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February 2, 2022

Mr. Justin Henderson
Heritage Partnerships Programs
National Park Services – IMO Regional Office
12