by 7 foot four-story tower, 30 feet high. The main structure measures 59 by 40 feet in plan, and is 12 feet high at the eaves. Two minor additions have been made to the original structure.

k. Bus Terminal (K-1026). - The bus terminal is located 900 feet southeast of the process "U". All busses connecting the plant with the Oak Ridge townsite use this terminal. (Off-area busses use several nearby parking areas.) The terminal includes a building 96 feet long, 22 feet wide, and 11 feet high at the eaves, housing the waiting rooms, dispatchers' office, and ticket office; Platform No. 1, which is 250 feet long by 18 feet wide, with a 185 foot roof; and Platform No. 2, of identical dimensions and with a 168 foot roof. The terminal is heated by means of a steam boiler housed in a small concrete block building just south of the main structure.

l. Bus Repair Shop (K-1027). - The bus repair shop is located 50 feet south of the terminal. It is a one-story wood frame building consisting of a 50 by 20 foot shop, 16 feet high, an attached 29 by 12 by 12 foot office, and an open, covered service shed, 35 by 38 by 12 feet high. The facility will accommodate two busses. There are two service stands with gasoline pumps under the covered shed.

m. Field Office Building (K-1029). - This building (App. E40) was erected during January and February of 1945 to meet the current requirements for additional office space. During the construction period, it was occupied by the Kellex and Jones organizations. Since the completion of plant construction, it has been used by Carbide as a field office building. It is a two-story wood frame structure built in the shape of a "U", and is located 400 feet south of the main process buildings. The building rests on concrete block piers, and consists of a main section 87 feet long, 40 feet wide, and 17 feet high, plus two 120 by 38 foot wings. Attached to, and opening into, the building are two brick-and-concrete, two-story vaults, and one one-story vault.

n. Industrial Relations Building (K-1032). - Located outside the plant area fence, and 270 feet south of the administration building, K-1001, the industrial relations building, houses office facilities for receiving and processing new employees, and includes various Carbide administrative offices having to do with training, housing, personnel records, and other matters pertaining to industrial relations. It is a two-story wood frame building, structurally similar to one wing of Building K-1001, 238 feet by 37 feet in plan, and 21 feet high, with a small east wing measuring 36 by 37 feet. A two-story 17 by 13 by 17 foot fireproof vault opens into the east side of the building. It was designed and built by the Jones Company in March 1945.

o. Process Area Administration Building (K-1034). - Together with K-1029, this building (App. E40) houses the Carbide field technical administrative facilities. It is located 600 feet south of the process "U". It was built in April 1945 and was originally used by Kellex, Jones, and the District Office. It is a two-story "H"-shaped wood frame structure. Each wing measures 200 by 38 feet in plan, and 17 feet in height. The connecting structure between wings measures 87 feet by 40 feet. Adjoining the building, in the south court of the "H", are two brick-and-concrete two-story vaults measuring 14 by 14 by 17 feet. In the north area between wings is a large two-story reinforced concrete file vault accessible from within the building, and from a concrete loading ramp.

p. Telephone Exchange Building (K-1039). - The telephone exchange building is located 100 feet southeast of the service laboratories, and serves the entire K-25 area. It is an automatic station, enclosed in a one-story, flat roof structure. The floor slab, frame, and roof are of reinforced concrete. Outside walls are of brick; interior walls are of finished glazed tile. A small concrete cable vault lies below a portion of the floor. Dimensions are 58 feet by 41 feet by 16 feet high. It was designed and built by the Jones Company, using basic data furnished by the Bell Telephone Company.

5-9. Construction Plant Facilities. - During the course of the K-25 construction program, the many types of large scale construction activities going on required varied and extensive handling facilities. Construction plant facilities included quarries, shops, construction warehouses, a concrete mixing plant, a transportation plant, and earth moving and excavation equipment. Subcontracts were let (App. A2) for furnishing crushed stone by the ton from quarries both on and off the site, and for furnishing and truck delivery of mixed concrete by the yard. Transportation of materials involved a large truck fleet with adequate repair and maintenance facilities.

a. Quarries. - A large quantity of crushed stone and sand was required in the construction work: crushed stone for road work and parking areas, coarse and fine aggregate for concrete, and graded stone for stabilized rock fill. In all, it is estimated that about 869,330 tons of crushed stone was used. In June 1943, Lee Lambert was operating a quarry for road stone on the U. S. Route No. 70 (App. B1). Crushed stone for the early roads was purchased from this quarry. That company then opened up a quarry across the river from the power plant area. In connection with construction of the railroad from Blair, D. W. Winkelman opened a quarry off the area from which railroad ballast and aggregate stone was furnished. The Birmingham Slag Company shipped in, from their commercial quarries, most of the aggregate used, including sand. In September 1943, Lambert Brothers and the Birmingham Slag Company, operating together, opened up the principal quarry on the area (known as Poplar Creek Quarry), 2400 feet northeast of the conditioning building, from which most of the road stone and concrete aggregate was obtained after September 1943. Road stone was furnished to the J. A. Jones Construction Company by Lambert Brothers and the Birmingham Slag Company under subcontract (App. A2); concrete aggregate was sold to Cooney Brothers and the Transit Mix Concrete Corporation. Sand was all shipped in from outlying points. Most of the stone was sold delivered, until 20 July 1944, when the Jones Company, using government trucks, began taking delivery at the quarry.

b. Shops. - Each specialty subcontractor had its own work shop, as did each of the prime contractors. Of the general shops, the Jones Company operated a truck and car repair shop throughout the construction period. A heavy equipment repair shop was built north of the power plant area; a sheet metal shop and a carpenter shop were operated by Jones just east of the K-27 area. At the beginning of operations in the process area, an additional motor repair shop was built. Other general shops included a riggers loft and a structural steel prefabricating shop. A roundhouse was built to care for repair and servicing of railroad equipment. In all, about 180,000 square feet of temporary shops were set up.

c. Warehousing. - At the start of power house construction, four warehouses were built, each of approximately 10,000 square feet floor area, for Jones, Pope, Schulman, and Combustion, respectively. While these were being built, an unloading and storage area of approximately 10 acres was graded. Subsequently, 5,000 feet of unloading track was laid in the yard. When process area construction began, two warehouses were built, each containing approximately 25,000 square feet of floor space, to store materials and equipment received by Jones, but not immediately required in the construction. Similar warehouses were built for the Comstock and Bryant Electric Companies, for the Midwest Piping and Supply Company, and for the Poe Piping and Heating Company. Several small warehouses were also built for specialty subcontractors. A total of about 147,000 square feet of temporary warehousing was constructed. (Permanent warehouses, later becoming a part of the finished production plant, and construction camp warehousing facilities, are discussed in Paragraphs 3-5 and 3-10, respectively.)

d. Concrete Mixing. - When construction work at the power house was begun, the Transit Mix Concrete Corporation was operating under prime contract W-7418-eng-4 in the Y-12 area. Under Modification No. 5 to that contract, dated 7 July 1943, a batching plant with a capacity of 1000 cubic yards per eight-hour shift was erected on the river bank near the power house site. It then furnished concrete for the power plant work, and later, a small amount for the process area work. The concrete was batch-mixed in this plant, and delivered to the job in transit-mix trucks. Placing was done with pumpcrete machines. Aggregate was obtained from the Birmingham Slag Company and delivered by barge to a stock pile near the batching plant. After completion of the power house, subcontract 16 (App. A2) was awarded to Cooney Brothers for supply of mixed concrete for the other areas. That company erected a five-yard batching plant at the site, and furnished concrete which was mixed in transit-mix trucks and delivered to the required locations, where most of it was placed with pumpcrete machines. On 15 October 1944, the subcontract with Cooney Brothers was terminated; thereafter the mixing was done directly by the Jones Company. Control of proportioning, mixing, and placing of concrete, in order to insure a uniform high quality of product, was the responsibility of the concrete inspection department of the Kellex Corporation. Coarse aggregate was supplied by Lambert Brothers and the Birmingham Slag Company from the Poplar Creek Quarry, while the sand was shipped in by the Birmingham Slag Company from its off-site commercial plant.

3-10. <u>Construction Camp Facilities.</u> - Because of the remoteness of the site, and the lack of sufficient living accommodations within possible commuting distance, the two principal construction contracts provided for the construction and operation of temporary housing facilities. Camp facilities were located as near as possible to the construction areas (App. B3, B12), and were operated by the contractors, independently of the central facilities located in the Oak Ridge Townsite (Book I, Vol. 12). All facilities were of temporary low cost construction. Extensive use was made of pre-fabricated construction, and trailers were procured from other Government agencies. For reasons of security, it was necessary to maintain the utmost secrecy regarding the camp housing program, since publicized details would disclose information relating to the magnitude of the Project. Responsibility for schemes of development was assigned to only a few of the contractors' key Personnel.

a. <u>The Jones Camp.</u> - The initial authorization to the Jones Company included construction of 450 hutments and necessary cafeteria and washing facilities. This work was started on 5 June 1943. With the progress of construction, and increasing congestion in the Knoxville area, it became necessary, from time to time, to increase authorized facilities as the need became apparent. The Jones housing facilities ("Happy Valley") ultimately included dormitories, trailers, Victory Houses, a school, a commercial center, cafeterias, bakery, post office, camp storehouses, a refrigeration and cold storage plant, a theater, three recreation halls, a camp warehouse, a sterilization plant, and the camp operations office. Housing statistics are tabulated in Appendix D8. It will be noted that figures tabulated refer only to the working member of each family. At one time camp population was approximately 15,000. Millions of meals were served including over 300,000 field lunches; more than 2,000,000 sandwiches were sold at canteens. The stores, operated by concessionaires under Jones subcontracts, sold more than $2,000,000 worth of merchandise.

(1) Facilities.

(a) Dormitories and Barracks. - 8 dormitories and 17 barracks were constructed, with a total capacity of 3,500 persons. Of these, the dormitories were two-story, steam-heated, frame structures, each with its living room and inside toilet and shower facilities. Two dormitories were allotted for female occupancy, and six for male. The barracks were one-story, pre-fabricated structures of lower grade construction than the dormitories.

(b) Hutments. - 1590 four-man hutments were constructed, 16 feet square, stove-heated, and grouped in blocks around central wash rooms. The hutments were pre-fabricated, with screened windows.

(c) Trailers. - 1153 trailers were placed in groups around community bath houses. The trailers were supplied by the Federal Public Housing Authority through the Manhattan District.

(d) Victory Houses. - Of somewhat higher quality construction, and having inside toilet facilities, the 100 Victory houses were small pre-fabricated dwellings. They were occupied by the contractors' foremen and their families.

(e) School. - A school building with a floor area of 34,000 square feet to accommodate 1800 pupils was built in November 1943. Of ample size and pleasing appearance, it has been in continuous operation to date.

(f) Commercial Center. - In November 1943 a commercial center was constructed and placed in operation. The buildings were set side by side along the main thoroughfare. They were one-story, flat-roofed buildings of the most temporary wood construction, and housed a grocery store, barber shop, shoe shop, and a dry goods store. A community building was erected in June 1944, to house a nursery, Red Cross, and women's club activities. Recreation buildings, were erected in February and June 1944.

(g) Cafeterias. - As requirements increased, cafeterias were constructed at locations scattered throughout the camp area so that the distance from living quarters would not be too great. In the later stages of the program, there were eight cafeterias in operation, having a combined capacity of 13,000. All were temporary frame buildings. The last and largest of these was converted, after the construction peak was passed, into offices for the Jones Company after they moved from the restricted area.

(h) Bakery. - In April and May 1944 a bakery was erected just north of the commercial area.

(i) Refrigeration Plant and Cold Storage. - In August 1944 an ice plant and a cold storage house were erected. This plant supplied storage facilities for perishable supplies, and manufacturing facilities for ice for drinking water and domestic use.

(j) Theater. - A theater was built in February 1944 with a seating capacity of 1,200. It served all Project residents.

(2) Disposal. - On 25 January 1946 camp operation was transferred to the Roane-Anderson Company. A portion of the trailers had previously been returned to the Federal Public Housing Authority, and the balance was subsequently returned by Roane-Anderson. The Victory Houses were returned to the Jones Company from Roane-Anderson on 9 May 1946, and were re-opened in connection with X-10 Project activities (Book IV). As of 31 December 1946, 77 of the houses were occupied by 209 persons (including 165 children). All of the hutments were sold by the Jones Company on open bid. Five of the eight dormitories have been dismantled and re-erected for use at X-10. Of the 17 barracks, one was retained by the Jones Company, and eight were dismantled and turned over to the F.P.H.A. in July 1946. (They were re-erected and converted to apartments at the University of Tennessee.) The school was transferred to the District in March 1946 and has since been operated as the "New Wheat School" by the Oak Ridge school system. The theater, bowling alley, a recreation building, and 32 other camp

buildings have been used as Jones Company warehouses to date. The ice plant was transferred to the Roane-Anderson Company in November 1945. Cafeteria and machine shop equipment was transferred to the Roane-Anderson Company, the Veterans Administration, and various Government agencies.

b. The Ford, Bacon, and Davis Camp.

(1) Facilities. - Organized and operated along similar lines, a smaller camp was maintained by Ford, Bacon, and Davis, accommodating approximately 2,100 persons. It contained 244 trailers, housing 1122 persons, 250 hutments (white and colored), and 1 cafeteria serving a maximum of 3,000 persons per day. In January 1944, a recreation and community hall was opened under the supervision of a recreation director. A comprehensive program of activities was initiated shortly thereafter, including movies, community singing, horse shoe pitching, baseball, and other sports. A similar program was instituted in the colored section. A day nursery was provided for children of working parents, and a Sunday School was opened. The Ford, Bacon, and Davis colony also included such commercial facilities as a grocery and meat store, barber shop, and beauty parlor.

(2) Disposal. - Upon completion of construction activities, the Ford, Bacon, and Davis camp was transferred to the Roane-Anderson Company. The trailers were subsequently returned to the Federal Public Housing Authority.

3-11. Construction Features. - A tabulation of principal quantities of material and equipment used in the construction of the K-25 and K-27 process areas is given in Appendix D9. Further indication of the scope and extent of the construction work may be obtained from the building sizes and cost estimates of Appendix D1, and from the contract cost figures of Appendix A. This paragraph outlines major construction features with specific reference to the functional center of the gaseous diffusion plant, the main process buildings. Except for numerical statements, remarks generally apply also to the K-27 area. K-27 construction, though smaller in magnitude, involved similar technical problems, utilized corresponding erection techniques, and was built according to comparably rapid schedules. Since it was constructed after the greater portion of the main process area was complete (App. D6), such problems as organization, transportation, and force housing were very greatly reduced, and the work could be prosecuted on an immediately effective basis by taking advantage of the technical and practical "know-how" gained during the prior K-25 activities. A panoramic view of the gaseous diffusion plant is shown in Appendix E41. Further details of the K-25 and K-27 construction programs are given in Sections IV and S-IV, respectively, of the Kellex Completion Report. A comprehensive detailed presentation of structural, mechanical, and electrical specifications for the entire plant is indicated in Appendix F6.

a. Structural.

(1) Steel. - The major portion of the structural work was involved in the construction of the main process buildings. These buildings are of simple structural design; their erection is distinguished principally by the magnitude of the job (e.g. some 30,000 tons of structural steel were required), and by the severe time scheduling of the work. Structural erection followed rapidly upon

the completion of design; in the earlier stages of the program, coordination of structural work with design work was difficult, involving a certain amount of inefficiency and required changes. Nevertheless, the work progressed rapidly, and no serious delays were caused in other phases of the construction program because of lagging progress in building erection. The repetitive nature of the work on the 51 process buildings and 3 purge buildings was of great advantage in offsetting early delays, and facilitating the completion of the overall job within allotted time schedules. In accordance with anticipated cleanliness control measures (see below), a carefully planned sequence of erection was necessary. Also, temporary partitions and access doors were arranged so that this control could be maintained. Practically all structural steel was shop fabricated prior to shipment to the site, but a well equipped shop was also set up within the area, making it possible to do some field fabrication, such as alterations based on field changes.

(2) Concrete. - Approximately 200,000 cubic yards of concrete were used in the main process buildings. All concrete was dry batched into transit mix trucks for mixing and delivery to the point of placing. The bulk of the concrete used in the process buildings, with the exception of footings, was placed by means of pumpcrete machines. During construction, every effort was made to inspect the mixing, transportation, and placing of the concrete with great care. Whenever possible, forms for concrete construction were made up in large panels or sections, which could be used repeatedly with little or no alteration, thereby promoting speed and economy.

(3) Equipment Enclosures. - The construction of the dry air equipment enclosure system (Vol. 3) is of interest because of the magnitude of the work, the unusual construction involved, and the extraordinary tightness requirements. These enclosures required the fabrication of approximately 13,000 tons of #16 gauge steel sheets and 3/16 inch steel plates (App. E16). As many as 300 to 400 welders were simultaneously occupied in this work, which involved the production of an estimated 950 miles of air-tight welding. The application of insulation to these casings required about 2,000,000 square feet of two inch thick mineral wool felt, and 3/16 inch thick asbestos wallboard.

b. Mechanical.

(1) Piping. - The process gas equipment had to meet rigid tightness specifications, much more severe than any previously encountered in construction work. The entire process gas piping system (aggregating over 100 miles) was installed without the use of flanged joints. At one time over 1200 welding machines were in simultaneous use at the Project. All process equipment had to be thoroughly cleaned before being turned over to the construction forces for installation; it was then necessary to maintain extreme cleanliness during installation. The tightness requirement necessitated extremely careful control of the welding procedure, and painstaking inspection and testing. Because of the various metals used, differences in pipe thickness, and variations in joint design to meet specific conditions, 14 specially detailed welding techniques had to be developed, some of which had never previously been used commercially. In order to promote

speed, efficiency, and quality of workmanship, the greatest possible proportion of the work was done in fabricating shops. The Midwest Piping and Supply Company maintained a shop at St. Louis, Missouri, and in the conditioning building at the site. The arrangement of equipment, and the layout of the cell piping ~~was~~ were such that the piping could not take up flexure stresses caused by changes in pressure or temperature fluctuation. Moreover, the stage pumps were also unable to take external piping stress. Accordingly, diaphragm type expansion joints were used, but slight variations in equipment setting locations still caused some undesirable stresses with adverse effect on pump operation. The problem was solved by specifying a definite and carefully planned sequence of pipe and equipment erection.

(2) Stage Converters. - The installation of some 3500 diffusion converters in K-25 and K-27 (App. E17), weighing up to seven tons each, and of delicate internal construction, led to the development of a special apparatus for the rapid and safe handling of these items with a minimum manpower requirement. The method involved the use of special dollies rigged to slip under the converters on the in-coming freight cars, and specially equipped trucks onto which the dollies could be rolled, and then rolled off onto the platform of the conditioning building. This procedure was also used to transport and transfer the converters to their points of installation in the cascades. None of the converters had to be rejected after placement because of damage occurring during installation operations.

(3) Stage Pumps. - Nearly 7000 process stage pumps also had to be placed and connected within the cascade system (App. E15).

This work was accomplished with a negligible amount of equipment damage.

c, Electrical. - The electrical installation at the gaseous diffusion plant is notable for its size, its complexity, and the requirement for generation and utilization of power at a variety of frequencies. Calling for the construction of a plant to produce and utilize over 200,000 KW of power, the diffusion plant electrical design is unique in magnitude. About 825 miles of electrical conduits, 3800 miles of cables and wires of various sizes and classes, and over 8,000 motors are included in the K-25 installation.

(1) Temporary Installations. - The provision of temporary electrical facilities during the construction period posed a number of problems, and conflicted, to some extent, with the construction of permanent facilities, particularly since work on the two installations had to be carried on simultaneously over an extended period of time. There are no permanent lighting facilities inside the cell enclosures; temporary lighting had to be provided in each of the 572 cells of the K-25 and K-27 cascades, in order to permit installation of equipment. At one time, the electrical contractor, Comstock and Bryant (App. A2), maintained 45,000 temporary lamps in the main process buildings alone. The large number of welding machines in use also had to be serviced mainly by temporary facilities. At its peak, the temporary light and power load of the main process buildings was served by 10,500 KVA of temporary transformer capacity. With load centers shifting from day to day, the chief problem was to provide the necessary flexibility. In order to solve this problem, 18 portable, skid-mounted 13,800/120/208 volt substations were designed, ranging

in size from 225 to 450 KVA. These mobile substations permitted shutdown, relocation, and re-energizing cycles of less than ten hours.

(2) Permanent Installations. - The 1000 permanent transformers in K-25 and K-27 are all of the air-cooled type, and must be kept dry and free of dust at all times. This involved obvious difficulties resulting from the tight construction schedule, which made it desirable, and sometimes necessary, to set the transformers before the vault construstion and other building erection had progressed far enough to eliminate all possibility of contamination by dust or moisture. In such circumstances it became necessary to cover the transformers, and to supply heat inside the casing. Before the units were finally energized, they were vacuum-cleaned. In many cases the testing of electrical systems had to be performed prior to total completion of the system, because operating activities followed so closely after construction. This required that special testing procedures for electrical installations be initiated, and that special safety precautions be developed. The testing of equipment became a major activity. For the sake of efficiency, testing was departmentalized so that individual crews could specialize in specific classes of equipment. The heating of cell and pipe enclosures, process lines, and jacketed vessels required 18,000 KW of automatic electrical heating equipment. Lighting for the various buildings and areas required over 22,000 lighting fixtures. The supervisory control equipment, installed in connection with the central control room for the process, comprises one of the largest installations of this type of equipment that has ever been assembled. In addition, there were installed a comprehensive

telephone system, loud speaker call system, fire alarm system, and grounding system for the permanent grounding of all electrical equipment.

d. Instrumentation. - It is probable that the instrument installation in the gaseous diffusion plant (Vol. 2, Vol. 3) is the largest ever accomplished; it is certain that its diversity has no parallel. The receiving, warehousing, installation, testing, operation, and maintenance of instruments, control devices, and analytical devices combined to form one of the major activities of the Project. Because proper and accurate instrumentation is indispensable to successful operation of the plant, requirements for accuracy of performance, vacuum tightness, cleanliness, and dependability were without precedent.

e. Vacuum Tightness. - Practically the entire process system is operated at sub-atmospheric pressure. In order to achieve satisfactory performance, it was necessary to insure that inleakage be held within severely rigid tolerances (Vol. 1, Vol. 3). Moreover, many auxiliary systems, which are not part of the process system proper, but which operate in conjunction with it, some of which handle highly valuable chemicals (e. g. process coolant) or highly toxic substance (e.g. fluorine), had to be quite tight for reasons of plant economy and personnel safety. Ambient air and nitrogen gas systems (handling fluids whose prime requisite is extremely low dew point) had to be very tight in order to prevent infiltration of moist atmospheric air. Inleakage of atmospheric air to process service systems was to be doubly guarded against by operation of buffer and blanket systems at super-atmospheric pressures, so as to negate the effect of any minute leaks finally occurring in spite of the elaborate precautions taken during installation, but this in no way detracted from the stringency of fabrication workmanship specifications. The attainment of K-25 vacuum tightness specifications proved to be an immense task from the construction standpoint. Unique methods of vacuum testing had to be developed and applied on an enormous scale. Where possible, equipment was tested before delivery; the overall and final testing was done at the site. The number of individual vacuum tests made are estimated at well over one million.

f. Cleanliness Control. - All hope of successful operation of the gaseous diffusion system was predicated upon essentially perfect attainment of a "clean" plant (Vol. 1). There resulted a dual program of cleaning and cleanliness control. Thus, it became necessary, first, to clean all parts of the process equipment system, and secondly, to maintain all items in a condition of controlled cleanliness without subsequent contamination during installation. The cleanliness control program, set up as a result of this second requirement, soon assumed major proportions, and came to define many of the techniques and specifications to be followed during the work of construction. On 18 April 1944, the J. A. Jones Construction Company set up a cleanliness control unit as a department. The first practical application of cleanliness control was encountered on 26 May 1944, when two cell areas in Building K-303-2 were placed under restriction, the cells having been isolated from the remainder of the building by means of temporary partitions. Within the following week, restriction of the entire K-303-2 building was effected, and erection was begun of process gas piping, previously subjected to a thorough cleaning treatment in the conditioning building (Vol. 5). The goal of the cleanliness control program was to create and maintain the conditions of cleanliness, required by process design specifications, during erection of process gas piping and connection of piping and process equipment. These specifications may be summarized as follows:

1. A building must be closed completely.
2. Pressure ventilation must be used, with filtered air.
3. Entry of all personnel and material must be controlled from a cleanliness standpoint.
4. Cleaning must be by vacuum cleaners and mopping, avoiding the dust-raising of dry sweeping.

The institution of cleanliness control necessarily interfered, to some extent, with the normal methods of construction activity. At first, extremely rigid regulations were impos d; these were somewhat relaxed as practical experience was gained, but without discontinuance of sufficient precautions necessary to conform with cleanliness specifications. Construction personnel, working under cleanliness control, were subjected to inspection upon entering a restricted building. In the early stages of the work, shoes, trousers, shirts, caps, and goggles were furnished to workers; those handling equipment were required to wear white lintless gloves. Material supply trucks were hosed down at the building entrance. In cases where process pipe joints had to be opened and rewelded in uncontrolled areas, the immediate vicinity was surrounded with a thin canvas fabric which was inflated to positive pressure, forming a large "balloon" around the joint; the welding work was then done inside. With the development of the program, the clothing of supervisory and other classes of personnel required to enter and leave buildings continually, was simply brushed off and vacuum cleaned, and the requirement for a complete change of clothes was discontinued in these cases. The procedure used in placing a building under restriction for cleanliness control involved primarily, partitioning it off to effect separation from adjoining units (the process buildings are not walled separately above the ground floor level). Next, the building was thoroughly cleaned from roof to basement in that order; all construction debris was cleaned away, and all interior surfaces wiped down by hand and vacuum cleaned. Once clean, elaborate precautions were taken, as discussed above, to maintain cleanliness. At the peak of construction activities, 32 buildings were simultaneously under cleanliness control restrictions, together with 10 cold trap rooms and other special locations. As soon as the process gas piping and connecting equipment were welded tight, buildings were released from control so as to permit completion of insulation and other work creating debris. The K-25 cleanliness control program is thought to be one of the most unique activities ever encountered on a construction job of any considerable scale.

SECTION 4 - SAFETY AND SECURITY

4-1. Safety Program. - Following usual industrial procedure, and War Department policy, a safety and accident prevention program was inaugurated with the inception of construction activities. The Manhattan District has maintained a resident Safety Engineer at the Project site since the start of construction, to supervise and assist the safety departments set up by contractors. The prime contractors were each required, under the terms of their contracts, to employ a full time, qualified safety engineer, and to develop an adequate safety program, the objective of which was the reduction to a minimum of the number and severity of accidents occurring, by means of employee education, and enforcement of rules and regulations. Project-wide use was made of safety posters and other literature, and a considerable safety organization was built up as the total number of employees increased. The Jones Company's safety organization grew to include a maximum of 25 persons employed under the Safety Engineer; Ford, Bacon, and Davis employed 5 persons under a Safety Engineer. The program in general was based on standard District policies and principles as outlined in Book I, Volume 11. The accident record of the principal K-25 construction contractors is tabulated in Appendix D3, and the K-25 Project accident record is compared with other published records in Appendix D4. Further discussion of the K-25 site safety program and organization is presented in Volume 5.

a. Fire Protection. - In January 1944, the Jones Company set up a special department with responsibility for instituting and directing a fire protection program. As construction progressed, the very considerable amount of temporary frame construction which required protection necessitated a greatly increased force of fire prevention personnel. The Jones Company's fire prevention department gradually grew to include more than 100 inspectors and patrolmen. Beginning in 1944, the organization was supplemented by Carbide personnel and equipment, and, in June 1944, Carbide assumed responsibility for the fire protection program. Fire losses were held to a minimum during the construction period. There were no fires which caused a delay in the construction program, and total monetary loss from fires was quite small in comparison with the amount of property requiring protection.

4-2. Security Program. - The development of the Jones security organization followed general policies laid down by the District Intelligence Office (Book I, Vol. 14). The Jones personnel department started issuing photographic identification badges to all employees under their management in October 1943, and the first full time security agent was employed in January 1944. The constant emphasis on speed of construction, and the large numbers of workers requiring quick access to all areas complicated the problems connected with security; however, coordination within the organization was worked out, and no major violations of security are known to have occurred. Further discussion of the District security organization, the Ford, Bacon, and Davis security organization, and security measures taken at the K-25 site may be found in Volume 5.

SECTION 5 - PERSONNEL PROCUREMENT AND INDUSTRIAL RELATIONS

5-1. Personnel Procurement. - Throughout the course of the construction program, personnel procurement was a major factor in successful prosecution of the work. From the beginning of construction in June 1943, the various contractors actively recruited personnel of all classifications required for the job. A general discussion of this subject may be found in Book I, Volume 8.

a. Methods. - Under the regulations of the War Manpower Commission, contractors' representatives were assigned for prescribed periods of time in various United States Employment Service Offices throughout the country. These agents worked under the direction of the respective contractors' personnel departments at the site. The United States Engineer Office also recruited for the Clinton Engineer Works, allocating labor to the various contractors. Of the K-25 construction contractors, the J. A. Jones Company maintained the largest working forces, and encountered the greatest personnel problem, doing the bulk of the recruiting work. The Jones Company recruited for its own, and for its subcontractors', requirements, and supplemented the above methods through the extensive use of newspaper advertising. Throughout the country, company representatives interviewed applicants, and secured the services of those found eligible and qualified. Those hired at outlying points were furnished railroad fare and subsistence while enroute to the job. Considerable assistance was also obtained through the cooperation of labor unions, particularly at times of critically acute need for specific types of specialized craftsmen.

Recruitment of unskilled labor, involving mostly colored workers, was confined to the states of Alabama, Georgia, Mississippi, South Carolina, and Tennessee.

5-2. Employment Statistics.

a. Employment Growth. - Appendix D5 shows the strength variation of construction forces from the inception of the work in June 1943 through 31 December 1946, and includes a breakdown of the total figures by prime contractors. Appendix D6 shows the distribution of working forces by type of work, and compares the growth of personnel strength with the percentage of completion of the work. The existence of a sizeable working force after the indicated date of substantial completion is explained by the considerable amount of clean-up and clerical work remaining. In connection with supervisory force strength, the novel techniques and exacting specifications involved (e.g. cleanliness and vacuum tightness), the complexity of installations, the generally high requirements for quality of workmanship, and the widely separated working areas within the plant site all combined with the severe time schedules laid down, and the necessity for correlation and coordination between different crafts and different contractors, to require an abnormally high proportion of supervisory personnel. This is reflected in the "Administrative and Non-Manual" column of the table in Appendix D6. Appendix D7 presents a tabulated record of hirings, labor turnover, and absenteeism for the two principal contractors. An overall graphical summary of variation of payroll strength and absenteeism is shown in Appendix C25. In all cases, the figures given for prime contractors include the forces of pertinent subcontractors.

b. Total Employment. - The total amount of construction labor consumed at the K-25 site through 31 December 1946 is estimated at 110,048,961 man-hours, which can be separated into 104,381,938 for Kellex, Jones, subcontractors, and prime contractors under Jones supervision, and 5,667,023 for Ford, Bacon, and Davis and subcontractors. At the peak of construction employment (May 1945) the combined working force totaled 25,266, of which 20,379 were classed as manual, 3,747 were classed as administrative and non-manual, and 1,140 were included under camp operation and maintenance. Ford, Bacon, and Davis employed a total of 2,732 at the peak of their activities (February 1944), of which 2000 were manual construction workers, 602 were non-manual workers, and 130 were engaged in camp operation.

5-3. Work Stoppages. - No serious work stoppages occurred during the progress of construction. There were no authorized strikes. In consequence of a jurisdictional dispute, approximately 370 iron workers stopped work for one week in May 1944, with a loss of 14,500 man-hours. Approximately 2,600 steamfitters stopped work for two days in October 1944, with a loss of about 32,000 man-hours, alleging poor transportation, lack of housing, and inadequate time allowance at shift ends, for storing tools and changing clothing. Some 1500 electricians engaged in a three-day strike (40,000 man-hours) in December 1944, as a consequence of a dispute involving the selection of supervisory personnel. Less than 100,000 man-hours were lost by work stoppages of all sorts during the construction program. Completion dates were unaffected by these stoppages; representing about one tenth of one per cent of the total man-hours worked, this record reflects creditably for both labor and management.

5-4. Labor Relations. - Considering all circumstances - the length of the construction period, the necessarily rough living conditions imposed upon a large proportion of the personnel, the fact that labor was recruited over a very large geographical area, and the small opportunity for development of company loyalty in newly recruited forces - relations between management and labor were excellent throughout the progress of construction. The urgency of the Project, and its importance to the nation's war effort was continually emphasized to all personnel, and the excellent labor record may be attributed in no small measure to the patriotism of the workers, particularly since security prevented the development of morale by disclosure of the ultimate goal of the work. Wage disputes were infrequent, and never resulted in walk-outs. Hourly wage rates are tabulated in Appendix D2.

5-5. Recreation and Welfare. - Every effort consistent with War Department policy was made by both the Jones Company and Ford, Bacon, and Davis to keep the workers' morale at the highest possible level; considerable construction was undertaken with this end in view (Par. 5-10).

5-6. Transportation. - The K-25 site was not readily accessible from any large population center. The nearest city of consequence is Knoxville, Tennessee, about 40 miles from the plant. It was not possible to build up commercial carriers as rapidly as the need for workers from surrounding communities developed; both Jones and Ford, Bacon, and Davis operated Government-owned equipment to and from the near-by towns in order to provide employee transportation.

a. Busses and Trucks. - In July and August 1943, Jones began sending out trucks to bring in labor. By the end of August 1943, a total of ten trucks were in use; by October 1943, ten busses were in use; and by December 1943, twenty-six busses and sixteen trucks were operating on regular schedules. In January 1944, trucks were discontinued and replaced with trailer type busses, and by March 1944, the Jones company was operating 49 busses. In April 1944, the operation of all busses was taken over by the C.E.W. Bus Authority. The Ford, Bacon and Davis transportation history follows a course parallel to that of the Jones Company. At one time, forty busses and fifteen trucks with improvised seats were hauling between 2000 and 2500 persons per day to the Project.

b. Private Vehicles. - One of the prime concerns of the construction contractors was to keep as many private passenger automobiles in operation as possible. To this end "Share-the-Ride" clubs were organized and encouraged by every possible means. In cooperation with the War Department and the O.P.A., a gasoline and tire rationing board was opened at the site; it then functioned efficiently through the progress of construction. Successful operation of the rationing board, with the cooperation of all contractors and subcontractors, was of great importance in securing and retaining an adequate supply of labor.

SECTION 6 - COSTS

6-1. <u>Introduction.</u> - An overall compilation of costs attributable to the K-25 Project is given in Volume 1, Section 7, together with an explanation of the principles involved in the method of cost presentation used. This section presents total costs chargeable to K-25 construction activities.

6-2. <u>Cost Breakdown.</u> - A detailed cost breakdown according to prime contracts is shown in Appendix A1, which also presents original and modified contract estimates. Subcontract costs are tabulated in Appendices A2, A3, and A4. Estimated structural and equipment costs for each building are listed in Appendix D1.

6-3. <u>Cost Summary.</u> - Total cost figures for K-25 construction, effective as of the end of the fiscal year 1946, are as follows:

Contract Payments to Date	$193,808,333
Fixed Fee Payments to Date	1,494,267
Material Furnished by Government to Date	7,798,935
Total Contract Costs to Date	203,101,535
Estimated Total Costs for Completed Contracts	207,004,739

SECTION 7 - ORGANIZATION AND PERSONNEL

7-1. K-25 Construction Office.

a. Organization. - In order to provide direct supervision over all phases of construction, authority was delegated to the K-25 Construction Officer, who reported to the Unit Chief, and acted for the District Engineer, in all matters pertaining to administration of the various construction contracts. In order to obtain most efficient supervision, the Construction Officer's staff of military and civilian personnel was set up generally parallel to the contractor organization. Authority vested in the Construction Officer, as Authorized Representative of the Contracting Officer, was exercised by direct instruction to the various prime contractors, except that in matters involving initiation of changes in permanent construction, instructions were issued to the Kellex Corporation for transmittal to the construction contractors. The line of authority is indicated in Appendix C16. Typical K-25 construction office organization charts are shown in Appendices C17 and C18.

b. Personnel. - From the outset until November 1943, when the above organizational set-up was adopted, all construction work was under the supervision of Lt. Colonel Warren George, Chief, Construction Division, Clinton Engineer Works. Thereafter, Lt. Colonel W. P. Cornelius, as K-25 Construction Officer, was in charge of all construction for the K-25 plant. In December 1943 Major W. T. St. Clair was designated Deputy Construction Officer, and was placed in charge of the process area. Further information pertaining to key personnel of the K-25 Construction Office is tabulated in Appendix H1.

c. Reorganization. - On 1 May 1946, the office of the K-25 Construction Officer was discontinued. Lt. Colonel Cornelius then assumed the position of Chief of the District Construction Division, and the duties of the K-25 Construction Officer were transferred to the Chief of the K-25 Construction Section, reporting to the Chief of the Construction Division.

7-2. The Kellex Corporation (Field Organization).

a. Organization. - The field organization of the Kellex Corporation functioned as a branch of its New York Office, having charge of overall inspection and field engineering, interpretation of plans and specifications, and providing technical advice to the various contractors. A considerable force was built up of service engineers and technical specialists of many types. Typical organization charts are shown in Appendices C19 and C20.

b. Personnel. - Mr. J. J. Allinson headed the Kellex field organization, as Chief Resident Engineer. Mr. N. H. Jones and Mr. A. A. Hickman acted as Assistant Chief Resident Engineers. A tabulation of key personnel of the Kellex field office is presented in Appendix H2.

7-3. J. A. Jones Construction Company, Inc.

a. Organization. - Starting with the relatively small organization required to construct the power plant facilities, the Jones staff was expanded continually, after the modification of contract W-7421-eng-11 to include construction of the process area, and as the construction, maintenance, and operation of roads, railroads, and housing facilities became necessary. Typical organization charts are shown in Appendices C21, C22, and C23.

b. Personnel. - Mr. Edwin L. Jones, General Manager, has headed the Jones organization from the inception of the work. Mr. W. D. Twing acted as Project Manager in the power plant until November 1943, when he was appointed Special Assistant to the General Manager, occupying that position until June 1944. As the job assumed major proportions, five principal assistants to Mr. Jones were appointed: Mr. H. V. Appen, Project Manager in charge of construction in the process and administration areas, Mr. J. E. Davidson, Project Manager in charge of construction in the power plant area, and, after November 1943, in charge of roads and railroads, Mr. T. F. McVeigh, Executive Assistant, Mr. A. V. Junkin, Administrative Manager, and Mr. A. L. Crawford, who has had charge of inspection of all construction in the process area to insure compliance with plans and specifications. A tabulation of key personnel of the Jones Company is given in Appendix B3.

c. Subcontractors. - A complete tabulation of the Jones subcontractors is presented in Appendix A2. The three major subcontractors were the Midwest Piping and Supply Company (Mr. R. R. Wiehlmeyer, Project Manager), the Poe Piping and Heating Company (Mr. H. C. Poe, Jr., Manager), and the L. K. Comstock Electric Company and the Bryant Electric Company, the latter two companies jointly accepting subcontract 19 as co-venturers, with Mr. Hobart Bryant acting as General Manager. Further details pertaining to key personnel of Jones subcontractors are contained in Appendix B4.

7-4. Ford, Bacon, and Davis, Inc.

a. Organization. - Plans for the conditioning area facilities were prepared by Ford, Bacon, and Davis at their home office in New York;

only a construction organization was sent to the site. The size of the organization reached a peak of over 2700 employees. Appendix C24 shows an organization chart, effective March 1944. The organization remained essentially unchanged throughout the period of the construction contract.

b. Personnel. - Mr. C. C. Whittelsey and Mr. S. R. Fleming, respectively Project Manager and Assistant Project Manager, headed the Ford, Bacon, and Davis construction organization. Other key personnel are tabulated on Appendix H5.

7-5. Other Prime Contractors. - Information is presented in Appendix H5 regarding key personnel of the A. S. Schulman Electric Company, the William A. Pope Company, and the Combustion Engineering Company, Inc. These companies operated under prime Government contracts, subject to coordination of activities by the J. A. Jones Construction Company.

MANHATTAN DISTRICT HISTORY

BOOK II - GASEOUS DIFFUSION (K-25) PROJECT

VOLUME 4 - CONSTRUCTION

APPENDIX "A"

CONTRACTS

No.	Title
1.	Prime Contracts.
2.	J. A. Jones Construction Company Subcontracts.
3.	Ford, Bacon, and Davis Subcontracts.
4.	Combustion Engineering Company Subcontracts.

The following list represents a tabulation of K-25 construction contracts and subcontracts. The Tennessee Valley Authority contracts are not officially charged to the K-25 Project, since the T.V.A. facilities do not serve K-25 exclusively; these contracts are included in the table for completeness. The list is complete as of the end of the fiscal year 1946, and cost figures are effective as of this date. Parenthetical figures shown in the table are not to be added into a determination of specific construction cost totals, since they include charges accounted for under design, engineering, and procurement (Volume 3); they are presented in this table in order to provide a complete picture of the volume of work handled by construction contractors.

Contract type is tabulated in the first column and denoted by a numerical code, the key for which is as follows:

(1) Cost plus fixed fee prime contract.
(2) Cost plus fixed fee subcontract.
(3) Unit price subcontract.
(4) Lump sum subcontract.
(5) Concession agreement subcontract.
(6) Service subcontract.

Method of letting is tabulated in the third column and denoted by a numerical code, the key for which is as follows:

(1) Negotiated by the District Engineer and approved by Major General Leslie R. Groves.

(2) Negotiated by the District Engineer.
(3) Let by competitive bidding.
(4) Negotiated by prime contractor and approved by the District Engineer.
(5) Negotiated by the prime contractor and the District Engineer.
(6) Negotiated by the New York Area.

CONTRACT NO. TYPE	NAME OF CONTRACTOR EFFECTIVE DATE	HOME OFFICE OF CONTRACTOR METHOD OF LETTING	SCOPE OF WORK
W-7421-eng-11 (1)	J.A. Jones Construction Company, Inc. 18 May 1943 (Materials furnished by Government under other prime contracts but erected by J.A. Jones) (Contract including materials furnished by Government but not incorporated in Jones Accounts)	Charlotte, N. C. (1)	Construction of [illegible] house, process b[illegible] and appurtenant [illegible]
W-7407-eng-19 (1)	Ford, Bacon and Davis, Inc. - 9 July 1943	New York, N. Y. (1)	Design and constr[illegible] of facilities in [illegible] ditioning area.
W-7405-eng-100 (1)	William A. Pope Company 21 June 1943	Chicago, Ill. (1)	Installation of [illegible] in boiler house.
W-7405-eng-101 (1)	A.S. Schulman Electric Company 22 June 1943	Chicago, Ill. (1)	Electrical work [illegible] house and transm[illegible] to process area.
W-7405-eng-104 (1)	Combustion Engineering Company, Inc. 24 August 1943	New York, N. Y. (1)	Erection of boil[illegible] house.
W-7418-eng-6 (1)	Tennessee Valley Authority 22 July 1943	Chattanooga, Tenn. (2)	Supply estimates [illegible] a 154,000 volt l[illegible] Station to K-25.
W-7418-eng-163 (1)	Tennessee Valley Authority 22 August 1944	Chattanooga, Tenn. (2)	Design and constr[illegible] volt line from F[illegible] to K-25.
W-7405-eng-23 (1)	The Kellex Corporation 14 December 1942	New York, N. Y. (6)	Field supervisio[illegible]

TOTALS (Including Subcontracts)

TOTALS (Including items furnished by Government under other prime supply contracts but erected by the above contractors. Also including T.V.A. contracts.)

PRIME CONTRACTS

OFFICE OF TRACTOR HOD OF LETTING	SCOPE OF WORK	ORIGINAL CONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	MODIFIED CONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	CONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FIX P T
otte, N. C.	Construction of power house, process buildings, and appurtenant facilities.	$ 70,299,772	$100,837,078	$174,054,811	$1,
		(157,356,085)	(186,789,085)		
		(227,655,857)	(287,626,163)		
ork, N. Y.	Design and construction of facilities in conditioning area.	11,804,000	11,853,800	11,464,453	
go, Ill.	Installation of piping work in boiler house.	2,475,000	3,098,400	2,097,278	
go, Ill.	Electrical work in power house and transmission system to process area.	1,788,960	5,125,881	4,979,245	
ork, N. Y.	Erection of boilers in power house.	1,465,000	1,466,000	1,193,549	
anooga, n.	Supply estimates and construct a 154,000 volt line from Elza Station to K-25.	(120,000)	(120,000)	-	
anooga, n.	Design and construct a 154,000 volt line from Fort Loudon to K-25.	(219,100)	(219,100)	-	
ork, N. Y.	Field supervision of all work.	(Estimated cost of work at site only.)			
		87,832,732	122,374,159	193,808,333	1,
nt under other prime supply ntractors. Also including		(245,327,917)	(309,502,344)		

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[M]ODIFIED CONTRACT ESTIMATED AMOUNT [N]OT INCLUDING FEE)	CONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FIXED FEE PAYMENTS TO DATE	MATERIAL FURNISHED BY GOVERNMENT TO DATE	TOTAL CONTRACT COSTS TO DATE	ESTIMATED TOTAL CONTRACT COSTS WHEN COMPLETED
100,837,078	$174,054,811	$1,080,727	$ 7,199,524	$182,305,062	$185,500,000
186,789,085)			(97,291,353)		(97,291,353)
287,626,163)					
11,353,800	11,484,463	221,325	130,367 (Credit) (1,384,753)	11,575,411	12,000,000 (1,384,753)
3,092,400	2,097,276	77,760	54,931 (887,411)	2,229,967	2,446,000 (887,411)
5,125,881	4,979,245	89,555	613,554 (8,721,792)	5,682,354	5,750,000 (8,721,792)
1,465,000	1,192,548	54,900	61,291 (2,571,731)	1,308,739	1,308,739 (2,571,731)
(120,000)	-	(1)	-	-	(75,468)
(219,100)	-	(1)	-	-	(275,000)
mated cost of work at site only.)					(4,100,000)
122,374,159	193,808,333	1,494,267	7,798,933	203,101,533	207,004,739
309,502,344)			(118,555,973)		(322,312,247)

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J. A. JONE
(Amounts are inclu

SUBCONTRACT NUMBER TYPE	NAME OF SUBCONTRACTOR EFFECTIVE DATE	HOME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK
1 (1)	B. W. Winkelman 5 June 1943	Syracuse, N. Y. (3)	Grading and drai railroad to Blai
2 (4)	The Foundation Company 5 June 1943	New York, N. Y. (4)	Supervise constr power house foun
3 (8)	H. E. Bryant 1 October 1943	Morristown, Tenn. (4)	Operation of a b
4 (2)	Garrison-Hopkins 26 May 1943	Charlotte, N. C. (4)	Plumbing and hea power house area
5 (4)	M. B. Foster Electric Company, Inc. 12 June 1943	Boston, Mass. (4)	Engineering serv electrical work buildings.
6 (2)	Harriman Canteen Company 1 June 1943	Charlotte, N. C. (4)	Operating facili and housing work
7 (3)	Bethlehem Steel Company 4 August 1943	Bethlehem, Pa. (3)	Erection of stru in power house a
8 (4)	M. E. "Ed" Alexander 12 August 1943	Charlotte, N. C. (3)	Erection of stru bridge across Po
9 (4)	Poe Piping and Heating Company 5 September 1943	Greenville, S. C. (3)	Steam heating an system in tempor in power house a
10 (3)	Oman Creighton Company 10 September 1943	Nashville, Tenn. (3)	Grading and drai area.
11 (4)	The Cement Tile Corporation 18 September 1943	Chicago, Ill. (3)	Precast roof sla room and turbine
12 (3)	Cement Gun Company 23 November 1943	Allentown, Pa. (3)	Gunite lining of slag and stacks

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J. A. JONES CONSTRUCTION COMPANY SUBCONTRACTS
(Amounts are included in Prime Contract shown in Appendix A1)

ME OFFICE OF SUBCONTRACTOR METHOD OF LETTING)	SCOPE OF WORK	ORIGINAL SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FIX I T
racuse, N. Y. (3)	Grading and drainage for railroad to Blair Junction.	$ 122,232	$ 144,099	$ 143,960	
w York, N. Y. (4)	Supervise construction of power house foundation.	6,170	6,170	6,170	
rristown, Tenn. (4)	Operation of a barber shop.	-	-	117 (Credit)	
arlotte, N. C. (4)	Plumbing and heating in power house area.	533,235	533,235	421,827	
ston, Mass. (4)	Engineering services for electrical work in temporary buildings.	1,000	1,000	1,000	
arlotte, N. C. (4)	Operating facilities for feeding and housing workmen.	-	-	42,710	
thlehem, Pa. (3)	Erection of structural steel in power house area.	170,442	170,577	173,696	
arlotte, N. C. (3)	Erection of structural steel bridge across Poplar Creek.	20,400	13,453	13,453	
eenville, S. C. (3)	Steam heating and utility system in temporary buildings in power house area.	15,990	15,990	15,990	
shville, Tenn. (3)	Grading and drainage in process area.	601,200	1,127,688	1,051,597	
icago, Ill. (3)	Precast roof slabs for boiler room and turbine house.	37,179	35,193	35,193	
lentown, Pa. (3)	Gunite lining of coal bunkers, slag and stacks in power house.	16,358	38,554	38,517	

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...UBCONTRACTS
...wn in Appendix A1)

...RACT ...D ...D-	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FIXED FEE PAYMENTS TO DATE	MATERIALS FURNISHED BY GOVERNMENT TO DATE	TOTAL SUBCONTRACT COSTS TO DATE	ESTIMATED TOTAL SUBCONTRACT COSTS WHEN COMPLETED
...)	$ 144,099	$ 143,960	-	-	$ 143,960	$ 143,960
...)	6,170	6,170	-	-	6,170	6,170
	-	117 (Credit)	-	-	117 (Credit)	117 (Credit)
...)	533,235	421,827	15,000	248,066	684,893	688,810
...)	1,000	1,000	-	-	1,000	1,000
	-	42,710	15,000	-	57,710	57,710
...)	170,577	173,696	-	-	173,696	173,696
...)	13,453	13,453	-	-	13,453	13,453
...)	15,990	15,990	-	-	15,990	15,990
...)	1,127,688	1,051,597	-	-	1,051,597	1,051,597
	35,193	35,193	-	-	35,193	35,193
	38,584	38,517	-	-	38,517	38,517

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SUBCONTRACT NUMBER TYPE	NAME OF SUBCONTRACTOR EFFECTIVE DATE	HOME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK
13 (4)	Interstate Roofing Company 20 September 1943	Anniston, Ala. (3)	Roofing and shee work in power ho
14 (4)	Interstate Roofing Company 20 September 1943	Anniston, Ala. (3)	Installation of air heating in t buildings.
15 (3)	Birmingham Slag Company and Lambert Brothers, 20 September 1943	Knoxville, Tenn. (3)	Crushed stone fo
16 (3)	Cooney Brothers 5 October 1943	Tarrytown, N. Y (3)	Concrete for K-2 area.
17 (4)	R. Doughty Sons Company, Inc. 2 October 1943	New York, N. Y. (3)	Erection of turb ators and Conden
18 (3)	Virginia Bridge Company 28 September 1943	Roanoke, Va. (3)	Furnish and erec steel for K-25 p
19 (2)	L. K. Comstock Company, Inc., and Bryant Electric Company 15 October 1943	Knoxville, Tenn. (5)	Electrical work area.
20 (4)	Interstate Roofing Company 17 November 1943	Anniston, Ala. (3)	Installation of air heating in t buildings.
21 (4)	Sewanee Coal and Supply Company 3 November 1943	Chattanooga, Tenn. (3)	Installation of facility in mess
22 (3)	The Asbestos and Magnesia Materials Company 11 November 1943	Chicago, Ill. (3)	Pipe insulation house and heatin process area.
23 (3)	H. B. Anning Company 11 November 1943	Chicago, Ill. (3)	Poured in place slabs in K-25 pr

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...ME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK	ORIGINAL SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	MODIFIED SUBCONTRAT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FIX... F... T...
...niston, Ala. (3)	Roofing and sheet metal work in power house area.	$ 22,838	$ 43,[illegible]	$ 43,507	
...niston, Ala. (3)	Installation of forced warm air heating in temporary buildings.	1,896	4,018	4,018	
...oxville, Tenn. (3)	Crushed stone for process area.	272,800	1,322,375	1,297,845	
...rrytown, N. Y (3)	Concrete for K-25 process area.	1,632,100	2,456,646	1,868,931	
...w York, N. Y. (3)	Erection of turbo-generators and Condensers.	275,820	267,120	267,120	
...anoke, Va. (3)	Furnish and erect structural steel for K-25 process area.	2,350,000	3,406,571	2,725,372	
...oxville, Tenn. (5)	Electrical work for process area.	16,990,000	21,752,000	14,283,509	19...
...niston, Ala. (3)	Installation of forced warm air heating in temporary buildings.	25,376	30,572	30,572	
...attanooga, Tenn. (3)	Installation of cold storage facility in mess halls.	4,725	4,725	4,725	
...icago, Ill. (3)	Pipe insulation for power house and heating plant in process area.	207,702	259,074	273,094	
...icago, Ill. (3)	Poured in place gypsum roof slabs in K-25 process area.	448,438	555,178	520,129	

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...INAL SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FIXED FEE PAYMENTS TO DATE	MATERIALS FURNISHED BY GOVERNMENT TO DATE	TOTAL SUBCONTRACT COSTS TO DATE	ES...
22,835	$ 43,[illegible]	$ [illegible],507	-	-	$ 43,507	$
1,896	4,018	4,018	-	-	4,018	
72,800	1,322,375	1,297,845	-	-	1,297,845	1
52,100	2,456,646	1,858,931	-	-	1,858,931	1
75,820	267,120	267,120	-	-	267,120	
50,000	3,406,571	2,725,372	-	-	2,725,372	2
90,000	21,752,000	14,283,509	199,800	19,066,484	33,549,793	3
25,376	30,572	30,572	-	-	30,572	
4,725	4,725	4,725	-	-	4,725	
07,702	259,074	273,094	-	-	273,094	
48,438	555,173	520,129	-	-	520,129	

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SUBCONTRACT NUMBER TYPE	NAME OF SUBCONTRACTOR EFFECTIVE DATE	HOME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK
24 (5)	Happy Valley Enterprises 27 November 1943	Knoxville, Tenn. (4)	Operation of a co center.
25 (4)	Pritchard Plate and Glass Company 1 December 1943	Charlotte, N. C. (3)	Glass and glazing house and turbine
26 (2)	Midwest Piping and Supply Company, Inc. 27 November 1943	St. Louis, Mo. (5)	Process piping in area.
27 (2)	Poe Piping and Heating Company 23 December 1943	Greenville, S. C. (4)	Services and auxi in process and ad area.
28	Cancelled		
29 (3)	Mitchell and Becker Company 6 January 1944	Charlotte, N. C. (3)	Structural steel K-25 process buil
30 (3)	G. G. Ray and Company 5 January 1944	Charlotte, N. C. (3)	Roofing and sheet for K-25 process certain temporary buildings.
31 (3)	Ce-Mas-Co Floor Company 13 January 1944	Chicago, Ill. (3)	Cold Mastic floor process buildings
32 (3)	R. E. Martin 8 January 1944	Nashville, Tenn. (3)	Access road from Bridge.
33 (3)	Oman Creighton Company 7 February 1944	Nashville, Tenn. (3)	Access road to Hi near Blair.
34 (4)	East Tennessee Sheet Metal Works, Inc. 4 February 1944	Bristol, Tenn. (3)	Installation of v system in switch auxiliary switch
35 (6)	East Tennessee York Company 10 February 1944	Knoxville, Tenn. (4)	Make required ins refrigeration equ maintain same.

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OME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK	ORIGINAL SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FI
noxville, Tenn. (4)	Operation of a community center.	-	-	$ 123,037 (Credit)	
harlotte, N. C. (3)	Glass and glazing in boiler house and turbine room.	6,301	6,168	6,168	
t. Louis, Mo. (5)	Process piping in process area.	18,500,000	27,233,000	16,625,928	
reenville, S. C. (4)	Services and auxiliary piping in process and administrative area.	3,741,891	8,157,267	11,014,091	
harlotte, N. C. (3)	Structural steel stairs for K-25 process buildings.	27,000	21,700	19,656	
harlotte, N. C. (3)	Roofing and sheet metal work for K-25 process buildings and certain temporary and auxiliary buildings.	580,915	677,984	656,006	
hicago, Ill. (3)	Cold Mastic flooring in K-25 process buildings.	139,750	234,619	232,920	
ashville, Tenn. (3)	Access road from Gallaher Bridge.	185,039	190,006	177,170	
ashville, Tenn. (3)	Access road to Highway 61 near Blair.	126,296	149,460	143,600	
ristol, Tenn. (3)	Installation of ventilating system in switch house and auxiliary switch house.	28,620	28,061	28,061	
noxville, Tenn. (4)	Make required inspections of refrigeration equipment and maintain same.	-	-	25,914	

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CT	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FIXED FEE PAYMENTS TO DATE	MATERIALS FURNISHED BY GOVERNMENT TO DATE	TOTAL SUBCONTRACT COSTS TO DATE	ESTIMATED TOTAL SUBCONTRACT COSTS WHEN COMPLETED
	-	$ 123,037 (Credit)	-	-	$ 123,037 (Credit)	$ 123,037 (Credit)
	6,168	6,168	-	-	6,168	6,168
	27,233,000	16,626,928	190,710	30,202,969	47,019,604	47,064,163
	8,157,287	11,014,091	134,206	5,299,270	16,448,466	16,468,308
	21,700	19,656	-	-	19,656	19,656
	677,984	656,006	-	-	656,006	656,006
	234,619	232,920	-	-	232,920	232,920
	190,006	177,170	-	-	177,170	177,170
	149,460	143,600	-	-	143,600	143,600
	28,061	28,061	-	-	28,061	28,061
	-	28,914	-	-	28,914	28,914

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SUBCONTRACT NUMBER TYPE	NAME OF SUBCONTRACTOR EFFECTIVE DATE	HOME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK
36 (4)	G. G. Ray and Company 6 March 1944	Charlotte, N. C. (3)	Duct work for ve system in K-25 p buildings.
37 (4)	Interstate Roofing Company 17 March 1944	Anniston, Ala. (3)	Installation of f air heating in th
38 (5)	John D. Holloway 29 March 1944	Knoxville, Tenn. (4)	Operation of a b
39 (3)	Oman Creighton Company 13 April 1944	Nashville, Tenn. (3)	Access road from Ferry Bridge.
40 (3)	Decatur Iron and Steel Company 28 April 1944	Decatur, Ala. (3)	Furnish and erect steel for heating process area.
41 (3)	Tennessee Roofing Company 3 May 1944	Knoxville, Tenn. (3)	Ventilators for buildings.
42 (4)	Consolidated Chimney Company 20 May 1944	Chicago, Ill. (3)	Construct chimney plant in process
43 (3)	Standard Floor Company 12 June 1944	Pittsburgh, Pa. (3)	Install asphalt f administrative bu
44 (3)	Selby, Battersby and Company 22 June 1944	Philadelphia, Pa. (3)	Magnesite composi in laboratory bui
45	Cancelled.		
46 (4)	J. F. Pritchard and Company 28 July 1944	Kansas City, Mo. (4)	Supervise constru hydryer units in
47 (3)	Kerby Saunders 19 July 1944	New York, N. Y. (3)	Duct work for ver system in K-25 pr
48 (5)	Mrs. O. P. Richard 8 July 1944	Knoxville, Tenn. (4)	Concession for la cleaning agency.

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E OFFICE OF UBCONTRACTOR ETHOD OF LETTING	SCOPE OF WORK	ORIGINAL SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FI
rlotte, N. C. (3)	Duct work for ventilating system in K-25 process buildings.	$ 210,600	$ 878,928	$ 878,925	
iston, Ala. (3)	Installation of forced warm air heating in theater building.	9,558	9,558	9,558	
xville, Tenn. (4)	Operation of a barber shop.	-	-	131 (Credit)	
hville, Tenn. (3)	Access road from White Wing Ferry Bridge.	146,809	187,527	180,462	
atur, Ala. (3)	Furnish and erect structural steel for heating plant in process area.	19,932	19,932	19,177	
xville, Tenn. (3)	Ventilators for K-25 process buildings.	111,361	107,858	107,858	
cago, Ill. (3)	Construct chimney for heating plant in process area.	9,240	9,240	9,240	
tsburgh, Pa. (3)	Install asphalt floors in administrative buildings.	3,432	3,432	2,623	
ladelphia, Pa. (3)	Magnesite composition flooring in laboratory buildings.	4,261	10,141	9,702	
sas City, Mo. (4)	Supervise construction of hydryer units in process area.	19,360	17,984	17,984	
York, N. Y. (3)	Duct work for ventilating system in K-25 process area.	297,790	321,899	321,899	
xville, Tenn. (4)	Concession for laundry and dry cleaning agency.	-	-	497 (Credit)	

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RACT ED UD-	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FIXED FEE PAYMENTS TO DATE	MATERIALS FURNISHED BY GOVERNMENT TO DATE	TOTAL SUB-CONTRACT COSTS TO DATE	ESTIMATED TOTAL SUB-CONTRACT COSTS WHEN COMPLETED
00	$ 878,925	$ 878,925	-	-	$ 878,925	$ 878,925
58	9,558	9,558	-	-	9,558	9,558
	-	131 (Credit)	-	-	131 (Credit)	131 (Credit)
)	157,527	160,462	-	-	160,462	160,462
32	19,932	19,177	-	-	19,177	19,177
31	107,858	107,858	-	-	107,858	107,858
0	9,240	9,240	-	-	9,240	9,240
2	3,432	2,623	-	-	2,623	2,623
1	10,141	9,702	-	-	9,702	9,702
)	17,984	17,984	-	-	17,984	17,984
)	321,899	321,899	-	-	321,899	321,899
	-	497 (Credit)	-	-	497 (Credit)	497 (Credit)

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SUBCONTRACT NUMBER TYPE	NAME OF SUBCONTRACTOR EFFECTIVE DATE	HOME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK
49 (5)	Nelson B. Rue 15 March 1944	Franklin, Tenn. (4)	Conducting amuse devices and grill
50 (3)	The Reilly-Benton Company 7 September 1944	New Orleans, La. (3)	Insulating for pr and cell areas.
51 (3)	Kerby Saunders, Inc. 22 September 1944	New York, N. Y. (3)	Duct work for ve system in K-25 pr
52 (3)	G. G. Ray and Company 22 September 1944	Charlotte, N. C. (3)	Duct work for ven system in K-25 pr
53 (5)	Community Garage 22 September 1944	Knoxville, Tenn. (4)	Operate Community
54	Cancelled		
55 (5)	Model Laundry 30 November 1944	Knoxville, Tenn. (4)	Operate a laundry agency.
56 (5)	Community Garage 1 January 1945	Knoxville, Tenn. (4)	Operate a Communi
57 (5)	Model Laundry 6 February 1945	Knoxville, Tenn. (4)	Laundry and clean
58 (5)	Homer T. Marlin 2 April 1945	Oak Ridge, Tenn. (4)	Operation of a sh
59 (3)	Bethlehem Steel Company 3 April 1945	Bethlehem, Pa. (3)	Furnishing and er structural steel area.
60	Pertaining to the S-50 Project		
61 (4)	Schori Process Corporation 14 April 1945	Long Island, N. Y. (3)	Metallizing cold process area.
62 (3)	H. K. Anning Company 18 April 1945	Chicago, Ill. (3)	Poured in place g in K-27 process ar

...ME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK	ORIGINAL SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FI...
...anklin, Tenn. (4)	Conducting amusement devices and grill.	-	-	$ 8,474 (Credit)	
...w Orleans, La. (3)	Insulating for process piping and cell areas.	347,042	2,220,303	2,168,490	
...w York, N. Y. (3)	Duct work for ventilating system in K-25 process area.	425,110	477,219	477,219	
...arlotte, N. C. (3)	Duct work for ventilating system in K-25 process area.	411,160	458,628	458,628	
...oxville, Tenn. (4)	Operate Community Garage	-	-	369 (Credit)	
...oxville, Tenn. (4)	Operate a laundry and cleaning agency.	-	-	73 (Credit)	
...oxville, Tenn. (4)	Operate a Community Garage.	-	-	2,886 (Credit)	
...oxville, Tenn. (4)	Laundry and cleaning services.	-	-	523 (Credit)	
...k Ridge, Tenn. (4)	Operation of a skating rink.	-	-	721 (Credit)	
...thlehem, Pa. (3)	Furnishing and erecting structural steel in K-27 process area.	821,000	828,330	741,824	
...g Island, N. Y. (3)	Metallizing cold traps in K-25 process area.	12,500	18,894	18,894	
...cago, Ill. (3)	Poured in place gypsum roofs in K-27 process area.	108,063	123,822	123,756	

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MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FIXED FEE PAYMENTS TO DATE	MATERIALS FURNISHED BY GOVERNMENT TO DATE	TOTAL SUBCONTRACT COSTS TO DATE	ESTIMATED TOTAL SUBCONTRACT COSTS WHEN COMPLETED
-	$ 8,474 (Credit)	-	-	$ 8,474 (Credit)	$ 8,474 (Credit)
2,220,303	2,168,490	-	-	2,168,490	2,207,278
477,219	477,219	-	-	477,219	477,219
458,628	458,628	-	-	458,628	458,628
-	389 (Credit)	-	-	389 (Credit)	389 (Credit)
-	73 (Credit)	-	-	73 (Credit)	73 (Credit)
-	2,886 (Credit)	-	-	2,886 (Credit)	2,886 (Credit)
-	523 (Credit)	-	-	523 (Credit)	523 (Credit)
-	721 (Credit)	-	-	721 (Credit)	721 (Credit)
828,330	741,824	-	-	741,824	741,824
18,894	18,894	-	-	18,894	18,894
123,823	128,756	-	-	128,756	128,756

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SUBCONTRACT NUMBER TYPE	NAME OF SUBCONTRACTOR EFFECTIVE DATE	HOME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK
63 (3)	O. G. Ray and Company 19 April 1945	Charlotte, N. C. (3)	Ventilating syst process area.
64 (3)	Interstate Roofing Company 19 April 1945	Anniston, Ala. (3)	Insulation, roof exterior sheet m K-27 process are
65 (3)	Consolidated Chimney Company 10 May 1945	Chicago, Ill. (3)	Radial brick chi addition to buil K-25 process are
66 (3)	The Asbestos and Magnesia Materials Company 28 May 1945	Chicago, Ill. (3)	Insulation for b breeching, flues, equipment, valve for boiler plant
67 (3)	The Reilly-Benton Company, Inc. 29 June 1945	New Orleans, La. (3)	Insulation of ce pipe insulation area.
68 (3)	The Reilly-Benton Company Inc. 12 July 1945	New Orleans, La. (3)	Ventilating and systems for sub house in K-27 pr
	SUBTOTALS (J. A. JONES CONSTRUCTION COMPANY SUBCONTRACTS)		

3 OFFICE OF BCONTRACTOR THOD OF LETTING	SCOPE OF WORK	ORIGINAL SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FI
rlotte, N. C. 3)	Ventilating system in K-27 process area.	$ 340,120	$ 348,864	$ 348,864	
iston, Ala. 3)	Insulation, roofing and exterior sheet metal work in K-27 process area.	116,687	137,892	143,945	
cago, Ill. 3)	Radial brick chimney for addition to building 1501 in K-25 process area.	10,770	10,770	10,770	
cago, Ill. 3)	Insulation for boilers, breeching, flues, ducts, piping equipment, valves and fittings for boiler plant in S-50 area.	81,948	78,230	78,230	
Orleans, La. 3)	Insulation of cell areas and pipe insulation in K-27 process area.	264,580	339,357	305,548	
Orleans, La. 3)	Ventilating and air conditioning systems for substation switch house in K-27 process area.	21,374	22,485	22,485	
CTION COMPANY SUBCONTRACTS)		51,404,109	75,487,294	58,487,573	58

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…RACT …ED …CD*	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FIXED FEE PAYMENTS TO DATE	MATERIALS FURNISHED BY GOVERNMENT TO DATE	TOTAL SUB-CONTRACT COSTS TO DATE	ESTIMATED TOTAL SUB-CONTRACT COSTS WHEN COMPLETED
20	$ 348,864	$ 348,864	-	-	$ 348,864	$ 348,864
37	137,892	143,945	-	-	143,945	143,945
70	10,770	10,770	-	-	10,770	10,770
18	78,230	78,230	-	-	78,230	78,230
30	339,357	305,548	-	-	305,548	344,74[illegible] 8
74	22,485	22,485	-	-	22,485	22,485
09	75,487,294	58,487,573 ✓	554,715 ✓	54,816,791 ✓	113,859,079 ✓	114,011,937 ~~[illegible]~~

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FORD, B
(Amounts are include

SUBCONTRACT NUMBER TYPE	NAME OF SUBCONTRACTOR EFFECTIVE DATE	HOME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK
1 (3)	D. W. Winkelman	Syracuse, N. Y. (3)	Grading and drain plant site and ro
2 (2)	Edenfield Electric Company 23 September 1943	Nashville, Tenn (5)	Electrical work f ing building, cam construction faci
3 (3)	J. D. Helton Roofing Company 9 November 1943	Chattanooga, Tenn. (3)	Roof insulation, flashing for cond building.
4 (2)	Turner-McCoy 16 March 1943	Little Rock, Ark. (5)	Plumbing, heating ventilation and p for conditioning camp site and con facilities.
5 (4)	Ideal Electric Company 3 August 1943	Knoxville, Tenn. (3)	Electrical work i buildings.
6 (3)	Pittsburgh Plate Glass Company 6 December 1943	Knoxville, Tenn. (3)	Glass and glazing ditioning buildin
7 (4)	Buensod-Stacey, Inc. 11 January 1944	New York, N. Y. (3)	Ventilating syste ditioning buildin
8 (4)	International Chimney Company 24 January 1944	Buffalo, N. Y. (3)	Chimney for build
9 (3)	Tennessee Roofing Company 27 December 1943	Knoxville, Tenn. (5)	Completion of roo roofing and flash ditioning buildin
10 (4)	Buensod-Stacey, Inc.	New York, N. Y. (3)	Fume exhaust syst ditioning buildin

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FORD, BACON AND DAVIS SUBCONTRACTS
(Amounts are included in Prime Contracts shown in Appendix A1)

HOME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK	ORIGINAL SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SU… (NO… I…
yracuse, N. Y. (3)	Grading and drainage of plant site and roadways.	$ 116,476	$ 205,366	$
ashville, Tenn (3)	Electrical work for conditioning building, camp site and construction facilities.	1,109,000	1,307,000	1,
hattanooga, Tenn. (3)	Roof insulation, roofing and flashing for conditioning building.	55,136	43,436	
ittle Rock, Ark. (3)	Plumbing, heating, sheet metal, ventilation and process piping for conditioning building, camp site and construction facilities.	1,153,000	1,689,500	1,
noxville, Tenn. (3)	Electrical work in temporary buildings.	3,966	3,966	
noxville, Tenn. (3)	Glass and glazing in conditioning building.	12,427	13,223	
w York, N. Y. (3)	Ventilating system for conditioning building.	63,296	70,290	
ffalo, N. Y. (3)	Chimney for building K-1301.	850	1,046	
oxville, Tenn. (5)	Completion of roof insulation, roofing and flashing for conditioning building.	12,059	12,059	
w York, N. Y. (3)	Fume exhaust system for conditioning building.	39,770	42,097	

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TRACTS
shown in Appendix A1)

TRACT TED LUD-)	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUD-ING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUD-ING FEE)	FIXED FEE PAYMENTS TO DATE	MATERIALS FURNISHED BY GOVERN-MENT TO DATE	TOTAL SUB-CONTRACT COSTS TO DATE	ESTIMATED TOTAL SUB-CONTRACT COSTS WHEN COMPLETED
76	$ 205,366	$ 147,567	-	-	$ 147,567	$ 147,567
00	1,307,000	1,345,400	33,000	-	1,378,400	1,378,400
36	43,436	43,436	-	-	43,436	43,436
00	1,689,500	1,945,000	40,000	-	1,985,000	1,985,000
36	3,986	3,986	-	-	3,986	3,986
27	13,223	13,348	-	-	13,348	13,348
95	70,290	70,290	-	-	70,290	70,290
50	1,046	1,046	-	-	1,046	1,046
59	12,069	12,511	-	-	12,511	12,511
70	42,097	42,097	-	-	42,097	42,097

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SUBCONTRACT NUMBER TYPE	NAME OF SUBCONTRACTOR EFFECTIVE DATE	HOME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK
11 (3)	Young Sales Corporation 2 March 1944	Nashville, Tenn. (3)	Heat insulation temporary and pe facilities.
12 (3)	J. D. Helton Roofing Company	Chattanooga, Tenn. (4)	Roof insulation, and flashing for K-1301, K-1402, and part of K-14
	SUBTOTALS (FORD, BACON AND DAVIS SUBCONTRACTS)		

HOME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK	ORIGINAL SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FI
Nashville, Tenn. (3)	Heat insulation for temporary and permanent facilities.	$ 2,595	$ 24,156	$ 12,276	
Chattanooga, Tenn. (4)	Roof insulation, roofing and flashing for buildings K-1301, K-1402, K-1403 and part of K-1401.	5,443	5,443	4,742	
DAVIS SUBCONTRACTS)		2,574,037	3,417,604	3,840,696 ✓	7

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L TRACT ATED T CLUD- E)	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUD- ING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUD- ING FEE)	FIXED FEE PAYMENTS TO DATE	MATERIALS FURNISHED BY GOVERN- MENT TO DATE	TOTAL SUB- CONTRACT COSTS TO DATE	ESTIMATED TOTAL SUB- CONTRACT COSTS WHEN COMPLETED
598	$ 24,158	$ 12,276	-	-	$ 12,276	$ 12,276
443	5,443	4,742	-	-	4,742	4,742
037	3,417,604	3,641,696	73,000		3,714,696	3,714,696

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COMBUSTION
(Amounts are included

SUBCONTRACT NUMBER TYPE	NAME OF CONTRACTOR EFFECTIVE DATE	HOME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK
1 (4)	The Asbestos and Magnesia Materials Company 25 January 1944	Chicago, Ill. (5)	Installation only insulation on 3 generators.
	TOTAL, (ALL SUBCONTRACTS)		

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COMBUSTION ENGINEERING COMPANY SUBCONTRACTS
(Amounts are included in Prime Contract shown in Appendix A1)

HOME OFFICE OF SUBCONTRACTOR METHOD OF LETTING	SCOPE OF WORK	ORIGINAL SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FI
Chicago, Ill. (5)	Installation only of insulation on 3 steam generators.	$ 90,253	$ 90,253	$ 90,253	
		54,068,399	78,995,151	62,219,522	6

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SUBCONTRACTS
hown in Appendix A1)

AL ONTRACT MATED NT NCLUD- EE)	MODIFIED SUBCONTRACT ESTIMATED AMOUNT (NOT INCLUDING FEE)	SUBCONTRACT PAYMENTS TO DATE (NOT INCLUDING FEE)	FIXED FEE PAYMENTS TO DATE	MATERIAL FURNISHED BY GOVERNMENT TO DATE	TOTAL SUBCONTRACT COSTS TO DATE	ESTIMATED TOTAL SUBCONTRACT COSTS WHEN COMPLETED
),253	$ 90,253	$ 90,253	-	-	$ 90,253	$ 90,253
3,399	78,995,151	62,219,522	627,715	54,816,791	117,664,028	117,816,886 ~~[illegible]~~

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MANHATTAN DISTRICT HISTORY

BOOK II - GASEOUS DIFFUSION (K-25) PROJECT

VOLUME 4 - CONSTRUCTION

APPENDIX "F"

MAPS

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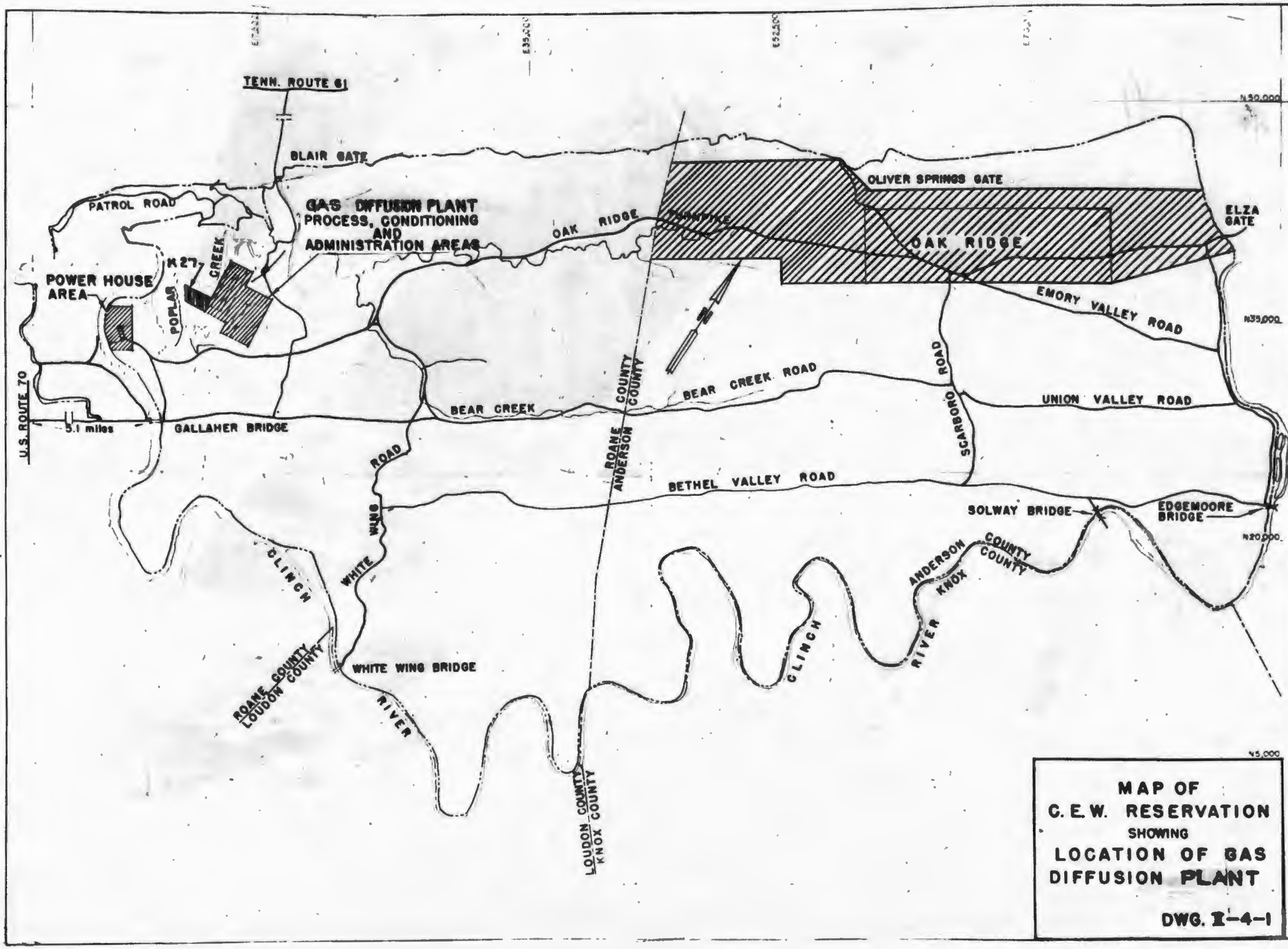

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PROCESS AREA
MAP No. II-4-E
TO HARRIMAN
TO BLAIR
CONDITIONING AND
ADMINISTRATION AREAS
MAP NO. II-4-F.
HOUSING
WATER STORAGE
TO OAK RIDGE
GENERAL LAYOUT MAP
K-25 AREA
CORPS OF ENGINEERS
MANHATTAN DISTRICT
CLINTON ENGINEER WORKS
II-4-A
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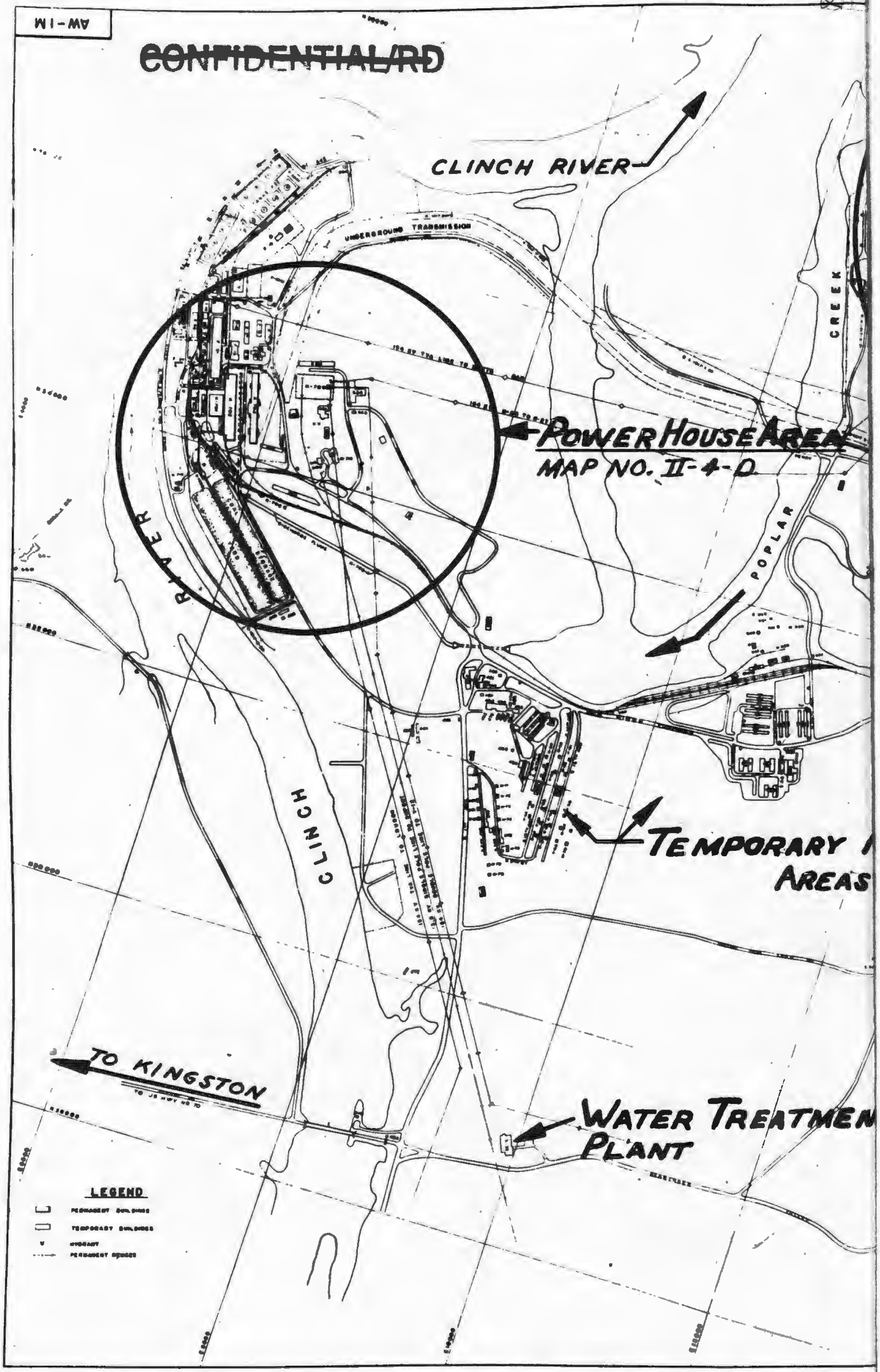

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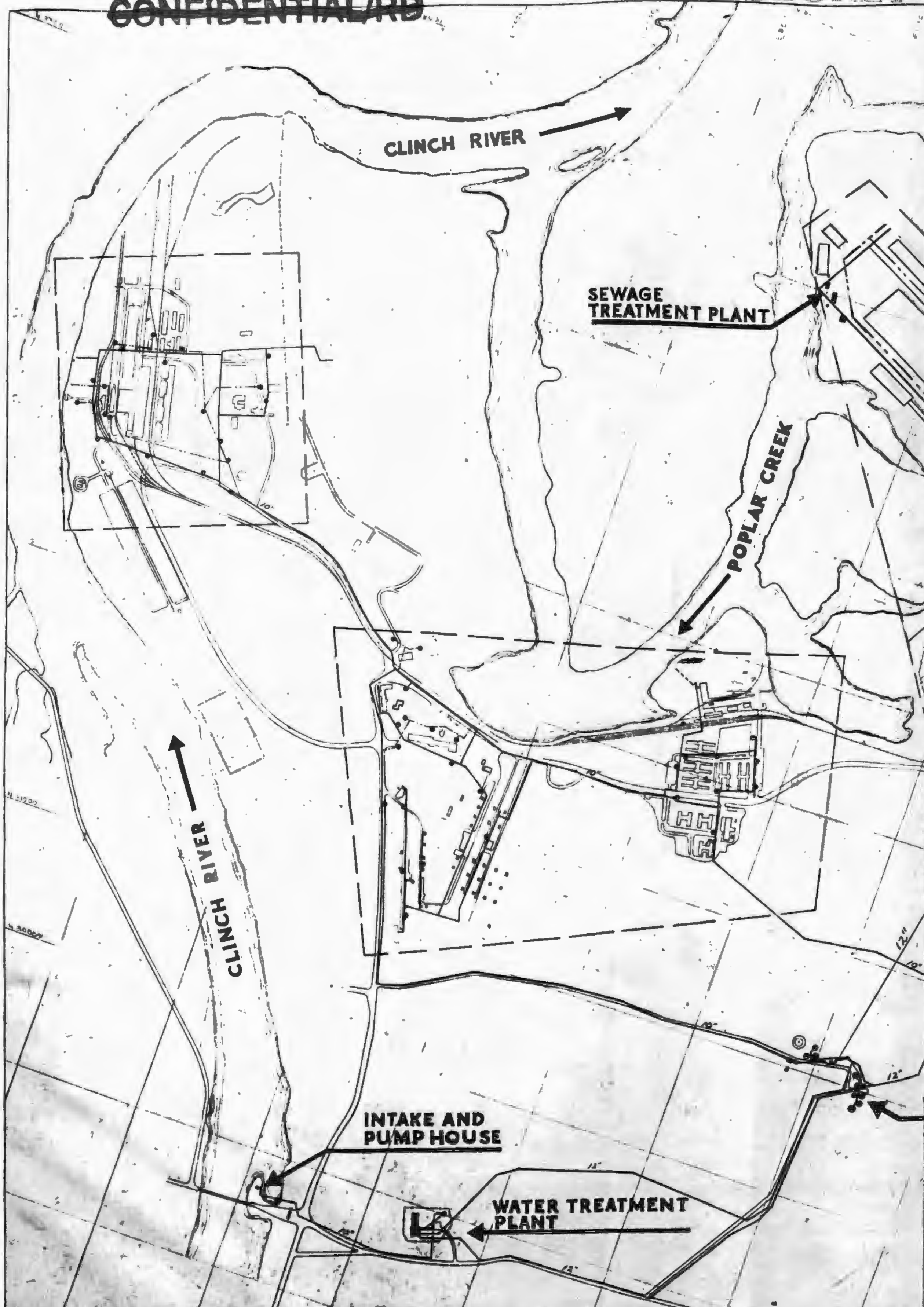

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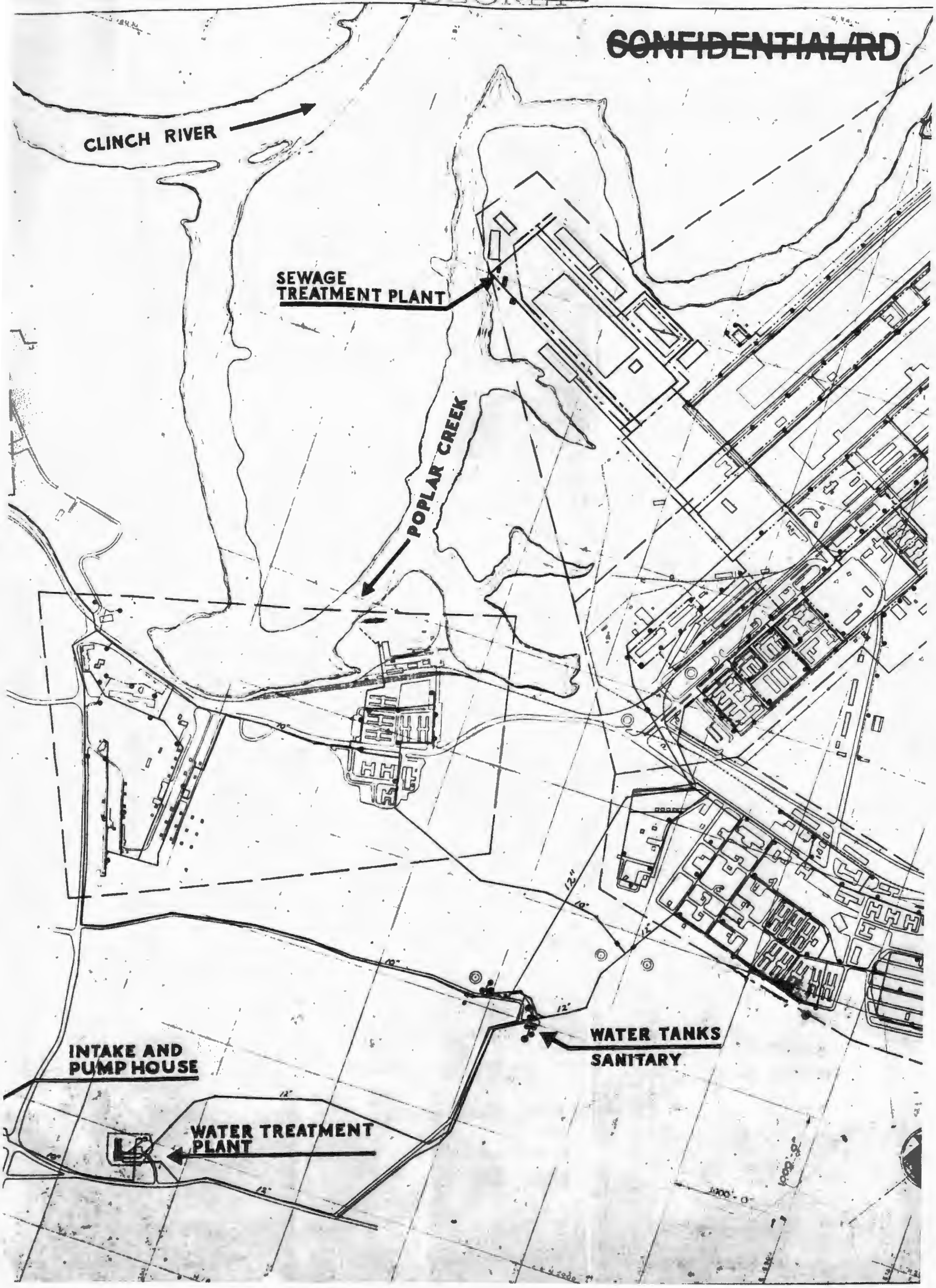

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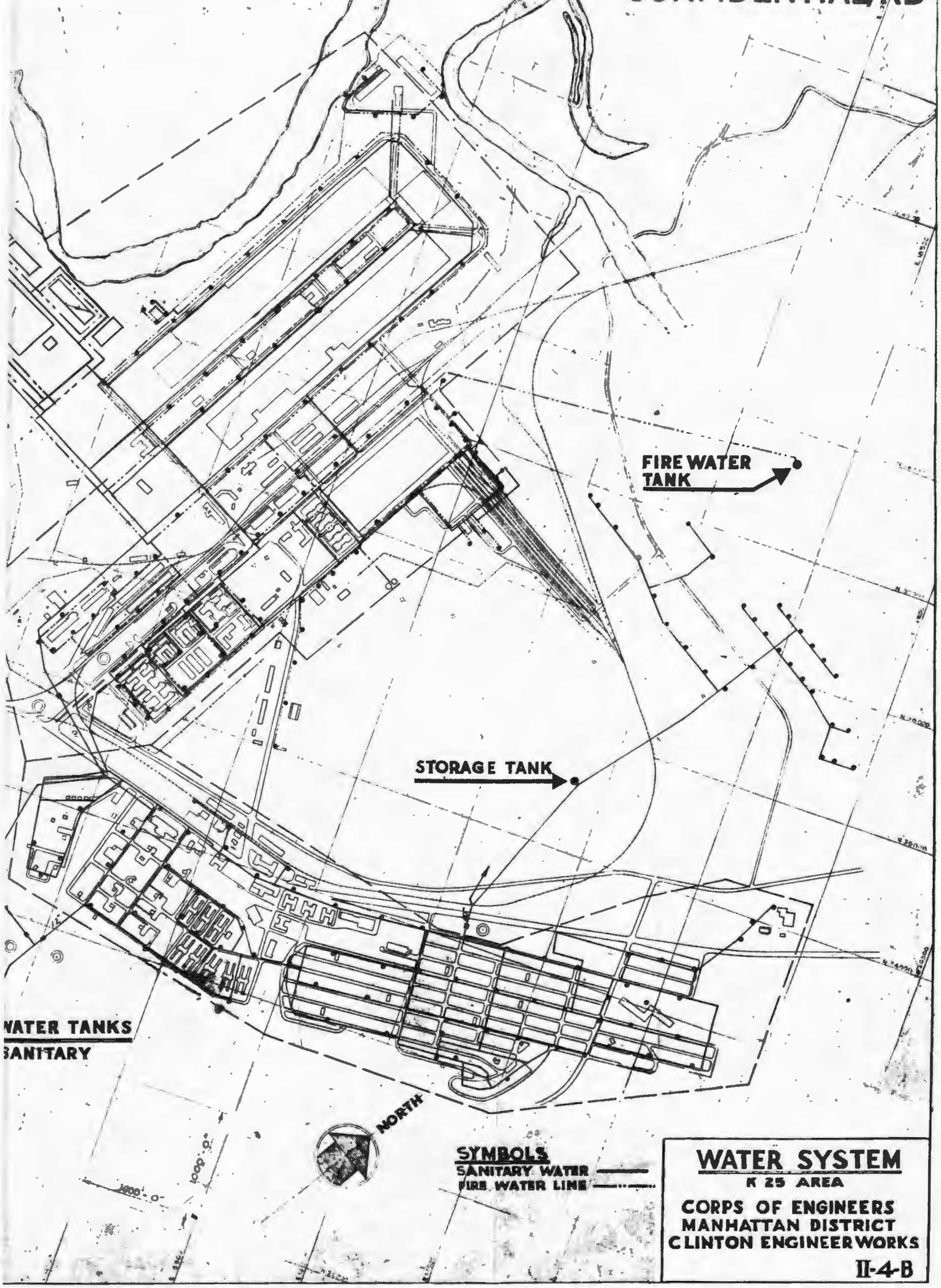

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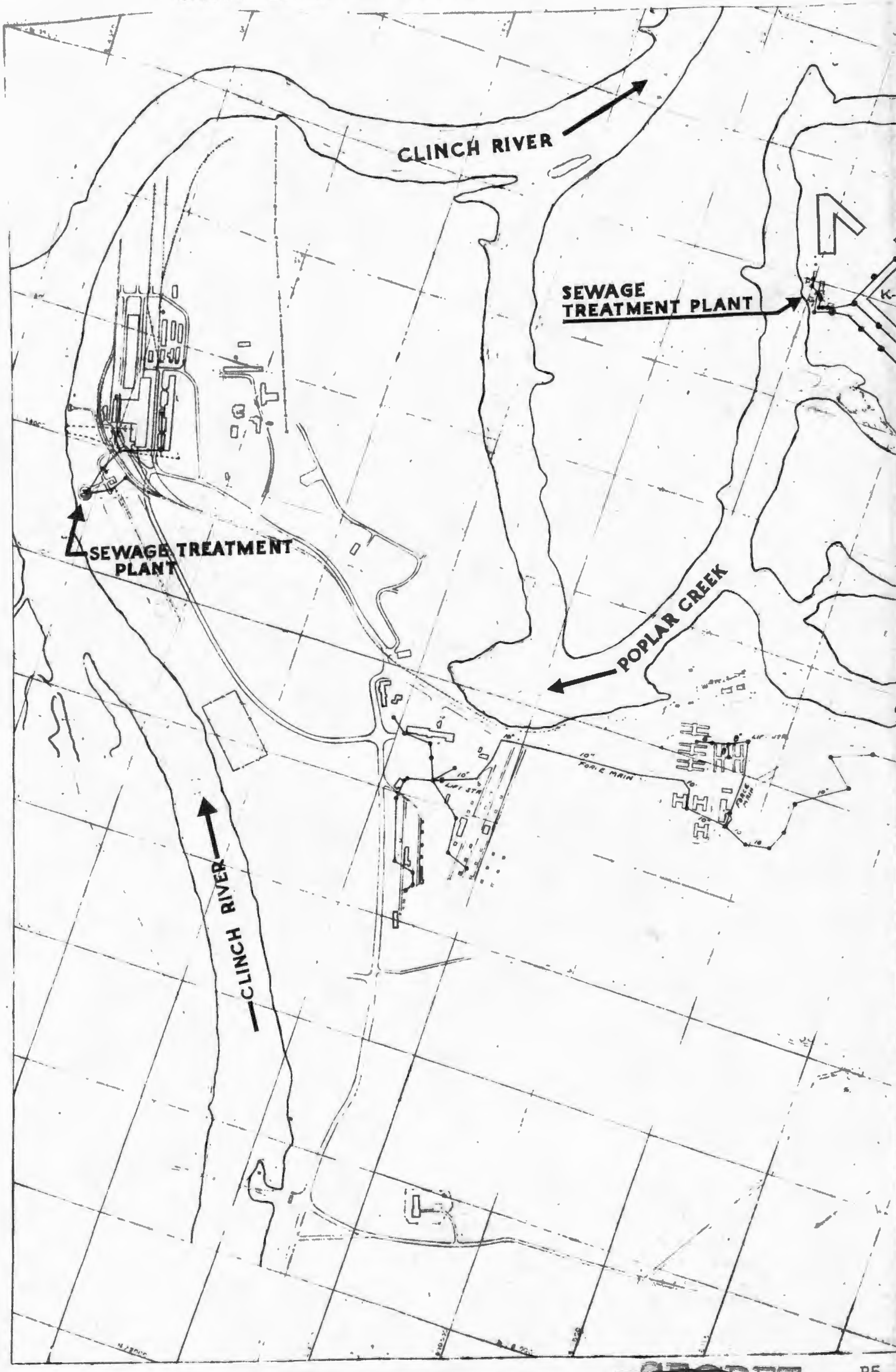

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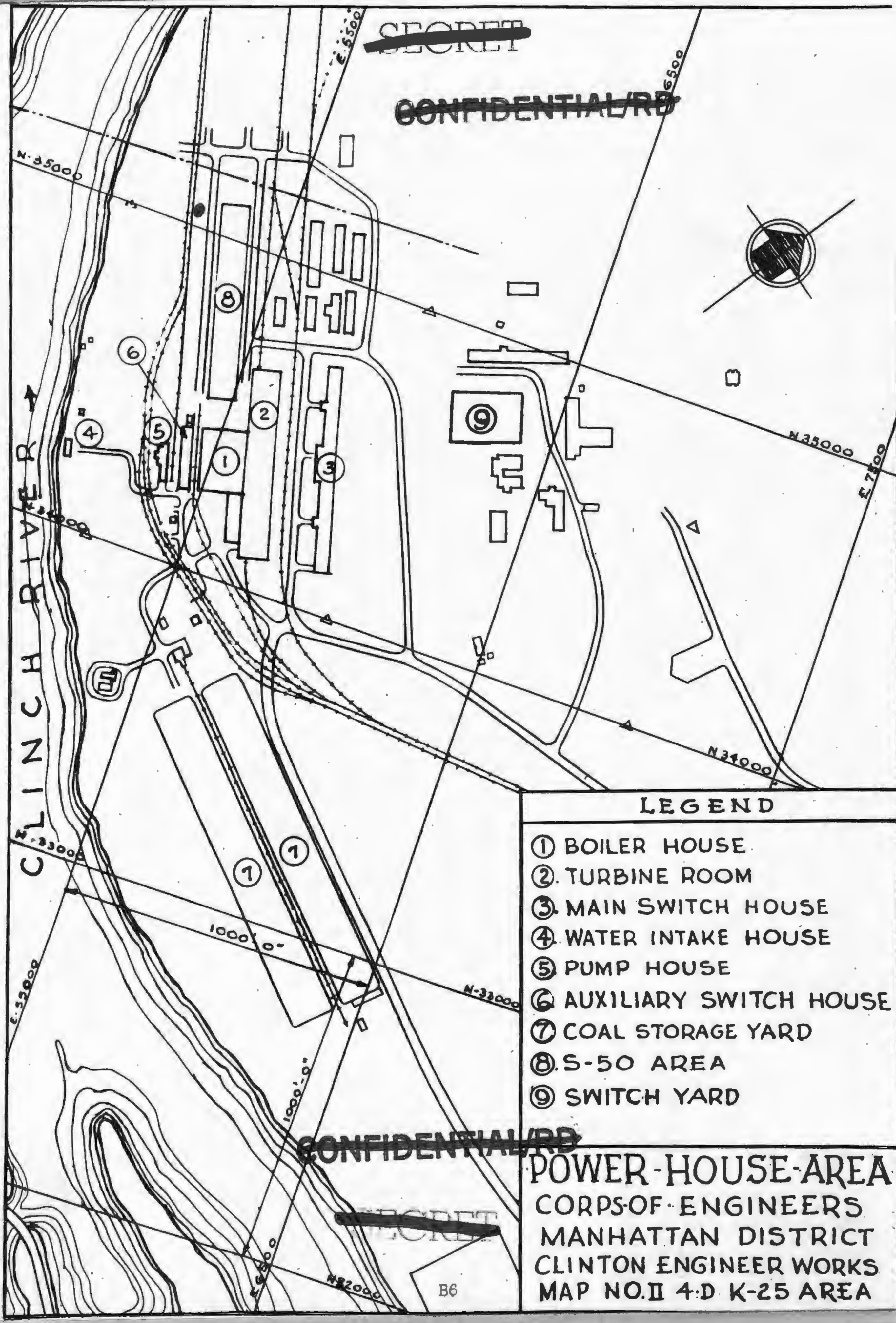
K-27
LIFT STA
NORTH
SYMBOLS
SANITARY SEWERS
STORM SEWERS
1000'-0"
SEWER SYSTEM
K-25 AREA
CORPS OF ENGINEERS
MANHATTAN DISTRICT
CLINTON ENGINEER WORKS
II-4-C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N-35000
N-34000
N-33000
N-32000
E-6500
E-7500
E-5500
1000'-0"
CLINCH RIVER
LEGEND
① BOILER HOUSE
② TURBINE ROOM
③ MAIN SWITCH HOUSE
④ WATER INTAKE HOUSE
⑤ PUMP HOUSE
⑥ AUXILIARY SWITCH HOUSE
⑦ COAL STORAGE YARD
⑧ S-50 AREA
⑨ SWITCH YARD
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POWER-HOUSE-AREA
CORPS-OF-ENGINEERS
MANHATTAN DISTRICT
CLINTON ENGINEER WORKS
MAP NO. II 4-D K-25 AREA
B6

B8-1

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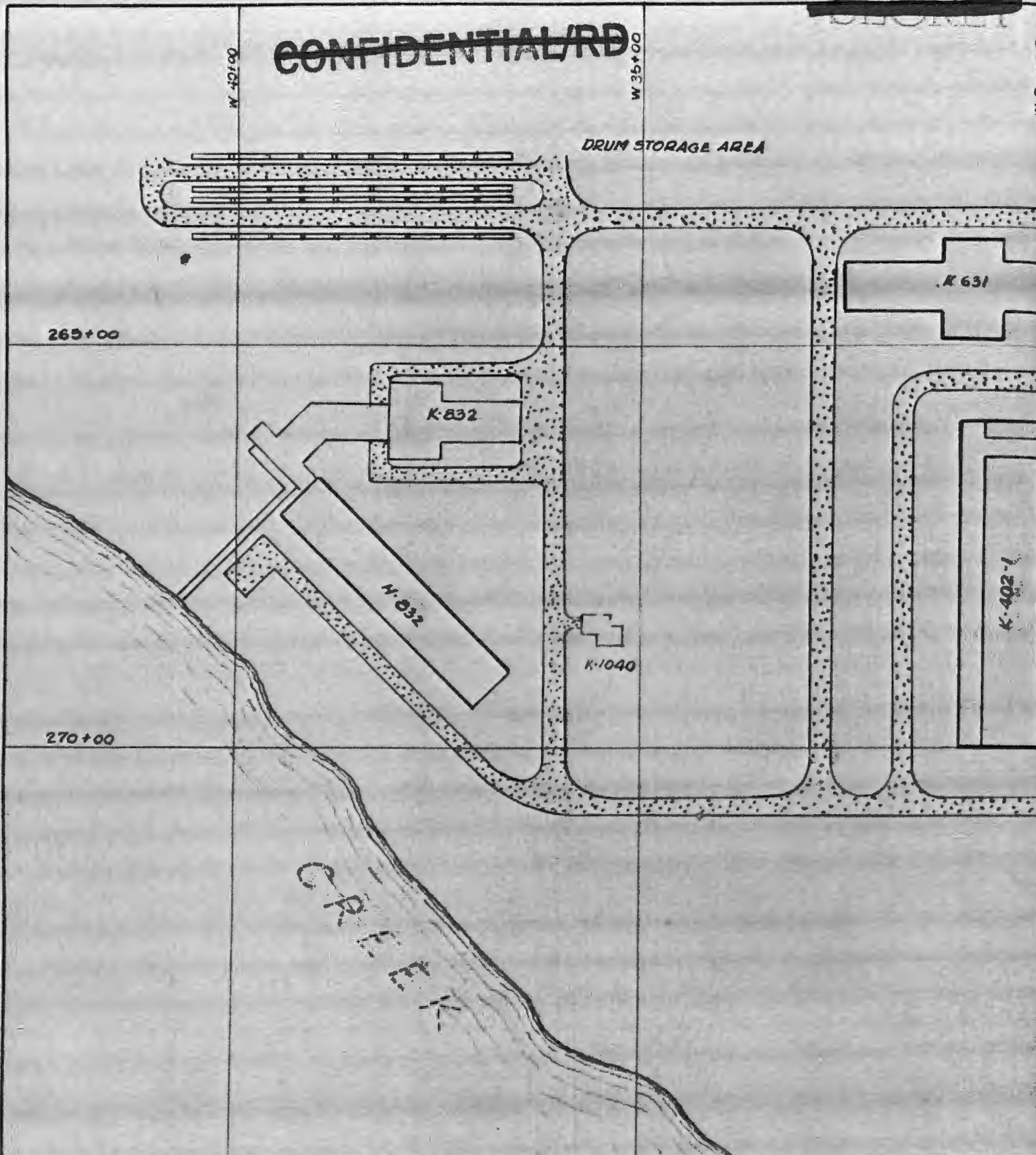

L E G E N D

K-131	FEED PURIFICATION	K-832	RECIRCULATING PUMP HSE.
K-132	ABSORPTION SYSTEM	H-832	COOLING TOWER
MAIN PROCESS BUILDINGS		K-833	COOLING WATER PUMP STA.
K-402	1-2-3-4-5-6-7-8-9	K-1040	FIRE STATION
K-413	PURGE & PRODUCT	K-1041	CYLINDER & DRUM WHSE.
K-631	WASTE DISPOSAL	K-1131	MAINTENANCE BLDG.
K-731	SWITCH HOUSE	K-1231	COMPRESSOR HOUSE
K-732	SWITCH YARD	K-1232	CONDENSATE COLLECTING STA
K-733	OIL FILTERING SYSTEM		

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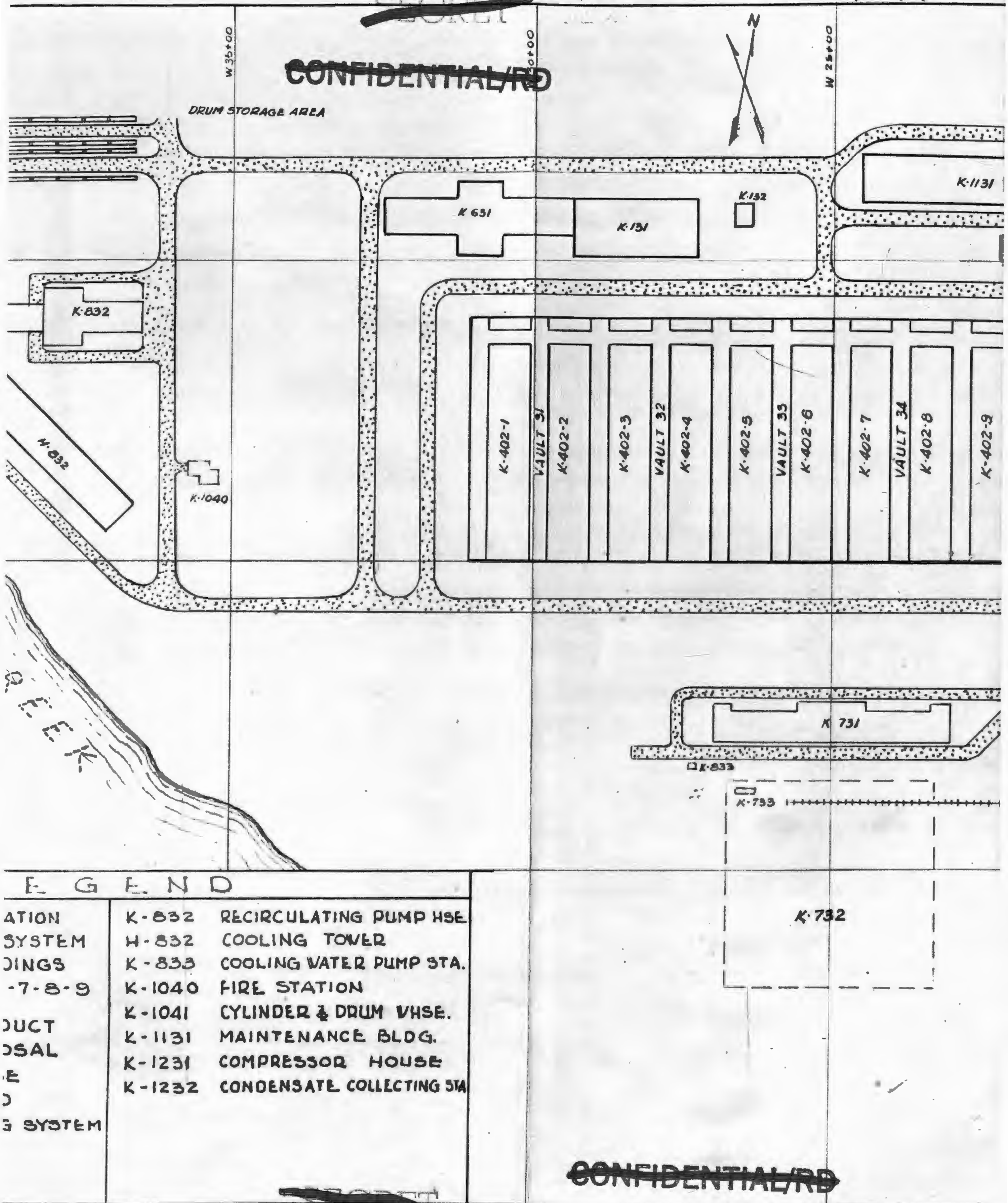

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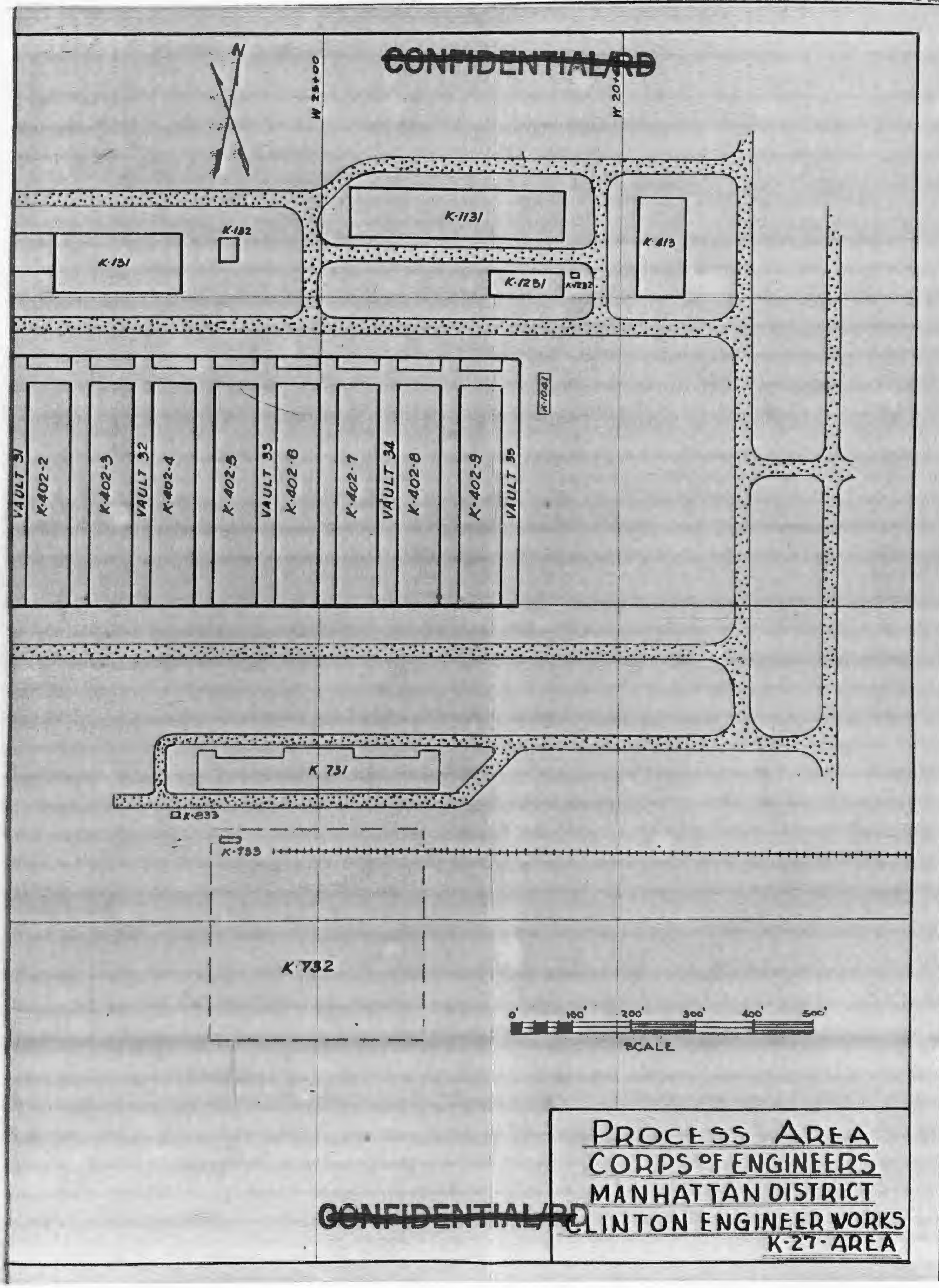

PROCESS AREA
CORPS OF ENGINEERS
MANHATTAN DISTRICT
CLINTON ENGINEER WORKS
K-27-AREA

B7-1 [redacted]

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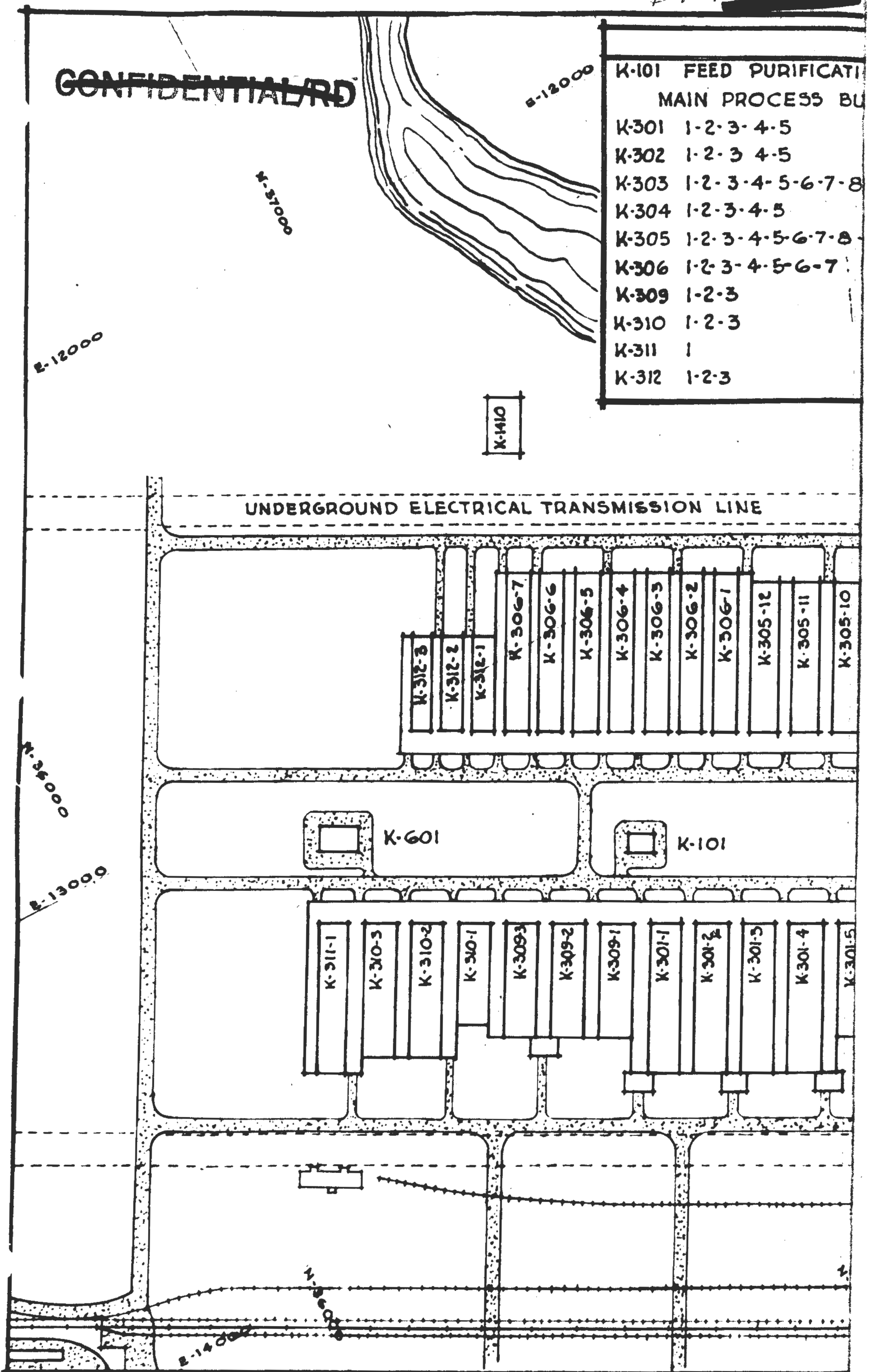

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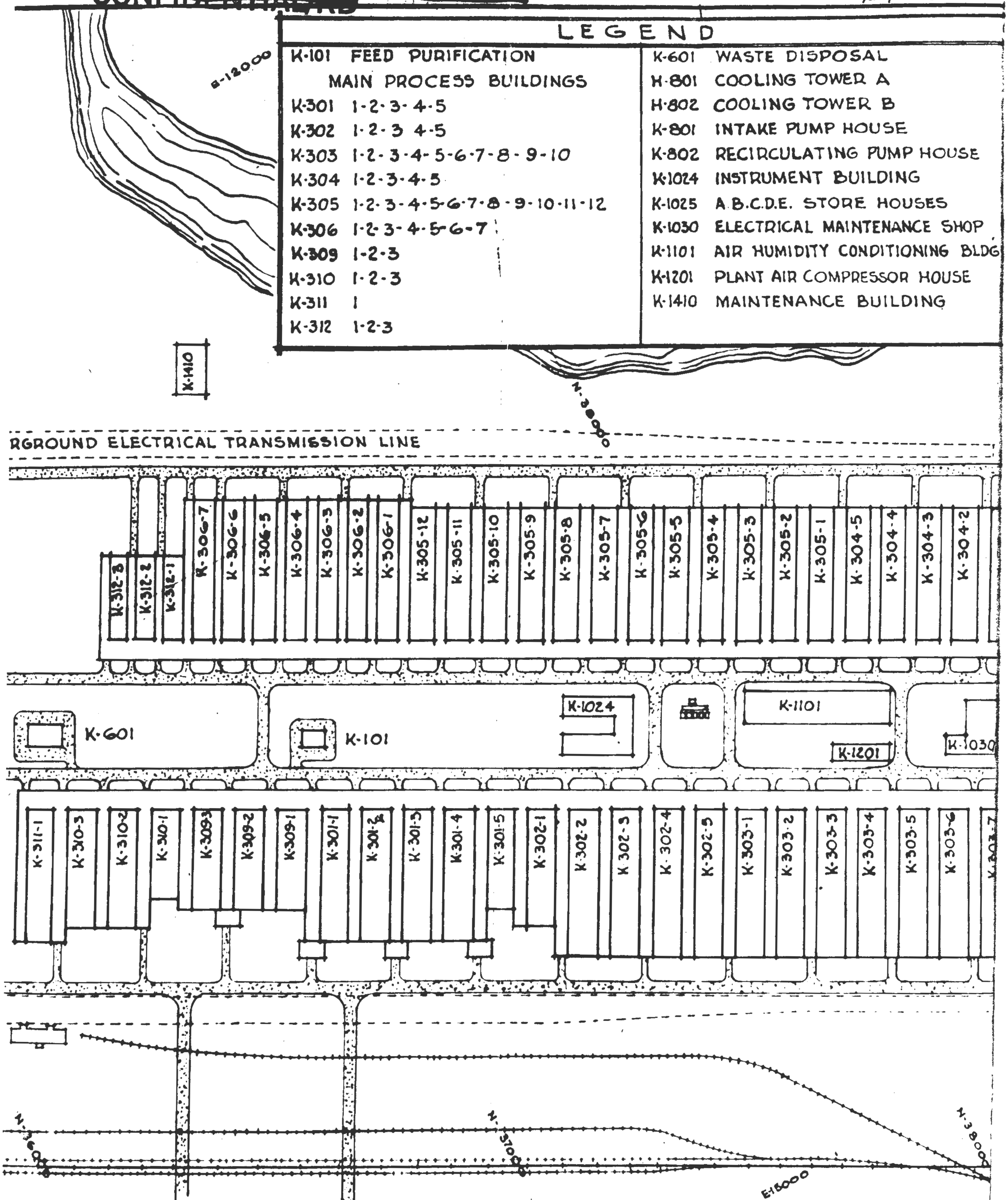

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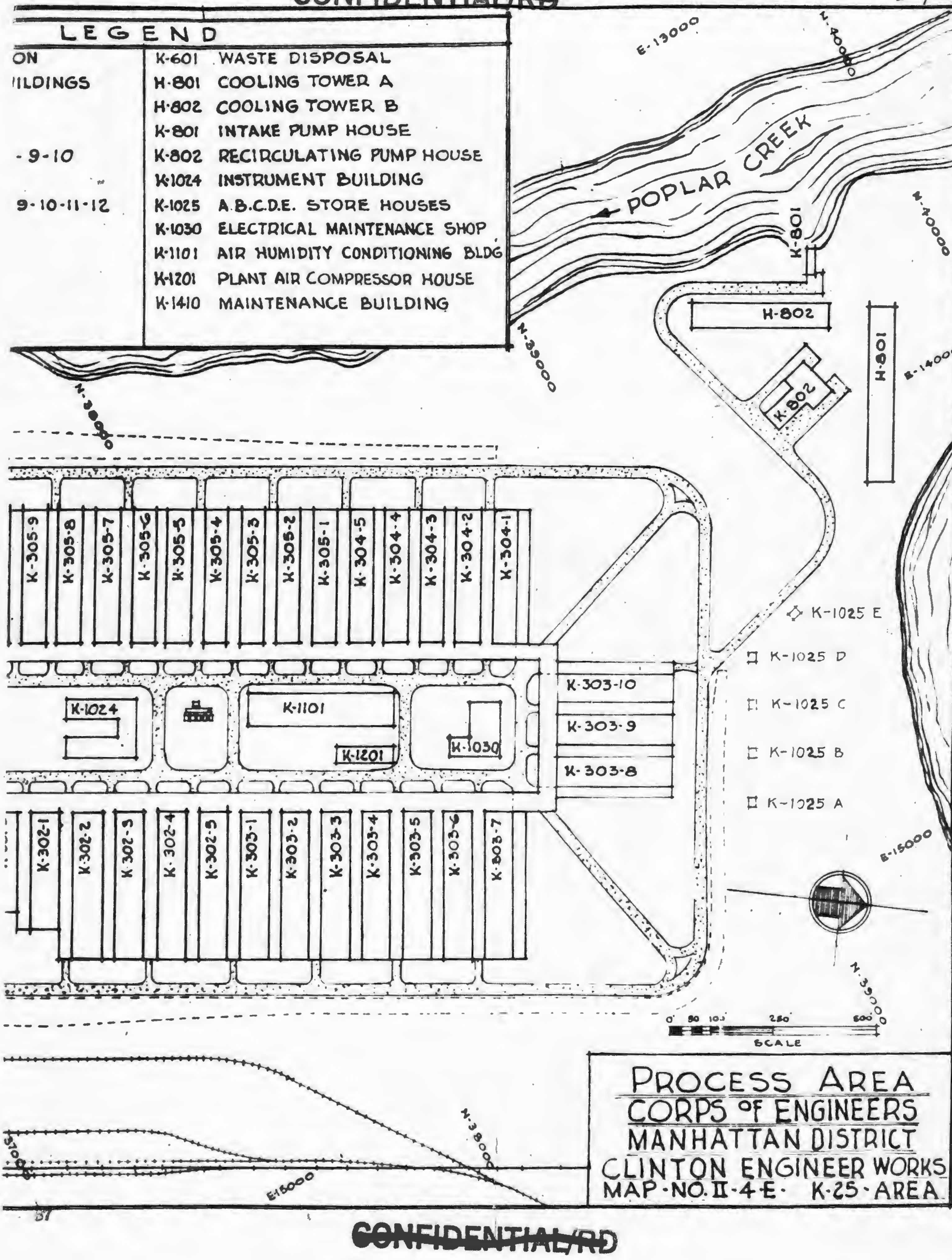

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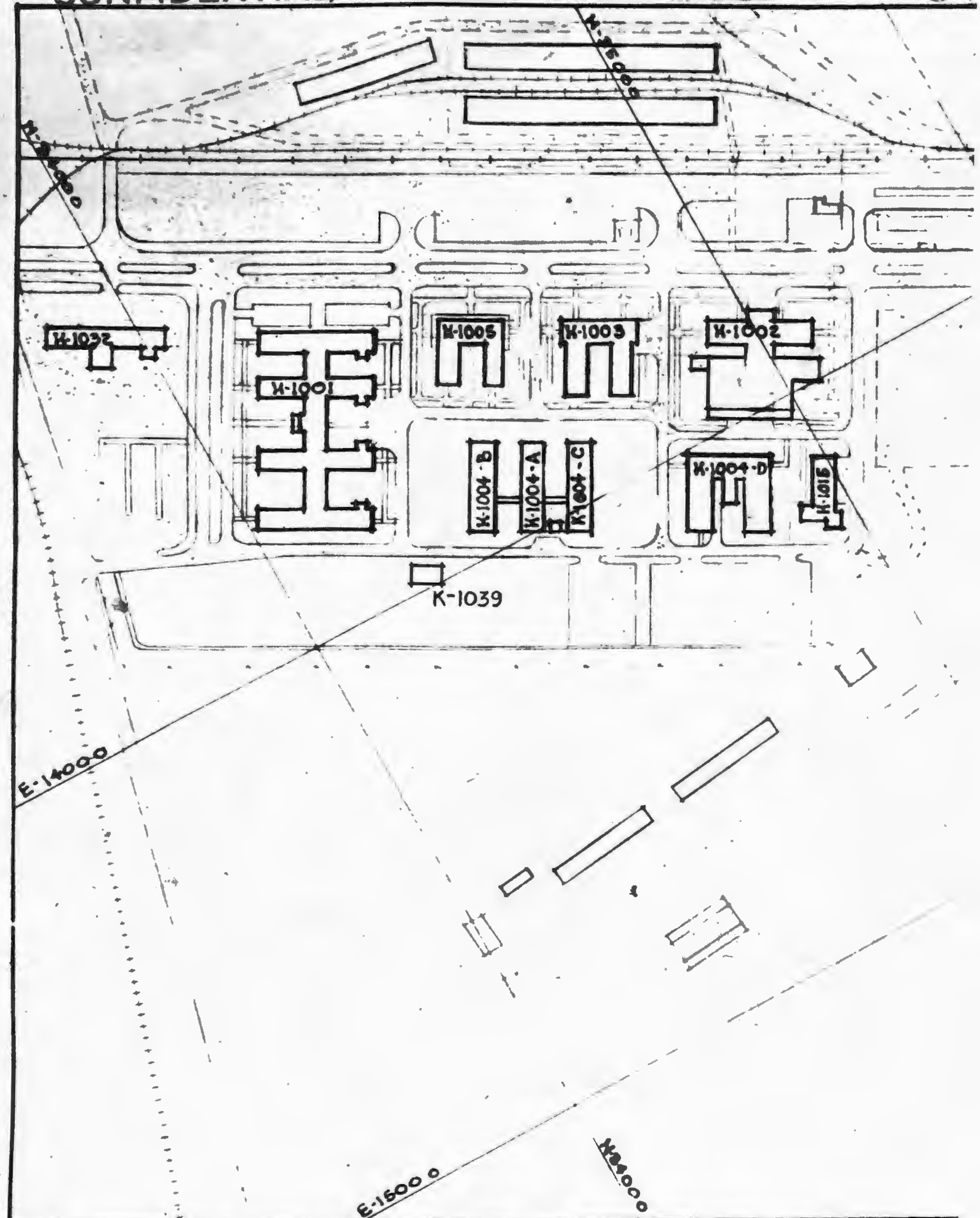
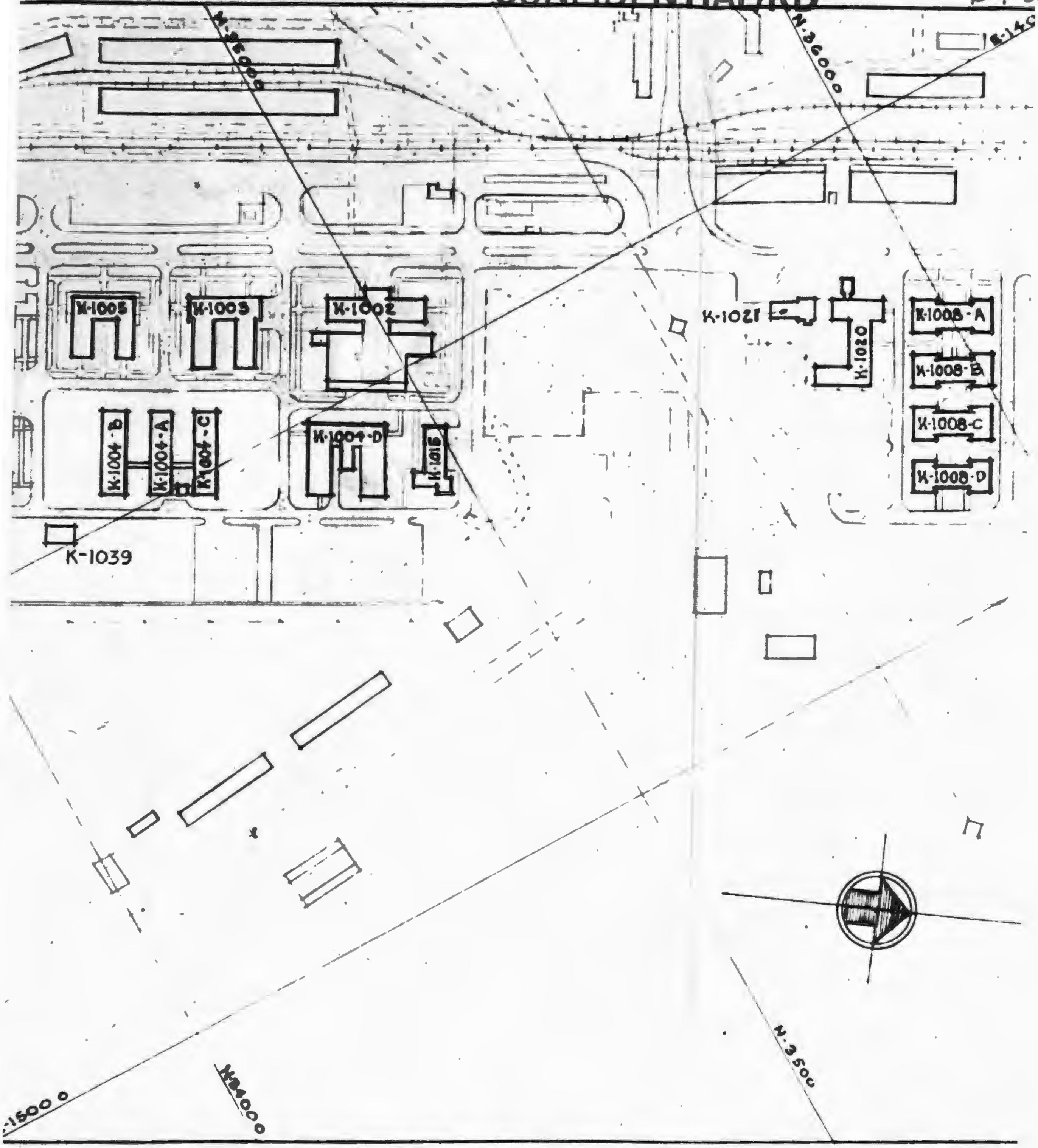


L E G E

K-1001	ADMINISTRATION BUILDING	K-1015	LAUNDRY	K-1301
K-1002	CAFETERIA	K-1020	GUARD HOUSE	K-1302
K-1003	DISPENSARY	K-1021	AMBULANCE GARAGE AND FIRE HOUSE	K-1303
K-1004	A.B.C.D LABORATORIES			K-1401
K-1005	PAY BUILDING			K-1405
K-1008	A.B.C.D. CHANGE HOUSES		[redacted]	K-1406

[redacted] ~~CONFIDENTIAL/RD~~ B9-2



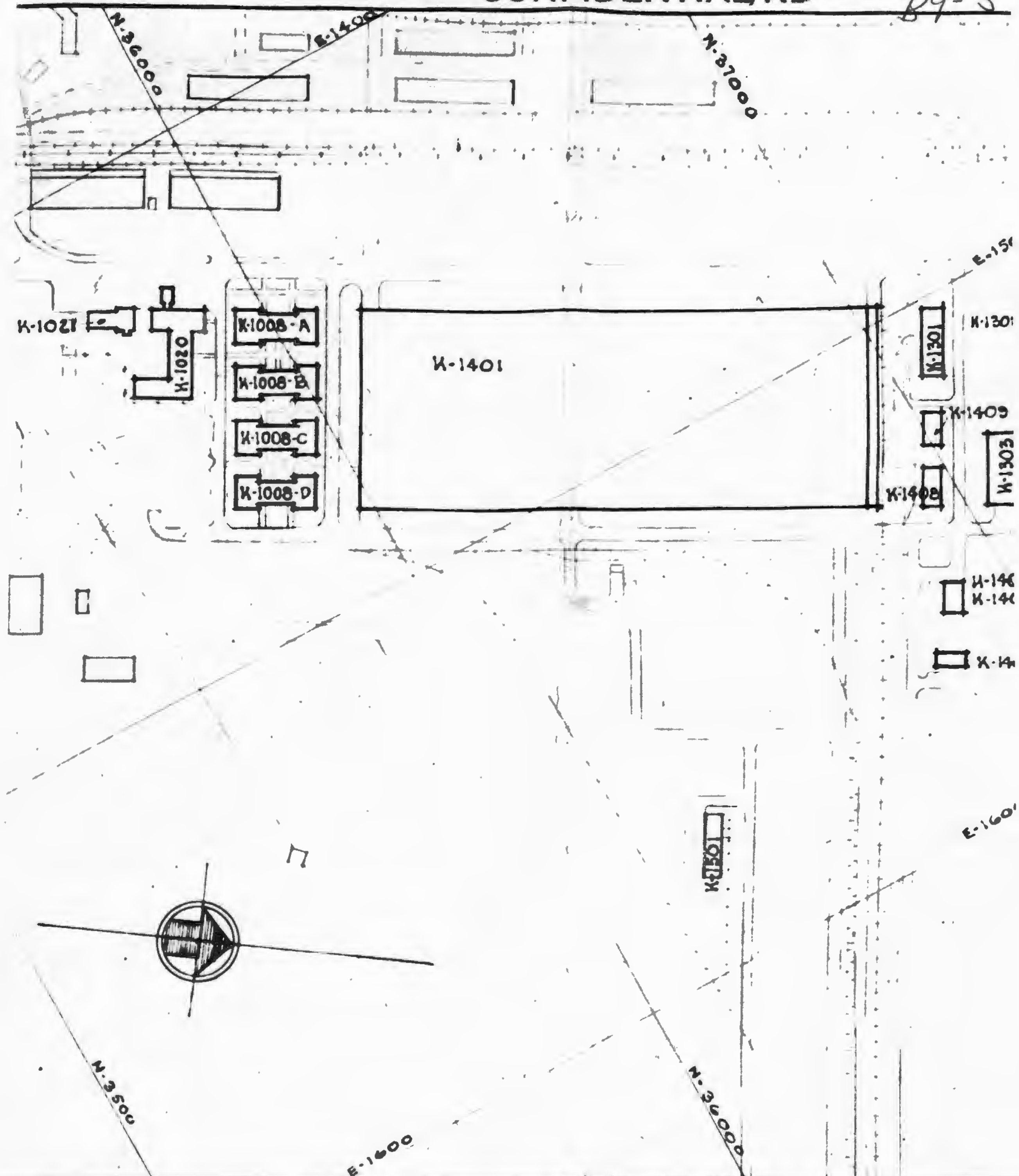
LEGEND

ING	K-1015	LAUNDRY	K-1301	C-216-BUILDING	K-1407	ACID N
	K-1020	GUARD HOUSE	K-1302	C-216-STORAGE	K-1408	NITRO(
	K-1021	AMBULANCE GARAGE AND	K-1303	BOTTLING PLANT	K-1409	CHANG
S		FIRE HOUSE	K-1401	CONDITIONING BUILDING	K-1501	STEAM
			K-1405	C216 DISPOSAL	K-1032	INDUS
USES		[redacted]	K-1406	C216 DISPOSAL		

~~CONFIDENTIAL/RD~~

~~CONFIDENTIAL/RD~~

B9-3



-ING	K-1407	ACID NEUTRALIZATION PLANT
AGE	K-1408	NITROGEN PLANT
PLANT	K-1409	CHANGE HOUSE
IG BUILDING	K-1501	STEAM PLANT
SAL	K-1032	INDUSTRIAL RELATIONS BLDG
OSAL		

0' 50' 100' 250' 500'

SCALE

CONDITIONING AND ADMINISTRATION AREAS

CORPS OF ENGINEERS

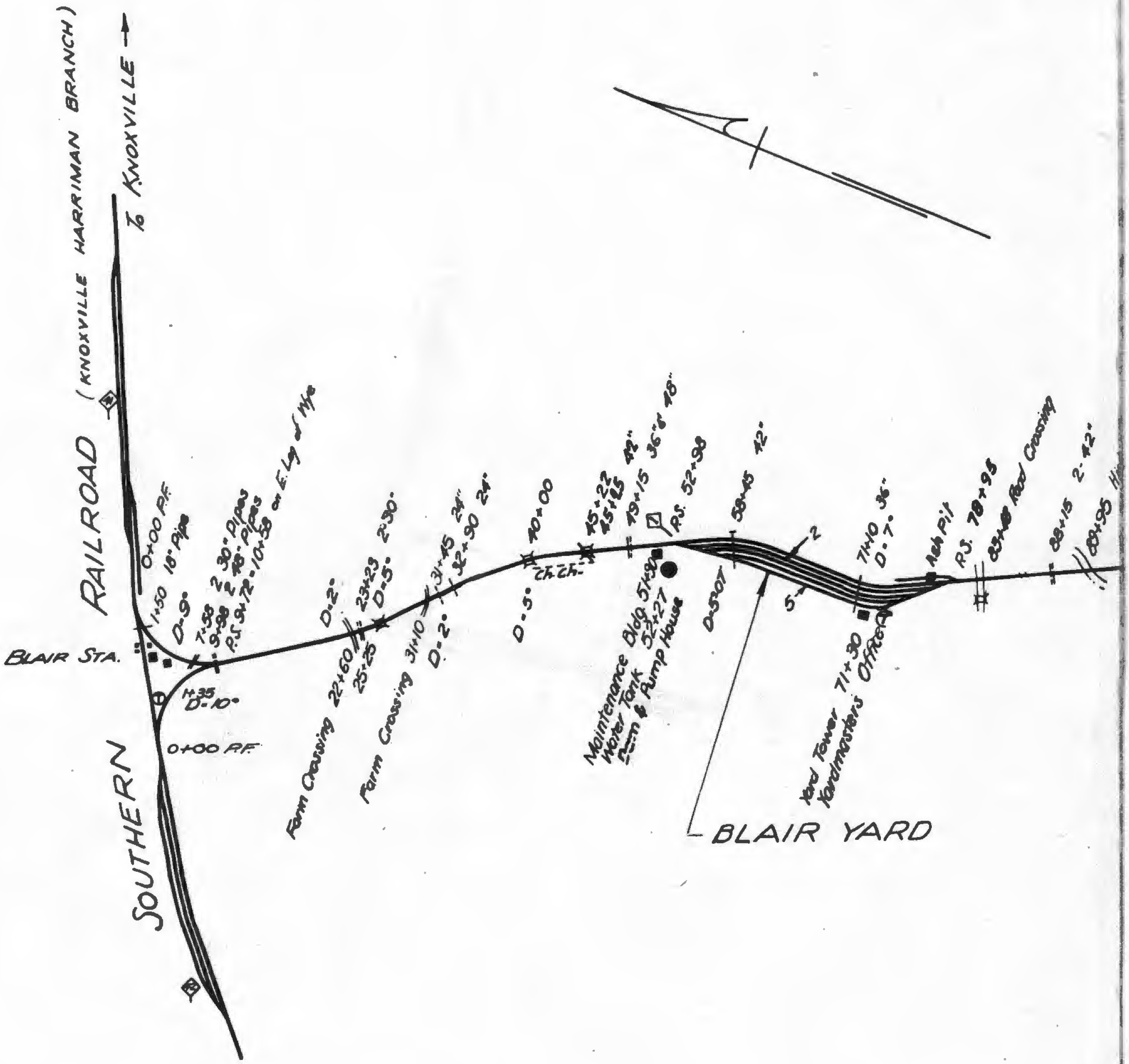
MANHATTAN DISTRICT

CLINTON ENGINEER WORKS

MAP II-4-F. K-25 AREA.

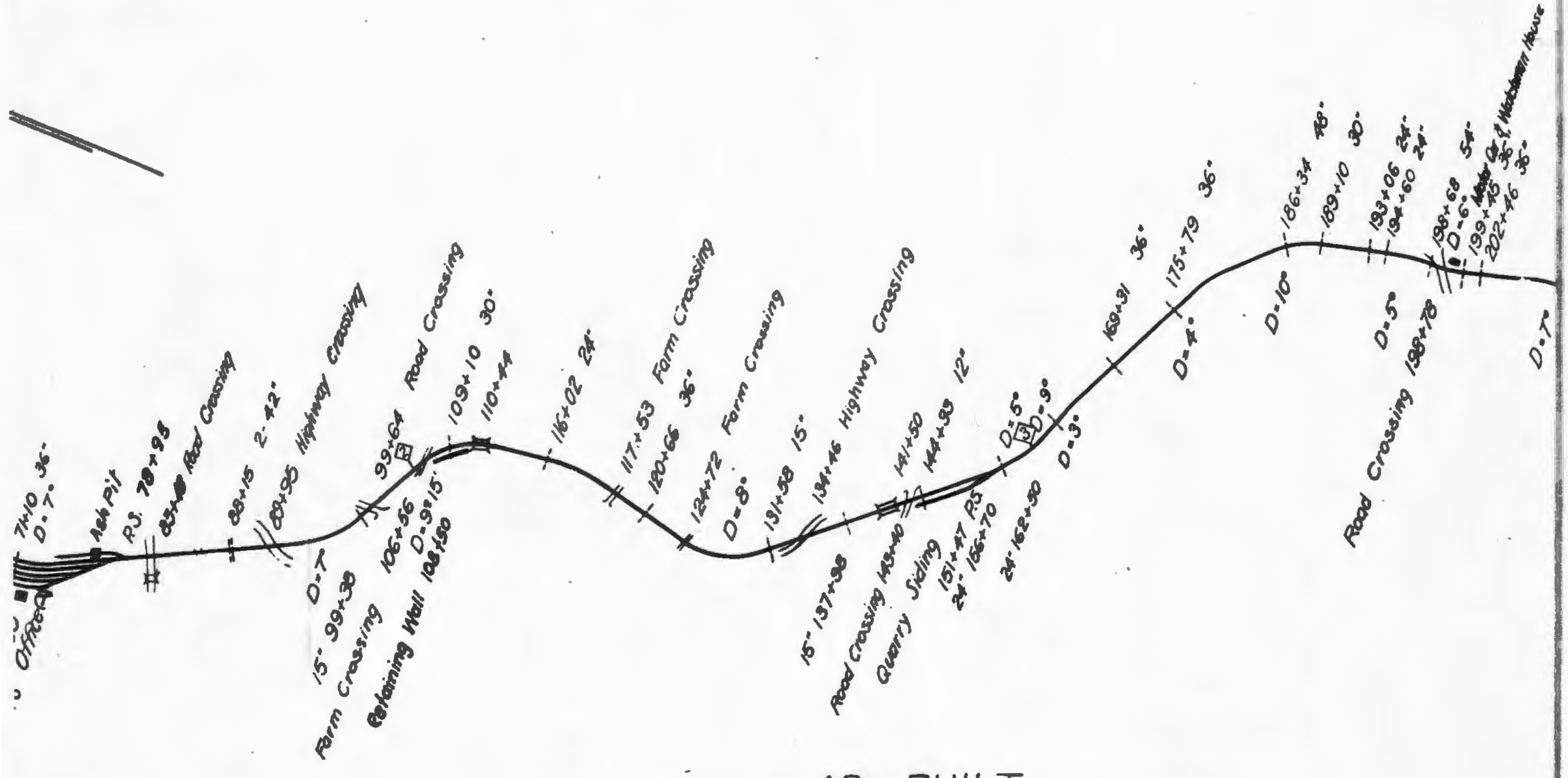
~~CONFIDENTIAL/RD~~

B10-1


SOUTHERN RAILROAD (KNOXVILLE HARRIMAN BRANCH)
To Knoxville
BLAIR STA.
0+00 P.F.
1+50 18" Pipe
D=9°
D=10°
0+00 P.F.
Farm Crossing 22+60
D=2°
D=5°
Farm Crossing 31+10
D=2°
D=5°
40+00
Ch.Ch.
Maintenance Bldg 51+30
Water Tank 52+27
Boom & Pump House
P.S. 52+38
58+45 42"
D=5°07'
71+10 36"
D=7°
Yard Tower 71+30
Yardmasters Office
Ash Pit
P.S. 78+95
83+40 Road Crossing
BLAIR YARD

B10-2

~~CONFIDENTIAL/RD~~ ~~SECRET~~



AS - BUILT

RAILROAD FACILITIES from the SOUTHERN RAILROAD to the K-25 AREA

TRESTLE & BRIDGE DATA		
23+25	25'	3 Bent Timber Trestle
40+00	25'	3 Bent Timber Trestle
45+22	25'	3 Bent Timber Trestle
110+44	98'	9 Bent Timber Trestle
141+50	100'	8 Bent Timber & Steel Trestle
226+23	150'	Steel Lattice Truss Span
338+66	2	8'×10' Rein. Conc. Box Culverts

SUMMARY OF RAILROAD MILEAGE	
MAINLINE TRACKS	10.7 MILES
YARDS & SIDINGS	12.9 MILES
TOTAL	23.6 MILES
TOTAL of #8 TURNOUTS	64
TOTAL of #8 CROSSOVERS	7

LEGEND

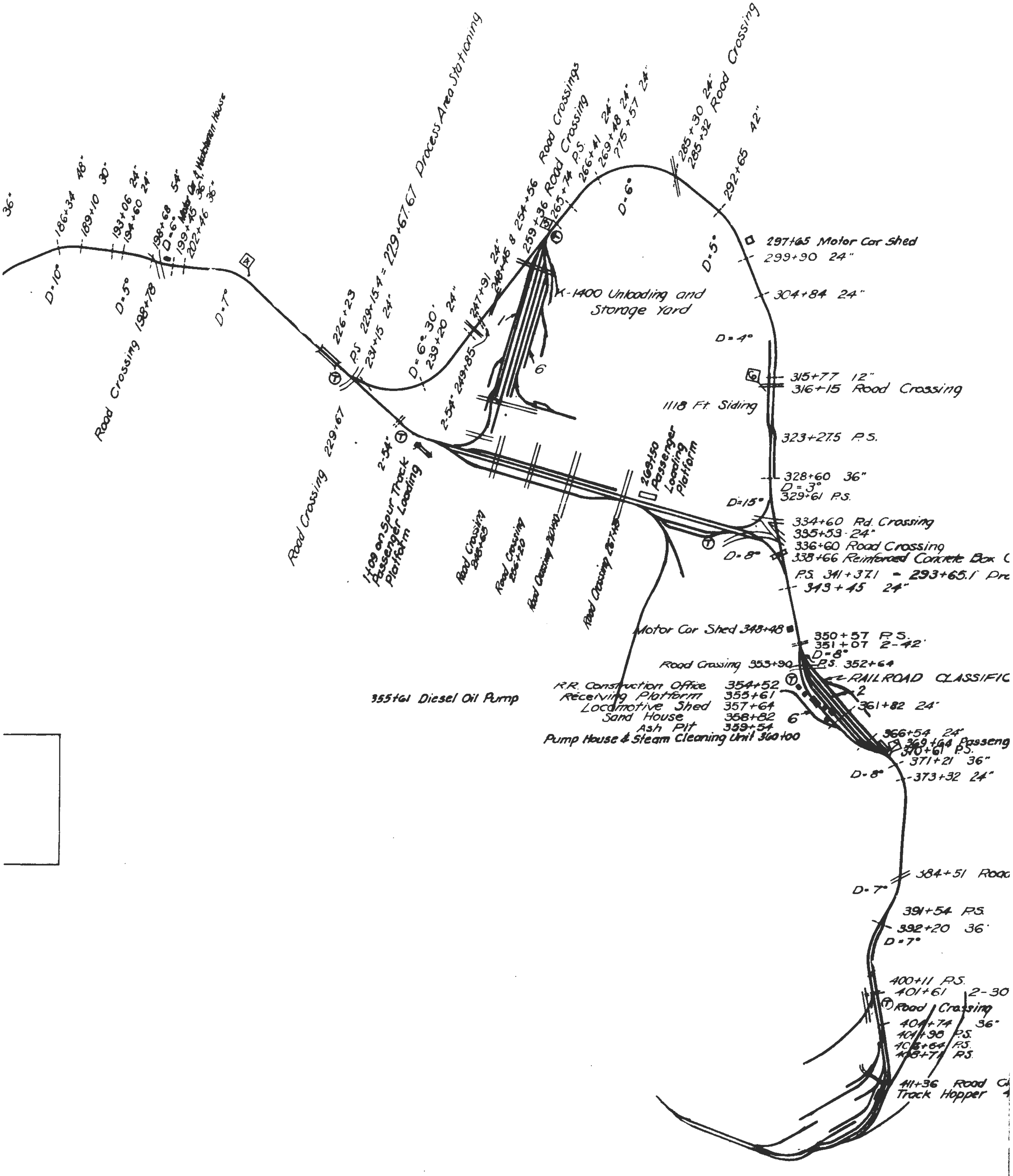
- Mile Post
- Telephone
- Pipe Culvert
- Trestle or Bridge

~~SECRET~~ B10

~~CONFIDENTIAL/RD~~

B10-3

~~CONFIDENTIAL/RD~~



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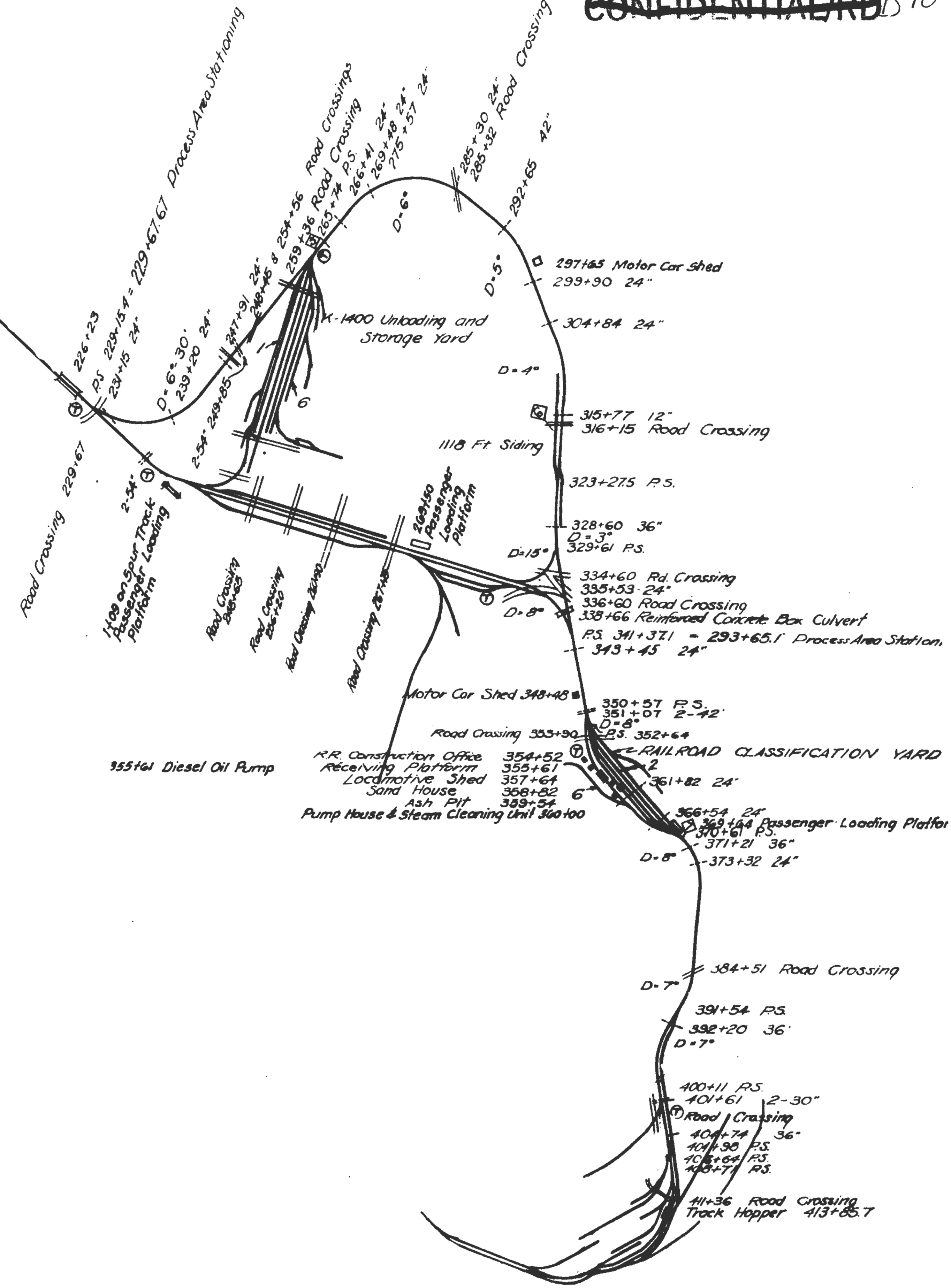
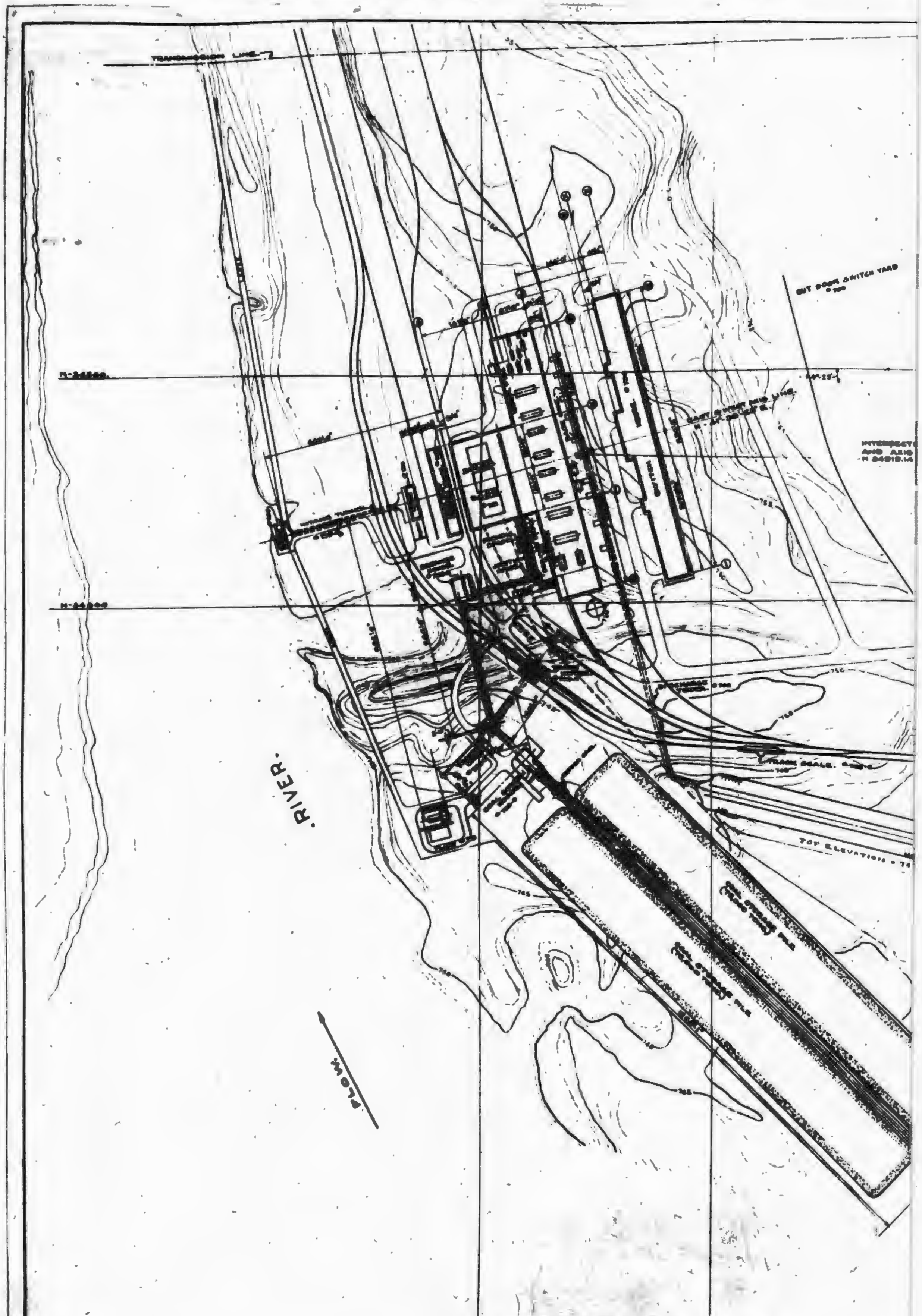
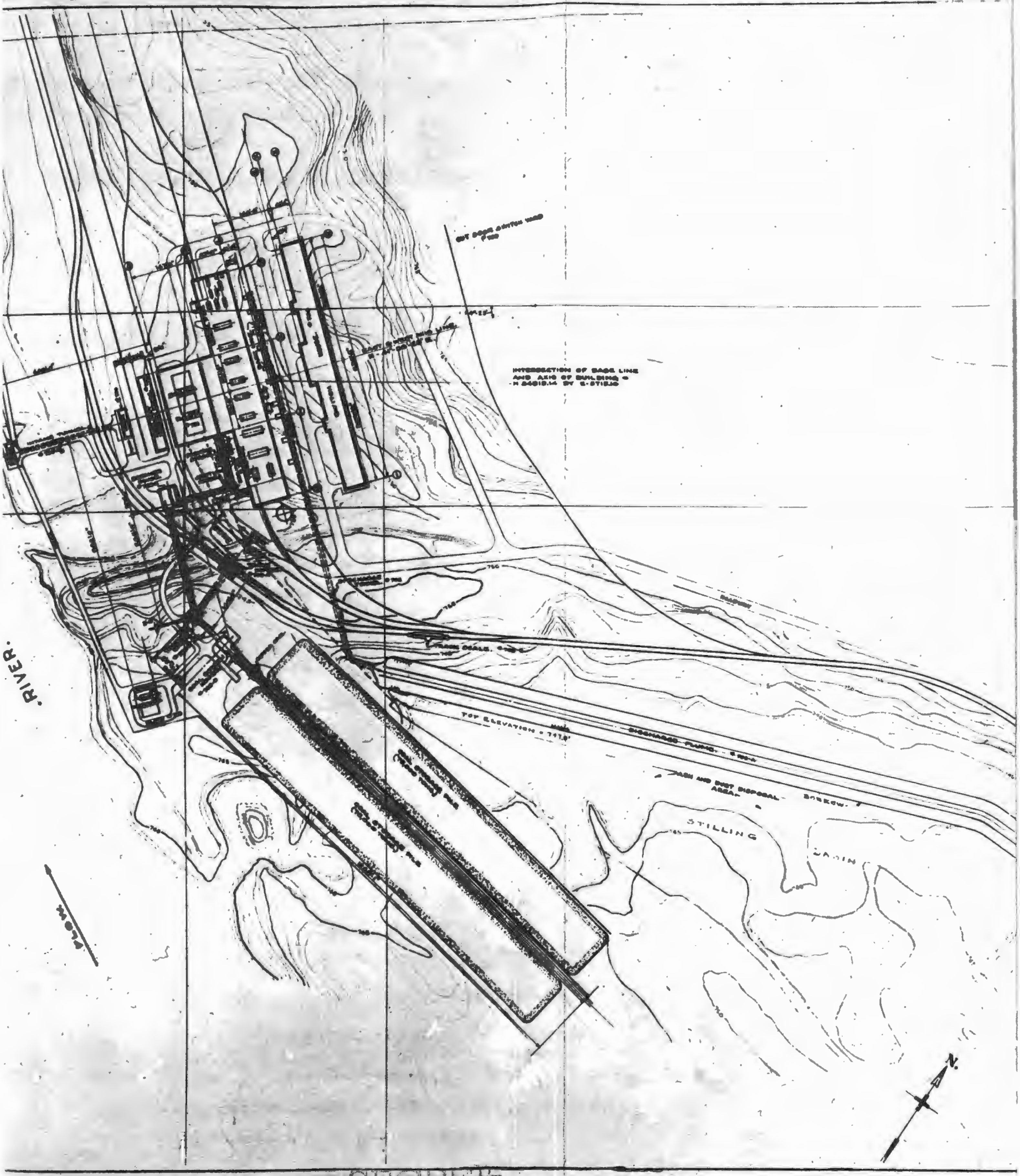
~~CONFIDENTIAL/RD~~ B10-4



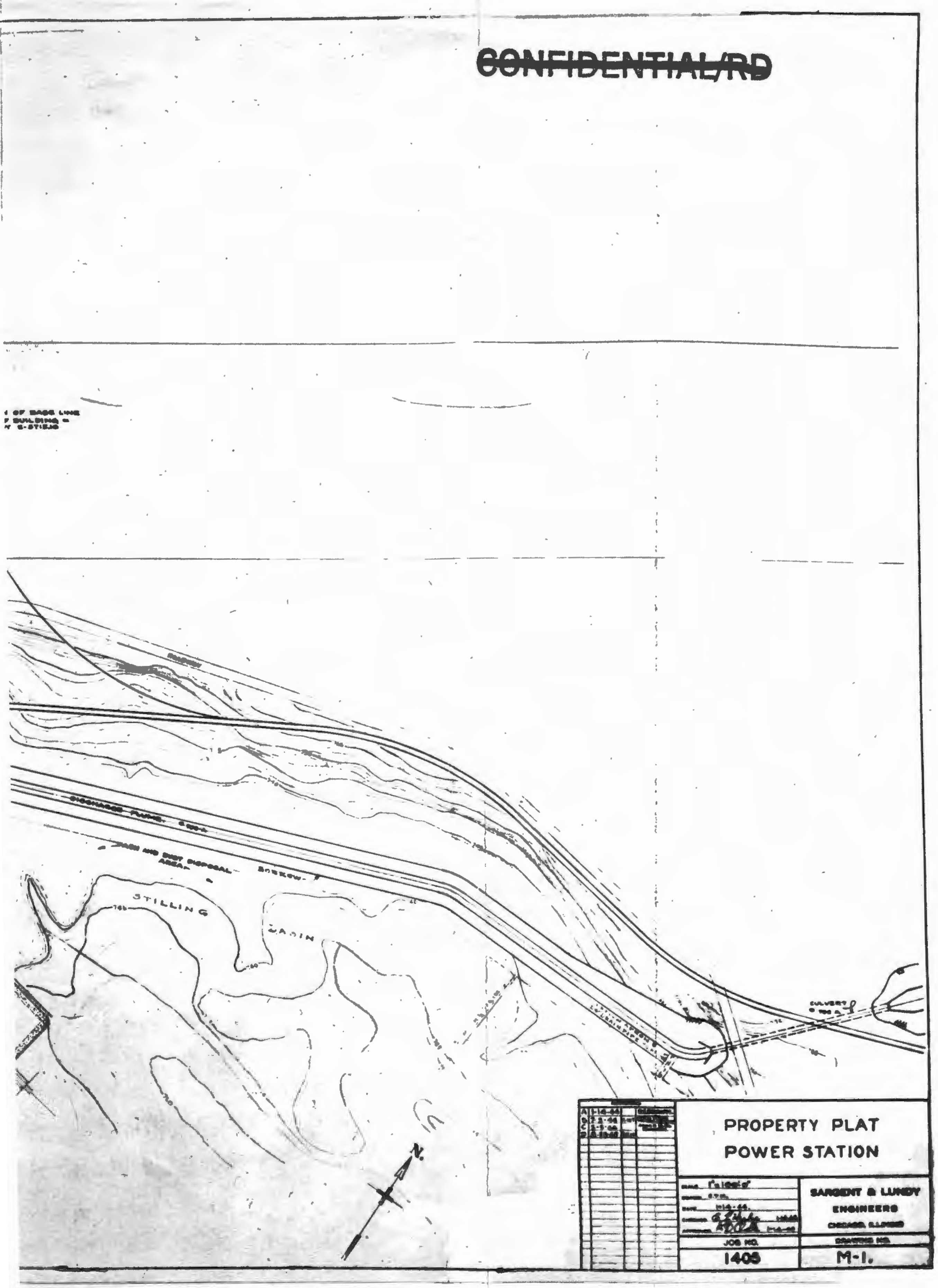
~~CONFIDENTIAL/RD~~


OUT DOOR SWITCH YARD
RIVER
FLOW

~~SECRET~~ ~~CONFIDENTIAL/RD~~ B11-2

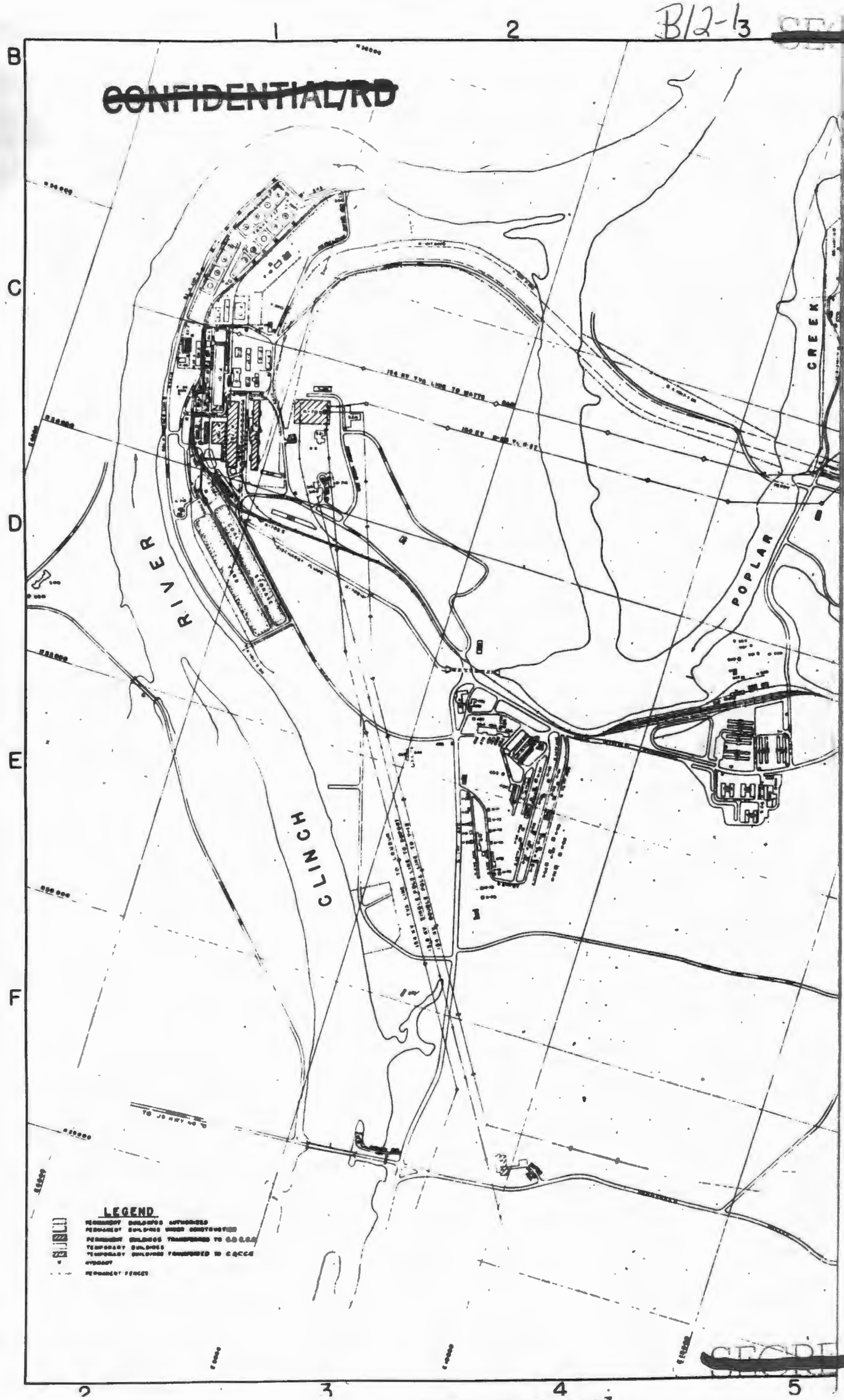


B11-3



~~CONFIDENTIAL/RD~~

B12-13



~~CONFIDENTIAL/RD~~

B12-2

[redacted]

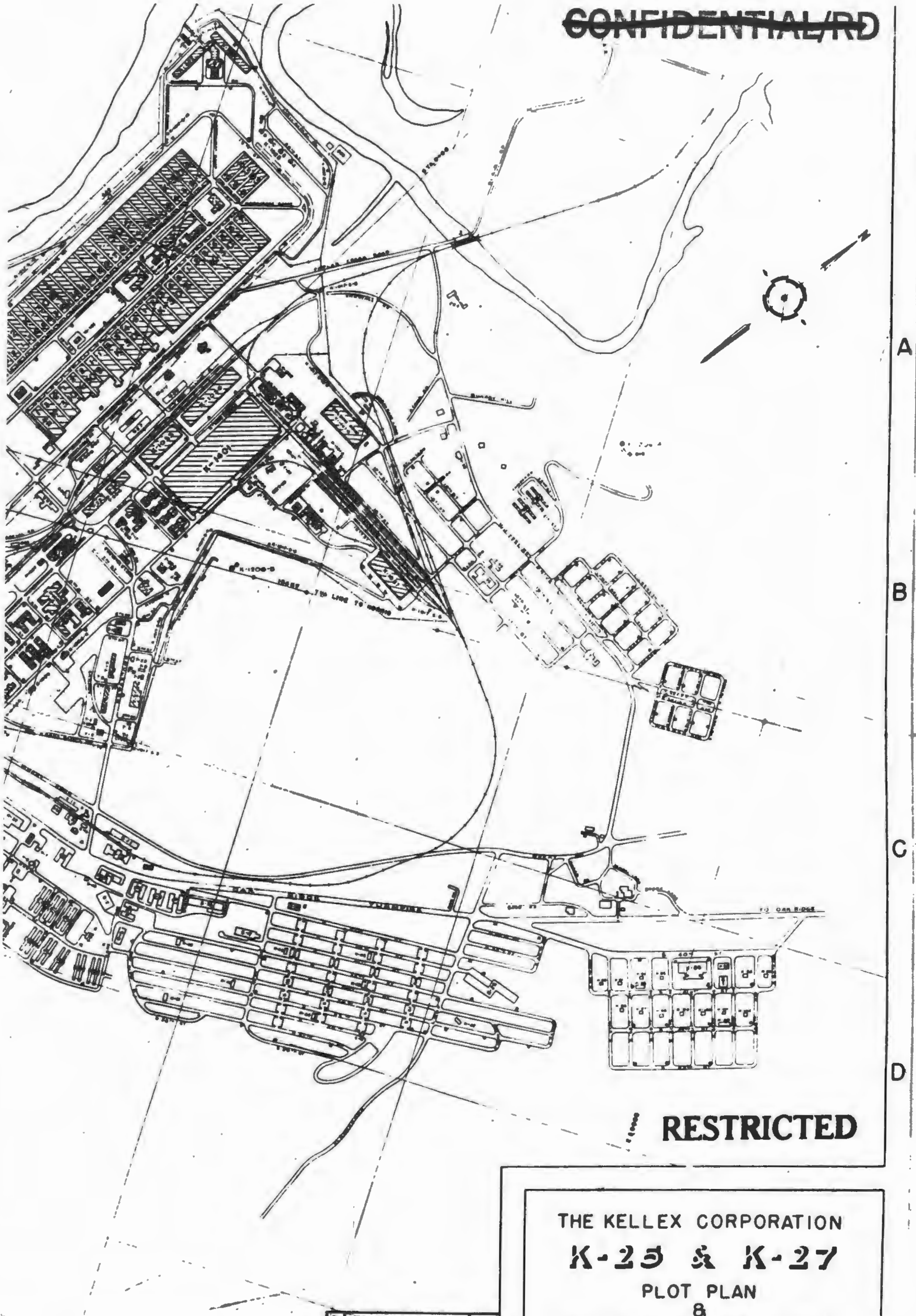
~~CONFIDENTIAL/RD~~

[redacted] 812

~~CONFIDENTIAL/RD~~

B12-3

~~CONFIDENTIAL/RD~~



RESTRICTED

9	ADDED MAR. CONSTR.	[illegible]
8	ADDED FEB. CONSTR.	[illegible]
7	ADDED JAN CONSTR.	[illegible]
6	ADDED DEC. CONSTR.	[illegible]
5	REDRAWN	[illegible]
NO.	DESCRIPTION REVISIONS	DATE

THE KELLEX CORPORATION

K-25 & K-27

PLOT PLAN
&
STATUS OF CONSTRUCTION

SCALE

DATE FEB 27, 1944

DRAWN BY [illegible]

DWG. NO. FD-01-AA-2

~~CONFIDENTIAL/RD~~

MANHATTAN DISTRICT HISTORY

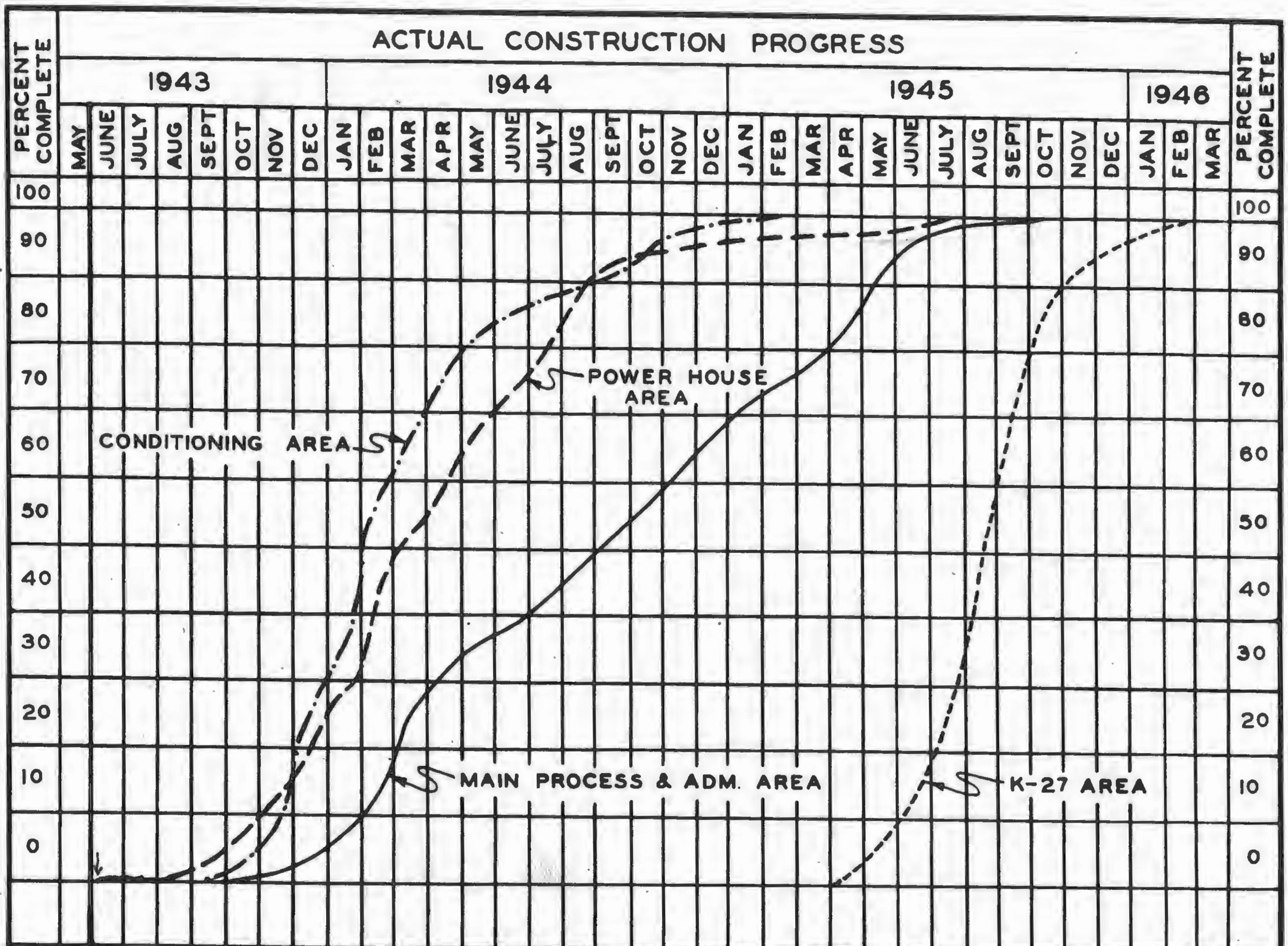
BOOK II - GASEOUS DIFFUSION (K-25) PROJECT

VOLUME 4 - CONSTRUCTION

APPENDIX "C"

CHARTS AND GRAPHS

GASEOUS DIFFUSION PROJECT



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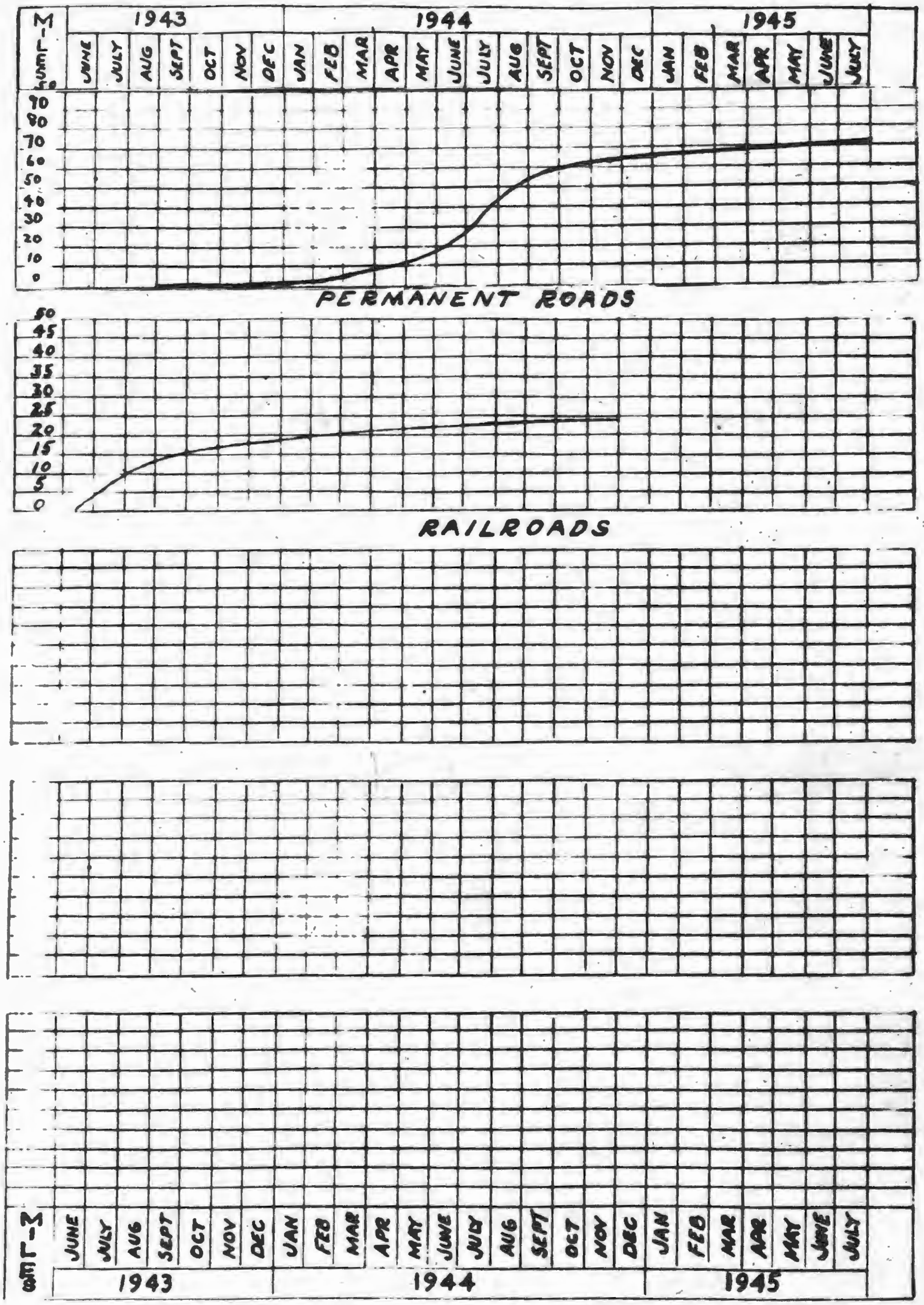
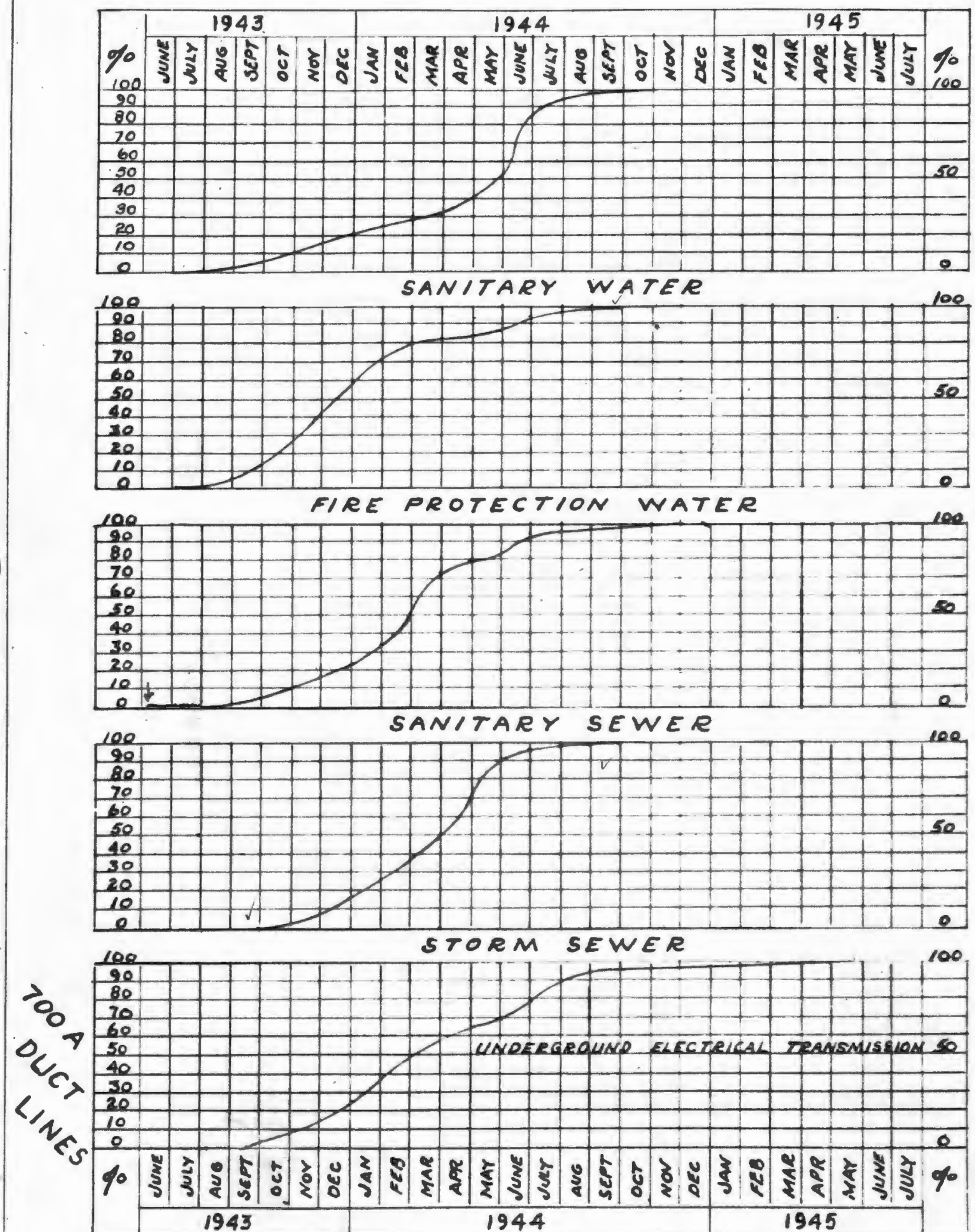
ACTUAL CONSTRUCTION PROGRESS

K-25 AREA

~~CONFIDENTIAL/RD~~

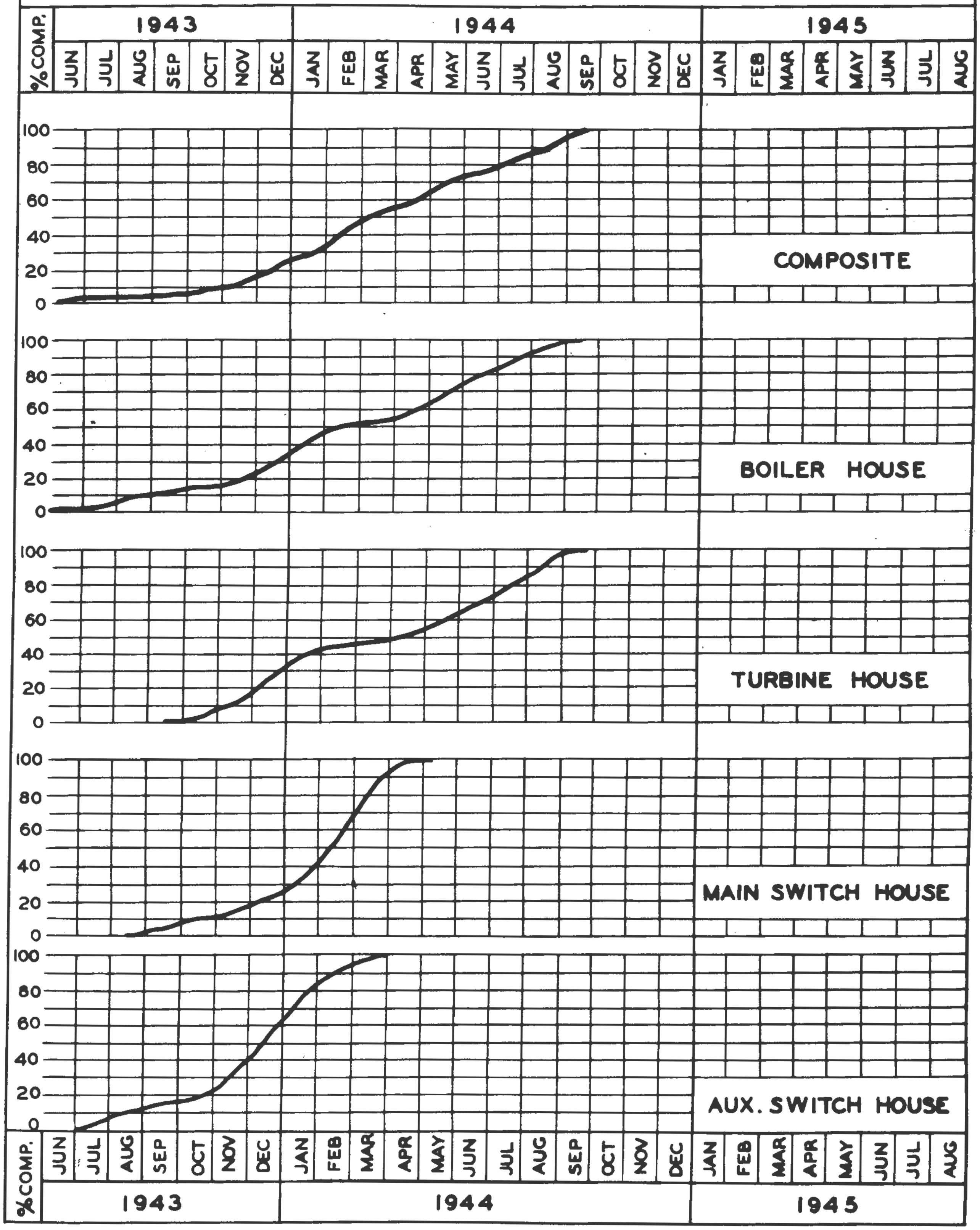


ACTUAL CONSTRUCTION PROGRESS
K-25 AREA



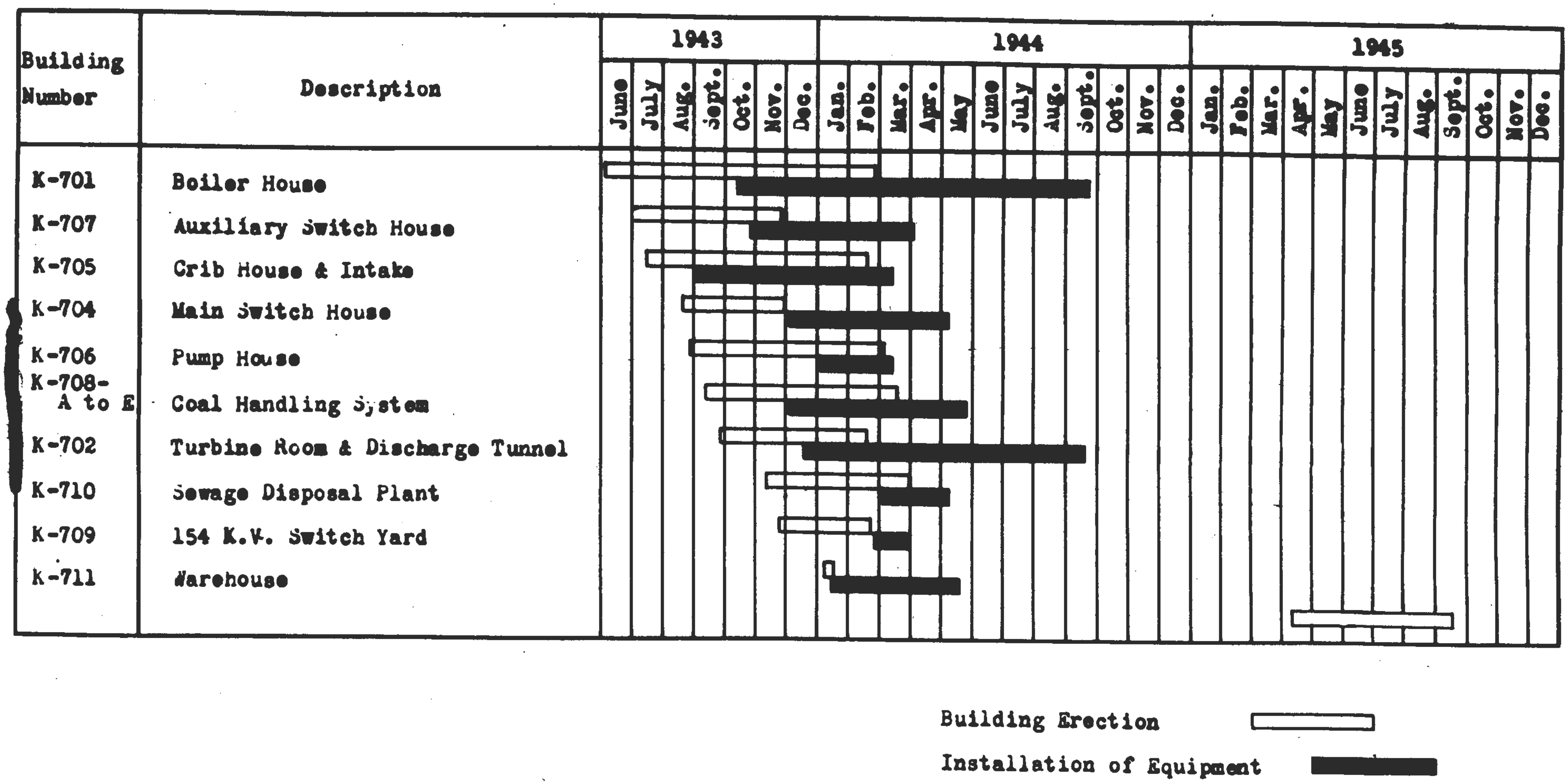
~~SECRET~~ ~~CONFIDENTIAL/RD~~

ACTUAL CONSTRUCTION PROGRESS
POWER HOUSE AREA

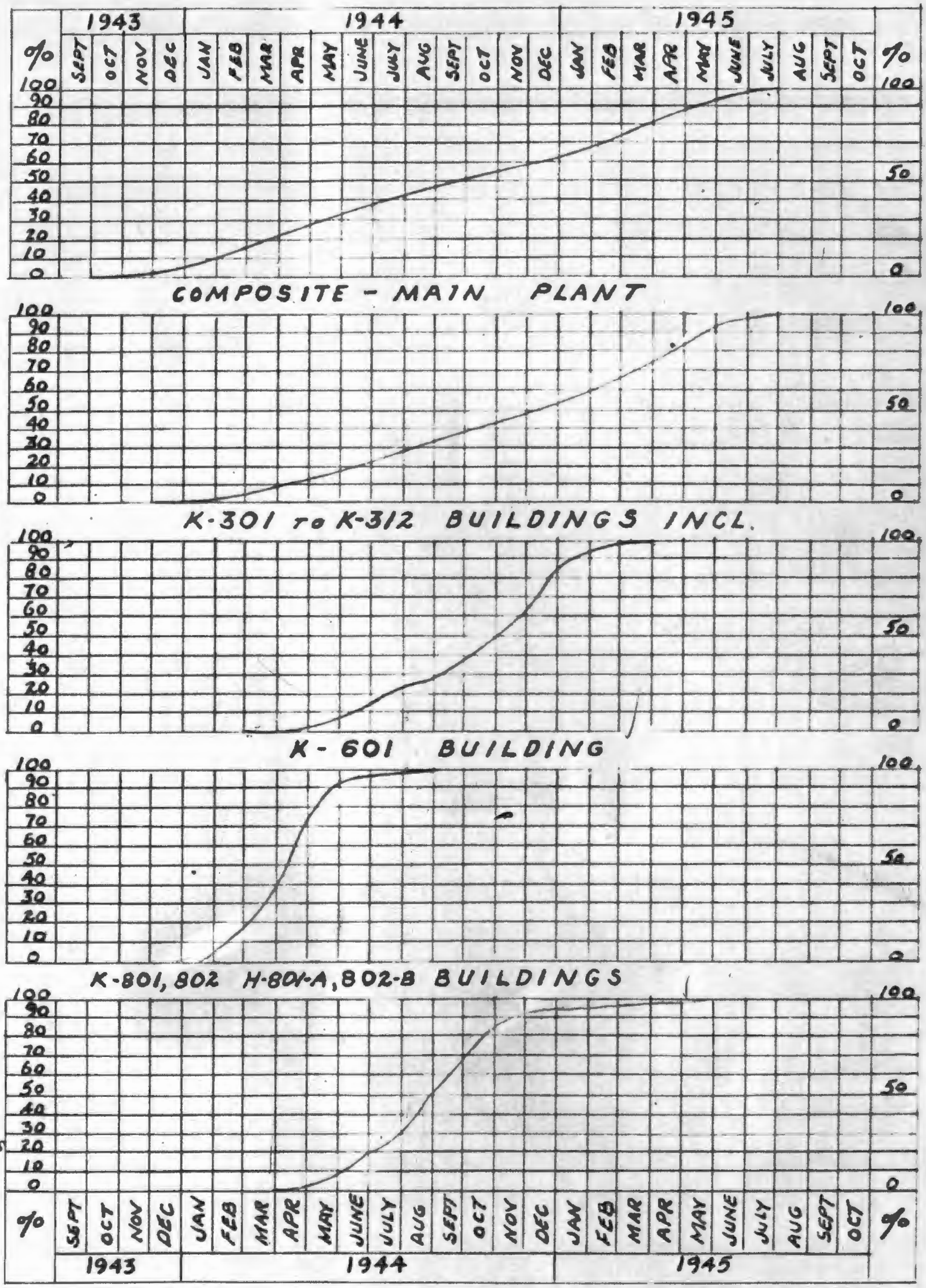


~~CONFIDENTIAL/RD~~

PROGRESS OF CONSTRUCTION
OF THE POWER PLANT



ACTUAL CONSTRUCTION PROGRESS
K-25 AREA



~~CONFIDENTIAL/RD~~

C7-1

PROGRESS
IN TH

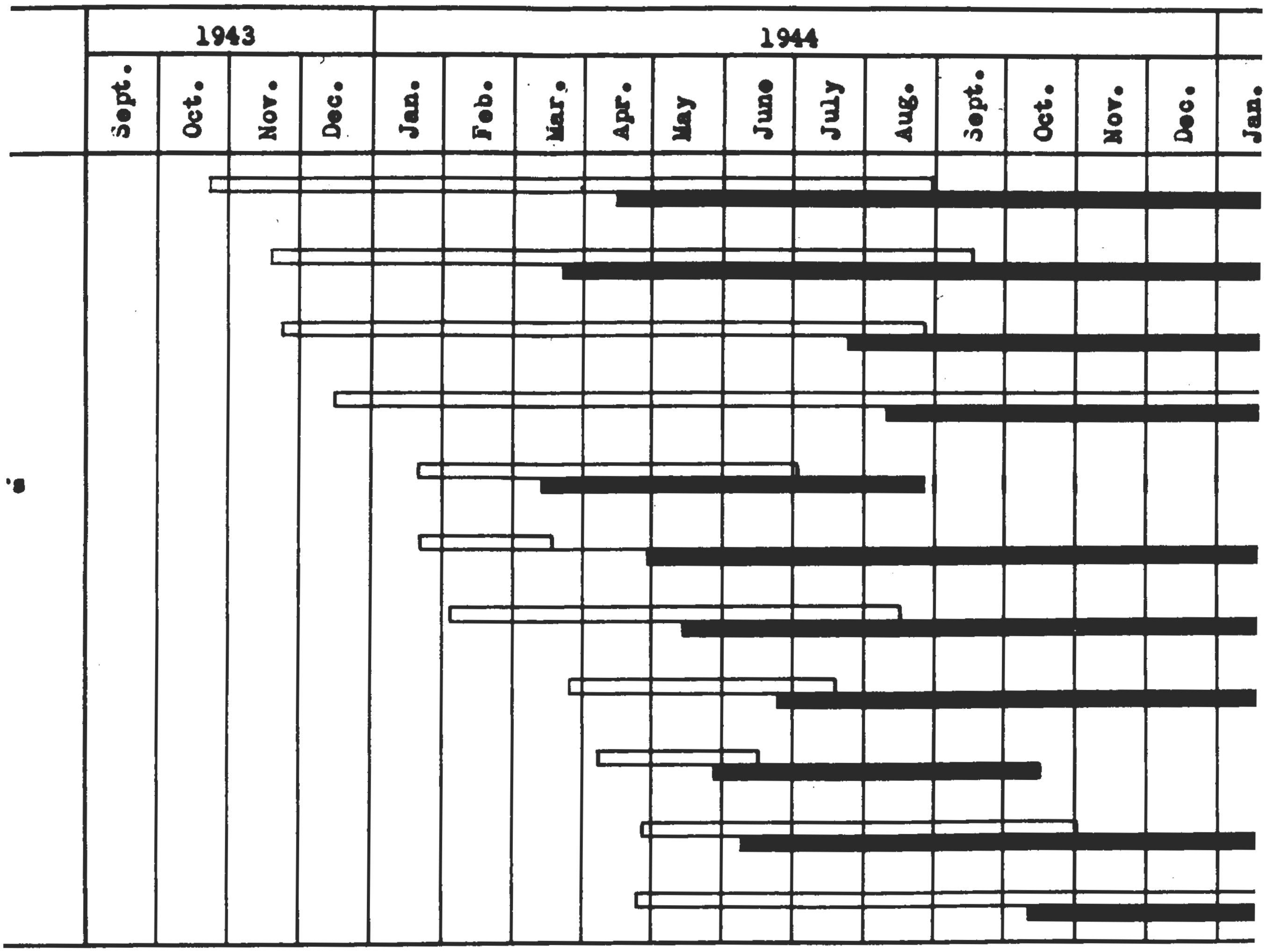
Section Number	Description	1943						
		Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Case I K-302 & 310	Process Buildings							
Case II K-303 & 311	Process Buildings							
Case III K-301 & 309	Process Buildings							
Case IV K-304,5 & 312	Process Buildings							
K-800	Pump House & Cooling Towers							
K-300-C	Coolant Drying & Storage System							
K-100	Feed Purification System							
K-600	Waste Disposal System							
K-1201	Compressor Building							
K-1100	Air Conditioning System							
Case V K-306	Process Buildings							

(a) First cell in Case I in Operation
(b) Case I 100% in Operation
(c) Case II 100% in Operation

~~CONFIDENTIAL/RD~~

~~SECRET~~ ~~CONFIDENTIAL/RD~~ C7-2

PROGRESS OF CONSTRUCTION
IN THE PROCESS AREA



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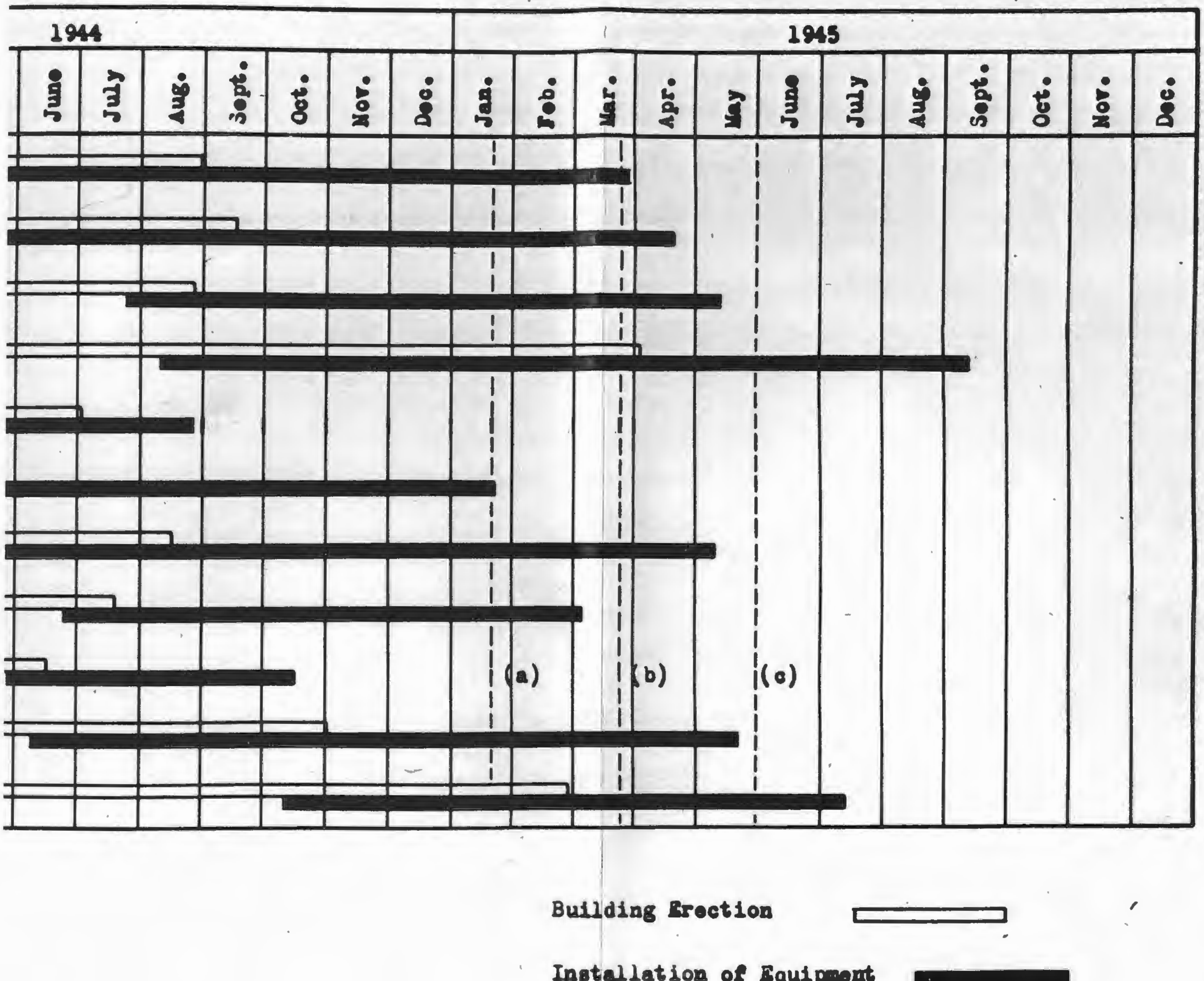
~~CONFIDENTIAL/RD~~

C7-3

TRUCTION
AREA



~~CONFIDENTIAL/RD~~

PROGR.
IN THE

Building Number	Description	1943						
		Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
K-1001	Administration Bldg. (1st 2Wings) (3rd and 4th Wings)							
K-1002	Cafeteria							
K-1028-1 to 4	Guard Houses						(1)	
K-1021	Fire House & Ambulance Garage							
K-1024-A	Oxygen & Pyrofax Manifold Sta.							
K-1015	Laundry							
K-1017	Sentry Towers (1 to 27)							
K-1003	Dispensary							
K-1005	Payroll & Safety Building							
K-1004-D	Works Laboratory							
K-1020	Gate House & Guard Building							
K-1024	Instrument Building							
K-1008-A to D	Change Houses							
K-1025-A to E	Warehouses for Shipping Drums							
K-1004-C	Physics Laboratory							
K-1004-B	Physical Chemistry Laboratory							
K-1004-A	Control Laboratory							
K-1026 & A	Main Bus Terminal & Boiler House							
K-1027	Bus Repair Shop							
K-1016	Ticket Off.& Bus Loading Platform							
K-1004-E	Laboratory Storage							
K-1029	Field Office Building							
K-1004-H	Oxygen & Pyrofax Storage Bldg.							
K-1030	Electrical Repair & Maint.Bldg.							
K-1031	Drum Storage Building							
K-1032	Industrial Relations Building							
K-1034	Process Area AdministrationBldg.							
K-1035	Warehouse, General Stores							
K-1037	Warehouse							
K-1036	Warehouse, Spare Parts & Maint.							

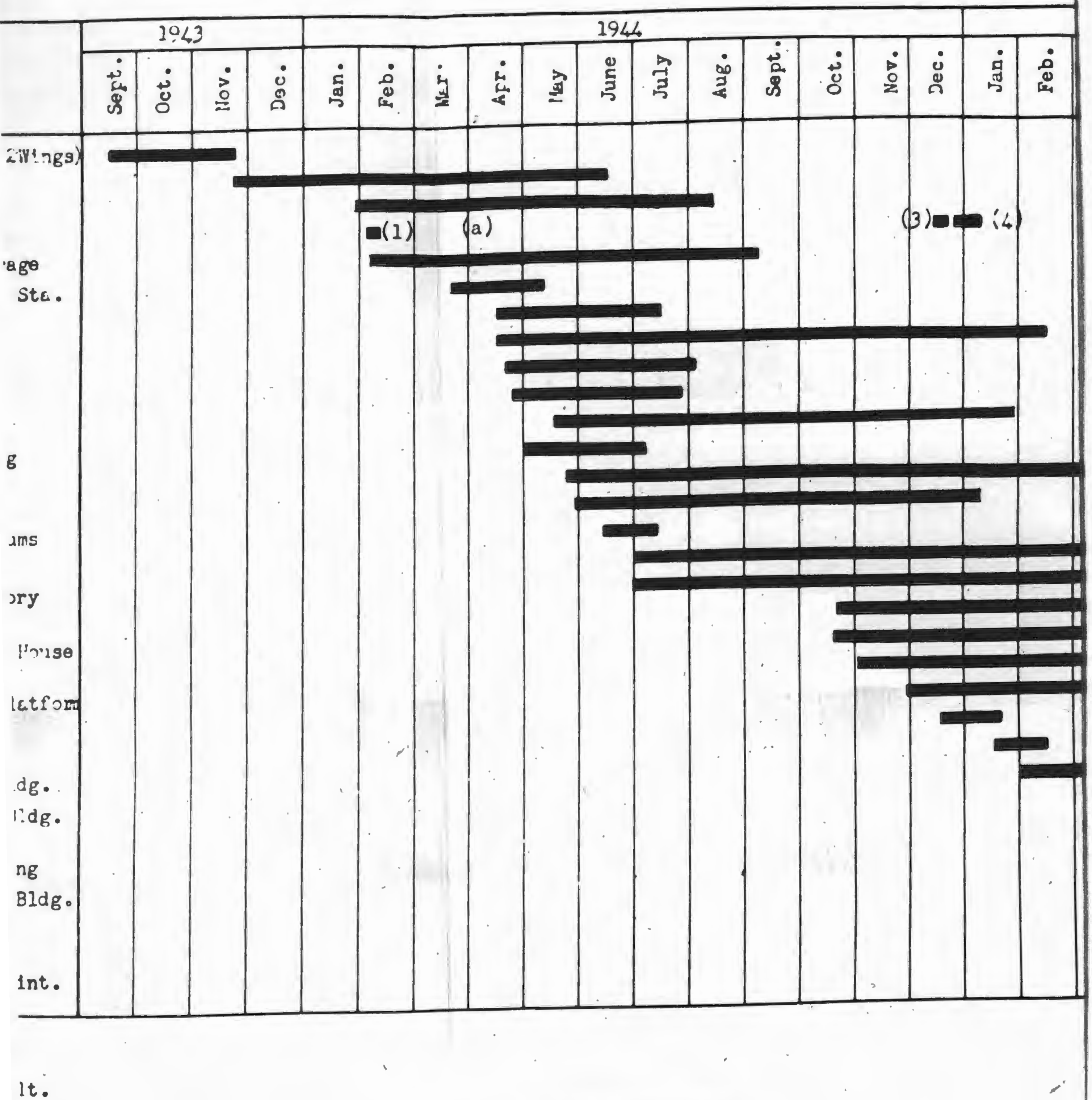
(a) K-1028-2 was never built.

~~CONFIDENTIAL/RD~~

C8-2

~~CONFIDENTIAL/RD~~ ~~SECRET~~

PROGRESS OF CONSTRUCTION
IN THE ADMINISTRATION AREA



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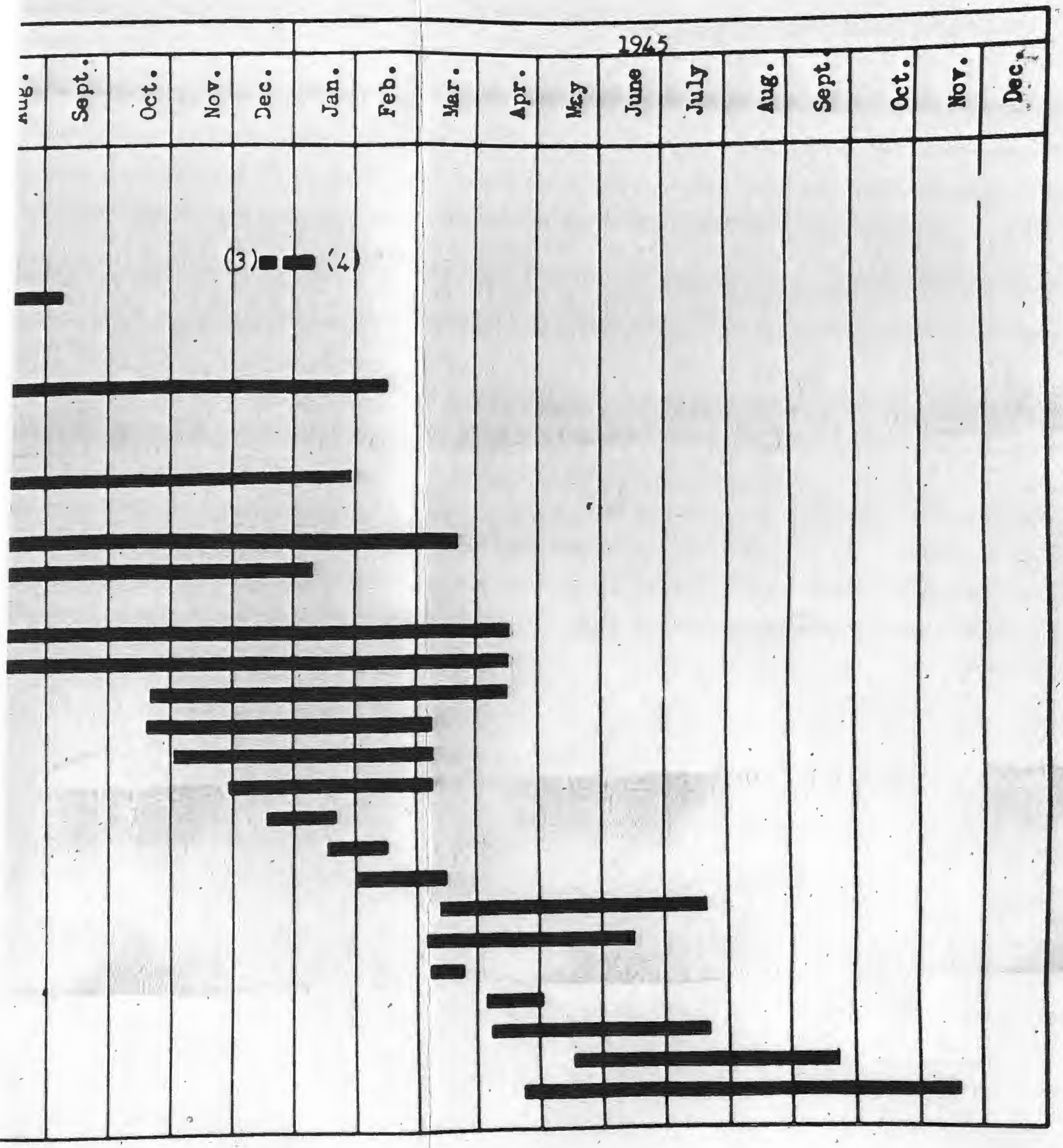
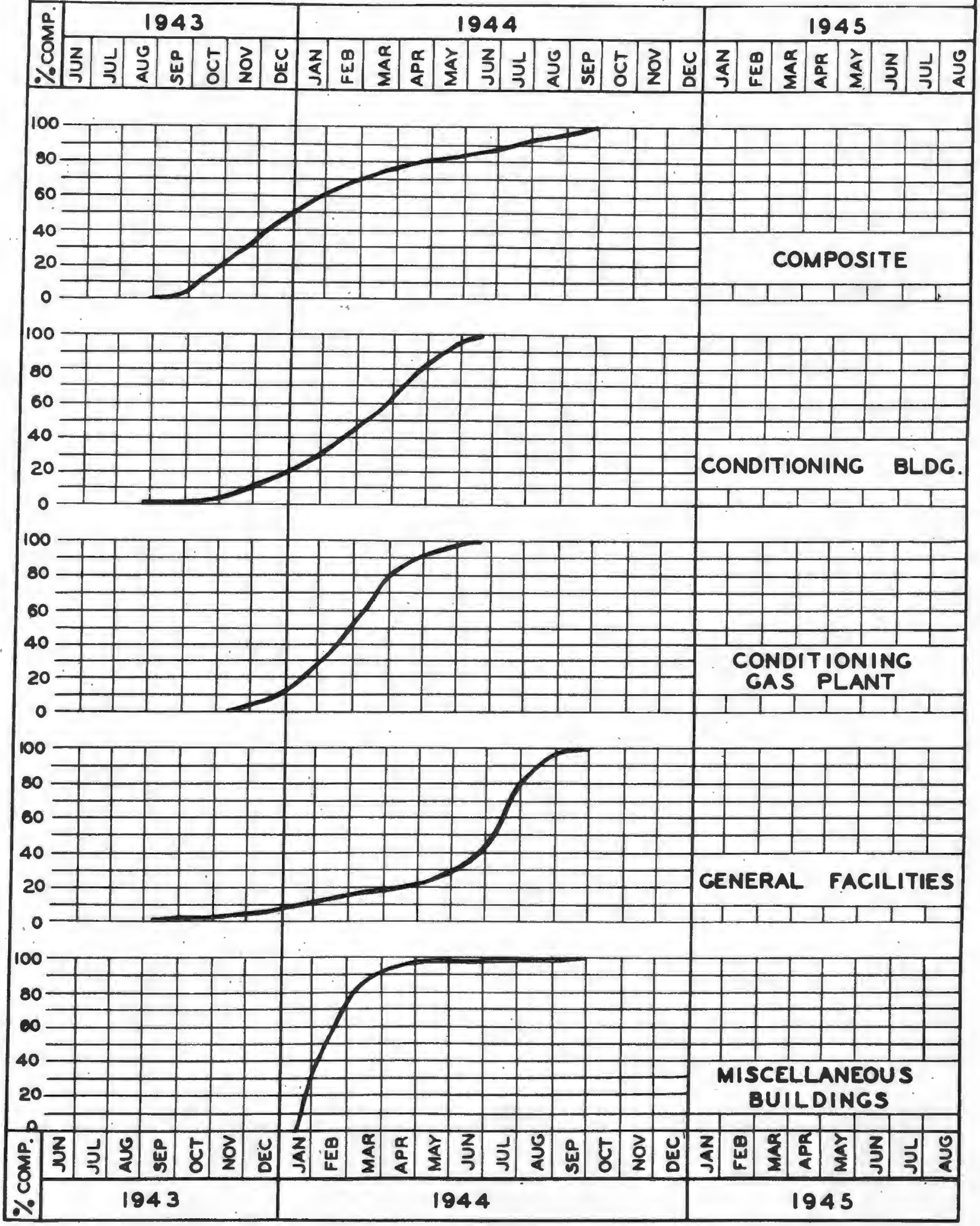
C8 ~~CONFIDENTIAL/RD~~

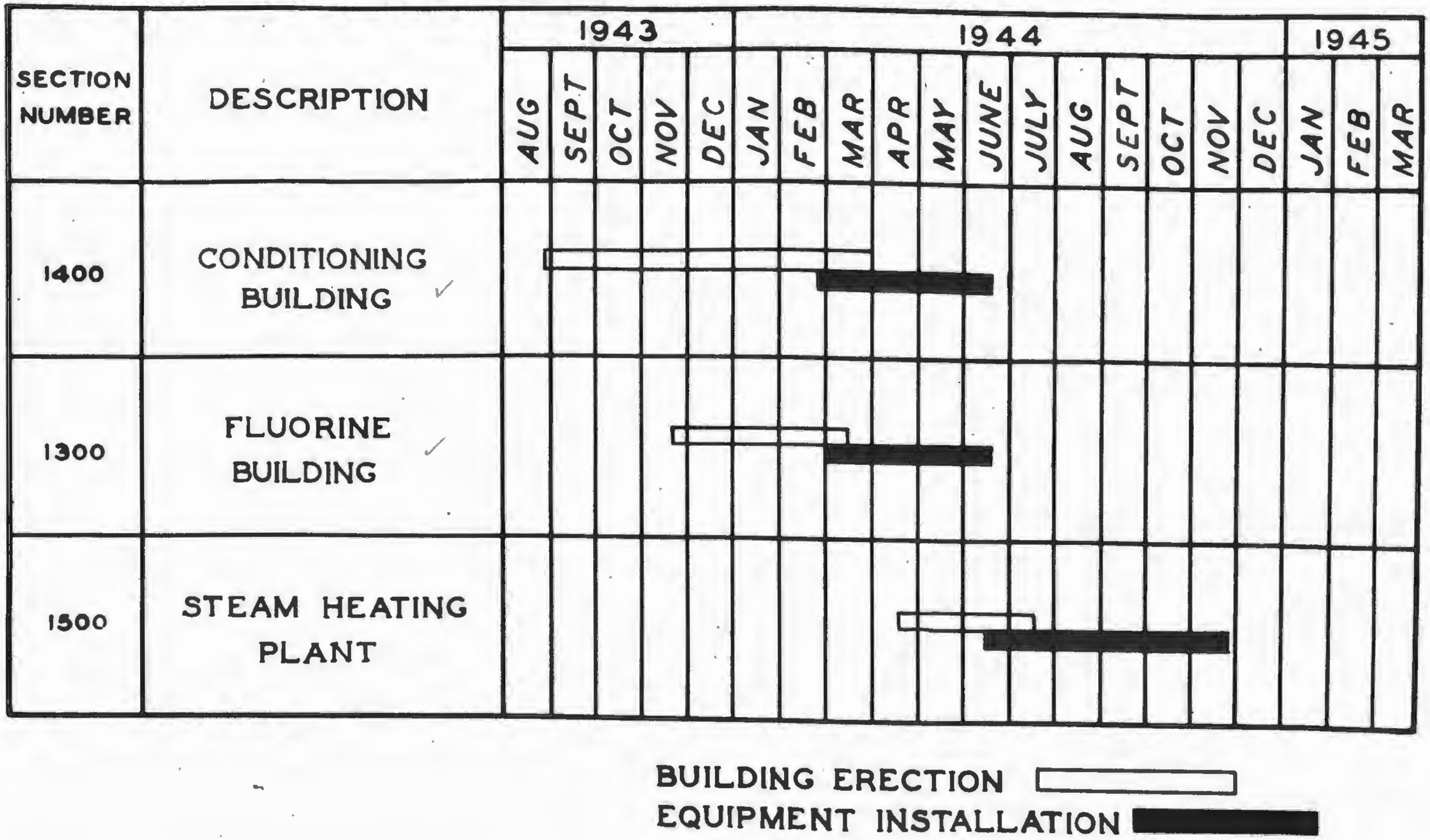
C8-3


1945
Aug.
Sept.
Oct.
Nov.
Dec.
Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec.
(3)
(4)

ACTUAL CONSTRUCTION PROGRESS
CONDITIONING AREA



PROGRESS OF CONSTRUCTION IN THE CONDITIONING AREA



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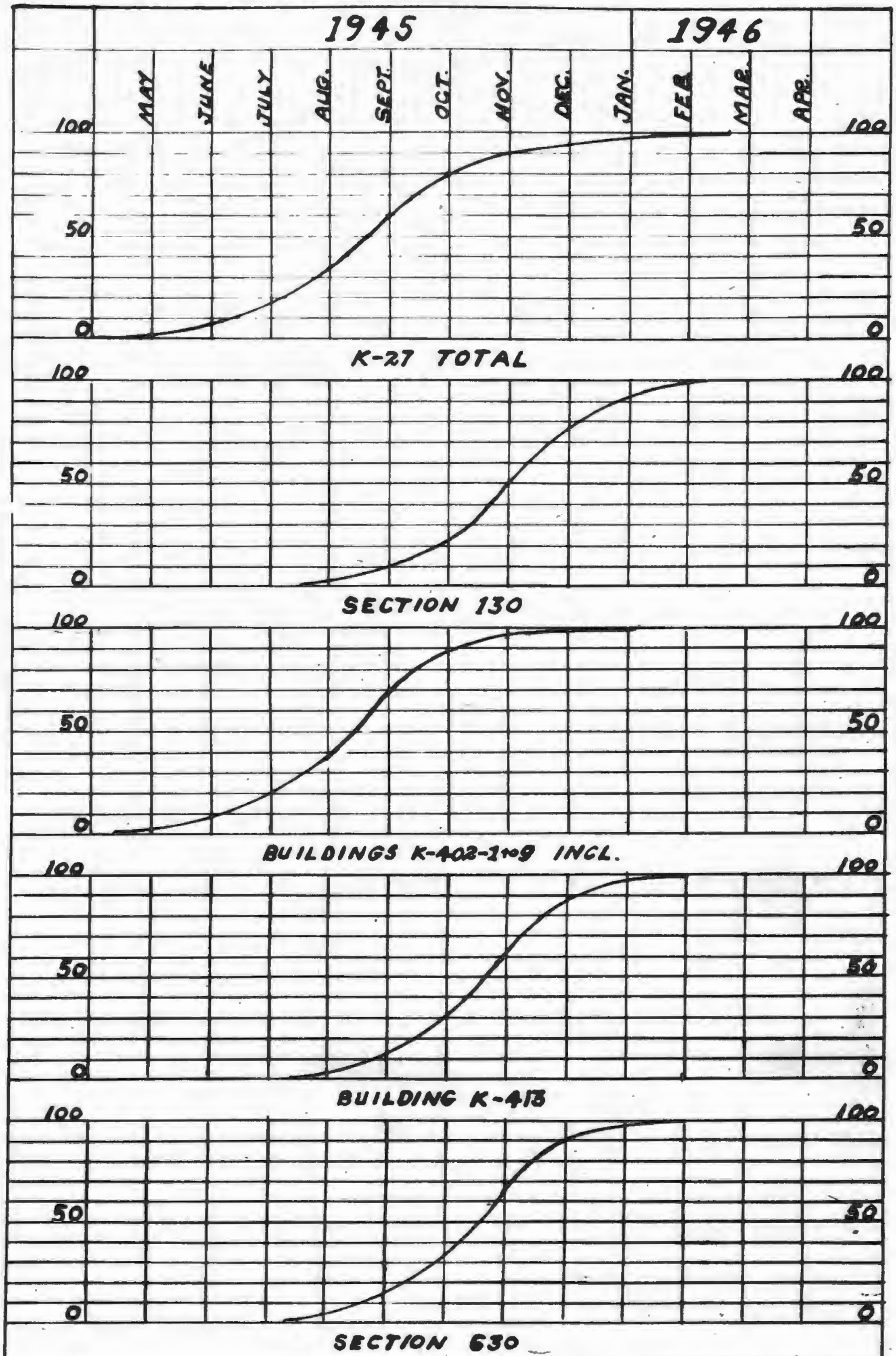
ACTUAL CONSTRUCTION PROGRESS
K-27 AREA



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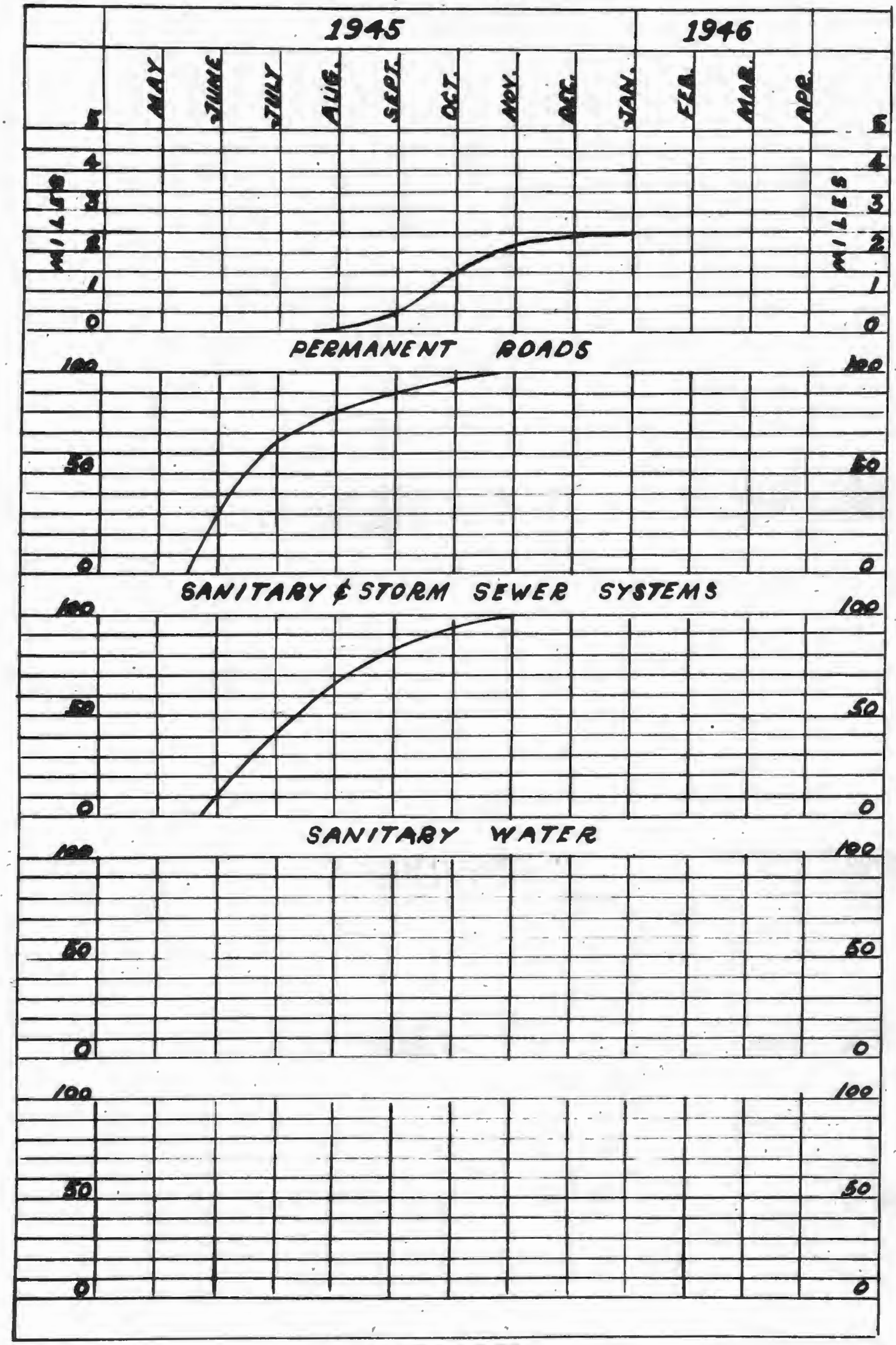
ACTUAL CONSTRUCTION PROGRESS
K-27 AREA



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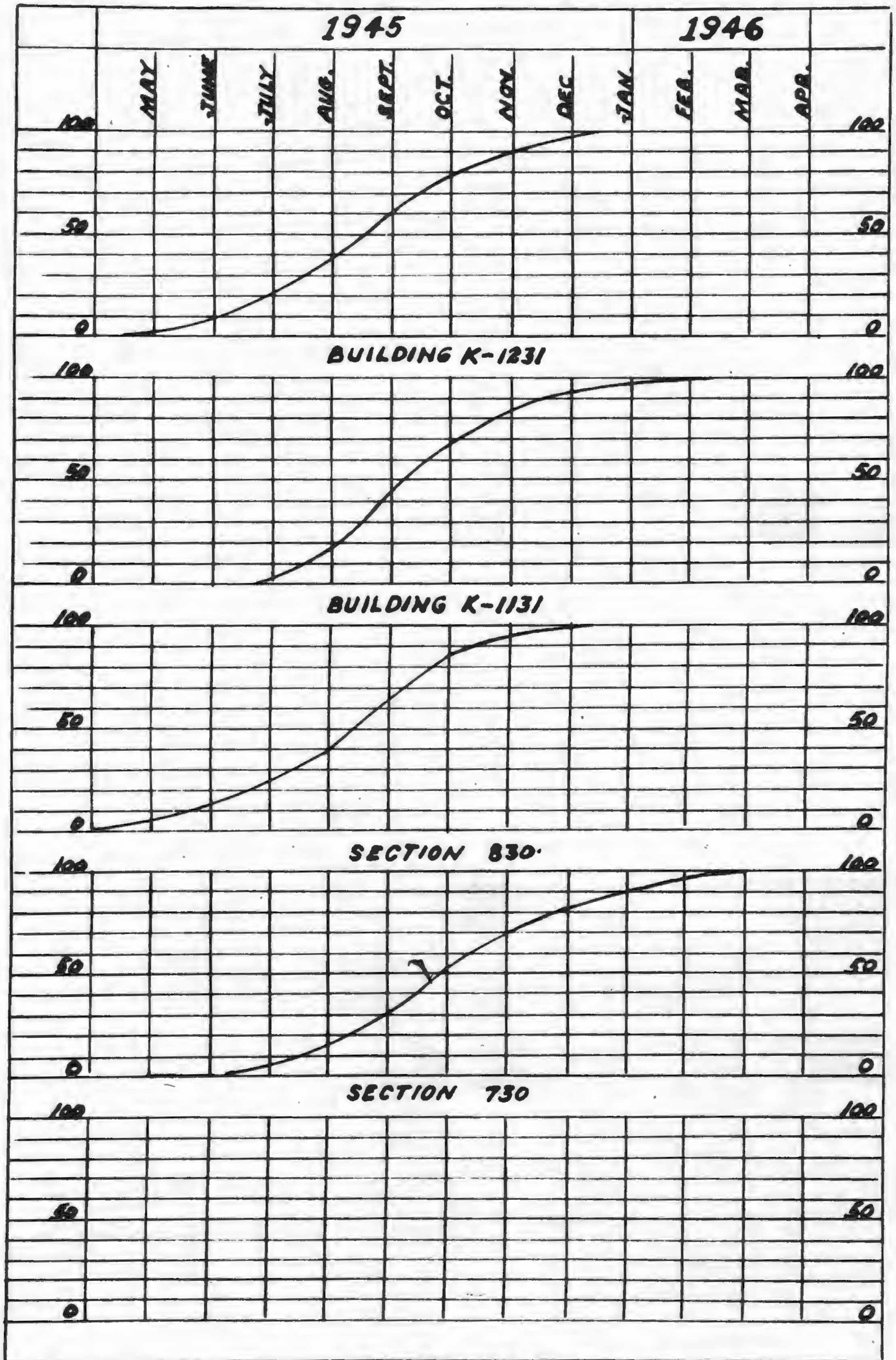
~~CONFIDENTIAL/RD~~

~~CONFIDENTIAL/RD~~

ACTUAL CONSTRUCTION PROGRESS
K-27 AREA

~~SECRET~~



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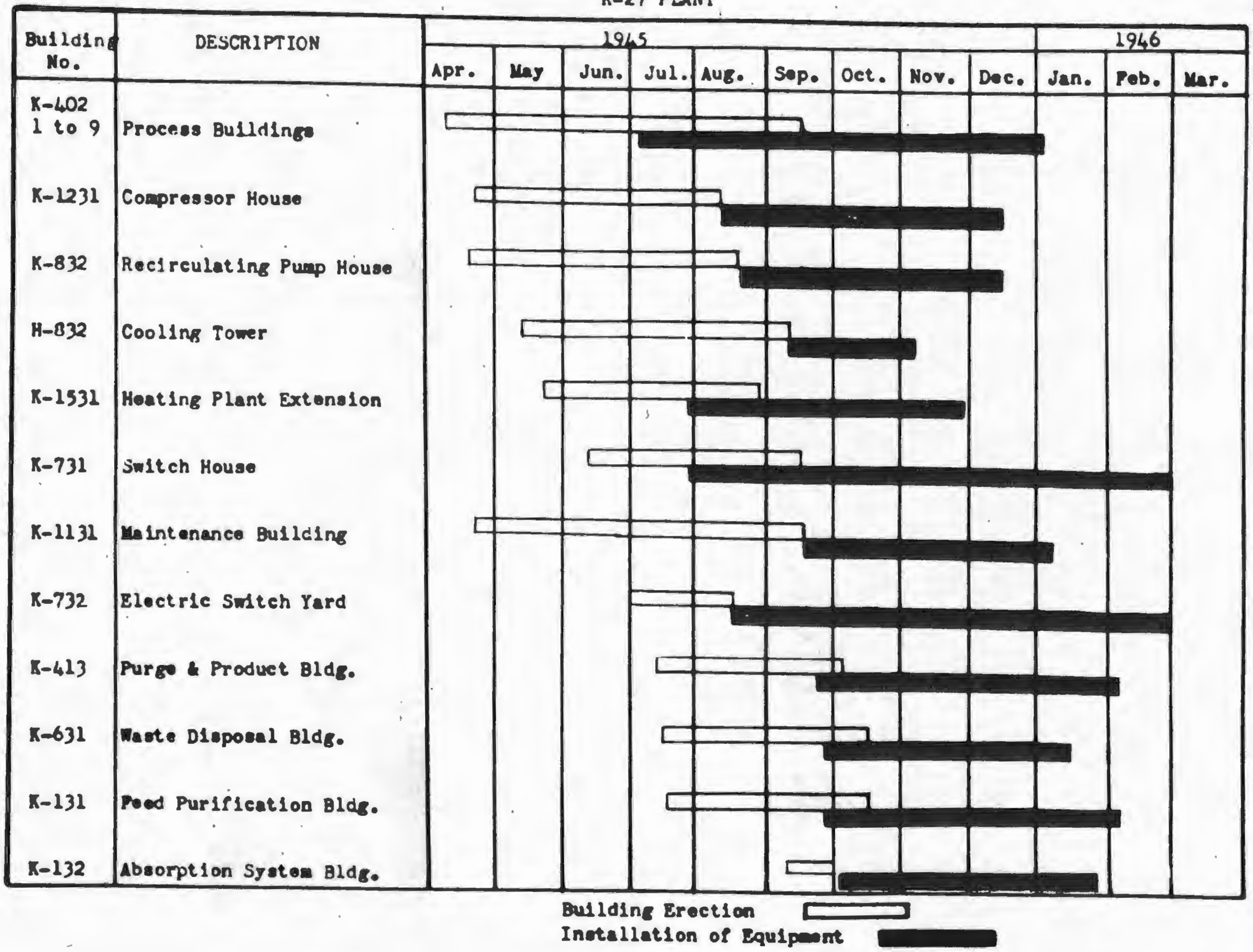
~~CONFIDENTIAL/RD~~

C14

PROGRESS OF CONSTRUCTION
K-27 PLANT



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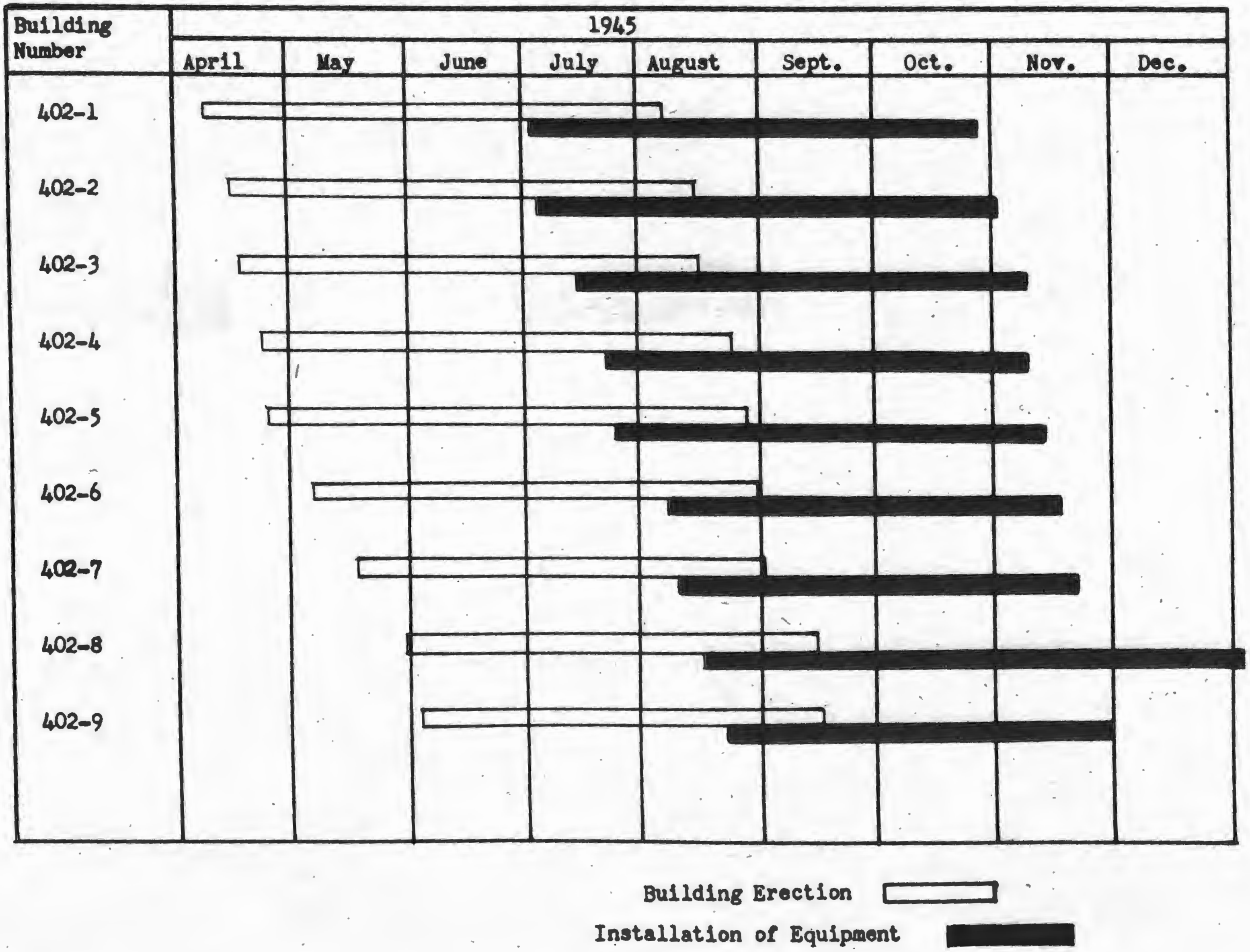
~~CONFIDENTIAL/RD~~

PROGRESS OF CONSTRUCTION

K-27 PROCESS BUILDINGS



~~SECRET~~

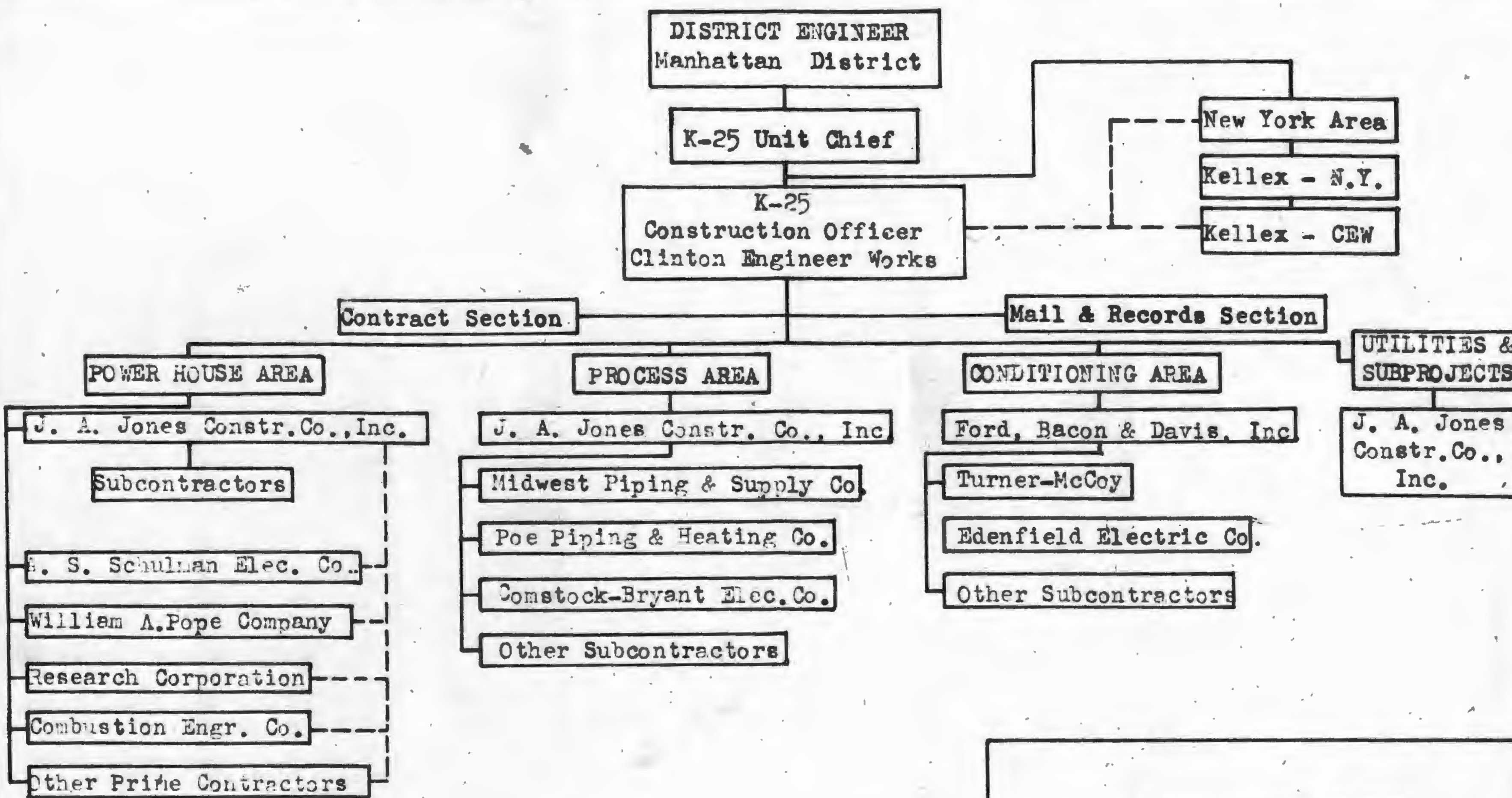
~~CONFIDENTIAL~~

C15

C16

~~SECRET~~

CONFIDENTIAL/RD



ORGANIZATION CHART

Showing Lines of Authority
for Administration of
K-25 Construction Contractors

1 February 1944

~~SECRET~~

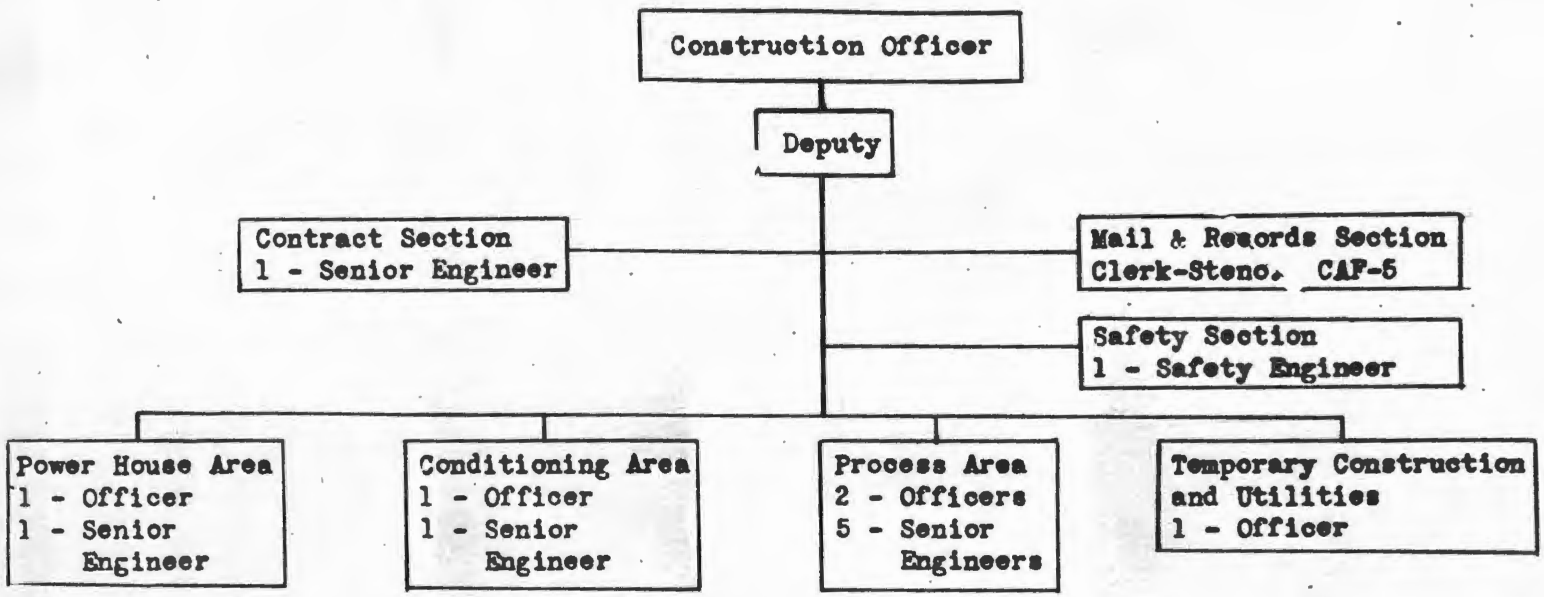
CONFIDENTIAL/RD

~~CONFIDENTIAL/RD~~ 17 ~~SECRET~~

ORGANIZATION CHART
Office of
CONSTRUCTION OFFICER

GAS DIFFUSION PROJECT

1 February 1944



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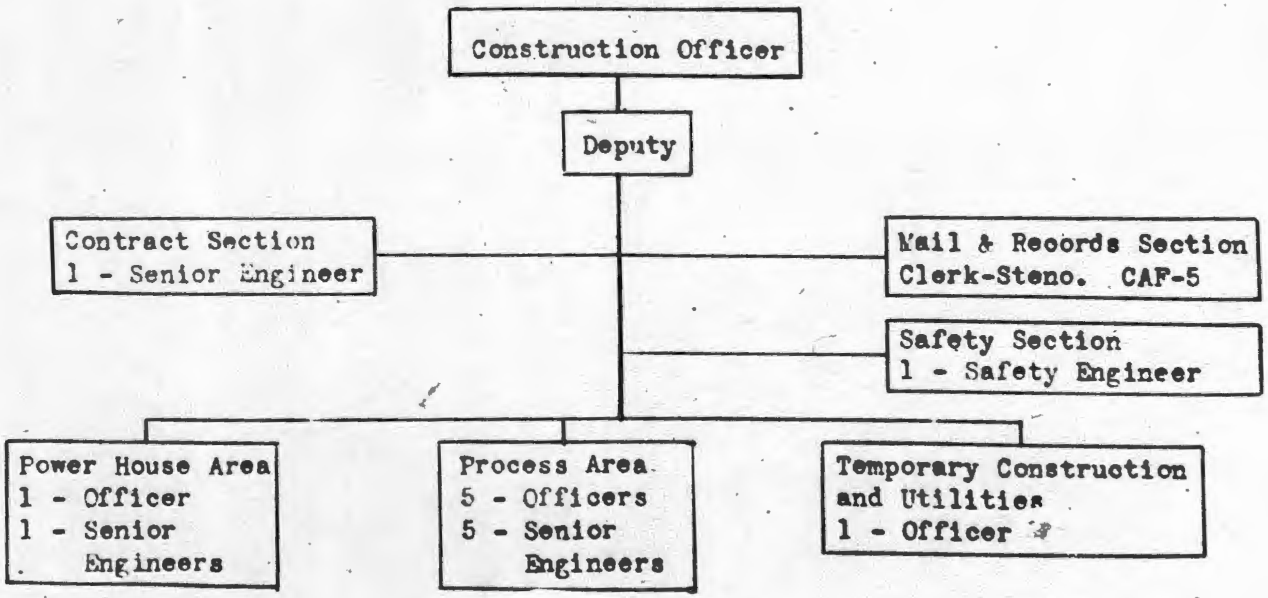
ORGANIZATION CHART
Office of
CONSTRUCTION OFFICER

GAS DIFFUSION PROJECT

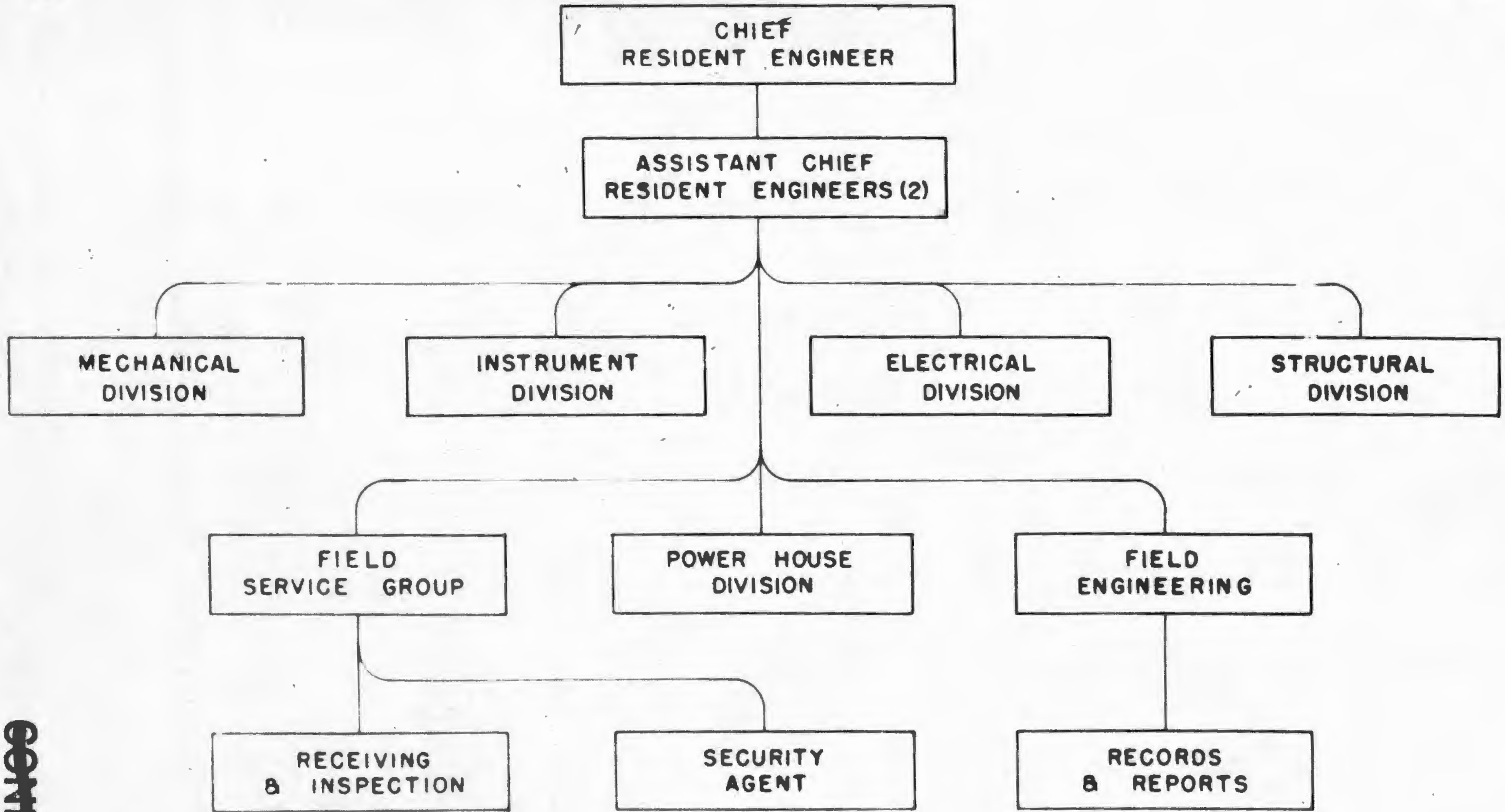
31 March 1945



C18

~~SECRET~~ CONFIDENTIAL/RD

~~SECRET~~ CONFIDENTIAL/RD

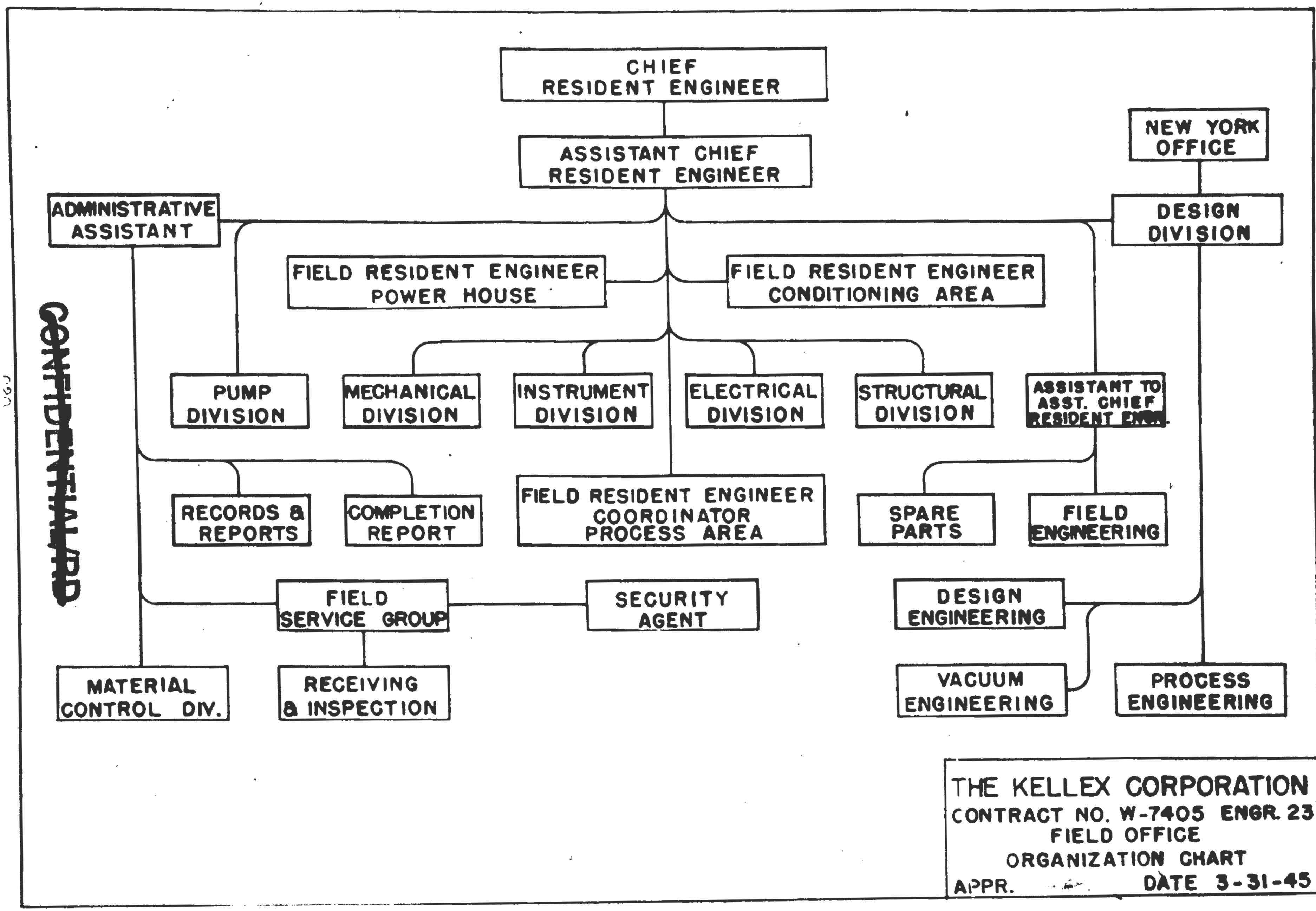


THE KELLEX CORPORATION
CONTRACT NO. W-7405 ENGR. 23
FIELD OFFICE
ORGANIZATION CHART
APPR. DATE: 2/1/44

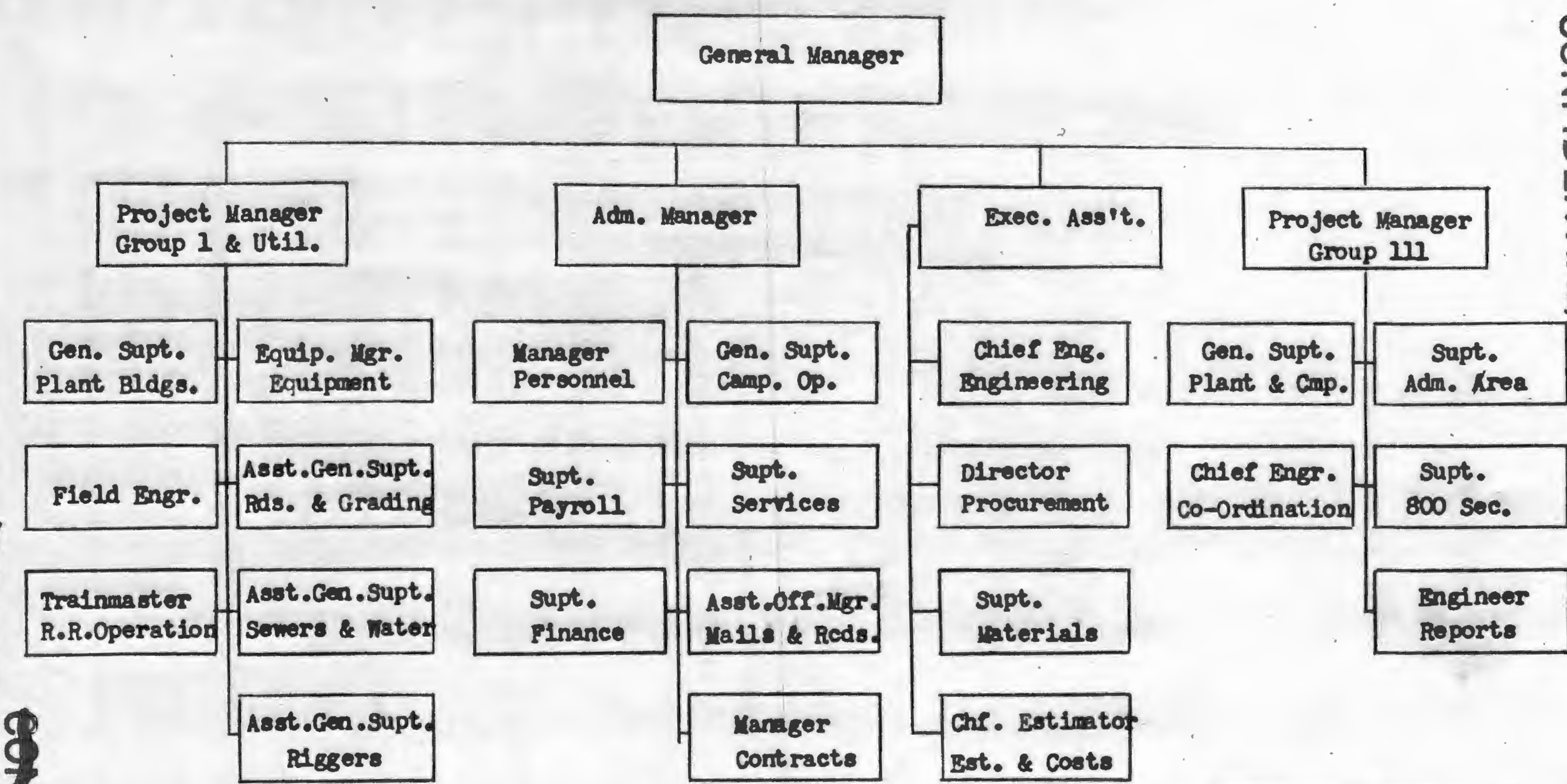
~~SECRET~~ C19
CONFIDENTIAL

~~SECRET~~
CONFIDENTIAL

~~CONFIDENTIAL~~



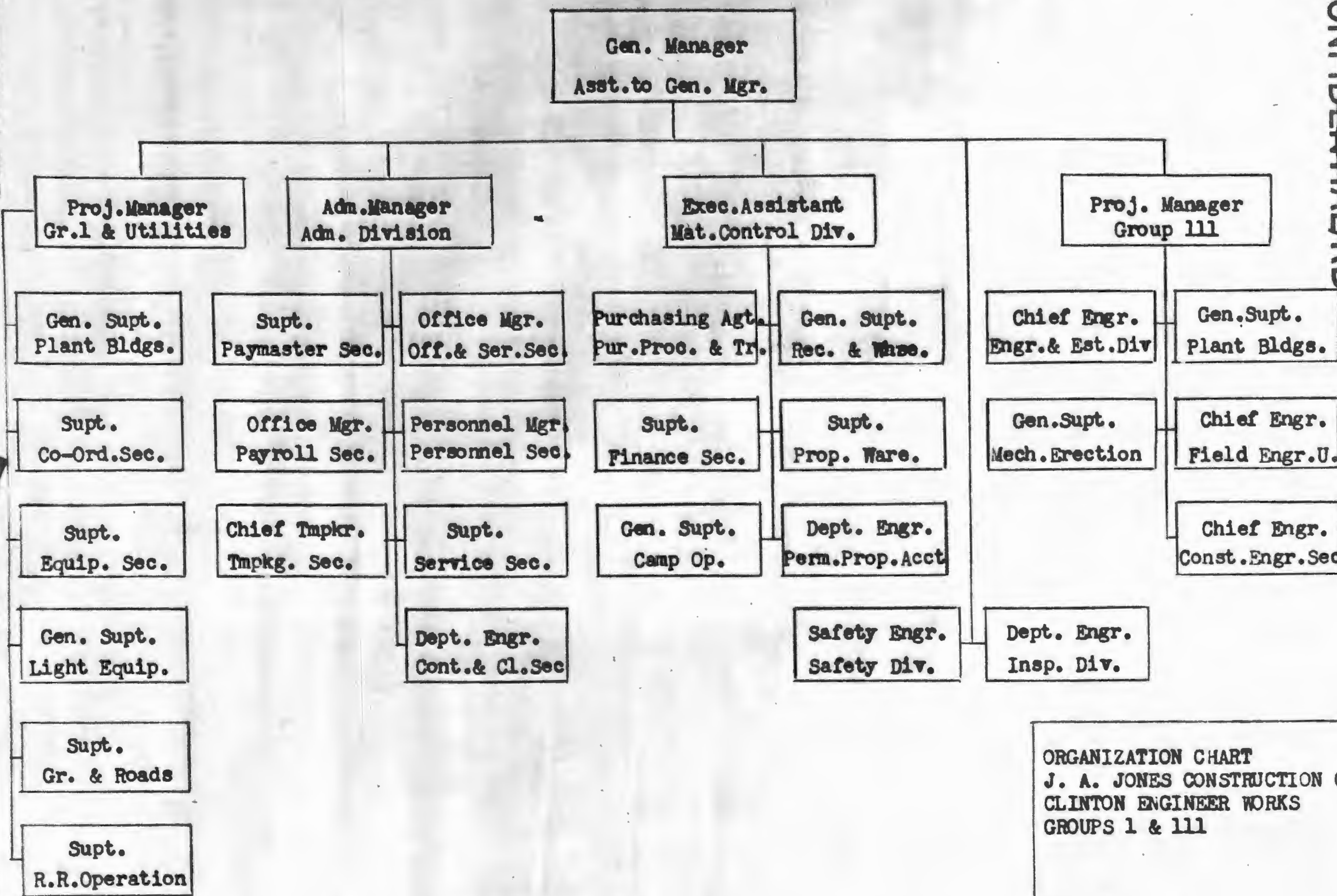
~~CONFIDENTIAL~~



ORGANIZATION CHART
J. A. JONES CONSTRUCTION CO.
CLINTON ENGINEER WORKS
GROUPS 1 & 111

February 1, 1944

~~CONFIDENTIAL~~ ~~RD~~

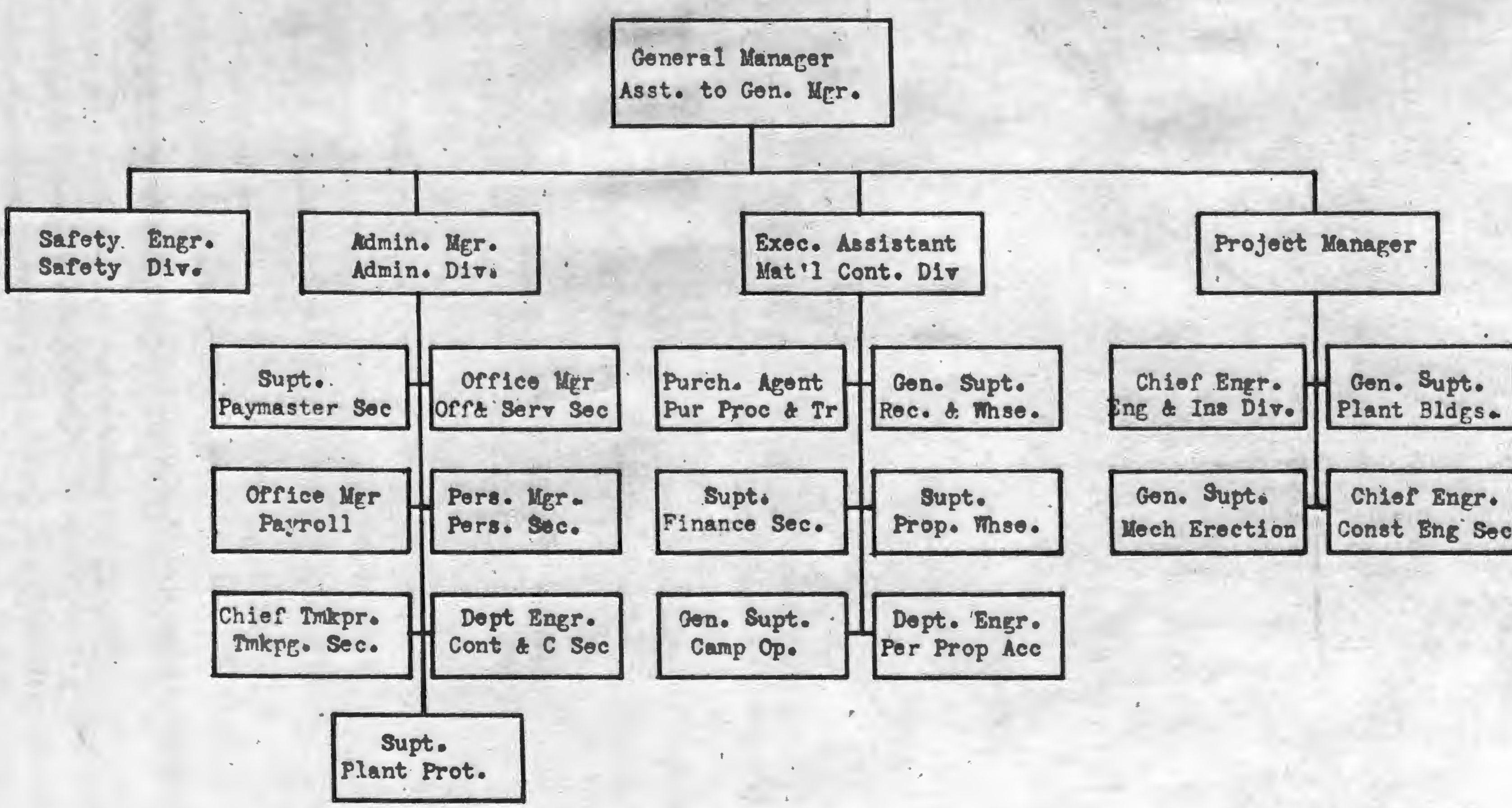


C22 ~~SECRET~~

ORGANIZATION CHART
J. A. JONES CONSTRUCTION CO.
CLINTON ENGINEER WORKS
GROUPS 1 & 111

Mar. 31, 1945

~~CONFIDENTIAL~~ ~~RD~~ ~~SECRET~~



ORGANIZATION CHART
J. A. JONES CONSTRUCTION CO.
CLINTON ENGINEER WORKS
GROUPS 1 & 111

1 January 1946

C23

~~SECRET~~ CONFIDENTIAL

~~SECRET~~ CONFIDENTIAL

U-1971-T-21-44

~~CONFIDENTIAL~~

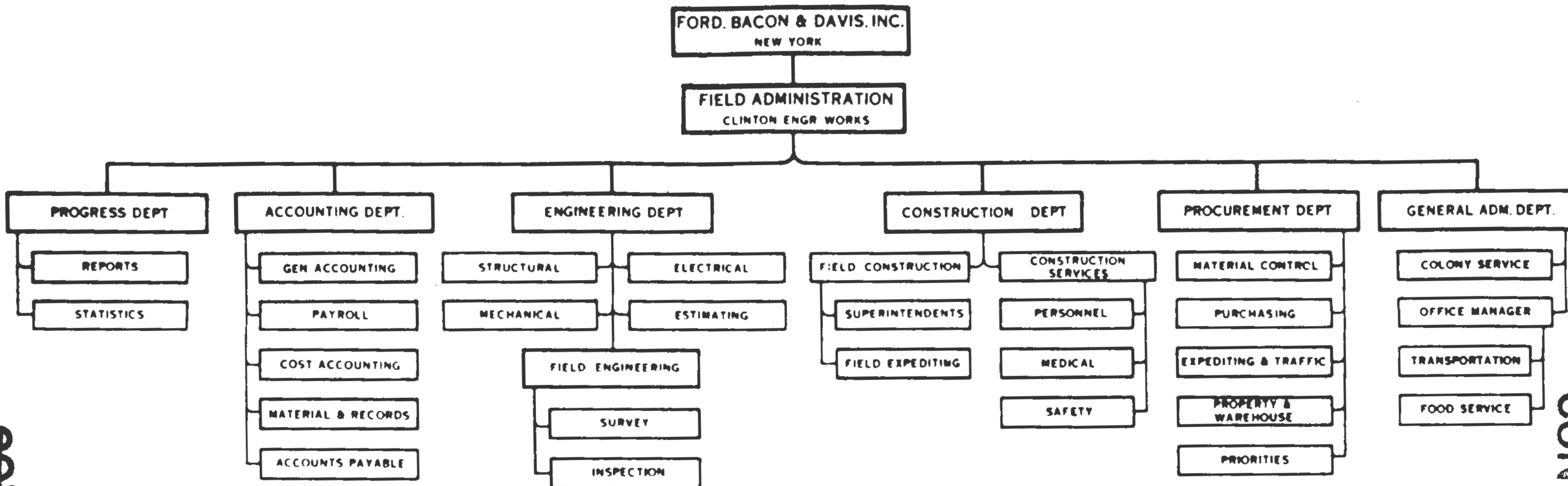
C24

REPORT

CLINTON ENGINEER WORKS

KNOXVILLE, TENN

CHART OF CONSTRUCTION ORGANIZATION AS OF MARCH, 1944



SUB-CONTRACTORS

D W WINKELMAN CO - GRADING
EDENFIELD ELECTRIC CO - ELECTRICAL
TURNER McCOY - PIPING
GUENBOD STACY INC - VENTILATION
YOUNG SALES CORP - HEAT INSULATION
PITTSBURGH PLATE GLASS CO - GLAZING
INTERNATIONAL CHIMNEY CORP - CHIMNEY
J D HELTON ROOFING CO - ROOFING
TENNESSEE ROOFING CO - ROOFING

~~CONFIDENTIAL~~

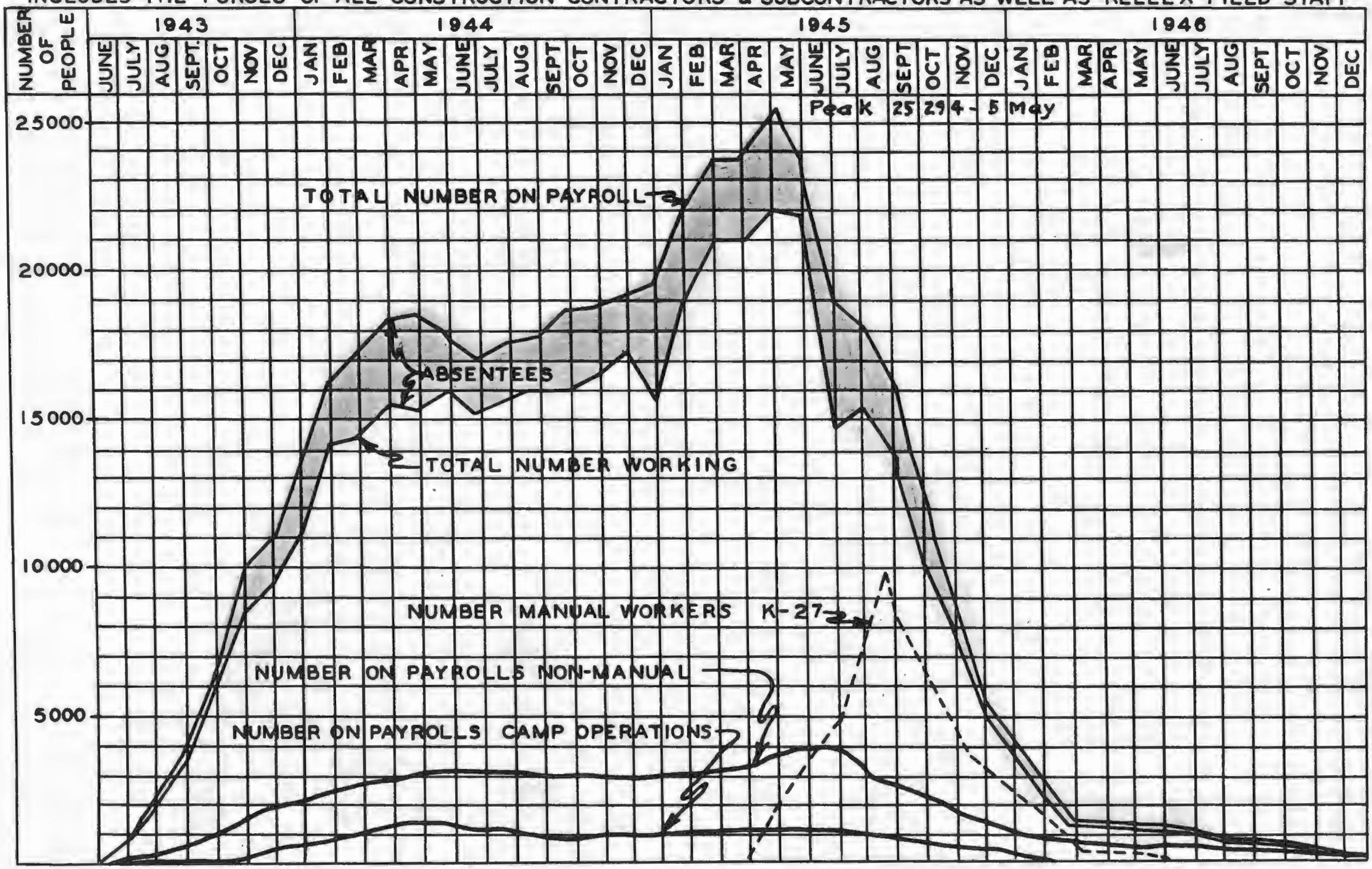
Ford, Bacon & Davis
Incorporated
Engineers

U-1971

C25 ~~SECRET~~
CONFIDENTIAL/RD

DAILY WORKING FORCES K-25 CONSTRUCTION (INCLUDING K-27)

INCLUDES THE FORCES OF ALL CONSTRUCTION CONTRACTORS & SUBCONTRACTORS AS WELL AS KELLEX FIELD STAFF



~~SECRET~~
CONFIDENTIAL/RD

MANHATTAN DISTRICT HISTORY

BOOK II - GASEOUS DIFFUSION (K-25) PROJECT

VOLUME 4 - CONSTRUCTION

APPENDIX "D"

TABULATIONS

D1-1

~~CONFIDENTIAL/RD~~

BUILDING NUMBER	DESCRIPTION	CONSTRUCTION DATES STARTING	COMPLETION
H-802	Cooling Tower "B"	2/5/44	8/26/44
K-832	Recirculating Pump House (K-27)	4/20/45	12/17/45
H-832	Cooling Tower (K-27)	5/12/45	11/7/45
K-833	Cooling Water Return Pump Station (K-27)	8/11/45	2/8/46
K-1024	Instrument Repair Building	5/26/44	3/25/45
K-1025	Drum Warehouses A, B, C, D, and E	6/8/44	9/7/45
K-1030	Electrical Maintenance Building	3/8/44	7/19/45
K-1031	Drum Storage Building	3/6/45	6/16/45
K-1035	Warehouse	4/7/45	8/23/45
K-1036	Maintenance and Spare Parts Warehouse	4/23/45	11/23/45
K-1037	Equipment Warehouse	5/11/45	9/21/45
K-1040	Fire Station No. 3	7/20/45	12/3/45
K-1041	Cylinder and Drum Warehouse	3/5/45	11/8/45
K-1101	Air Conditioning Building	4/28/44	5/23/45
K-1131	Shop and Warehouse (K-27)	4/25/45	1/8/46
K-1201	Air Compressor Building	4/10/44	10/14/44
K-1206-A	Fire Protection Water Tank	2/15/44	5/12/44

~~CONFIDENTIAL/RD~~

D1-2

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...ION DATES COMPLETION	TYPE OF CONSTRUCTION	APPROXIMATE VOLUME (CUBIC FEET)	APPROXIMATE FLOOR SPACE (SQUARE FEET)
8/28/44	Reinforced concrete frame, wood louvres	-	-
12/17/45	Reinforced concrete frame, concrete block walls	273,890	11,068
11/7/45	Structural steel frame, wood louvres	-	-
2/8/46	One story, superstructure frame	5,600	672
3/23/45	One story frame with two wings	296,448	18,528
9/7/45	Five, one-story frame houses	52,000	4,300
7/19/45	Steel frame, asbestos siding	240,378	20,802
6/16/45	One story frame	36,995	2,642
8/23/45	Steel frame, concrete block walls	1,051,407	58,911
11/23/45	Steel frame, concrete block walls	1,766,402	95,091
9/21/45	Steel frame, asbestos siding	1,770,300	49,175
12/3/45	One story frame, asbestos transite siding	15,480	1,296
11/8/46	One story frame, asbestos siding	33,028	2,642
8/23/45	Steel frame, asbestos siding	1,016,804	29,906
1/8/46	Steel frame, asbestos siding	1,016,804	29,906
10/14/44	Steel frame, asbestos siding	234,812	6,906
5/12/44		-	-

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ESTIMATED COSTS

STRUCTURAL	EQUIPMENT (JONES)	EQUIPMENT (KELLEX-GOVT.)	TOTAL
Included in K-601	Included in K-601	Included in K-801	Included in K-801
295,721	99,040	264,577	659,338
240,184	18,660	Included in K-832	258,844
12,101	0	24,239	36,340
220,199	Included in Structural	498,575	718,774 ✓
46,507	Included in Structural	2,551	49,058
177,190	Included in Structural	8,040	185,230 ✓
37,225	Included in Structural	1,364	38,589
332,475	Included in Structural	0	332,475 ✓
362,273	Included in Structural	0	362,273 ✓
406,861	Included in Structural	0	406,861 ✓
18,599	0	0	18,599
5,284	0	0	5,284
1,541,059	Included in Structural	759,830	2,300,889 ✓
352,989	37,328	12,603	402,920 ✓
331,515	Included in Structural	10,400	341,915 ✓
(with utilities)	0	(with utilities)	(with utilities)

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BUILDING NUMBER	DESCRIPTION	CONSTRUCTION DATES STARTING	COMPLETION	TYP
K-1021	Fire House and Ambulance Garage	2/3/44	9/7/44	One
K-1026	Main Bus Terminal	10/16/44	3/8/45	One
K-1027	Bus Repair Shop	11/2/44	3/8/45	One
K-1029	Field Office Building	1/15/45	2/15/45	Two
K-1032	Industrial Relations Building	3/7/45	3/16/45	Two
K-1034	Field Office Building	4/5/45	5/1/45	Two
K-1039	Telephone Exchange	7/18/45	10/31/45	One
	PROCESS BUILDINGS			
K-301-1	Process Building	12/2/43	5/8/45	Fou tra
K-301-2	Process Building	12/2/43	5/9/45	Fou tra
K-301-3	Process Building	12/6/43	5/11/45	Fou tra
K-301-4	Process Building	11/28/43	5/12/45	Fou tra
K-301-5	Process Building	11/23/43	5/14/45	Fou tra
K-302-1	Process Building	11/17/43	3/2/45	Fou tra
K-302-2	Process Building	10/25/43	3/28/45	Fou tra
K-302-3	Process Building	10/21/43	12/21/44	Fou tra
K-302-4	Process Building	10/20/43	1/6/45	Fou tra

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DATES PLETION	TYPE OF CONSTRUCTION	APPROXIMATE VOLUME (CUBIC FEET)	APPROXIMATE FLOOR SPACE (SQUARE FEET)
/44	One story frame	51,744	3,307
/45	One story frame	26,851	8,795
/45	One story frame	27,726	1,348
5/45	Two story high class frame	213,348	25,864
5/45	Two story high class frame	210,187	20,292
/45	Two story high class frame	315,479	37,850
31/45	One story, concrete frame, brick walls	28,536	2,376
/45	Four story, steel frame, built-up roofing, transite walls	2,126,100	111,800
45	Four story, steel frame, built-up roofing, transite walls	2,126,100	111,800
/45	Four story, steel frame, built-up roofing, transite walls	2,131,500	111,800
/45	Four story, steel frame, built-up roofing, transite walls	2,126,100	111,800
/45	Four story, steel frame, built-up roofing, transite walls	1,777,600	87,300
45	Four story, steel frame, built-up roofing, transite walls	1,965,700	100,900
/45	Four story, steel frame, built-up roofing, transite walls	2,315,500	122,700
/44	Four story, steel frame, built-up roofing, transite walls	2,315,500	122,700
5	Four story, steel frame, built-up roofing, transite walls	2,318,500	122,700

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ESTIMATED COSTS

STRUCTURAL	EQUIPMENT (JONES)	EQUIPMENT (KELLEX-GOVT.)	TOTAL
$ 56,684	Included in Structural	$ 0	$ 56,684 ✓
62,903	Included in Structural	0	62,903
16,507	Included in Structural	0	16,507
433,792	0	0	433,792
197,837	0	0	197,837
340,492	0	0	340,492
31,586	0	0	31,586
1,093,546	1,260,445	2,389,861	4,743,852
1,093,546	1,260,445	2,389,861	4,743,852
1,096,323	1,263,646	2,397,717	4,757,686
1,093,546	1,260,445	2,389,861	4,743,852
914,297	1,053,839	1,603,858	3,571,994
1,011,045	1,165,352	1,943,935	4,120,332
1,190,962	1,372,729	2,701,456	5,265,147
1,190,962	1,372,729	2,648,659	5,212,350
1,192,508	1,374,505	2,648,659	5,215,672

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BUILDING NUMBER	DESCRIPTION	CONSTRUCTION DATES STARTING	COMPLETION
K-302-5	Process Building	10/21/43	1/6/45
K-303-1	Process Building	11/21/43	4/18/45
K-303-2	Process Building	11/19/43	10/20/44
K-303-3	Process Building	11/23/43	3/31/45
K-303-4	Process Building	11/30/43	4/3/45
K-303-5	Process Building	11/30/43	3/31/45
K-303-6	Process Building	12/2/43	4/6/45
K-303-7	Process Building	12/27/43	4/15/45
K-303-8	Process Building	1/21/44	4/11/45
K-303-9	Process Building	1/21/44	4/13/45
K-303-10	Process Building	1/30/44	4/16/45
K-304-1	Process Building	12/13/43	5/22/45
K-304-2	Process Building	12/9/43	5/25/45
K-304-3	Process Building	12/15/43	6/7/45
K-304-4	Process Building	12/17/43	6/10/45
K-304-5	Process Building	12/20/43	6/15/45

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ES ETION	TYPE OF CONSTRUCTION	APPROXIMATE VOLUME (CUBIC FEET)	APPROXIMATE FLOOR SPACE (SQUARE FEET)
5	Four story, steel frame, built-up roofing, transite walls	2,315,500	122,700
45	Four story, steel frame, built-up roofing, transite walls	2,269,900	120,300
/44	Four story, steel frame, built-up roofing, transite walls	2,275,300	129,375
45	Four story, steel frame, built-up roofing, transite walls	2,269,900	120,300
5	Four story, steel frame, built-up roofing, transite walls	2,269,900	120,300
45	Four story, steel frame, built-up roofing, transite walls	2,269,900	120,300
5	Four story, steel frame, built-up roofing, transite walls	2,269,900	120,300
45	Four story, steel frame, built-up roofing, transite walls	2,753,000	134,500
45	Four story, steel frame, built-up roofing, transite walls	2,278,600	113,900
45	Four story, steel frame, built-up roofing, transite walls	1,867,400	108,375
45	Four story, steel frame, built-up roofing, transite walls	2,284,800	113,900
45	Four story, steel frame, built-up roofing, transite walls	2,149,900	107,090
45	Four story, steel frame, built-up roofing, transite walls	1,721,900	96,360
5	Four story, steel frame, built-up roofing, transite walls	1,719,300	96,360
45	Four story, steel frame, built-up roofing, transite walls	1,719,300	96,360
45	Four story, steel frame, built-up roofing, transite walls	1,719,300	96,360

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ESTIMATED COSTS

STRUCTURAL	EQUIPMENT (JONES)	EQUIPMENT (KELLEX-GOVT.)	TOTAL
$1,190,963	$1,372,730	$2,503,627	$5,067,320
1,167,508	1,345,696	2,404,374	4,917,578
1,170,286	1,348,897	2,567,459	5,086,642
1,167,509	1,345,696	2,557,514	5,070,719
1,167,509	1,345,696	2,557,514	5,070,719
1,167,509	1,345,696	2,557,514	5,070,719
1,167,509	1,345,696	2,612,400	5,125,605
1,415,988	1,632,099	2,570,983	5,619,070
1,171,983	1,350,853	2, 071,881	4,594,717
960,485	1,107,076	2,123,550	4,191,111
1,175,172	1,354,529	1,924,780	4,454,481
1,105,787	1,274,555	1,686,821	4,067,163
885,648	1,020,818	1,774,245	3,680,711
884,311	1,019,276	1,829,131	3,732,718
884,311	1,019,276	1,774,245	3,677,832
884,311	1,019,276	1,663,739	3,567,326

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BUILDING NUMBER	DESCRIPTION	CONSTRUCTION DATES STARTING	COMPLETION	TY
K-305-1	Process Building	2/3/44	6/1/45	Fou tr
K-305-2	Process Building	2/14/44	6/2/45	Fou tr
K-305-3	Process Building	3/21/44	5/30/45	Fou tr
K-305-4	Process Building	3/24/44	6/5/45	Fou tr
K-305-5	Process Building	3/30/44	6/20/45	Fou tra
K-305-6	Process Building	3/30/44	6/26/45	Fou tra
K-305-7	Process Building	4/3/44	6/14/45	Fou tra
K-305-8	Process Building	4/3/44	6/11/45	Fou tra
K-305-9	Process Building	4/13/44	6/12/45	Fou tra
K-305-10	Process Building	4/14/44	6/19/45	Fou tra
K-305-11	Process Building	4/17/44	6/27/45	Fou tra
K-305-12	Process Building	4/18/44	6/26/45	Fou tra
K-306-1	Process Building	4/20/44	6/30/45	Fou tra
K-306-2	Process Building	4/24/44	6/30/45	Fou tra
K-306-3	Process Building	4/27/44	7/10/45	Fou tra
K-306-4	Process Building	4/28/44	7/11/45	Fou tra

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ES TION	TYPE OF CONSTRUCTION	APPROXIMATE VOLUME (CUBIC FEET)	APPROXIMATE FLOOR SPACE (SQUARE FEET)
5	Four story, steel frame, built-up roofing, transite walls	1,719,300	96,360
5	Four story, steel frame, built-up roofing, transite walls	1,719,300	96,360
45	Four story, steel frame, built-up roofing, transite walls	1,724,700	106,035
5	Four story, steel frame, built-up roofing, transite walls	1,719,300	96,360
45	Four story, steel frame, built-up roofing, transite walls	1,721,900	96,360
45	Four story, steel frame, built-up roofing, transite walls	1,719,300	96,360
45	Four story, steel frame, built-up roofing, transite walls	1,719,300	96,360
45	Four story, steel frame, built-up roofing, transite walls	1,719,300	96,360
45	Four story, steel frame, built-up roofing, transite walls	1,719,300	96,360
45	Four story, steel frame, built-up roofing, transite walls	1,719,300	96,360
45	Four story, steel frame, built-up roofing, transite walls	1,724,700	106,035
45	Four story, steel frame, built-up roofing, transite walls	1,731,200	96,360
45	Four story, steel frame, built-up roofing, transite walls	1,551,900	84,582
45	Four story, steel frame, built-up roofing, transite walls	1,515,000	84,582
45	Four story, steel frame, built-up roofing, transite walls	1,511,400	84,582
45	Four story, steel frame, built-up roofing, transite walls	1,511,400	84,582

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ESTIMATED COSTS

STRUCTURAL	EQUIPMENT (JONES)	EQUIPMENT (KELLEX+GOVT.)	TOTAL
$ 884,311	$1,019,276	$1,664,687	$3,568,274
884,311	1,019,276	1,757,093	3,660,680
887,088	1,022,478	1,807,929	3,717,495
884,311	1,019,276	1,761,566	3,665,153
885,648	1,020,818	1,755,667	3,662,133
884,311	1,019,276	1,745,626	3,649,213
884,311	1,019,276	1,811,979	3,715,566
884,311	1,019,276	1,757,832	3,661,419
884,311	1,019,276	1,745,626	3,649,213
884,311	1,019,276	1,757,093	3,660,680
887,088	1,022,478	1,823,870	3,733,436
890,432	1,026,331	1,647,850	3,564,613
798,210	920,034	1,502,762	3,221,006
799,231	898,158	1,545,002	3,242,391
777,379	896,024	1,599,888	3,273,291
777,379	896,024	1,557,051	3,230,454

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BUILDING NUMBER	DESCRIPTION	CONSTRUCTION DATES STARTING	COMPLETIC
K-306-5	Process Building	4/28/44	7/10/45
K-306-6	Process Building	4/29/44	6/30/45
K-306-7	Process Building	8/23/44	6/30/45
K-309-1	Process Building	12/4/43	4/30/45
K-309-2	Process Building	12/12/43	4/30/45
K-309-3	Process Building	12/12/43	6/7/45
K-310-1	Process Building	12/27/43	2/28/45
K-310-2	Process Building	12/29/43	1/19/45
K-310-3	Process Building	12/27/43	2/28/45
K-311-1	Process Building	1/9/44	4/7/45
K-312-1	Process Building	11/14/44	9/11/45
K-312-2	Process Building	11/14/44	8/27/45
K-312-3	Process Building	11/14/44	8/3/45
K-402-1	Process Building (K-27)	4/9/45	10/29/45
K-402-2	Process Building (K-27)	4/18/45	11/2/45
K-402-3	Process Building (K-27)	4/19/45	11/6/45

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TES ...LETION	TYPE OF CONSTRUCTION	APPROXIMATE VOLUME (CUBIC FEET)	APPROXIMATE FLOOR SPACE (SQUARE FEET)
/45	Four story, steel frame, built-up roofing, transite walls	1,511,400	84,582
/45	Four story, steel frame, built-up roofing, transite walls	1,516,800	94,257
/45	Four story, steel frame, built-up roofing, transite walls	1,758,200	84,582
/45	Four story, steel frame, built-up roofing, transite walls	1,735,500	87,300
/45	Four story, steel frame, built-up roofing, transite walls	1,658,000	87,300
45	Four story, steel frame, built-up roofing, transite walls	1,658,000	87,300
/45	Four story, steel frame, built-up roofing, transite walls	1,581,900	88,778
/45	Four story, steel frame, built-up roofing, transite walls	1,899,100	100,900
/45	Four story, steel frame, built-up roofing, transite walls	1,928,500	100,900
45	Four story, steel frame, built-up roofing, transite walls	2,148,700	112,800
/45	Four story, steel frame, built-up roofing, transite walls	1,564,000	85,600
/45	Four story, steel frame, built-up roofing, transite walls	1,432,200	77,500
45	Four story, steel frame, built-up roofing, transite walls	1,621,400 4,617,600	87,000 250,100
/45	Four story, steel frame, built-up roofing, transite walls	2,683,800	122,750
/45	Four story, steel frame, built-up roofing, transite walls	2,345,400	122,750
/45	Four story, steel frame, built-up roofing, transite walls	2,315,400	122,750

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ESTIMATED COSTS

STRUCTURAL	EQUIPMENT (JONES)	EQUIPMENT (KELLEX-GOVT.)		TOTAL
$ 777,379	$ 896,024	$1,545,002		$3,218,405
780,156	899,225	1,619,356		3,298,737
904,319	1,042,338	1,503,899		3,450,556
892,643	1,028,880	1,813,064		3,734,587
852,782	982,935	1,813,064		3,648,781
852,782	982,935	1,221,801		3,057,518
813,640	937,819	1,421,978		3,173,437
967,790	1,125,870	2,118,553		4,212,213
991,912	1,143,299	2,118,553		4,253,764
1,105,170	1,273,843	1,695,156		4,074,169
804,433	927,208	997,546		2,729,187
736,643	849,071	1,043,313		2,629,027
[illegible]	961,237	997,546		2,792,740
2,375,033	2,737,516	3,038,405 2,737,516	5,775,921	
646,781	1,371,963	2,419,424		4,438,168
839,251	1,780,222	3,139,394		5,758,867
448,347	951,034	1,677,134		3,076,515

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BUILDING NUMBER	DESCRIPTION	CONSTRUCTION DATES STARTING	COMPLETION
K-402-4	Process Building (K-27)	4/21/45	11/9/45
K-402-5	Process Building (K-27)	4/24/45	11/13/45
K-402-6	Process Building (K-27)	5/4/45	11/19/45
K-402-7	Process Building (K-27)	5/9/45	11/27/45
K-402-8	Process Building (K-27)	5/30/45	1/3/46
K-402-9	Process Building (K-27)	6/1/45	11/30/45

AUXILIARY BUILDINGS

BUILDING NUMBER	DESCRIPTION	STARTING	COMPLETION
K-101	Feed Purification Building	2/5/44	5/8/45
K-131 ✓	Feed Purification Building (K-27)	7/12/45	2/5/46
K-132 ✓	Absorption System Building (K-27)	9/7/45	1/28/46
K-300-C	Coolant Storage	1/19/44	1/20/45
K-413 ✓	Purge and Product Building (K-27)	7/9/45	2/5/46
K-601 ✓	Surge and Waste Building	3/25/44	5/3/45
K-631 ✓	Surge and Waste Building (K-27)	7/10/45	1/17/46
K-801	Intake Pump House ✓	1/19/44	8/24/44
H-801	Cooling Tower "A" ✓	2/5/44	8/28/44
K-802	Recirculating Pump House ✓	2/16/44	8/24/44

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ION	TYPE OF CONSTRUCTION	APPROXIMATE VOLUME (CUBIC FEET)	APPROXIMATE FLOOR SPACE (SQUARE FEET)
	Four story, steel frame, built-up roofing, transite walls	2,315,400	122,750
5	Four story, steel frame, built-up roofing, transite walls	2,315,400	122,750
5	Four story, steel frame, built-up roofing, transite walls	2,320,700	122,750
5	Four story, steel frame, built-up roofing, transite walls	2,318,100	122,750
	Four story, steel frame, built-up roofing, transite walls	2,322,400	122,750
.5	Four story, steel frame, built-up roofing, transite walls	2,696,500	122,750
	Reinforced concrete frame, concrete block walls	63,824	3,940
	Steel frame, concrete block walls	677,850	31,635
	Steel frame, asbestos siding walls	38,836	1,381
	Wood frame, asbestos siding walls	33,597	-
	Steel frame, terra cotta tile	291,368	13,468
	North part concrete frame, concrete blocks, south part steel frame, asbestos siding	259,524	17,157
	Steel frame, concrete block walls	974,508	43,908
	Concrete foundations, wood frame, transite siding and roof	9,428	602
	Reinforced concrete frame, wood louvres	-	-
	Reinforced concrete frame, concrete block walls	135,144	9,400

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ESTIMATED COSTS

STRUCTURAL	EQUIPMENT (JONES)	EQUIPMENT (KELLEX-GOVT.)	TOTAL
$ 839,252	$1,780,222	$3,139,394	$5,758,868
448,347	951,034	1,677,134	3,076,515
839,252	1,780,222	3,139,394	5,758,868
448,347	951,034	1,677,134	3,076,515
839,252	1,780,222	3,139,394	5,758,868
646,781	1,371,963	2,419,426	4,438,170
144,760	173,616	229,651 173,616 403,267	548,027 ✓
391,285	320,456 468,281 788,737	320,456	1,180,022 ✓
37,329	9,172	383,456	429,957
51,405	Included in Structural	0	51,405
25,358	30,412	206,214	261,984
271,344	323,971	240,268 323,971 564,239	835,583 ✓
465,204	557,935	578,528	1,601,667
1,088,393	0	280,428	1,368,821 ✓
Included in K-601	Included in K-601	Included in K-601	Included in K-601
Included in K-601	Included in K-601	Included in K-601	Included in K-601

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BUILDING NUMBER	DESCRIPTION	CONSTRUCTION DATES STARTING	COMPLETION
K-1231	Compressor House (K-27)	4/21/45	12/17/45
K-1232	Condensate Collecting Station (K-27)	9/18/45	2/18/46
K-1410 ✓	Carbon Mixing Plant	8/5/44	6/12/45
K-1501 ✓	Steam Heating Plant	4/19/44	1/16/45
K-1551 ✓	Addition to Steam Heating Plant (K-27)	5/24/45	11/28/45
	POWERHOUSE BUILDINGS		
K-701 ✓	Boiler House	6/2/43	9/23/44
K-702 ✓	Turbine Room	9/24/43	9/26/44
K-703 ✓	Service Building	2/22/44	9/26-44
K-704 ✓	Main Switch House	8/19/43	5/6/44
K-705 ✓	Crib House	7/15/43	3/15/44
K-706 ✓	Pump House	8/25/43	3/10/44
K-707 ✓	Auxiliary Switch House	7/1/43	4/1/44
K-709 ✓	154 KV. Switchyard	11/20/43	3/30/44
K-711 ✓	Dead Storage Warehouse	4/2/45	9/14/45
K-731 ✓	Switch House (K-27)	6/9/45	2/28/46
K-732 ✓	Switchyard (K-27)	7/1/45	2/28/46

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ION	TYPE OF CONSTRUCTION	APPROXIMATE VOLUME (CUBIC FEET)	APPROXIMATE FLOOR SPACE (SQUARE FEET)
5	Steel frame, asbestos siding	234,812	6,908
	Concrete foundation and walls and sump	1,848	176
	One story, concrete frame, asbestos siding	291,488	8,328
	Steel frame, concrete foundations, floors and roof, asbestos siding	227,664	4,743
5	Steel frame, concrete foundations, floors and roof, asbestos siding	294,861	6,142
	Steel frame, brick walls, cast Haydite roof	3,500,000	24,000
	Steel frame, brick walls, reinforced concrete roof	4,427,000	51,000
	Reinforced concrete frame, brick walls, concrete roof	270,000	18,000
	Reinforced concrete frame, brick walls reinforced concrete roof	1,916,000	107,300
	Reinforced concrete frame, wood walls, concrete roof	26,550	950
	Reinforced concrete frame, wood walls, concrete roof	227,614	3,874
	Reinforced concrete frame, brick walls, concrete roof	304,000	28,400
	Wood pole construction		-
	Steel frame, asbestos sides	111,265	6,181
	Steel frame, concrete slab, brick walls, no windows	1,300,000	91,470
	Permanent Steel construction	-	-

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ESTIMATED COSTS

STRUCTURAL	EQUIPMENT (JONES)	EQUIPMENT (KELLEX-GOVT.)	TOTAL
$ 136,122	$ 45,756	$ 38,824	$ 220,702
3,471	0	0	3,471
206,249	Included in Structural	0	206,249
413,891	Included in Structural	141,137	555,028 ✓
491,699	Included in Structural	-	491,699
9,038,594	710,924	710,924 11,228,383 11,939,307	20,977,901 ✓
Included in K-701	Included in K-701	Included in K-701	Included in K-701
Included in K-701	Included in K-701	Included in K-701	Included in K-701
2,372,197	27,619	2,283,291 27 619 2,310,910	4,683,107 ✓
262,131	607	4,656	267,394
387,761	7,376	6,547 7,376 13,923	401,684 ✓
511,026	1,379	916,720 1,379 918,099	1,429,125 ✓
157,135	0	556,707	713,842
158,213	0	9,376	167,589
1,109,996	85,826	1,217,520	2,413,342
248,159	0	1,226,051	1,474,210

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BUILDING NUMBER	DESCRIPTION	CONSTRUCTION DATES STARTING	COMPLETION
	CONDITIONING BUILDINGS		
K-1301	Fluorine Generating Plant	11/19/43	6/21/44
K-1302	Fluorine Storage Building	11/19/43	7/26/44
K-1303	Fluorine Bottling Plant	3/9/44	7/26/44
K-1401	Conditioning Building	8/29/43	6/21/44
K-1405	Fluorine Disposal Building (Includes K-1406 Costs)	3/28/44	9/26/44
K-1407	Lime Storage and Acid Neutralizing Building	3/28/44	6/25/44
K-1408	Nitrogen Generating Building		

NOTE: A dash indicates that a figure is not appropriate.

The costs given do not include research, development or archit

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TYPE OF CONSTRUCTION	APPROXIMATE VOLUME (CUBIC FEET)	APPROXIMATE FLOOR SPACE (SQUARE FEET)
Steel frame, tile walls, built-up roof	117,071	9,440
Steel frame, tile walls, built-up roof	82,362	3,922
Steel frame, tile walls, built-up roof	104,603	10,460
Steel frame, factory window walls, precast conbrete slab roof	10,680,000	468,000
Two story frame with transite walls and roof, two wings	51,300	5,130
One story frame with partial basement of reinforced concrete	20,531	2,380
One story, masonry walls, concrete foundation	7,119	630

rchitect engineer charges, but all others.

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ESTIMATED COSTS

STRUCTURAL	EQUIPMENT (JONES)	EQUIPMENT KELLEX-GOVT.)	TOTAL
$ 419,862	$ 0	Included in Structural	$ 419,862
158,299	0	Included in Structural	158,299
251,342	0	Included in Structural	251,342
8,497,009	0	2,896,979	11,393,988 ✓
167,309	0	49,888	217,197
100,129	0	12,320	112,449
40,443	0	5,996	46,439 ✓

WAGE RATES AND CLASSIFICATIONS

NOTE: The following data is taken from contract W-7421-eng-11 and wage adjustment orders. Data for all prime construction contractors and subcontractors is substantially the same.

	Original Rate	Revised Rate
Air Tool operators (jackhammermen, vibrators)	$ .75	
Asbestos workers	1.275	1.50
Asbestos workers, improvers:	0.775	
1st year		0.75
2nd year		1.00
3rd year		1.125
4th year		1.20
Asphalt rakers	0.60	
Asphalt shovelers	0.50	0.575
Blacksmiths	1.375	
Blacksmiths helpers	0.775	
Boilermakers	1.50	
Boilermaker's helpers	1.25	
Bricklayers	1.625	
Bricklayers, apprentices:		
1st year	0.65	
2nd year	0.80	
3rd year	0.95	
4th year	1.10	
Bricklayer tenders	0.625	0.65
Blasters - powdermen	1.00	
Cable splicers (electricians)		1.75
Carpenters, journeymen	1.25	1.50
Carpenters, apprentices:		
1st year	0.65	
2nd year	0.80	
3rd year	0.95	
4th year	1.10	
Carpenter tenders	0.625	0.65
Cement finishers	1.375	
Cement Finisher tenders	0.625	0.65
Core drill operators		1.125
Core drill operator's helpers		0.75
Electricians	1.50	1.625
Electricians, apprentices:		
1st year	0.65	
2nd year	0.80	
3rd year	0.95	
4th year	1.10	

	Original Rate	Revised Rate
Elevator constructors		$1.55
Elevator constructor's helpers		1.085
Firemen and oilers	0.90	
Form setters (movers and strippers)		0.85
Gas and Diesel mechanics	1.375	1.50
Gas and Diesel mechanic's helpers	0.775	
Glaziers	1.25	
Iron workers, structural	1.625	
Iron workers, ornamental	1.625	
Iron workers, reinforcing	1.50	
Laborers, concrete	0.60	0.65
Laborers, unskilled	0.575	0.625
Lathers	1.50	
Leadmovers		2.00
Leadmovers, apprentices:		
1st year 40% of journeyman's rate		
Next six months 45% of journeyman's rate		
Next six months 60% of journeyman's rate		
3rd year 70% of journeyman's rate		
Locomotive Engineers, 20 Tons and over		1.375
Locomotive Engineers, under 20 Tons		1.25
Locomotive Switchman		1.00
Locomotive Fireman		1.00
Machinists	1.375	
Machinist's helpers	0.775	
Marble setters	1.50	
Marble setter's helpers	0.775	
Mason tenders	0.625	
Millwrights	1.25	1.30
Millwrights, precision		1.375
Mortar mixers	0.75	
Painters, brush	1.25	
Painters, spray	1.50	
Painters, sign	1.25	
Painters, structural steel	1.50	1.625
Piledrivermen	1.25	1.30
Pipe layers (concrete and clay)	0.75	
Plasterers	1.50	
Plasterer's tenders	0.625	0.65
Plumbers	1.50	
Plumber's helpers	0.775	
Plumbers and Steam Fitters	1.50	1.625
Power equipment operators:		
Air compressors, portable	1.00	
Air compressors, stationary	1.25	
Blade graders	1.25	
Bulldozers	1.25	1.375
Caterpillar tractors		1.375

	Original Rate	Revised Rate
Cranes, derricks, draglines	$1.50	$1.625
Hoists, 1 drum	1.00	
Hoists, 2 or more drums	1.25	1.50
Mixers (less than 1 yard)	1.00	
Mixers (1 yard and over)	1.25	
Pumpcrete operator		1.50
Motor graders	1.25	
Piledrivers	1.50	1.625
Pumps	1.00	
Rollers, earth	1.00	
Rollers, bituminous	1.25	
Scrapers (pan-tournapull type)	1.50	
Shovels	1.50	1.625
Tank builder		1.45
Tank builder helper		1.20
Tractors (under 50 h.p.)	1.00	
Tractors (50 h.p. and over)	1.25	
Trench machines	1.25	1.375
Roofers, composition	1.125	
Roofers, slate and tile	1.125	
Roofer's helpers	0.50	0.875
Sheet Metal workers	1.50	
Sheet Metal workers apprentices:		
1st 6 months 35% of journeymen's rate		
2nd 6 months 40% of journeymen's rate		
3rd 6 months 45% of journeymen's rate		
4th 6 months 50% of journeymen's rate		
5th 6 months 55% of journeymen's rate		
6th 6 months 60% of journeymen's rate		
7th 6 months 70% of journeymen's rate		
8th 6 months 80% of journeymen's rate		
Soft floor layers (linoleum)	1.25	1.30
Sprinkler fitter		1.50
Sprinkler fitter helper		0.875
Steam fitters	1.50	
Steam fitter's helpers	0.775	
Stone masons	1.625	
Terrazzo workers	1.50	
Terrazzo worker's helpers	0.775	
Tile setters	1.50	
Tile setter's helpers	0.775	
Truck drivers, under $5\frac{1}{2}$ tons (including dump trucks under 3 cubic yards struck measure)	0.65	0.70
Truck drivers, $5\frac{1}{2}$ tons to $7\frac{1}{2}$ tons (including dump trucks 3 cubic yards to 6 cubic yards, struck measure)	0.85	
Truck drivers, $7\frac{1}{2}$ tons and over (including dump trucks 6 cubic yards and over, struck measure)	1.00	

	Original Rate	Revised Rate
Truck drivers, Special equipment (such as winch truck, refrigerator truck, trailer truck, etc.)	$1.00	
Truck drivers, Fuel delivery	0.85	
Truck drivers, Power system construction (special equipment)	1.00	
Tubing cleaners		0.80
Wagondrill operators		0.90
Wagondrill operator's helpers		0.625
Welders - receive rate prescribed for craft performing operation to which welding is incidental		
Well drillers	1.125	
Well driller's helpers	0.75	
Waterproofer's helpers	1.125	
Wreckers	0.50	0.575

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ACCIDENT RECORD, PRINCIPAL PRIME CONSTRUCTION CONTRACTORS

NOTE: Frequency Rate is the number of lost time accidents per 1,000,000 man hours worked.
Severity Rate is the number of days lost on account of injury per 1,000 man hours worked.
Fatality Rate is the number of deaths per 1,000,000 man hours worked.

Number of man hours worked - J. A. Jones Construction Company - 104,381,938
- Ford, Bacon and Davis, Inc. - 5,667,023
Total - 110,048,961

	J. A. JONES CONSTRUCTION COMPANY				FORD, BACON AND DAVIS, INC.			
	Frequency Rate	Severity Rate	Fatality Rate	Deaths	Frequency Rate	Severity Rate	Fatality Rate	Deaths
June 1943	16.48	.92		0	.00			
July	132.00	3.06		0	.00	.00		0
August	30.11	51.27		2	13.02	.33		0
September	23.29	.63		0	17.73	.04		0
October	28.32	8.70		0	5.81	.12		1
November	23.00	8.23		1	16.23	14.06		0
December	8.92	.40		1	8.74	.28		0
Cumulative rate for year 1943	21.25	6.32	.62	4	11.70	4.07	.65	1
January 1944	9.38	.32		0	4.56	.01		0
February	8.00	2.39		0	1.60	.14		0
March	6.82	4.14		2	3.52	.68		0
April	9.23	1.11		1	4.00	.04		0
May	6.72	.22		0	2.77	.08		0
June	6.86	.22		0	6.60	.18		0
July	3.06	3.26		2	.00	.35		0
August	4.45	.22		0	.00	.12		0
September	8.78	.57		0	.00	.00		0
October	4.53	2.84		2	.00	.00		0
November	2.99	.19		0	.00	.00		0
December	3.89	2.08		0	.00	.00		0

Cumulative rate

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December	[illegible]	[illegible]		0	.00	.00		0
Cumulative rate for year 1944	5.45	1.30	.15	7	5.15	.17	.00	0
January 1945	6.63	3.78		3				
February	4.20	.38		0				
March	5.30	.27		0				
April	4.75	1.14		1				
May	6.00	.69		0				
June	7.16	1.63		1				
July	5.76	2.12		1				
August	6.29	.40		0				
September	4.35	4.17		1				
October	9.46	3.09		0				
November	3.01	.38		0				
December	3.33	2.98		0				
Cumulative rate for year 1945	5.70	1.53	.14	7				
January 1946	1.49	.00		0				
February	.00	.04		0				
March	.00	.06		0				
April	10.16	.32		0				
May	0.00	.09		0				
June	0.00	.00		0				
July	6.20	.02		0				
August	14.62	.23		0				
September	0.00	.38		0				
October	2.54	.45		0				
November	0.00	.94		0				
December	0.00	.00		0				
Cumulative rate for year 1946	2.71	0.11	.00	0				
Cumulative rate for Project	6.48	1.73	.17	18	5.47	1.23	.17	1

NOTE: The above figures include subcontractors, and the Jones figures also include personnel of Kellex and prime contractors supervised by Jones.

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COMPARISON OF K-25 PROJECT ACCIDENT RECORD WITH OTHER PUBLISHED RECORDS

	Frequency Rate				Severity Rate			
	1943	1944	1945	1946	1943	1944	1945	1946
K-25 Project	19.39	5.23	5.70	2.71	5.88	1.29	1.53	0.11
Clinton Engineer Works	9.29	6.24	6.12	3.83	2.04	1.65	1.04	0.13
Corps of Engineers New Military Construction	7.52	6.53	7.41	8.25	5.43	3.52	1.68	2.91
National Safety Council Construction	15.39	18.21	19.84		2.48	2.49	2.27	

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EMPLOYMENT STATISTICS BY CONTRACTORS

Note: Figures represent the payroll strength on a full day near the first of each month.

Date	Jones	F. B. and D.	Pope	Schulman	Combustion	Kellex	Total
6/1/43	115	0	0	0	0	0	115
7/1/43	926	0	0	2	0	14	942
8/1/43	2,140	75	4	22	0	30	2,271
9/1/43	3,029	675	21	152	13	45	3,935
10/1/43	4,607	1,380	44	225	20	72	6,348
11/1/43	7,627	1,685	60	291	142	110	9,915
12/1/43	8,206	1,901	121	363	223	119	10,933
1/1/44	10,274	1,835	241	510	339	135	13,334
2/1/44	12,020	2,732	349	717	327	154	16,299
3/1/44	13,208	2,235	396	957	385	183	17,364
4/1/44	14,547	2,130	318	831	371	232	18,429
5/1/44	15,116	2,050	302	663	228	271	18,630
6/1/44	14,934	1,650	210	549	170	292	17,805
7/1/44	14,455	1,480	185	455	163	330	17,068
8/1/44	15,437	1,090	199	462	150	358	17,696
9/1/44	15,991	750	213	476	75	334	17,839
10/1/44	17,308	540	148	388	49	352	18,785
11/1/44	17,998	0	77	369	12	354	18,810
12/1/44	18,409	0	49	340	9	365	19,172
1/1/45	18,846		30	288	8	363	19,535
2/1/45	21,376		29	239	5	396	22,045
3/1/45	23,167		28	229	0	404	23,828
4/1/45	23,112		42	199	0	402	23,755
5/1/45	24,652		64	157		393	25,266
6/1/45	23,108		85	237		387	23,817
7/1/45	18,168		135	266		349	18,918
8/1/45	17,494		101	269		310	18,174
9/1/45	15,709		7	299		281	16,296
10/1/45	11,890		5	270		208	12,373

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7/1/43	926	0	0	2	0	14	942
8/1/43	2,140	75	4	22	0	30	2,271
9/1/43	3,029	675	21	152	13	45	3,935
10/1/43	4,607	1,380	44	225	20	72	6,348
11/1/43	7,627	1,685	60	291	142	110	9,915
12/1/43	8,206	1,901	121	363	223	119	10,933
1/1/44	10,274	1,835	241	510	339	135	13,334
2/1/44	12,020	2,732	349	717	327	154	16,299
3/1/44	13,208	2,235	396	957	385	183	17,364
4/1/44	14,547	2,130	318	831	371	232	18,429
5/1/44	15,116	2,050	302	663	228	271	18,630
6/1/44	14,934	1,650	210	549	170	292	17,805
7/1/44	14,455	1,480	185	455	163	330	17,068
8/1/44	15,437	1,090	199	462	150	358	17,696
9/1/44	15,991	750	213	476	75	334	17,839
10/1/44	17,308	540	148	388	49	352	18,785
11/1/44	17,998	0	77	369	12	354	18,810
12/1/44	18,409	0	49	340	9	365	19,172
1/1/45	18,846		30	288	8	363	19,535
2/1/45	21,376		29	239	5	396	22,045
3/1/45	23,167		28	229	0	404	23,828
4/1/45	23,112		42	199	0	402	23,755
5/1/45	24,652		64	157		393	25,266
6/1/45	23,108		85	237		387	23,817
7/1/45	18,168		135	266		349	18,918
8/1/45	17,494		101	269		310	18,174
9/1/45	15,709		7	299		281	16,296
10/1/45	11,890		5	270		208	12,373
11/1/45	8,100		0	268		173	8,541
12/1/45	5,383		0	299		155	5,837
1/1/46	3,859			275		85	4,219
2/1/46	2,352			205		60	2,617
3/1/46	1,378			116		2	1,496
4/1/46	1,142			113		0	1,255
5/1/46	1,089			99		0	1,188
6/1/46	1,075			75		0	1,150
7/1/46	1,019			33			1,052
8/1/46	760			7			767
9/1/46	831			24			855
10/1/46	645			18			663
11/1/46	470			0			470
12/1/46	198			0			198
12/31/46	216						216

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EMPLOYMENT STATISTICS BY TYPE OF WORK

COMPARED WITH PERCENTAGE OF COMPLETION

Note: Figures represent the payroll strength on a full day near the first of each month.

Date	Per Cent Complete K-25 Area	Per Cent Complete K-27 Area	Construction Manual	Camp Operation and Maintanance	Administrative and Non-Manual	Total Personnel
6/1/43	0.0		51	0	64	115
7/1/43	0.1		680	81	181	942
8/1/43	0.4		1,785	117	369	2,271
9/1/43	0.9		3,102	152	681	3,935
10/1/43	1.6		4,988	205	1,155	6,348
11/1/43	3.4		7,853	286	1,776	9,915
12/1/43	4.8		8,691	409	1,893	10,933
1/1/44	7.1		10,471	653	2,210	13,334
2/1/44	15.0		12,899	896	2,504	16,299
3/1/44	23.3		13,528	1,189	2,647	17,364
4/1/44	30.4		14,299	1,274	2,856	18,429
5/1/44	34.5		14,116	1,467	3,047	18,630
6/1/44	39.2		13,404	1,260	3,141	17,805
7/1/44	45.0		12,802	1,176	3,090	17,068
8/1/44	50.6		13,386	1,115	3,195	17,696
9/1/44	54.2		13,762	980	3,097	17,839
10/1/44	59.8		14,738	983	3,064	18,785
11/1/44	63.9		14,984	1,020	2,806	18,810
12/1/44	66.4		15,297	1,031	2,844	19,172
1/1/45	69.6		15,679	979	2,877	19,535
2/1/45	72.4		18,038	1,019	2,988	22,045
3/1/45	75.5		19,693	1,007	3,128	23,828
4/1/45	81.5	0.0	19,405	1,045	3,305	23,755
5/1/45	86.9	2.3	20,379	1,140	3,747	25,266
6/1/45	94.4	8.1	18,959	1,150	3,708	23,817
7/1/45	98.6	12.3	14,069	1,025	3,824	18,918
8/1/45	99.8	27.1	14,267	946	2,961	18,174
9/1/45	99.9	52.3	12,701	804	2,791	16,296
10/1/45	100.0 1/	80.0	9,228	561	2,584	12,373

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12/1/43	4.8		8,631	409	1,893	10,933
1/1/44	7.1		10,471	659	2,210	13,334
2/1/44	15.0		12,899	896	2,504	16,299
3/1/44	23.3		13,528	1,189	2,647	17,364
4/1/44	30.4		14,299	1,274	2,856	18,429
5/1/44	34.5		14,116	1,467	3,047	18,630
6/1/44	39.2		13,404	1,260	3,141	17,805
7/1/44	45.0		12,802	1,176	3,090	17,068
8/1/44	50.6		13,386	1,115	3,195	17,696
9/1/44	54.2		13,762	980	3,097	17,839
10/1/44	59.8		14,738	983	3,064	18,785
11/1/44	63.9		14,984	1,020	2,806	18,810
12/1/44	66.4		15,297	1,031	2,844	19,172
1/1/45	69.6		15,679	979	2,877	19,535
2/1/45	72.4		18,038	1,019	2,988	22,045
3/1/45	75.5		19,693	1,007	3,128	23,828
4/1/45	81.5.	0.0	19,405	1,045	3,305	23,755
5/1/45	86.9	2.3	20,379	1,140	3,747	25,266
6/1/45	94.4	8.1	18,959	1,150	3,708	23,817
7/1/45	98.6	12.3	14,069	1,025	3,824	18,918
8/1/45	99.8	27.1	14,267	946	2,961	18,174
9/1/45	99.9	52.3	12,701	804	2,791	16,296
10/1/45	100.0 1/	80.0	9,228	561	2,584	12,373
11/1/45		91.5	6,304	456	1,781	8,541
12/1/45		95.0	4,072	349	1,416	5,837
1/1/46		97.0	2,879	283	1,057	4,219
2/1/46		99.0	1,772	73	772	2,617
3/1/46		99.9	897	0	599	1,496
4/1/46		100.0 1/	710	0	545	1,255
5/1/46			738		450	1,188
6/1/46			684		466	1,150
7/1/46			636		416	1,052
8/1/46			377		390	767
9/1/46			476		379	855
10/1/46			357		306	663
11/1/46			74		396	470
12/1/46			0		198	198
12/31/46			0		216	216

1/ Indicates substantial completion.

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EMPLOYMENT STATISTICS, HIRINGS, TURNOVER, AND ABSENTEEISM

Date	New Hires: Jones and Sub-contractors 1/	New Hires: Ford, Bacon aand Davis and Subcon-tractors	New Hires: Total	Number on Payrolls on the full day nearest first of month	Monthly Turnover Per Cent 2/	Absenteeism: Number on the full day nearest first of month	Absenteeism: Percentage Of Number on Payrolls
6/1/43	384	0	384	115		3	3
7/1/43	1,517	0	1,517	942		1	0
8/1/43	1,931	134	2,065	2,271		284	13
9/1/43	1,885	1,557	3,442	3,935		443	11
10/1/43	2,480	911	3,391	6,348		631	10
11/1/43	3,115	905	4,020	9,915		1,541	16
12/1/43	3,074	936	4,010	10,933		1,427	13
1/1/44	3,583	656	4,239	13,334		2,356	18
2/1/44	5,868	1,151	7,019	16,299	11	2,113	13
3/1/44	4,228	641	4,869	17,364	9	2,961	17
4/1/44	4,446	475	4,921	18,429	11	2,835	15
5/1/44	4,094	338	4,432	18,630	12	3,240	17
6/1/44	4,072	182	4,254	17,805	18	1,733	10
7/1/44	3,283	169	3,452	17,068	19	1,974	12
8/1/44	4,902	208	5,110	17,696	17	1,908	11
9/1/44	5,083	12	5,095	17,839	21	1,565	9
10/1/44	4,369	2	4,371	18,785	16	2,642	14
11/1/44	4,380	2	4,382	18,810	17	2,252	12
12/1/44	3,665	0	3,665	19,172	15	1,998	10
1/1/45	2,910	0	2,910	19,535	11	3,880	20
2/1/45	5,834		5,834	22,045	15	3,208	15
3/1/45	4,769		4,769	23,828	13	2,726	11
4/1/45	4,655		4,655	23,755	20	2,709	11
5/1/45	4,839		4,839	25,266	15	3,344	13
6/1/45	3,690		3,690	23,817	21	1,874	8
7/1/45	2,342		2,342	18,918	29	4,108	22
8/1/45	2,512		2,512	18,174	19	2,639	15
9/1/45	2,771		2,771	16,296	26	2,575	16

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[illegible]	3,115	905	4,020	9,915		1,541	16
12/1/43	3,074	936	4,010	10,933		1,427	13
1/1/44	3,583	656	4,239	13,334		2,356	18
2/1/44	5,868	1,151	7,019	16,299	11	2,113	13
3/1/44	4,228	641	4,869	17,364	9	2,961	17
4/1/44	4,446	475	4,921	18,429	11	2,835	15
5/1/44	4,094	338	4,432	18,630	12	3,240	17
6/1/44	4,072	182	4,254	17,805	18	1,733	10
7/1/44	3,283	169	3,452	17,068	19	1,974	12
8/1/44	4,902	208	5,110	17,696	17	1,908	11
9/1/44	5,083	12	5,095	17,839	21	1,565	9
10/1/44	4,369	2	4,371	18,785	16	2,642	14
11/1/44	4,380	2	4,382	18,810	17	2,252	12
12/1/44	3,665	0	3,665	19,172	15	1,998	10
1/1/45	2,910	0	2,910	19,535	11	3,880	20
2/1/45	5,834		5,834	22,045	15	3,208	15
3/1/45	4,769		4,769	23,828	13	2,726	11
4/1/45	4,655		4,655	23,755	20	2,709	11
5/1/45	4,839		4,839	25,266	15	3,344	13
6/1/45	3,690		3,690	23,817	21	1,874	8
7/1/45	2,342		2,342	18,918	29	4,108	22
8/1/45	2,512		2,512	18,174	19	2,639	15
9/1/45	2,771		2,771	16,296	26	2,575	16
10/1/45	1,155		1,155	12,373		2,270	19
11/1/45	817		817	8,541		632	7
12/1/45	296		296	5,837		574	10
1/1/46	211		211	4,219		462	11
2/1/46	136		136	2,617		194	7
3/1/46	41		41	1,496		76	5
4/1/46	159		159	1,255		125	10
5/1/46	130		130	1,188		91	8
6/1/46	146		146	1,150		135	12
7/1/46	109		109	1,052		110	10
8/1/46	53		53	767		147	19
9/1/46	226		226	855		93	11
10/1/46	120		120	693		61	7
11/1/46	2		2	470		164	35
12/1/46	0		0	198		43	22
12/31/46	0		0	216		31	14

1/ Includes also the prime contractors whose work was coordinated by the Jones Company

2/ Number of separations during the month divided by the number on the payroll at at the month's end.

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J. A. JONES CONSTRUCTION COMPANY AND SUBCONTRACTORS

NUMBER OF EMPLOYEES OCCUPYING C.E.W. HOUSING

Date	Barracks	Hutments	Victory Homes	Trailers	Family Apartments
June 1943		25			
July		171			
August		467			
September		711			
October		1,476		20	
November		1,597		22	(Included in
December		2,457		172	Hutments)
January 1944	601	3,590	6	367	22
February	912	3,798	40	660	22
March	1,150	3,905	72	878	22
April	1,343	3,908	92	918	22
May	1,710	3,595	100	904	21
June	1,635	3,038	100	908	21
July	1,721	3,040	100	903	22
August	2,073	3,372	100	903	22
September	2,231	3,400	100	907	22
October	2,231	3,347	100	907	22
November	2,179	3,328	100	903	22
December	2,108	3,106	100	903	22
January 1945	2,439	3,788	100	903	22
February	2,445	4,057	100	905	22
March	2,847	4,192	100	908	22
April	2,771	4,226	100	908	22
May	2,856	6,317	100	907	22
June	2,630	4,680	100	906	22
July	2,217	2,930	97	845	22
August	1,917	2,809	95	848	22
September	1,790	2,477	93	803	20
October	1,252	1,067	92	722	19
November	1,899	0	82	688	14
December	1,488	0	75	568	13
January 1946	1,129	0	57	475	12
25 January 1946	234	0	45	381	8

NOTE: On 25 January 1946 Camp Operations was turned over to the Roane-Anderson Company, and operated under subcontract by the Gibson Service Management Company.

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PRINCIPAL MATERIALS AND EQUIPMENT USED IN CONSTRUCTION OF THE K-25 AND K-27 PROCESS AREAS

	1/ K-25	2/ K-27	Total
MECHANICAL			
Pumps - 1/8 to 700 H.P. including:	7,418	1,322	8,740
Centrifugal Stage Pumps	5,806	1,082	6,888
Reciprocating Stage Pumps	152		152
Coolant Pumps	561	104	665
Diffusers	3,020	542	3,562
Ventilating Fans - 5 to 25 H.P.	828	232	1,060
Motors - 1/20 to 700 H.P.	12,085	2,020	14,105
Coolant Coolers	500	94	594
Process Gas Coolers	634		634
Drums - 4" x 15'3/8" to 8' x 22'	2,150	352	2,502
Tons of Sheet Metal	15,195	3,508	18,703
INSTRUMENTATION			
Instruments	109,535	22,622	132,157
Instrument Panel Boards	921	104	1,025
Line Recorder Units	108	18	126
Instrument Transfer Cocks	36,561	8,038	44,599
Feet of Copper Tubing	3,600,000	386,484	3,986,484
ELECTRICAL			
Transformers - 25 KVA to 40,000 KVA	830	240	1,070
Switchgear - 1,000 KVA to 3,500,000 KVA	410	91	501
Circuit Breakers - 15 A to 225 A	3,430	1,020	4,450
Relays	1,520	790	2,310
Safety Switches - 5 A to 600 A	1,305	677	1,982
Push Button Stations	670	236	906

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Motors - 1/20 to 700 H.P.	12,085	2,020	14,105
Coolant Coolers	500	94	594
Process Gas Coolers	634		634
Drums - 4" x 15'3/8" to 8' x 22'	2,150	352	2,502
Tons of Sheet Metal	15,195	3,508	18,703

INSTRUMENTATION

Instruments	109,535	22,622	132,157
Instrument Panel Boards	921	104	1,025
Line Recorder Units	108	18	126
Instrument Transfer Cocks	36,561	8,038	44,599
Feet of Copper Tubing	3,600,000	386,484	3,986,484

ELECTRICAL

Transformers - 25 KVA to 40,000 KVA	830	240	1,070
Switchgear - 1,000 KVA to 3,500,000 KVA	410	91	501
Circuit Breakers - 15 A to 225 A	3,430	1,020	4,450
Relays	1,520	790	2,310
Safety Switches - 5 A to 600 A	1,305	677	1,982
Push Button Stations	670	236	906
Control Panels	560	74	634
Calrod Heaters	12,017	2,238	14,255
Electric Air Heaters	7,781	2,531	10,312
Lighting Panels	934	304	1,238
Lighting Fixtures	32,052	8,168	40,220
Motor Starters and Contactors	2,486	889	3,375
Feet of Cable (All Sizes)	2,088,459	407,685	2,496,144
Feet of Single Conductor Wire	10,250,000	1,139,045	11,389,045

PIPING

Valves - 1/8" to 42" including:	222,319	28,490	250,809
Special Crane Valves, Manually Operated	97,075	16,121	113,196
Special Crane Valves, Motor Operated	1,199	149	1,348
Feet of Piping - 1/8" to 54"	3,030,429	677,263	3,707,692
Feet of Pipe Insulation	330,825	83,500	414,325
Square Feet of Housing Insulation	1,900,500	299,700	2,200,200

STRUCTURAL

Cubic Yards of Concrete	262,479	68,658	331,137
Tons of Structural, Miscellaneous and Pipe Bridge Steel	33,473	8,000	41,473
Tons of Reinforcing Steel	8,359	2,825	11,184
Cubic Yards of Earth and Rock Excavation	2,773,249	750,000	3,523,249

CONSTRUCTION EQUIPMENT

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[illegible]	[illegible]	[illegible]	[illegible]
Lighting Panels	934	304	1,238
Lighting Fixtures	32,052	8,168	40,220
Motor Starters and Contactors	2,486	889	3,375
Feet of Cable (All Sizes)	2,088,459	407,685	2,496,144
Feet of Single Conductor Wire	10,250,000	1,139,045	11,389,045

PIPING

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Special Crane Valves, Manually Operated	97,075	16,121	113,196
Special Crane Valves, Motor Operated	1,199	149	1,348
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Feet of Pipe Insulation	330,825	83,500	414,325
Square Feet of Housing Insulation	1,900,500	299,700	2,200,200

STRUCTURAL

Cubic Yards of Concrete	262,479	68,658	331,137
Tons of Structural, Miscellaneous and Pipe Bridge Steel	33,473	8,000	41,473
Tons of Reinforcing Steel	8,359	2,825	11,184
Cubic Yards of Earth and Rock Excavation	2,773,839	750,000	3,523,839

CONSTRUCTION EQUIPMENT

Air Compressors	165
Cranes	114
Locomotives	11
Tractors and Bulldozers	300
Wagon Scrapers	[illegible]
Motor Graders	60
Welding Machines	1,700
Pumps	300
Automobiles	250
Trucks	1,300
Power Shovels	12

1/ J. A. Jones Construction Company memorandum, dated 18 October 1945, from W. E. Young (Engineering Materials Division) to L. C. Danielson (Chief Engineer, Process Area).

2/ Ditto dated 23 November 1945.

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MANHATTAN DISTRICT HISTORY

BOOK II - GASEOUS DIFFUSION (K-25) PROJECT

VOLUME 4 - CONSTRUCTION

APPENDIX "E"

PHOTOGRAPHS

No.	Title
1.	Aerial view of the Site of the Gaseous Diffusion Plant before the Start of Construction, facing North.
2.	General air view of the Gaseous Diffusion Plant during the latter stage of Construction, facing South.
3.	Aerial view of the Main Process Area during Construction, facing South.
4.	Aerial view of the Administration Area during Construction, facing Southwest.
5.	Aerial view of Section 800, which Supplies, Recirculates, and Cools the Water used in Cooling the Process Gas.
6.	East side of the Main Process Buildings, facing North.
7.	View inside the Main Process Building "U", facing North.
8.	View inside the "U", Main Process Buildings, facing Southeast, showing the Air Compressor House (K-1201) left, and the Air Conditioning Building (K-1101) right, with Steel Framing For the Electrical Maintenance Building (K-1030) in the left foreground.
9.	North end of the "U", Main Process Buildings, showing Electrical Maintenance Building (K-1030) in the right foreground.
10.	Feed Purification Building (K-101) during Construction.
11.	View of the Surge and Waste Building (K-601).
12.	View inside the Cascade "U", facing Northwest, showing Vessels and Piping used in the Dry Air Plant (K-1101).

No.	Title
13.	Typical view of a Main Process Building Operating Floor, showing Roof Construction, Ventilating Ducts and Outlets, and Handwheels for Operating Valves in the Pipe Gallery below.
14.	Interior View of the second floor of Surge and Waste Building (K-601), showing Piping Enclosures and Instrumentation.
15.	Typical Process Gas Stage Pump being Installed.
16.	Interior View of a Typical Sheet Steel Cell in the Main Process Buildings just before Installation of the Six Converters, showing Process Gas Pumps, Piping, Control Valves, and Instruments.
17.	Typical Stage Pump and Converter Installation, before Converter and Connected Piping were Sealed in the Cell by Welding a Sheet Plate over the opening shown in left foreground.
18.	Aerial view of the Power Plant Area, showing the Crib House (K-705) on the bank of the Clinch River, and (left to right) the Pump House (K-706), Auxiliary Switch House (K-707), Boiler House (K-701), Turbine Room (K-702), Main Switch House (K-704) and Outdoor Switchyard (K-709).
19.	View of the Boiler House (K-701), in the Power Plant Area.
20.	View of the Main Switch House (K-704) in the Power Plant Area.
21.	Outdoor Switch Yard (K-709), Power Plant Area.
22.	Interior View of the Turbine Room (K-702).
23.	View of the K-27 Process Buildings, facing Northeast.
24.	A later view of the K-27 Process Buildings, facing Northeast.
25.	View of the K-27 Cooling Tower (H-832) and Recirculating Pump House (K-832), facing Northwest.
26.	View of the K-27 Process Buildings, facing West.
27.	View of the K-27 Switch House (K-731) and Switchyard (K-732), facing Southeast.

No.	Title
28.	View of the K-27 Feed and Purification Building (K-131) in the foreground, and Surge and Waste Building (K-631) in the background.
29.	Foundation Excavation for the K-27 Switch House (K-731), facing East.
30.	Concrete slab (ground floor) for the K-27 Process Buildings, showing start of Erection of Structural Steel in the background.
31.	Start of Erection of Structural Steel for the K-27 Process Buildings (K-402-1).
32.	Typical installation of Auxiliary Process Gas Piping in K-27, showing Heating Elements attached to Piping before Application of Insulation.
33.	View of the Conditioning Building (K-1401), facing Northwest.
34.	View of the Fluorine Generating Building (K-1301), facing Northeast.
35.	Interior of Conditioning Building (K-1401), showing Vats for Cleaning and Processing Pipe, Valves and other Equipment prior to Installation in the Process Area.
36.	View of the Steam Heating Plant (K-1501) during Construction of the Addition (K-1531) for Supplying Steam to the K-27 Area.
37.	View of the Steam Heating Plant (K-1501) including the Addition (K-1531) after the Completion of Construction.
38.	View of the Administration Area, facing Northwest.
39.	Main Administration Building (K-1001), facing North.
40.	View of the Field Office Buildings (K-1029) and (K-1034), facing Southeast.
41.	Panorama of the K-25 Area during Construction, facing Southwest.

B1 Aerial view of the Site of the Gaseous Diffusion Plant before the Start of Construction, facing North.

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[redacted] ~~CONFIDENTIAL/RD~~

E2 General air view of the Gaseous Diffusion Plant during the latter stage of Construction, facing South.

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[redacted]

E3 Aerial view of the Main Process Area during Construction, facing South.

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E4 Aerial view of the Administration Area during Construction, facing Southwest.

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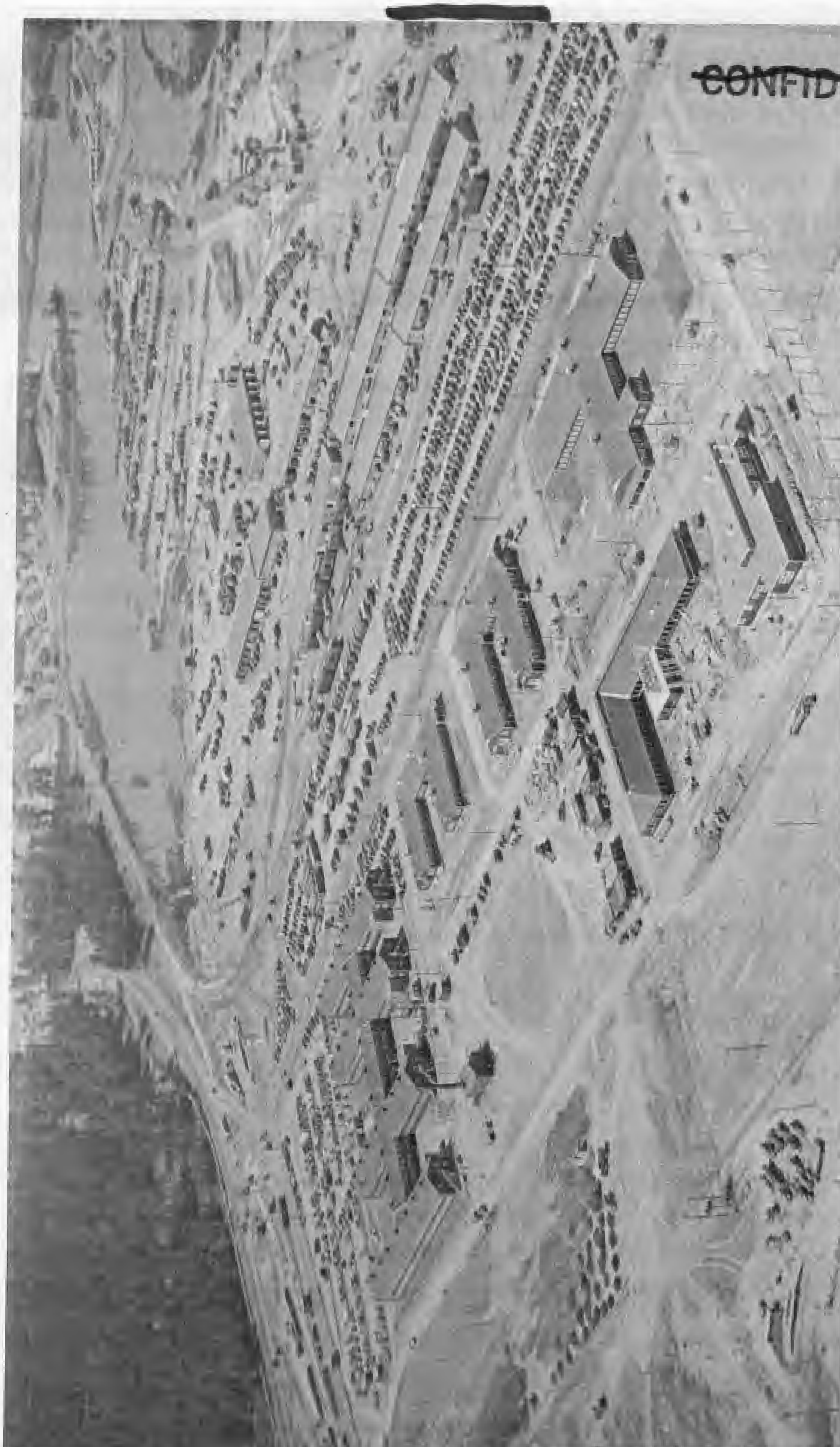

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E5 Aerial view of Section 800, which Supplies, Recirculates, and Cools the Water used in Cooling the Process Gas. Left to right are: The Intake Pumphouse (K-801), Cooling Tower (H-801), Cooling Tower (H-802), and Recirculating Pumphouse (K-802). Facing Northeast.

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E6 East side of the Main Process Buildings, facing North.

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E-6

E7 View inside the Main Process Building "U", facing North. The Feed Purification Building (K-101) is shown in the center.

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[redacted]

E7

E8 View inside the "U", Main Process Buildings, facing Southeast, showing the Air Compressor House (K-1201) left, and the Air Conditioning Building (K-1101) right, with Steel Framing for the Electrical Maintenance Building (K-1030) in the left foreground.

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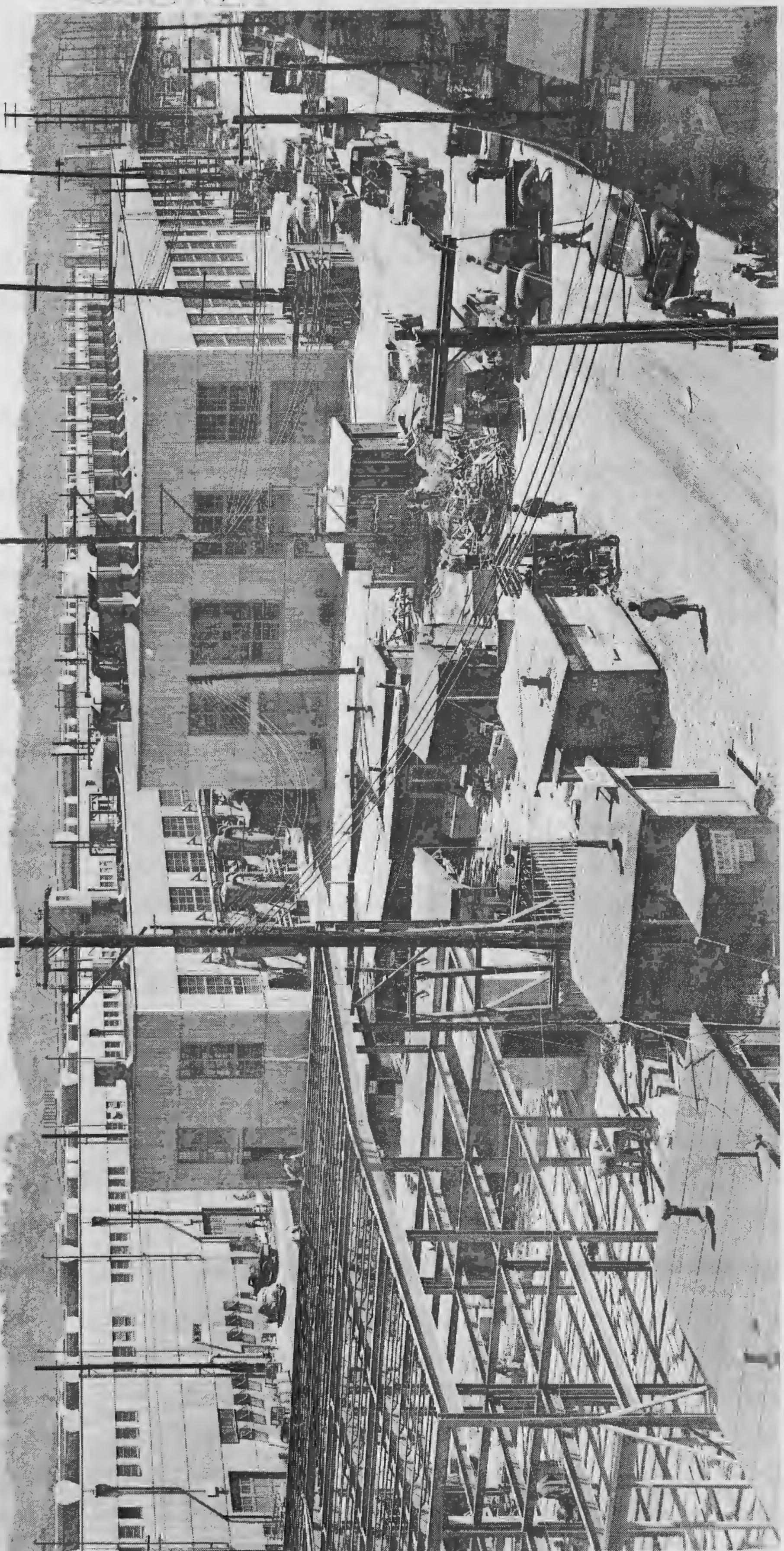

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E9 North end of the "U", Main Process Buildings, showing Electrical Maintenance Building (K-1030) in the right foreground.

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E10 Feed Purification Building (K-101) during Construction.

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F10

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E11 View of the Surge and Waste Building (K-601).

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E-11

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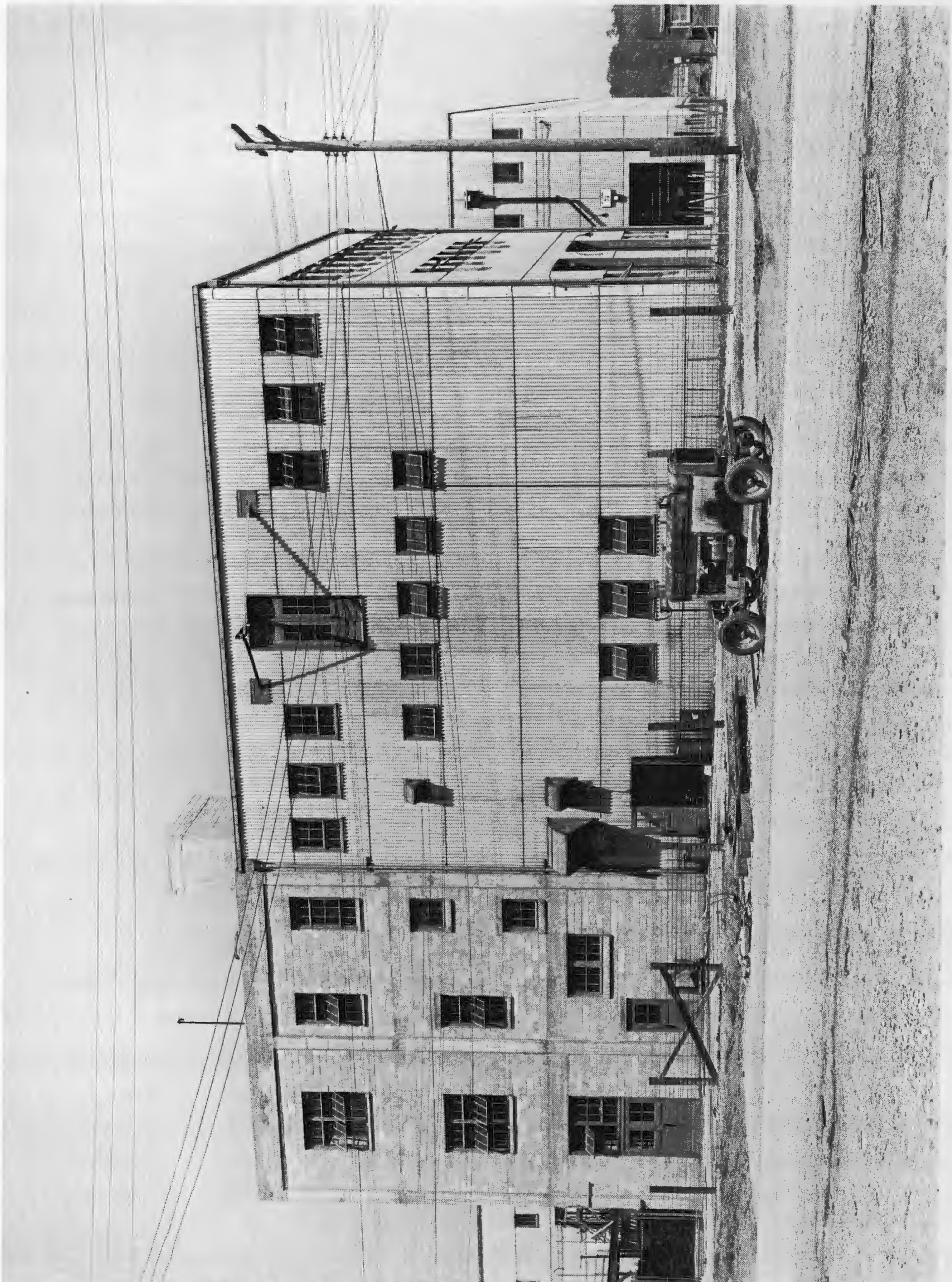

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E12 View inside the Cascade "U", facing Northwest, showing Vessels and Piping used in the Dry Air Plant (K-1101).

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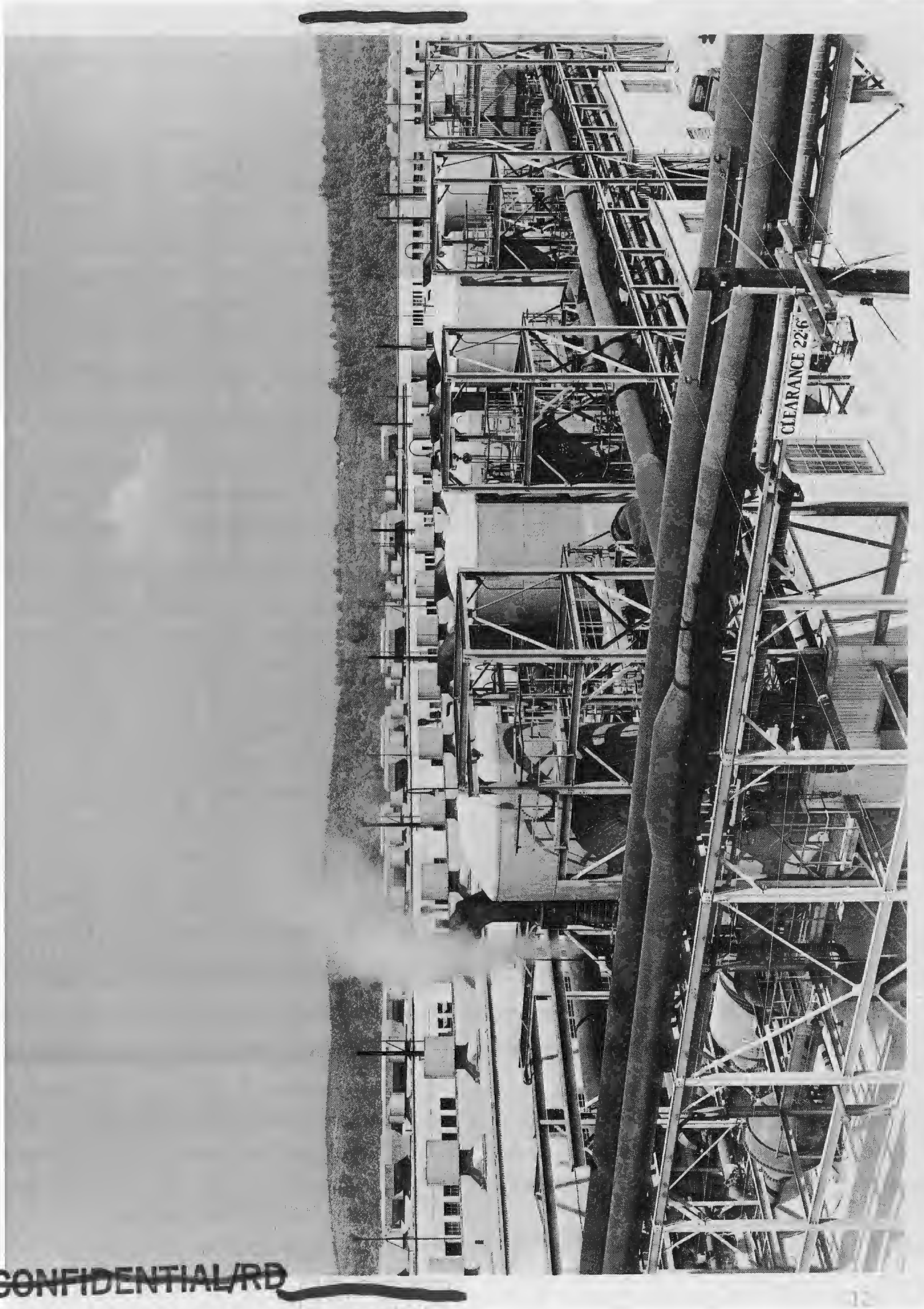
F-12



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E13 Typical view of a Main Process Building Operating Floor, showing Roof Construction, Ventilating Ducts and Outlets, and Handwheels for Operating Valves in the Pipe Gallery below.

E-13

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E14 Interior View of the second floor of Surge and Waste Building (K-601), showing Piping Enclosures and Instrumentation.

F-14

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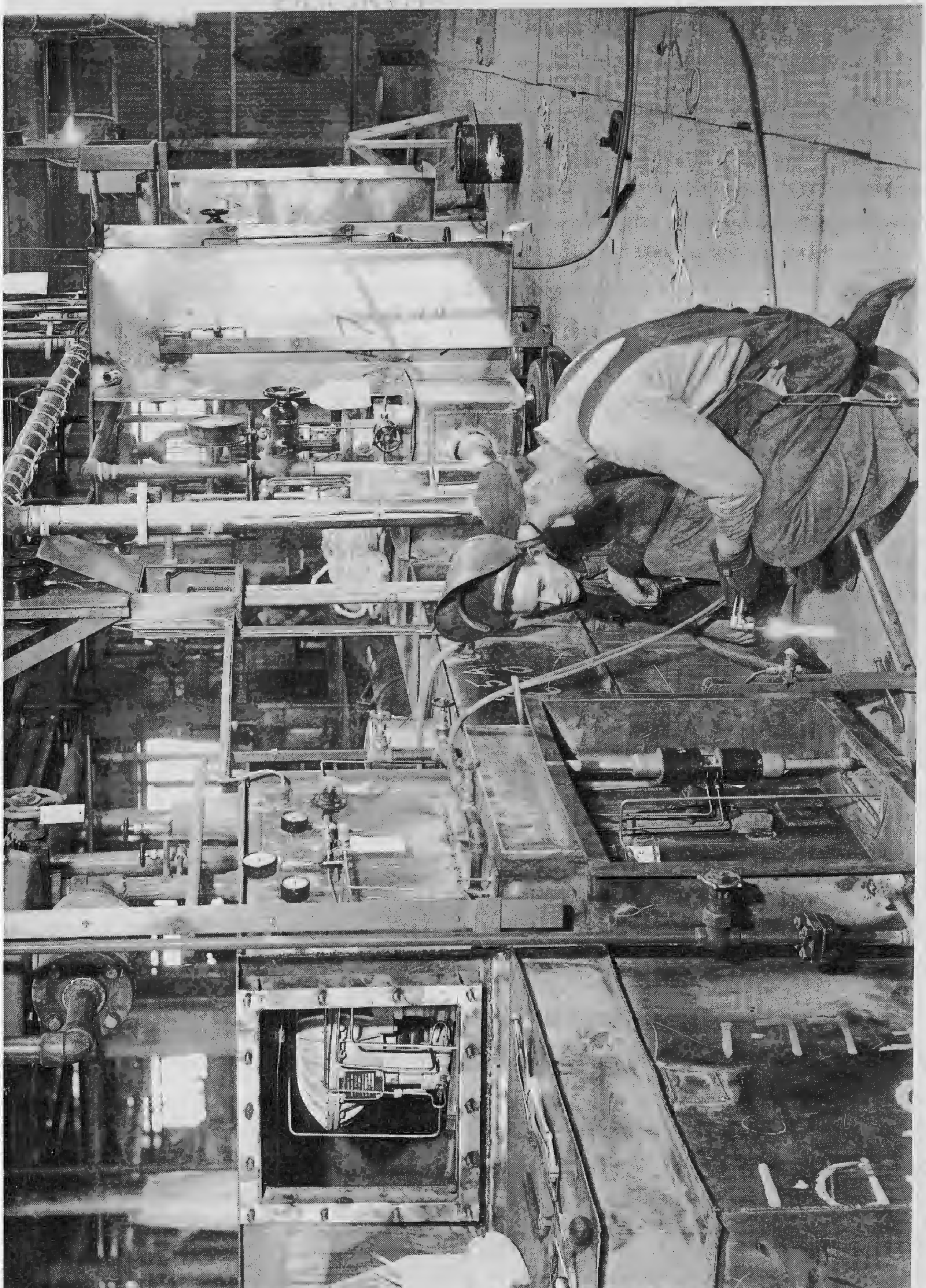

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E15 Typical Process Gas Stage Pump being Installed.
There are nearly 7000 Similar Pumps in the K-25
and K-27 Cascade System.

E-16

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E15

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E16 Interior View of a Typical Sheet Steel Cell in the Main Process Buildings just before Installation of the Six Converters, showing Process Gas Pumps, Piping, Control Valves, and Instruments.

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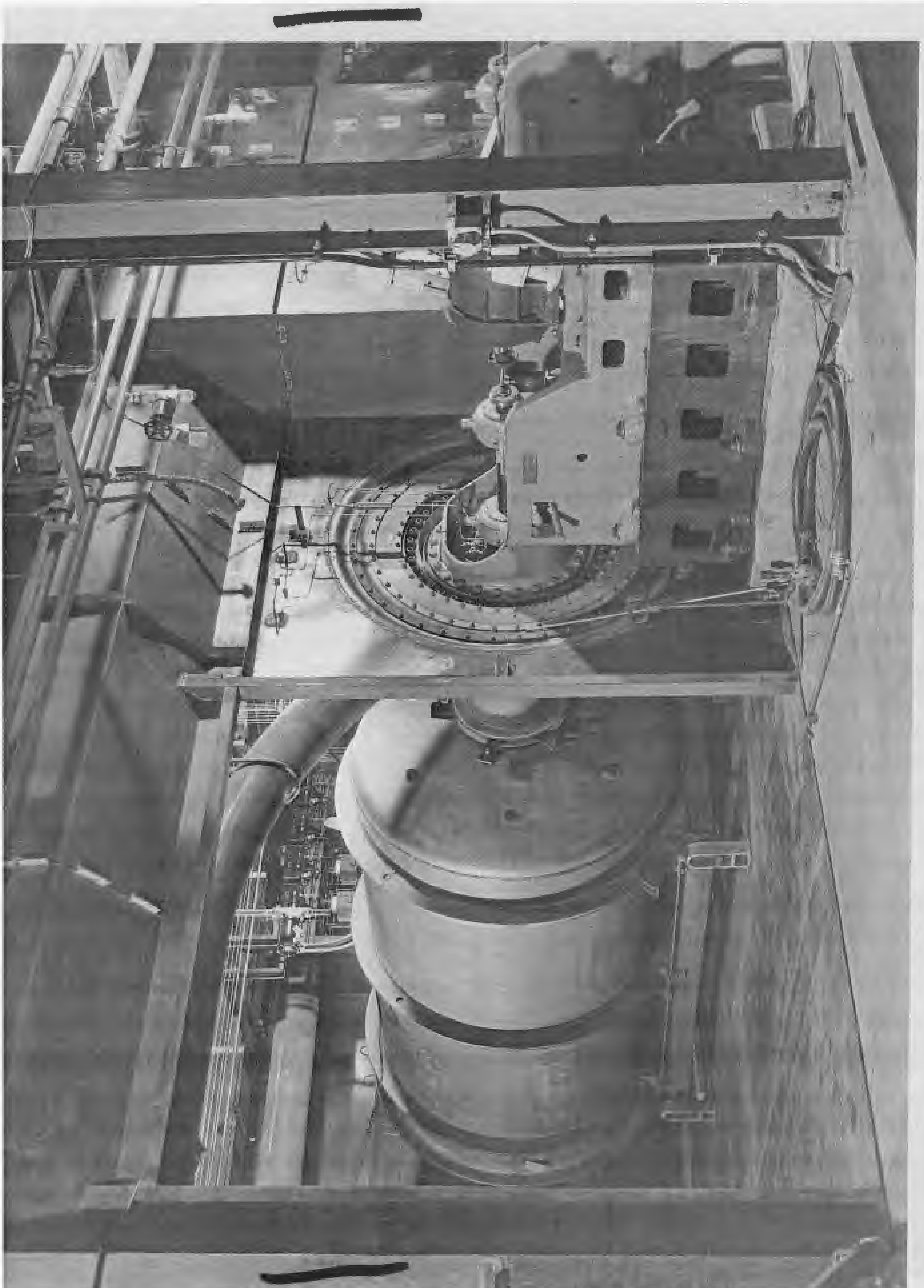
E17 Typical Stage Pump and Converter Installation, before Converter and Connected Piping were Sealed in the Cell by Welding a Sheet Steel Plate over the opening shown in left foreground.

E-17



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[redacted]

E18 Aerial view of the Power Plant Area, showing the Crib House (K-705) on the bank of the Clinch River, and (left to right) the Pump House (K-706), Auxiliary Switch House (K-707), Boiler House (K-701), Turbine Room (K-702), Main Switch House (K-704) and Outdoor Switchyard (K-709).

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E-18

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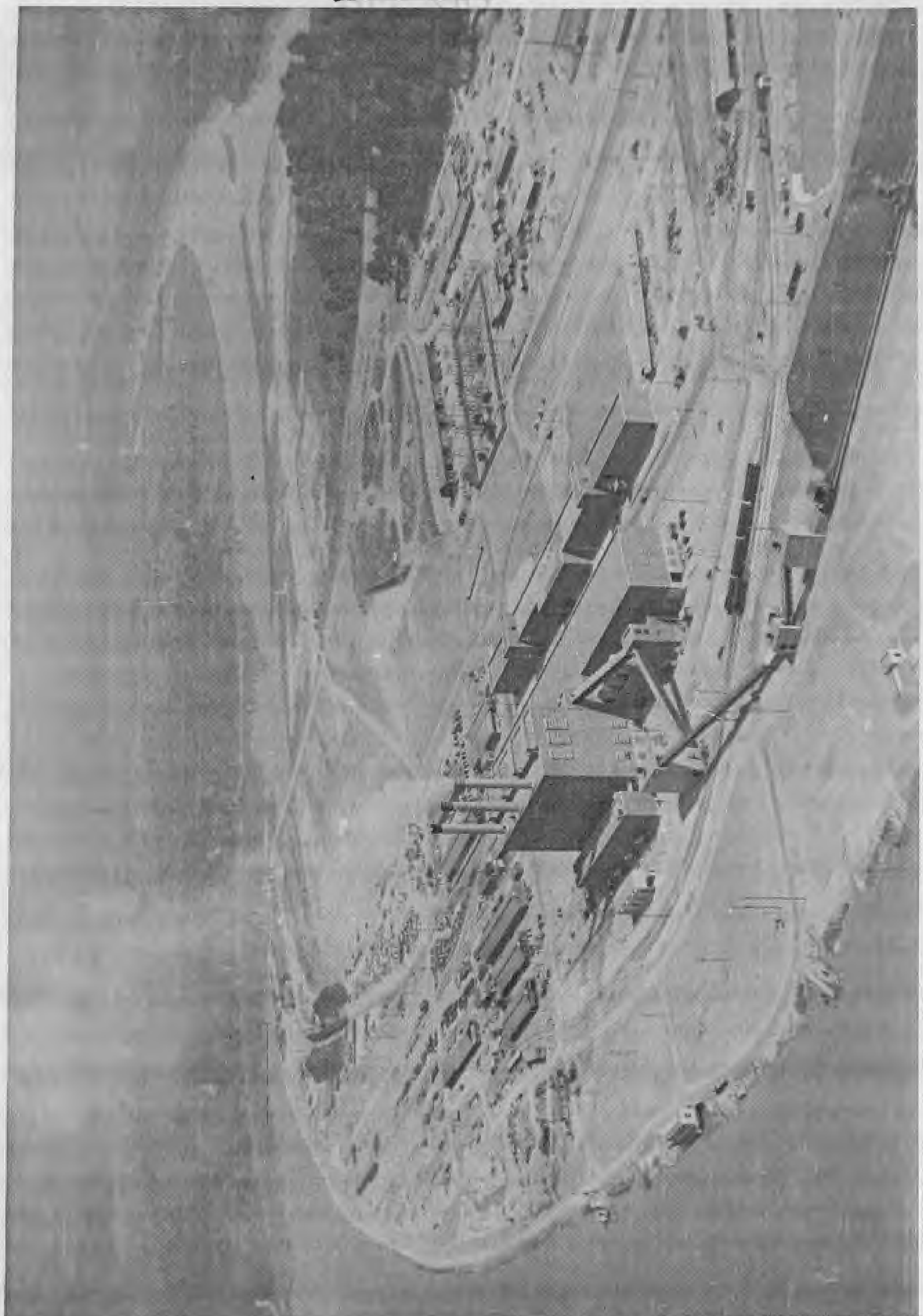
[redacted]



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E19 View of the Boiler House (K-701), in the Power Plant Area. The building in the left background is the Liquid Thermal Diffusion Plant (S-50 Project), for which the boilers of the Power Plant provided most of the steam.

F-19

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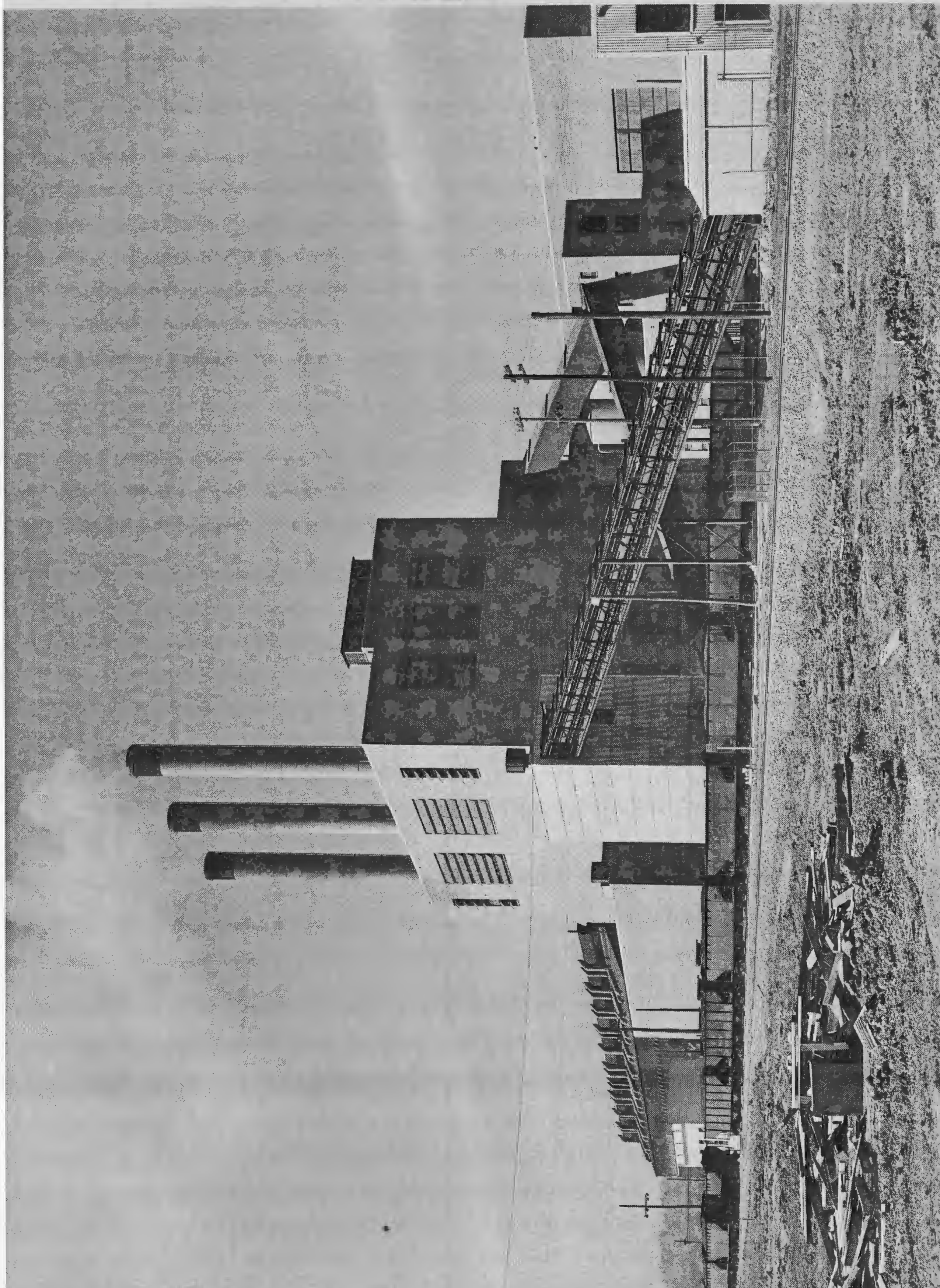

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E20 View of the Main Switch House (K-704) in the Power Plant Area.

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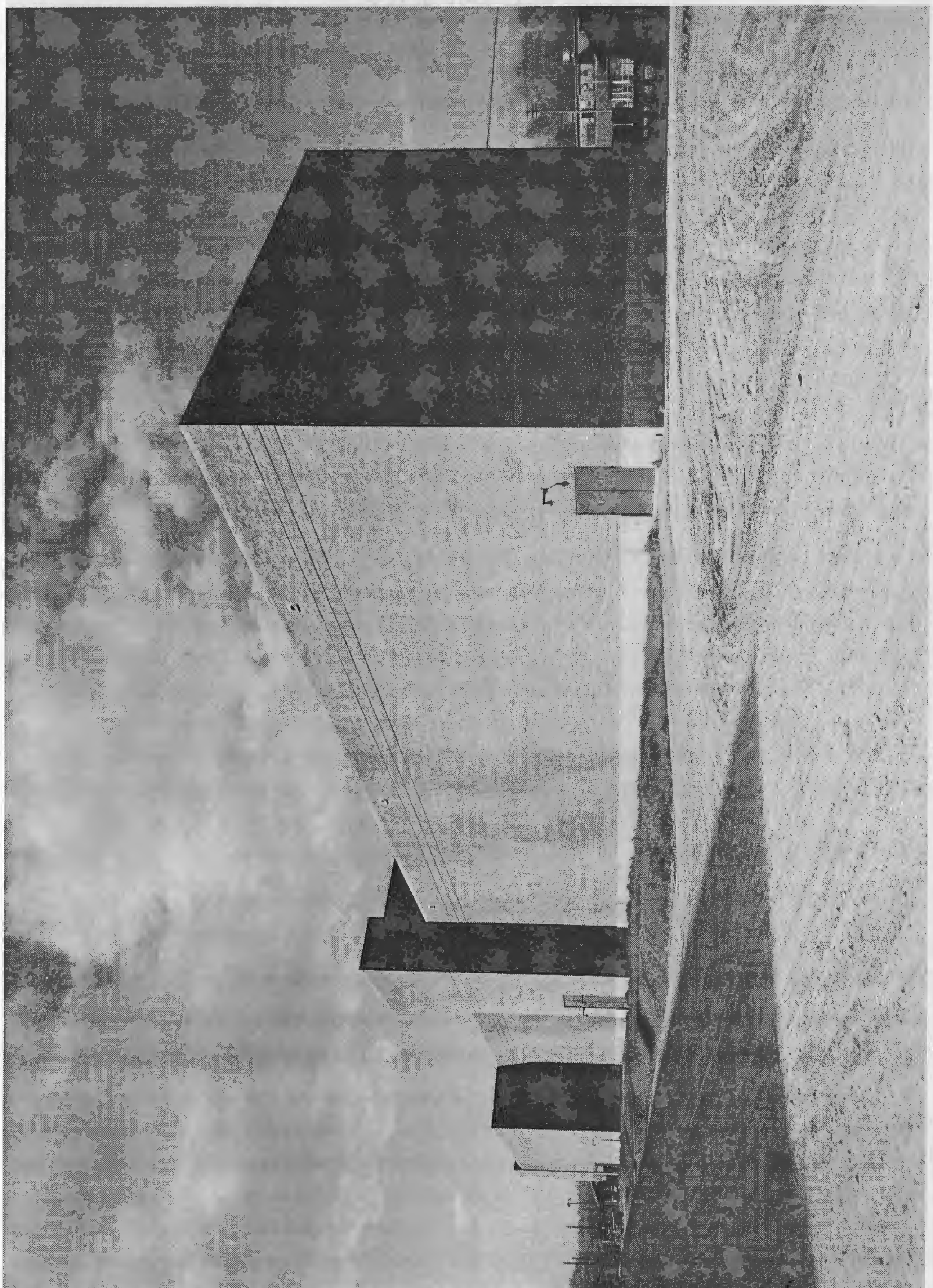

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221 Outdoor Switch Yard (K-709), Power Plant Area.

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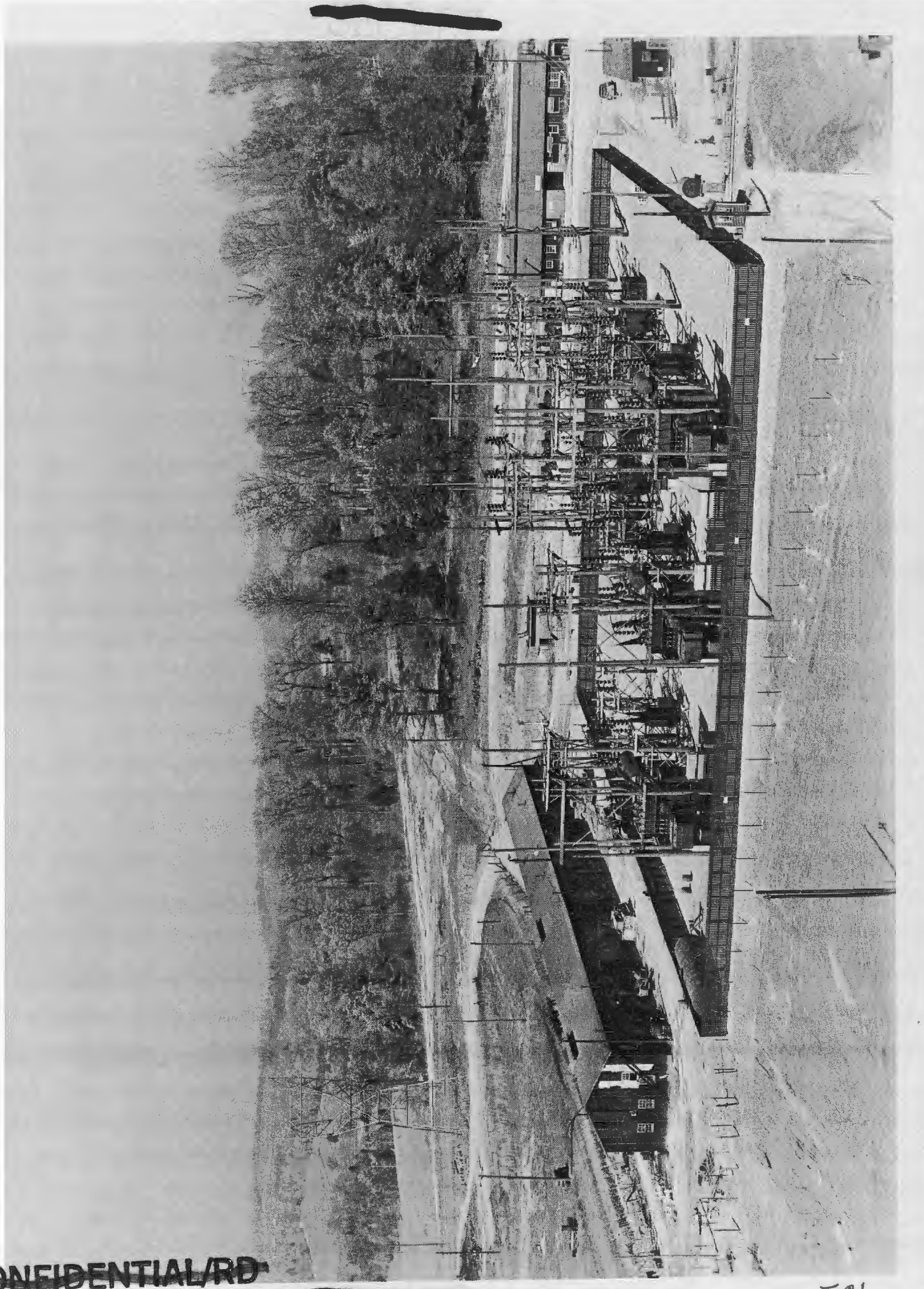

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E321

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E22 Interior View of the Turbine Room (K-702).

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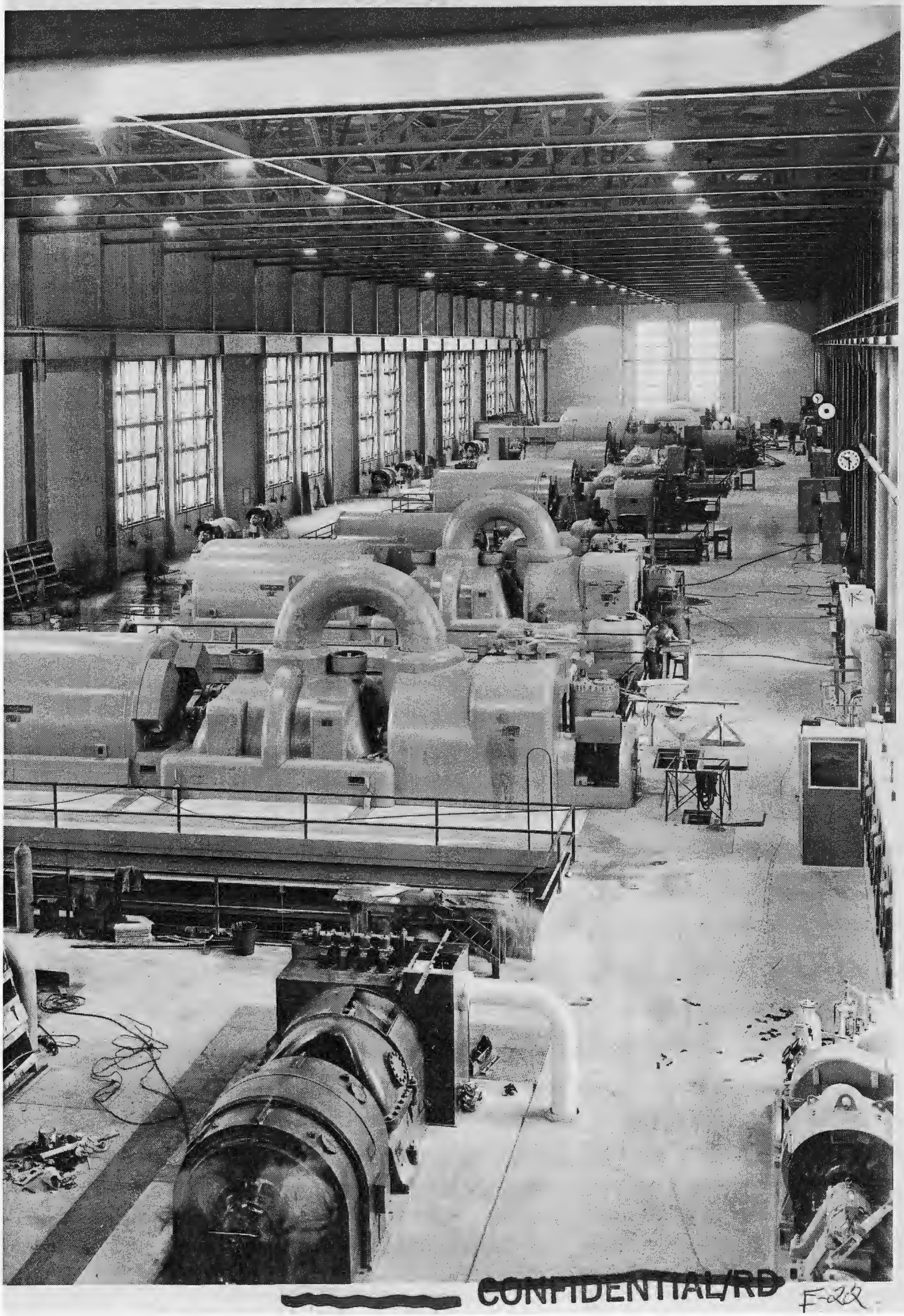

[redacted] ~~CONFIDENTIAL/RD~~ F-22

E23 View of the K-27 Process Buildings, facing Northeast.

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Fig 23

E24 A later view of the K-27 Process Buildings, facing Northeast. The Switch-house (K-731) is shown at the right.

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[redacted] ~~CONFIDENTIAL/RD~~ Fig 24

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225 View of the K-27 Cooling Tower (H-832) and Recirculating Pump House (K-832), facing Northwest. The small building in the foreground is a Fire Station.

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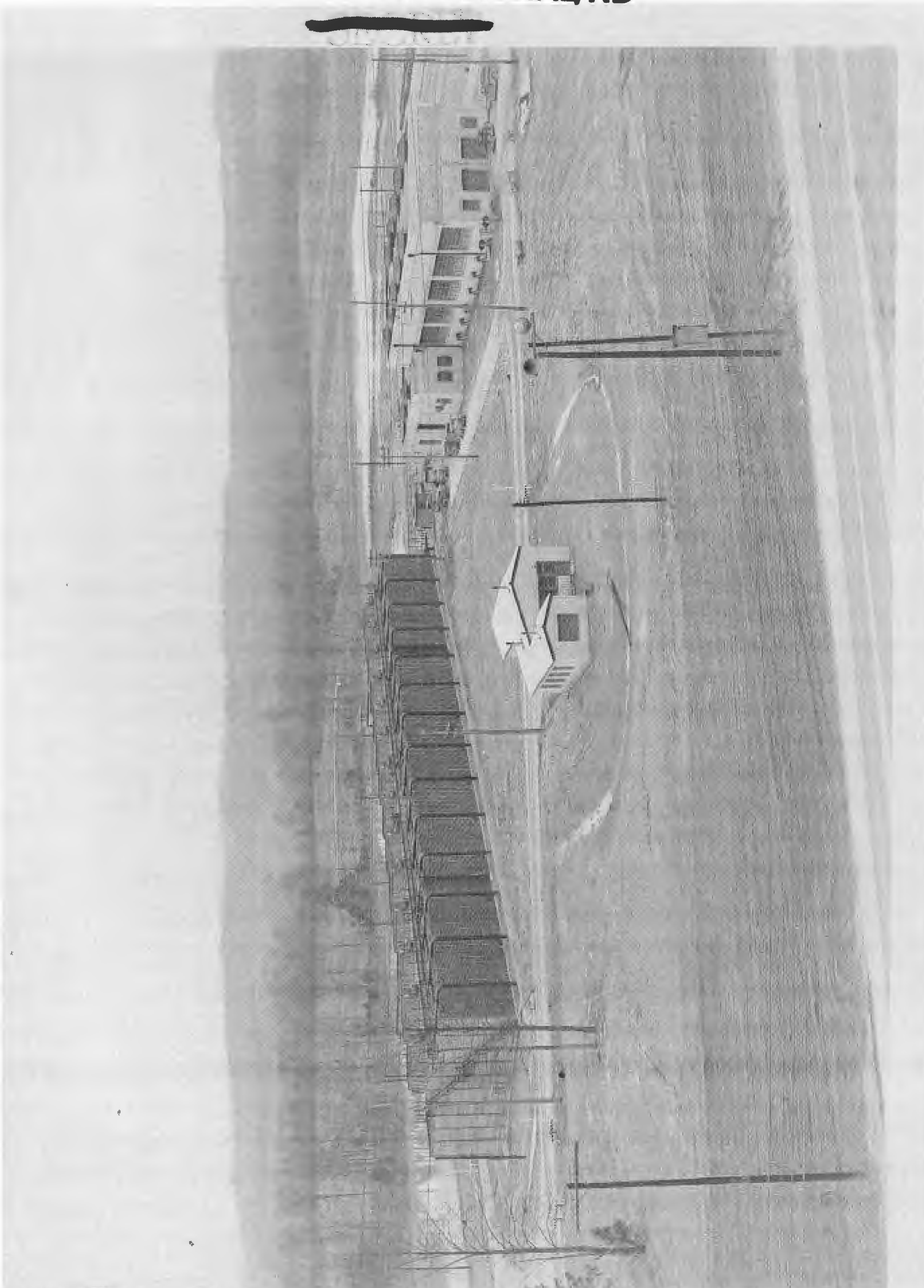

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E-25

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E26 View of the K-27 Process Buildings, facing West. The offsets are Stair Towers. The Louvered Lean-to's are Fresh Air Filters.

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E286

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E27 View of the K-27 Switch House (K-731) and Switch-yard (K-732), facing Southeast.

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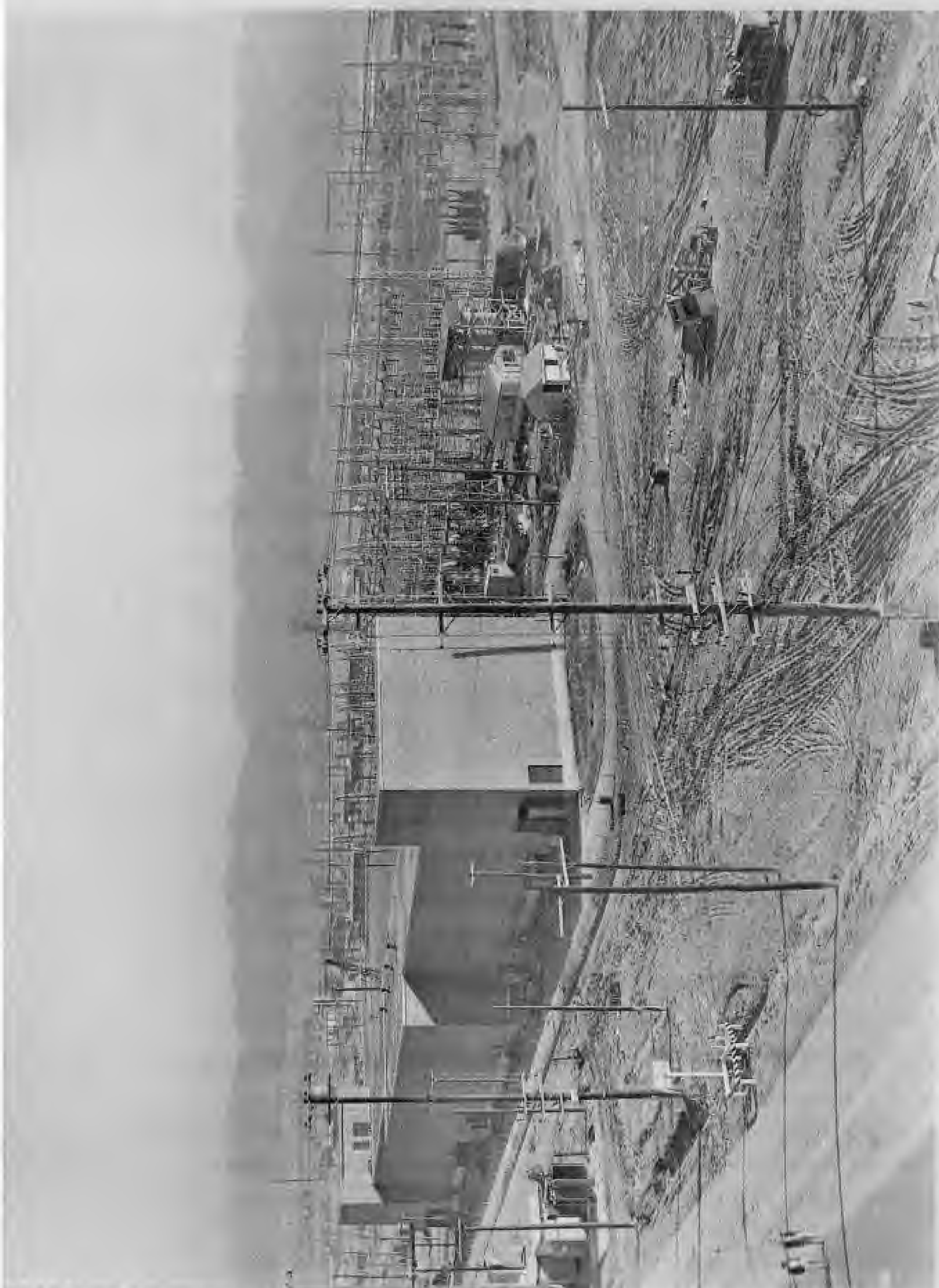
[redacted]



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E28 View of the K-27 Feed and Purification Building (K-131) in the foreground, and Surge and Waste Building (K-631) in the background.

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[redacted]

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E-28

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E29 Foundation Excavation for the K-27 Switch House (K-731), facing East.

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~~SECRET~~ ~~CONFIDENTIAL/RD~~

E30 Concrete slab (ground floor) for the K-27 Process Buildings, showing start of Erection of Structural Steel in the background.

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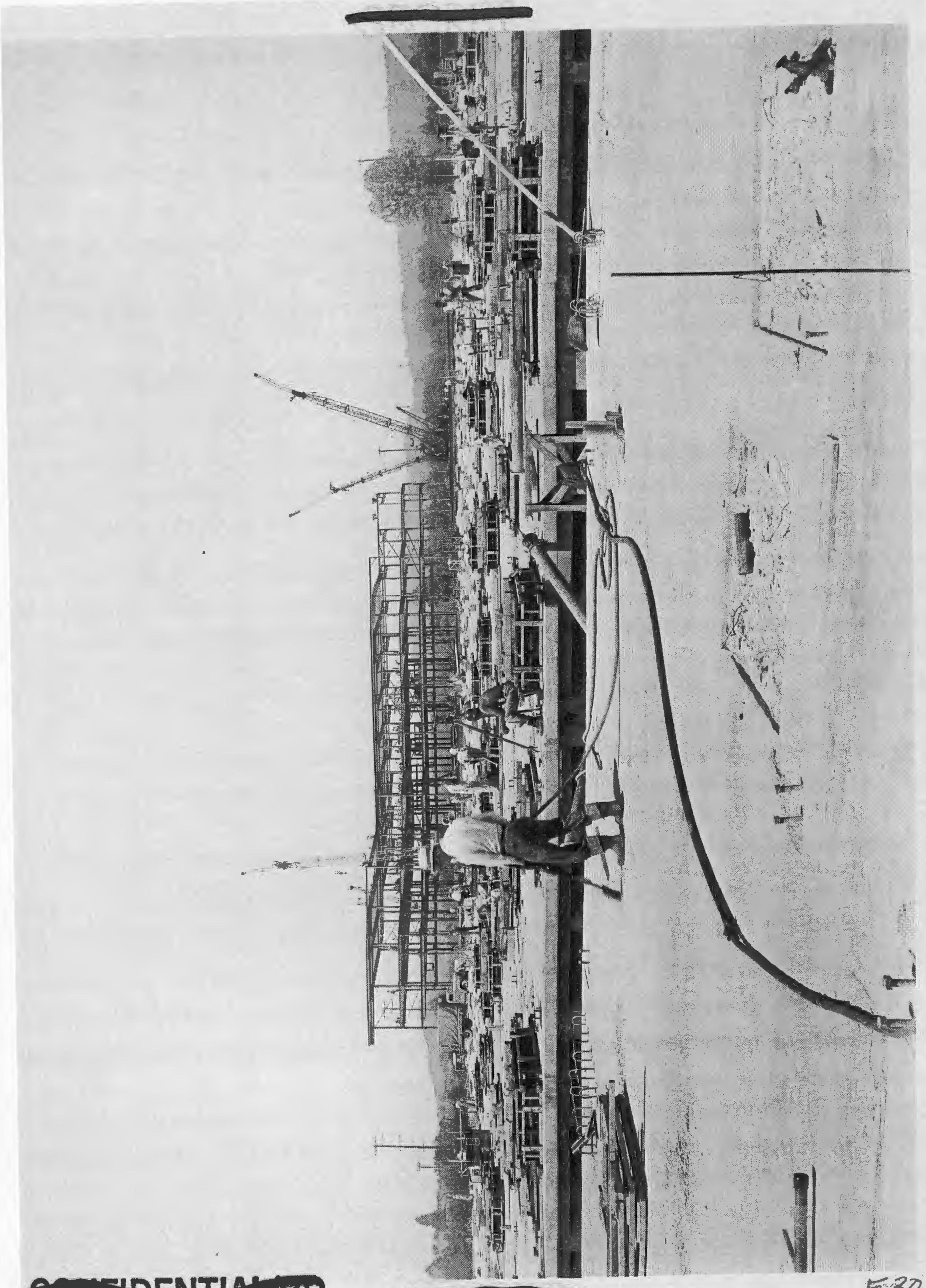

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E-30

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E31 Start of Erection of Structural Steel for the K-27 Process Buildings (K-402-1).

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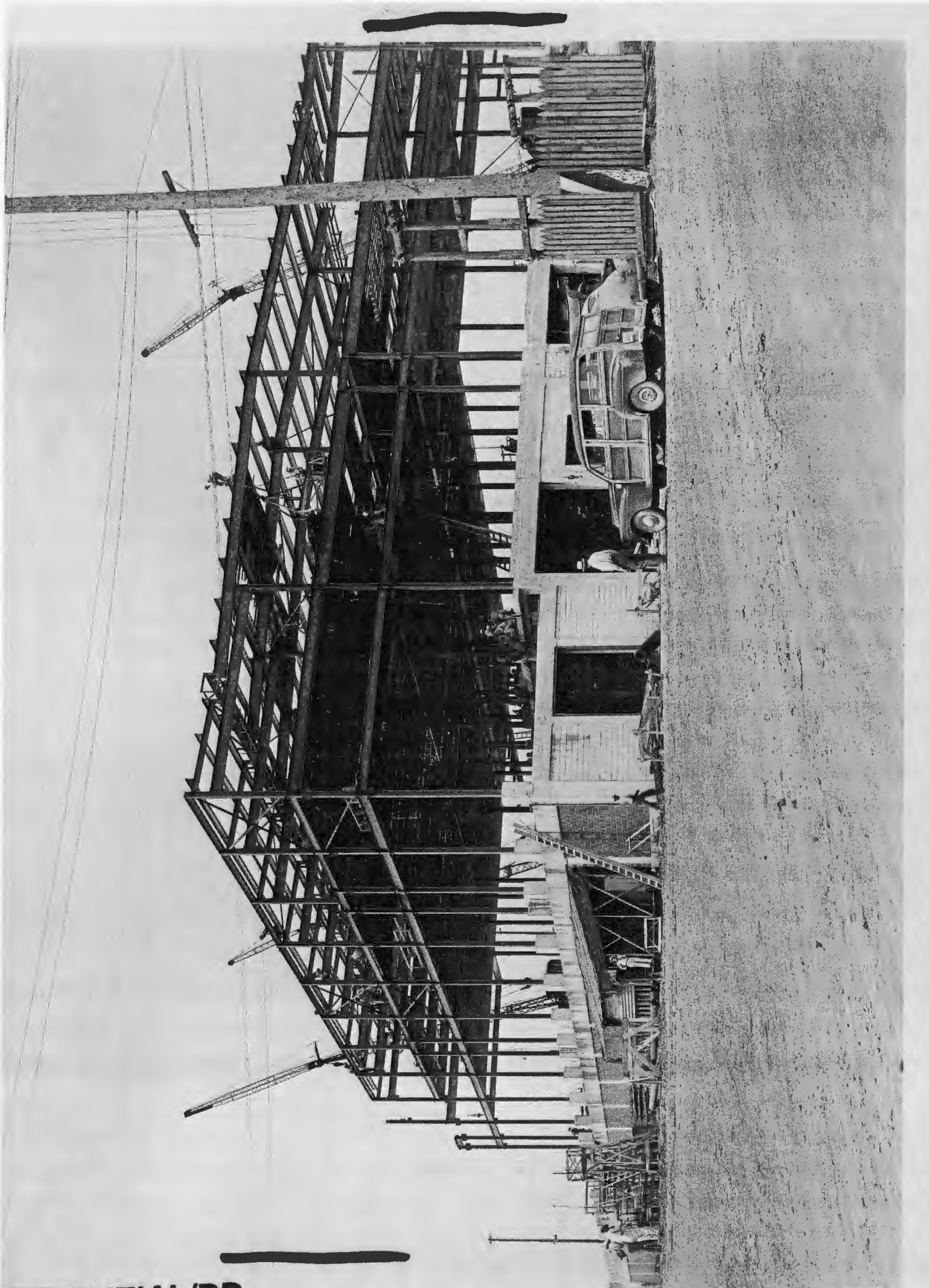

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E-31

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~~CONFIDENTIAL/RD~~

E32 Typical installation of Auxiliary Process Gas Piping in K-27, showing Heating Elements attached to Piping before Application of Insulation.

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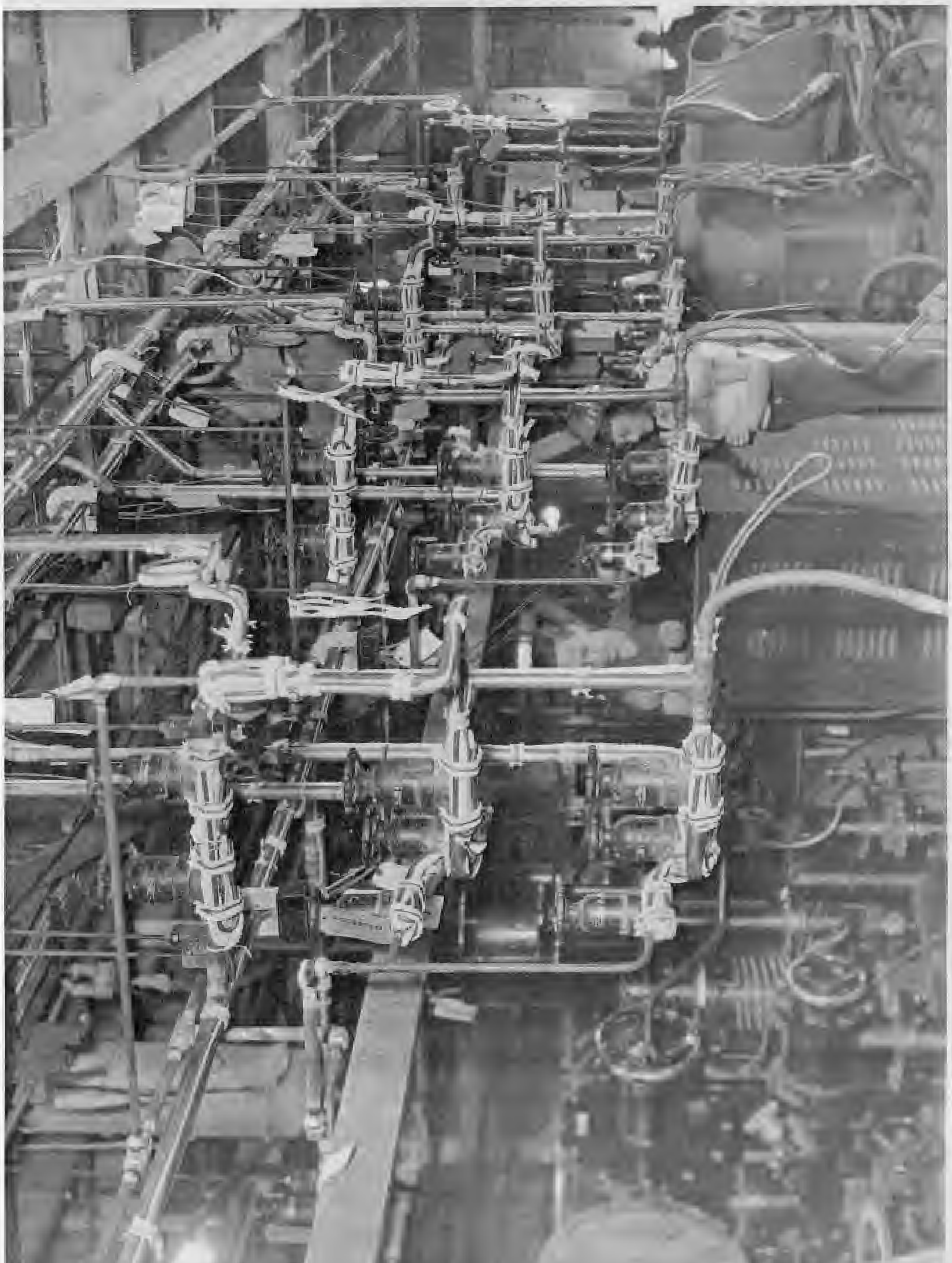

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E-32

~~SECRET~~

~~TOUCHE~~

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E33 View of the Conditioning Building (K-1401), facing Northwest. Construction Shacks are shown in the foreground.

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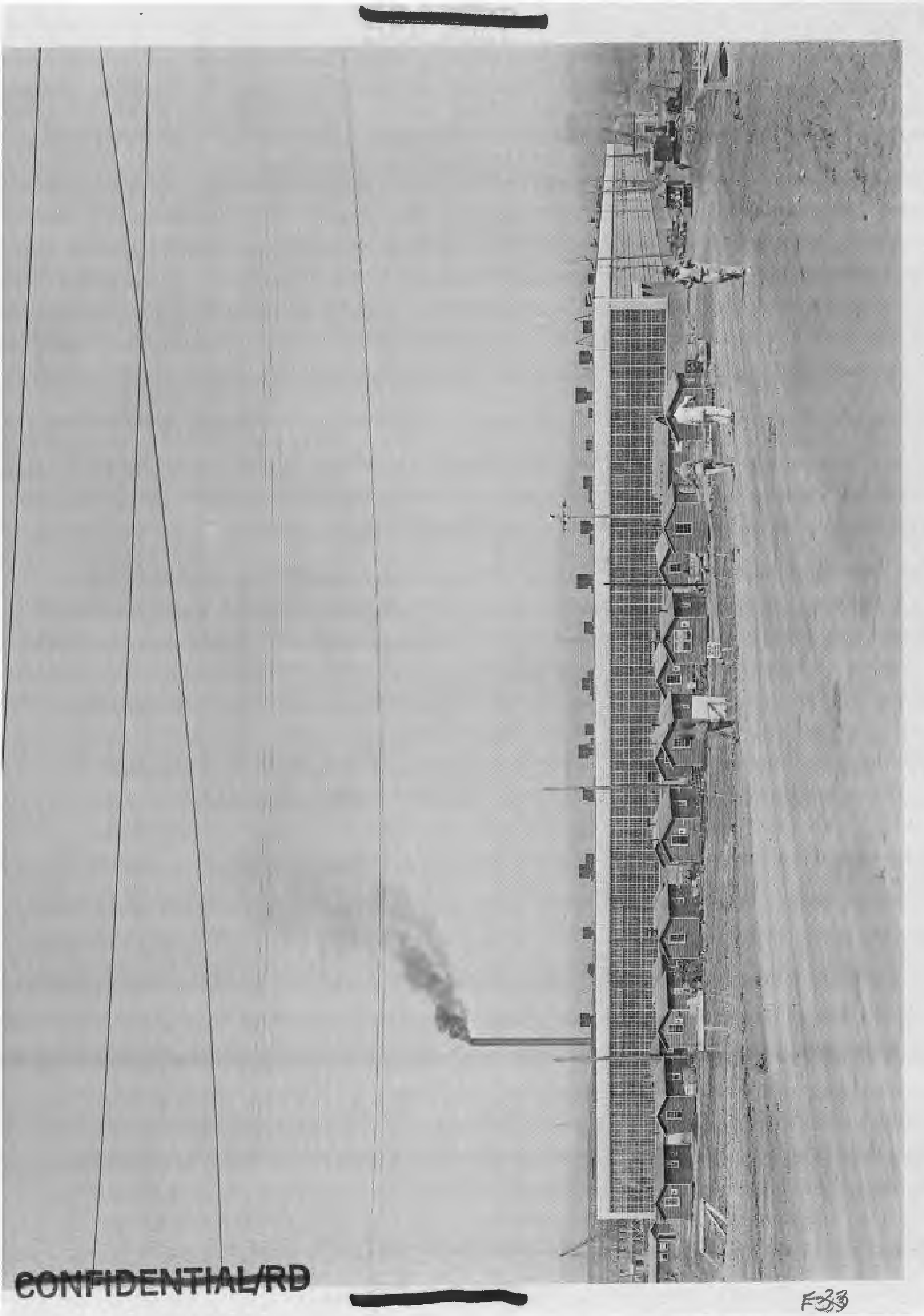

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F33

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E34 View of the Fluorine Generating Building (K-1301), facing Northeast.

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~~CONFIDENTIAL/RD~~

E384

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~~SECRET~~ ~~CONFIDENTIAL/RD~~

E36 Interior of Conditioning Building (K-1401), showing Vats for Cleaning and Processing Pipe, Valves and other Equipment prior to Installation in the Process Area.

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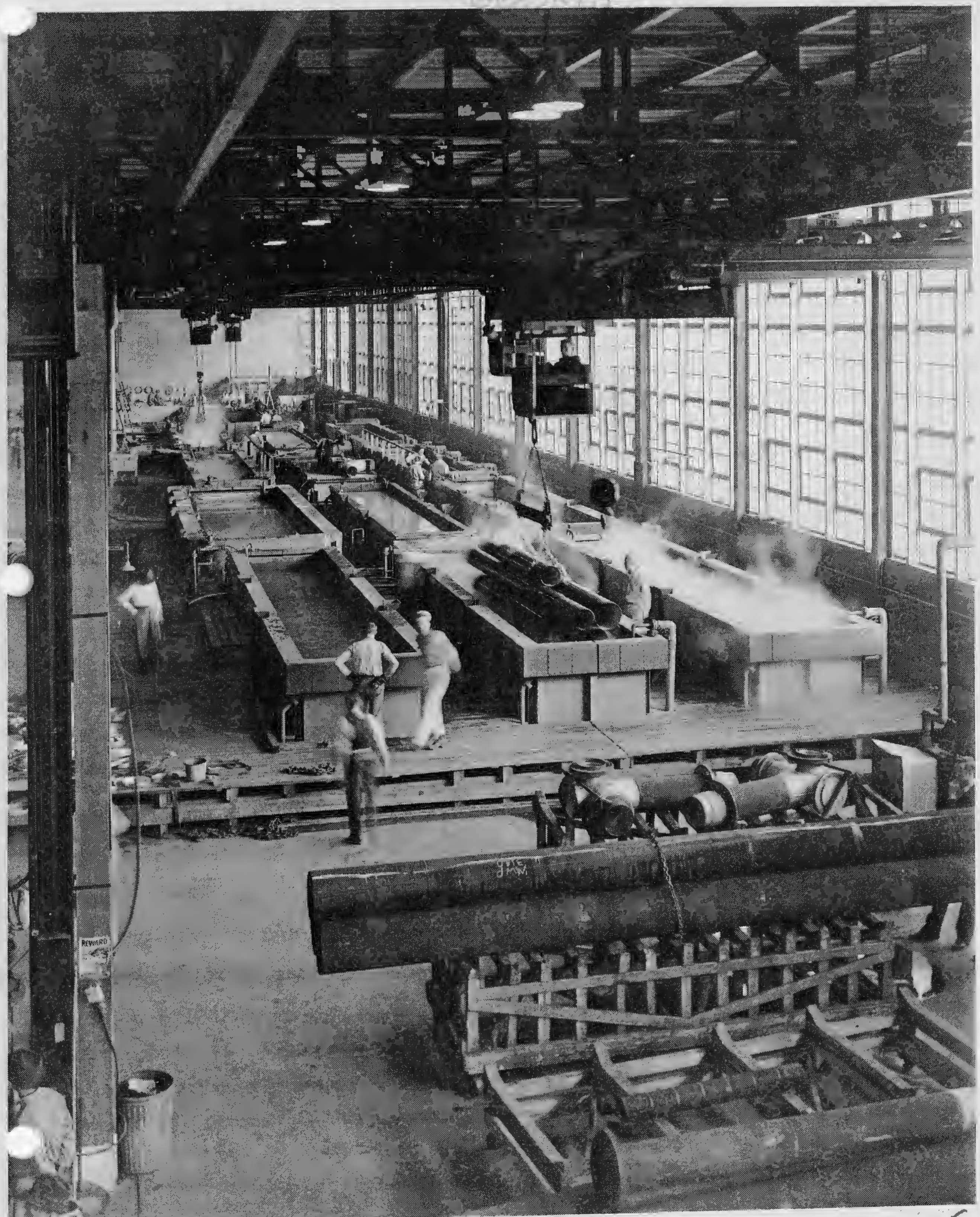

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E36 View of the Steam Heating Plant (K-1501) during Construction of the Addition (K-1531) for Supplying Steam to the K-27 Area.

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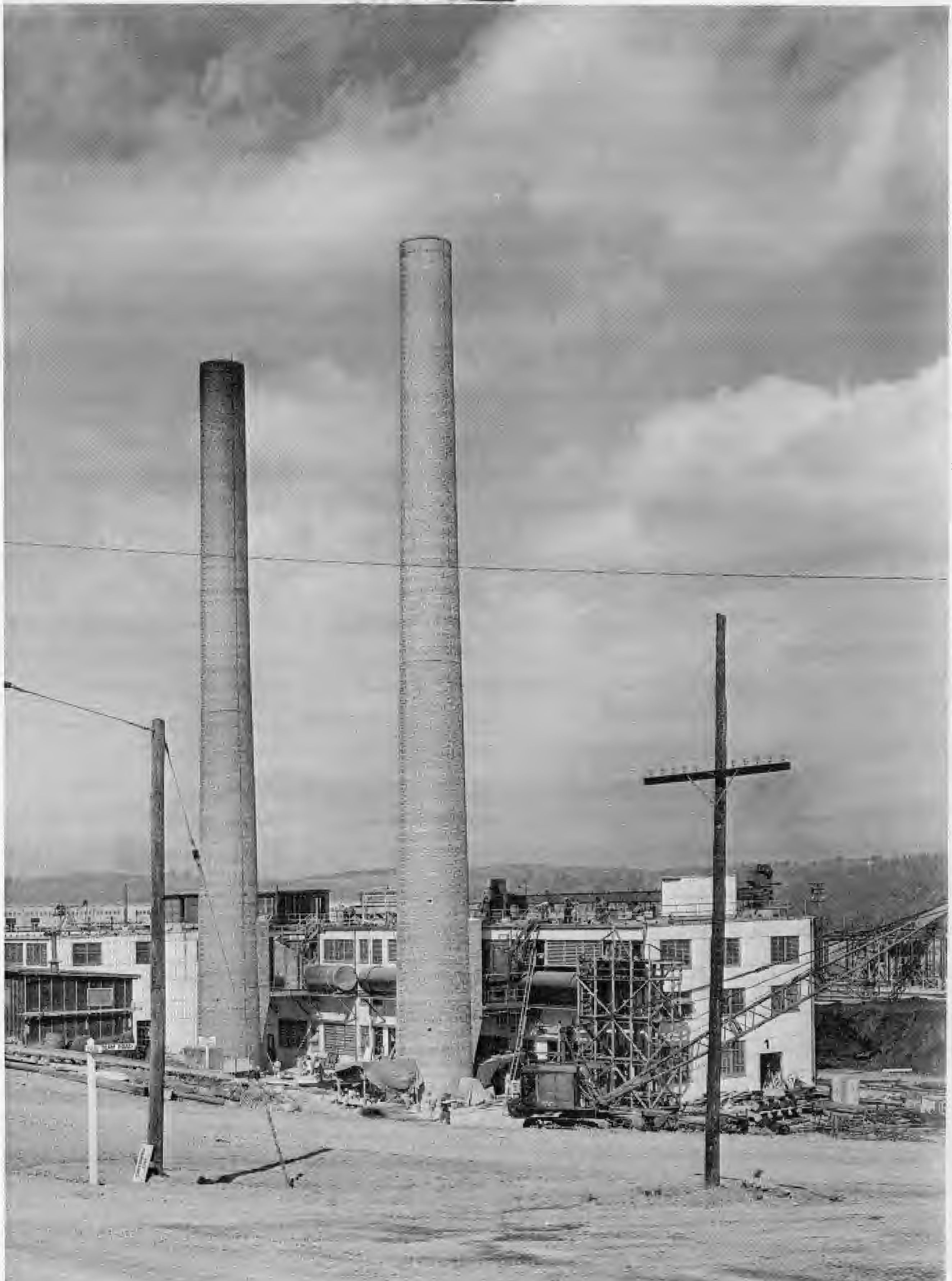

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E 316

337 View of the Steam Heating Plant (K-1501) including the Addition (K-1531) after the Completion of Construction.

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E384

E38 View of the Administration Area, facing Northwest. From left foreground to right background are shown the East Wing of the Administration Building (K-1001), the Laboratories (K-1004-A, -B, and -C), the Cafeteria (K-1002), and the Temporary Steam Plant (K-1502). The Main Process Buildings are seen in the left background.

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E-38

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E39 Main Administration Building (K-1001), facing North.

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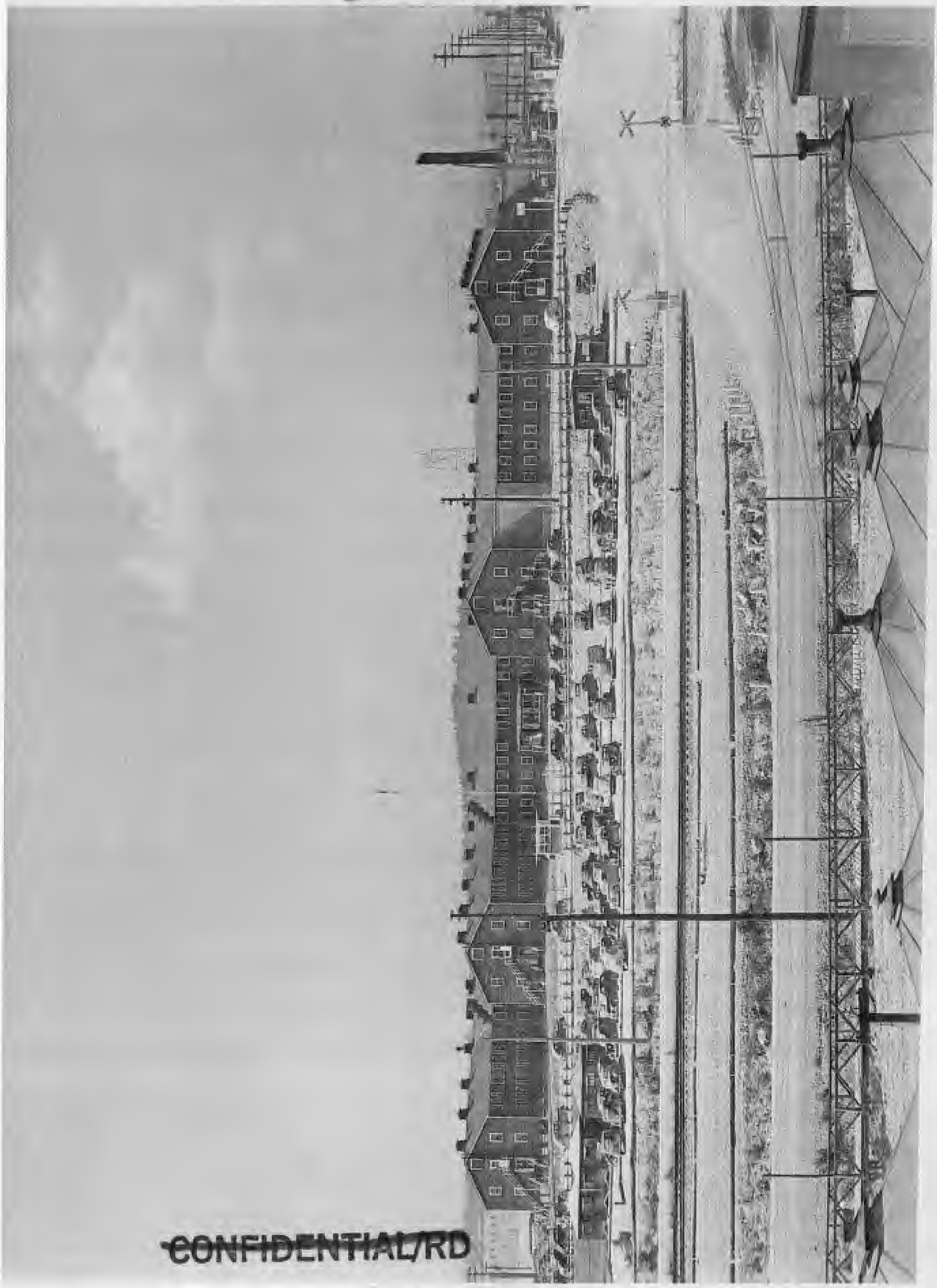

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539

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E40 View of the Field Office Buildings (K-1029) and (K-1034), facing Southeast.

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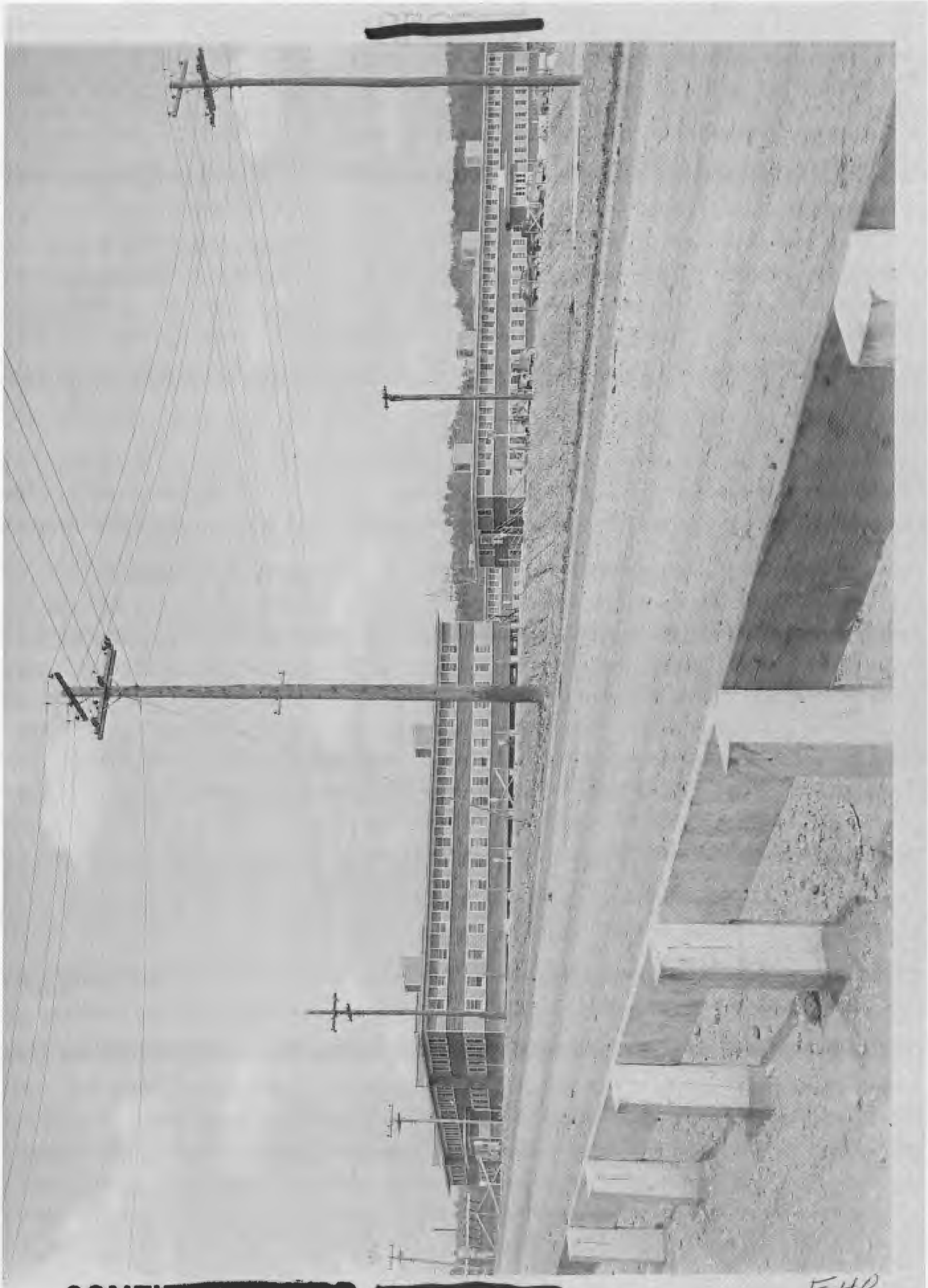

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E40

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E41 Panorama of the K-25 Area during Construction, facing Southwest.

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E41-1

E41-2

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~~CONFIDENTIAL/RD~~

MANHATTAN DISTRICT HISTORY

BOOK II - GASEOUS DIFFUSION (K-25) PROJECT

VOLUME 4 - CONSTRUCTION

APPENDIX "F"

FILE REFERENCES

No.	Reference
1.	Letter Contract W-7421-eng-11, dated 18 May 1943, from the District Engineer to the J. A. Jones Construction Company, Inc. Manhattan District Classified Contract Files.
2.	Letter Contract W-7421-eng-11, Supplement No. 3, dated 30 August 1943, from the District Engineer to the J. A. Jones Construction Company, Inc. Manhattan District Classified Contract Files.
3.	Letter Contract W-7407-eng-19, dated 9 July 1943, from the District Engineer to Ford, Bacon, and Davis, Inc. Manhattan District Classified Contract Files.
4.	Minutes of Conference by A. L. Baker, dated 11 August 1943, Subject: Effect on Estimates and Schedule. New York Area Classified Files, File No. NY 337 (Kellex).
5.	Letter dated 7 September 1943 from S. B. Smith to Lt. Colonel J. C. Stowers, New York Area Classified Files, File No. NY 337 (Kellex).
6.	As Built Specifications, K-25 and K-27 (in 28 volumes) - Kellex Corporation. Engineering Files, K-25 Division, Manhattan District.
7.	Letter Contract W-7421-eng-11, Supplement No. 5, dated 31 March 1945, from the District Engineer to the J. A. Jones Construction Company, Inc. Manhattan District Classified Contract Files.
8.	Letter from the Kellex Corporation to Lt. Colonel J. C. Stowers, dated 4 September 1944. New York Area Classified Files, File No. NY 337 (Kellex).

MANHATTAN DISTRICT HISTORY

BOOK II - GASEOUS DIFFUSION (K-25) PROJECT

VOLUME 4 - CONSTRUCTION

APPENDIX "G"

GLOSSARY

Term	Definition
Back Hoe -	an item of excavating equipment operated by power. Used mostly in the excavation of trenches and foundations, it is similar to a power shovel, except that the dipper is loaded by being drawn toward the machine. The advantage over a shovel is that digging can be done below grade level, whereas a power shovel digs only to grade level.
Batching Plant -	a plant used in concrete construction, and consisting of storage hoppers, measuring scales, and chutes for proportioning the ingredients of concrete. It is ordinarily used in connection with transit mix trucks.
Borrow Pit -	a place from which earth or rock is taken (or "borrowed") to make a fill, as a road fill or railroad embankment.
Cellotex -	trade name for a building and insulating board made of pressed cane fibre.
Cemasco -	trade name for a type of flooring surface consisting of a mixture of an asphalt emulsion with fine aggregate sand.
Crawler Crane -	a moveable lifting machine consisting of a hoist and a long boom, at variable angle, which can be swung generally around in a complete circle. The lifting cable or cables pass through sheaves at the end of the boom. The machine is supported and propelled by moveable tractor shoes which operate over four sprocket wheels.
Crossover -	an arrangement of two railroad switches that connect two (generally parallel) tracks. Numeral designations (i.e., #4, #8, etc.) indicate the size of the angle formed with the main track.

Term	Definition
Dragline -	an item of excavating equipment, operated by power and used mostly for wet excavation below grade, generally to load trucks or barges. It consists of a machine with a long boom supporting a bucket by means of a retractable cable. The bucket is loaded by being drawn toward the machine through the use of a second cable, and dumped by slackening off of the latter cable.
Haydite -	a baked clay used as aggregate in the production of light weight pre-cast concrete slabs, generally roof slabs and floor slabs.
Imhoff Tank -	a large specially constructed and efficient septic tank named for its inventor.
Megger -	a small, high voltage, hand-operated electrical generator and meter, used in testing the insulation on electrical conductors.
Outfall -	the last and largest in a series of connecting pipes of a sewer system.
Pothead -	an electrical term designating a vertical, pipe-like container in which electrical conductors are brought together and connected.
Pumpcrete -	trade name for a method of placing concrete by means of a specially designed piston pump which accepts the concrete from a hopper and delivers it through pipes or hoses into forms.
Pyrofil -	trade name for a prepared mixture containing gypsum cement and wood chips. When mixed with water, it sets up quickly, forming a light weight artificial stone.
Rodding -	process by which a series of short-length, attachable rigid rods are inserted one by one into a cable duct at a manhole and so pushed steadily through until the first one protrudes at the next manhole, thereby forming a method for threading the cable through the duct by attaching it to the last rod and then pulling the assembly through, detaching the rods one by one at the exit end of the duct.
Septic Tank -	a small sewage treatment plant, consisting of a single tank, usually buried, through which the sewage is passed with a retention period of suitable length

Term	Definition
	to permit purification by bacterial action. The effluent is allowed to seep through the surrounding soil, during which process the final stages of purification are accomplished.
Sewage Lift -	a pumping station designed to raise the elevation of sewage from one pipe to another at a higher elevation.
Transite -	trade name for a product consisting of asbestos and cement, generally made in thin sheets, either corrugated or flat, and used for electrical insulation, roofing, and siding.
Transit Mix Truck -	a truck-mounted concrete mixer which accepts the measured ingredients from a central batching plant, and mixes them while in transit to the point of placing.
Turnout -	a railroad switch serving to turn a train from a track onto a siding. Numeral designations (i.e., #4, #8, etc.) indicate the size of the angle at which the turnout leaves the main track.

MANHATTAN DISTRICT HISTORY

BOOK II - GASEOUS DIFFUSION (K-25) PROJECT

VOLUME 4 - CONSTRUCTION

APPENDIX "H"

KEY PERSONNEL

No.	Title
1.	Key Personnel, K-25 Construction Office.
2.	Key Personnel, The Kellex Corporation (Field Organization).
3.	Key Personnel, J. A. Jones Construction Company, Inc.
4.	Key Personnel, Subcontractors under Jones Management.
5.	Key Personnel, Prime Contractors under Jones Supervision.
6.	Key Personnel, Ford, Bacon, and Davis, Inc.

KEY PERSONNEL, K-25 CONSTRUCTION OFFICE

Cornelius, Lt. Col. W. P. - K-25 Construction Officer from 31 July 1945 to 28 February 1946. Authorized Representative of the Contracting Officer on all phases of construction, including procurement and expediting of materials, direction of construction activities to insure completion on schedule, and certification of contractors for reimbursement. Chief, District Construction Division from 1 March 1946 to present.

George, Lt. Col. Warren - Chief, Construction Division, Clinton Engineer Works from November 1942 to November 1943. Responsible for administration of the start of construction and field design for the K-25 Project.

Nelson, Major C. A. - Assistant to the Construction Officer in charge of the conditioning area from December 1943 to February 1944.

St. Clair, Major W. T. - Assistant to the Construction Officer in charge of the conditioning area from September 1943 to December 1943. Deputy Construction Officer and Assistant to the Construction Officer in charge of the process area from December 1943 to February 1946. Construction Officer from February 1946 to March 1946.

Simpson, Major H. G. - Assistant to the Construction Officer in charge of the power plant area from 1 August 1944 to 22 November 1945.

Stewart, Major J. C. - Assistant to the Construction Officer in charge of the power plant area from February 1944 to September 1944.

Varley, Major N. - Assistant to the Construction Officer in charge of sub-projects and utilities from July 1943 to March 1946. Construction Officer from 1 March 1946 to 30 April 1946.

Wegner, Major W. W. - Assistant to the Construction Officer in charge of the power plant area from June 1943 to February 1944.

Kennedy, Captain R. H. - In charge of coordination of construction operations and material procurement from 13 April 1943 to 14 May 1946.

Nicholson, Captain A. J. - Assistant to Major Wegner on power plant construction from 24 August 1943 to 6 May 1944.

Wells, Captain W. G. - Assistant to the Construction Officer in charge of the conditioning area from February 1944 to April 1944.

Bradford, Miss Amelia - Assistant to the Construction Officer in charge of the Mail and Records Section from September 1943 to April 1946.

Brawley, E. L. - Safety Engineer from October 1943 to March 1946.

Heath, R. S. - Assistant to the Construction Officer in charge of the Contract Section from October 1943 to March 1945. Reviewed all contract modifications for technical adequacy. Reviewed payments to contractors for conformity with terms of contracts.

Hooton, F. W. - Assistant to the Construction Officer in charge of the conditioning area from April 1944 to December 1944. Assistant to Construction Officer in charge of the power plant area from November 1945 to February 1946.

Rose, J. J. - Assistant to the Construction Officer in charge of the Contract Section from March 1945 to February 1946.

KEY PERSONNEL, THE KELLEX CORPORATION (FIELD ORGANIZATION)

Allinson, J. J. - Chief Resident Engineer from 25 October 1943 to 30 November 1945. In charge of all field activities of the Kellex Corporation.

Auverman, A. A. - Field Division Engineer, Pump Division from 3 August 1944 to 31 January 1946.

Barrett, H. W. - Schedule Engineer from 23 August 1943 to 15 September 1945. Responsible for the collection and correlation of information in connection with the Completion Report.

Eccles, W. J. - Service Manager, Field Service Group from 14 February 1944 to 8 April 1946. Direct supervision of all the service departments, i.e., Personnel, Payroll, Traffic and Transportation, Receiving and Inspection, Security, Housing, and supervision of such activities as Property Accountant, Priorities, and the Stock Room.

Gordon, P. B. - Field Division Engineer, Design Division from 27 July 1943 to 31 March 1946. Responsible for liaison between the Field and the New York Office on design matters. Supervised the Field Vacuum Engineering and the Field Process Engineering Groups for administrative purposes.

Jacobs, Dr. R. B. - Vacuum Engineer, Design Division from 29 March 1943 to 11 September 1945, and from 18 February 1946 to 18 April 1946. Developed techniques, trained personnel, and, in general, made possible the construction and installation of equipment and systems which have proven to be vacuum tight to specifications and requirements never before thought possible for projects of even much lesser magnitude.

Johnson, Dr. C. A. - Process Engineer, Design Division from 29 March 1943 to 1 July 1946. Associated with the Gaseous Diffusion Project at the time of its early development, at various times had served in different capacities of importance. Since assignment to the Field, Dr. Johnson has been in charge of the Process Engineering Group, which was of great assistance in coordinating Kellex design intent with Carbide operation requirements.

Jones, E. T., Jr. - Progress Engineer, Records and Reports Division from 19 July 1943 to 10 September 1945. Responsible for the collection of all information on construction progress through contact with Kellex Division Engineers and inspection in the Field, and the preparation of progress reports.

Jones, Nathan W. - Assistant Chief Resident Engineer, from 18 October 1943 to 26 May 1944. Field assistant to Mr. Allinson in the process area. Coordinated activity of the field division heads engaged in the process plant.

LaBarr, M. C. - Field Division Engineer, Electrical Division (originally in the power plant, and finally in the process area) from 2 August 1943 to 28 December 1945.

Major, J. E. - Supervisor, Receiving and Inspection, and Traffic Departments from 26 August 1943 to 31 March 1946. Responsible for tracing and expediting all shipments from the gateway to the Project site, the distribution of information on these shipments, and the procurement of all passenger travel reservations required by Kellex from the Field Office. Received and tallied in all materials arriving on Kellex purchase orders.

Marcy, J. P. - Assistant Engineer from 9 August 1943 to 31 March 1946. After 1 April 1944, acted as Engineering Assistant to Mr. A. A. Hickman.

McCarthy, J. J. - Security Agent from 1 November 1943 to 30 June 1945. Interpreted security regulations, and recommended the correct procedure to be followed in carrying out these regulations. Was responsible for security instruction of new employees, as well as the proper identification of all persons on the area subject to Kellex jurisdiction. Also assisted with investigations of security violations, in cooperation with Project Security.

McKinzie, D. J. - Design Engineer, Design Division from 15 October 1943 to 1 April 1946. Assigned to the New York Design Group at the site. In charge of the preparation of specifications, instructions, and procedures covering all phases of field engineering work, functioned as a "trouble-shooter" to run down operational and mechanical difficulties in the start-up of plant equipment.

Mignon, C. W. - Departmental Engineer, Material Control Division from 8 February 1944 to 30 March 1946, responsible for the recording, interpreting, and transmitting of information on the status of materials and equipment procured on Government supply contracts and Kellex purchase orders.

Moore, R. F. - Departmental Engineer, Field Engineering from 15 June 1943 to 29 December 1945. Responsible for the receipt and distribution of all plans, specifications, schedules, etc., from the New York Office. Also responsible for the operation of the Master Plan Room and several subsidiary plan rooms. Principal duties have been the control of the drafting department engaged in the preparation of drawings of field-designed facilities.

Naylor, A. W. - Administrative Assistant from 13 April 1944 to 29 September 1945. In charge of the service group and all phases of the work aside from engineering matters.

Newcomb, N. B. - Assistant Field Division Engineer from May 1944 to July 1944. Field Division Engineer (Structural Division) from July 1944 to December 1945.

Nickman, A. A. - Assistant Chief Resident Engineer from 4 June 1943 to 8 January 1946. In charge of all field engineering matters, with all field division heads reporting directly to him. Also acted as Chief Resident Engineer prior to the arrival of Mr. Allinson.

Pearson, C. H. - Mechanical Field Division Engineer (power plant) from 26 October 1943 to May 1944. Field Resident Engineer (power plant) from May 1944 to August 1945.

Pelton, W. A. - Departmental Engineer, Spare Parts Division, from 29 October 1943 to 15 March 1946. Responsible for the Spare Parts Division at the site, and the handling of all field material transfers and shipments of Kellex-procured materials from the site.

Powell, N. A. - Field Division Engineer, Instrument Division from 8 February 1944 to 30 March 1946.

Rehmberg, H. A. - Field Division Engineer (Structural Division), and Assistant Field Division Engineer (Mechanical Division) from 11 October 1943 to 31 January 1946.

Small, H. L. - Field Resident Engineer-Coordinator, process area from 11 March 1944 to 4 April 1946.

Swank, W. R. - Field Division Engineer (Mechanical Division) from 30 August 1943 to 15 January 1946. Originally in the power plant area, and finally in the process area.

KEY PERSONNEL, J. A. JONES CONSTRUCTION COMPANY, INC.

Althoff, Raymond. - Chief Engineer, Construction Section from 21 March 1944 to 15 October 1945. This section coordinated and directed actual construction in the process and auxiliary areas.

Appen, H. V. - Vice-President and Project Manager (process and auxiliary areas) from 29 September 1943 to 28 February 1946.

Crawford, A.L. - Chief of Inspection Section from 29 June 1944 to 11 April 1946.

Danielson, L. C. - Assistant Chief Engineer from 31 March 1944 to August 1944, and thereafter Chief Engineer, Field Engineering Unit to the present.

Davidson, J. E. - General Superintendent (power house) from 9 July until 19 November 1943, and Project Manager (power house and utilities) thereafter. Became Assistant to the General Manager (and sponsor during his absence) in May 1945. Vice-President since 30 April 1946.

Doucha, J. C. - Assistant Project Manager (process and auxiliary areas) from 20 March 1944 to 18 August 1945. Served as Manager from 12 May 1945 to 11 July 1945 during the absence of Mr. Appen. Supervised Design, Engineering, and Estimating Sections.

Jones, Edwin L. - Secretary and Treasurer of the J. A. Jones Construction Company. General Manager and Sponsor for the Jones Company throughout the contract period.

Junkin, A. V. - Manager of Administration and Legal Section from 19 November 1943 to present. Supervised Personnel, Contract and Claims, Security, Office Service, Service, Paymaster, Payroll, and Timekeeping Sections.

Kelley, B. L. - Field Assistant to the Project Manager (process and auxiliary areas) from 13 January 1945 to March 1945. Thereafter General Superintendent, Mechanical Erection Section (process area) until 28 June 1945.

Kelley, D. N. - Safety Engineer from 18 October 1943 to present (with exception of a six month period in early 1946).

McVeigh, T. F. - Executive Assistant from 14 September 1943 to 1 February 1946. Supervised the Material Control Division, Procurement Division, and Cost Accounting, Finance and Camp Operations.

McWhirter, W. H. - General Superintendent, (power house area) from 19 June 1943 to 1 September 1945.

Milan, A. G. - General Superintendent, Mechanical Erection Section (process area) from 13 June 1944 to 10 March 1945.

Samford, A. C. - General Superintendent (process and auxiliary areas) from 7 September 1943 to 24 January 1946.

Twing, W. D. - Project Manager for the power house construction from May 1943 until November 1943. Executive Assistant to the General Manager from November 1943 to June 1944.

Watson, J. D. - Chief Engineer, Design Engineering and Estimating Sections from 29 May 1943 to 8 December 1945.

KEY PERSONNEL, SUBCONTRACTORS UNDER JONES MANAGEMENT

BETHLEHEM STEEL COMPANY

Blanton, C. G. - Resident Engineer from 13 August 1943 to 8 August 1944.

L. K. COMSTOCK AND BRYANT ELECTRIC COMPANIES

Bartlett, J. J. - General Superintendent from 7 July 1944 to 1 March 1946.

Bryant, Robert M. - General Manager from 15 October 1943 to date.

Pancost, H. R. - Project Manager from 18 October 1943 to 1 July 1945.

Rigby, W. H. - Departmental Engineer from 2 February 1944 to April 1945. Assistant Chief Engineer from 2 April 1945 to July 1945. Project Manager from 16 July 1945 to 23 November 1945.

Siebert, J. R. - Chief Engineer from 18 October 1943 to 28 June 1946.

MIDWEST PIPING AND SUPPLY COMPANY, INC.

Carter, O. P. - Chief Engineer, Process Piping from 17 January 1944 to 11 September 1945. Also scheduled all material through the site shop and from the Midwest St. Louis Plant.

Krause, K. M. - Chief Engineer, Instrumentation from 25 July 1944 to 29 October 1945.

Leslie, L. T. - General Superintendent, Instrumentation from 22 January 1945 to 12 January 1946.

Weatherwax, W. E. - General Superintendent, Piping from 20 May 1944 to 15 February 1946.

Wischmeyer, R. R. - Project Manager from 17 February 1944 to 31 October 1945.

OMAN-CREIGHTON COMPANY

Kirby, R. W. - Superintendent from 11 February 1944 to 22 July 1944.

POE PIPING AND HEATING COMPANY

Capell, Ernest - General Superintendent from 1 January 1944 to 13 March 1946.

Poe, N. C., Jr. - Manager from 1 January 1944 to date.

Price, Wilkes C. - Chief Engineer for Power and Steam Piping from 8 October 1943 to 11 February 1946.

Rouse, R. K. - Project Manager from 1 January 1944 to 13 August 1945.

Tancill, J. D. - Chief Engineer for Process Piping from 28 February 1944 to date.

G. G. RAY AND COMPANY

Becknell, L. M. - Chief Engineer from 9 August 1944 to 3 October 1945.

Holmes, Lee - Supervisor from 30 March 1944 to 3 October 1945.

Ray, G. I. - General Manager from 14 January 1944 to November 1945.

REILLY-BENTON COMPANY

Breeding, Dillard - Project Manager from 15 September 1944 to 8 February 1946.

Cutler, Boyd L. - Assistant Project Manager from 17 March 1945 to 8 February 1946.

KEY PERSONNEL, PRIME CONTRACTORS UNDER JONES SUPERVISION

COMBUSTION ENGINEERING COMPANY, INC.

Dobbs, S. C. - Project Manager from 1 August 1943 to 22 January 1945.

WILLIAM A. POPE COMPANY

Brandau, W. C. - Project Manager from 6 July 1943 to 20 October 1945.

A. S. SCHULMAN ELECTRIC COMPANY

Anderson, W. V. - Chief Engineer from 23 August 1943 to date.

Schleiden, H. N. - General Superintendent from 1 July 1943 to 13 February 1945.

Spangler, W. A. - General Superintendent from 5 August 1943 to date.

Wikle, C. A. - Project Manager from 27 August 1943 to date.

KEY PERSONNEL, FORD, BACON, AND DAVIS, INC.

Fleming, S. R. - Assistant Project Manager from 23 August 1943 to 3 August 1944. In charge of all subcontractors and of entire Project during Project Manager's absence.

Greife, R. P. - Structural Engineer from 12 July 1943 to 30 June 1944. In charge of structural engineering in field, succeeded W. A. White as Chief Engineer in April 1944.

Hale, W. H. - Procurement Head from 30 July 1943 to 16 August 1944. In charge of Procurement Department.

Kelley, W. D. - Chief Construction Engineer from 22 July 1943 to 9 June 1944. In charge of field layout, inspection and lump-sum subcontractors.

Phillips, G. O. - General Superintendent from 23 August 1943 to July 1944. Project Manager from July 1944 to 25 November 1944.

Rollyson, B. P. - Superintendent of General Administration from 30 July 1943 to 19 August 1944. In charge of entire General Administration Department and procurement of non-manual personnel.

White, W. A. - Chief Engineer from 23 August 1943 to 26 March 1944. In charge of entire Engineering Department, including field design, layout and estimating and coordination of field construction with design.

Whitehead, H. - Construction Superintendent from 6 September 1943 to 15 October 1944.

Whittelsey, C. C. - Project Manager from 9 July 1943 to 16 December 1944. Responsible for execution of entire project, including field construction and coordination of construction with design work in New York.

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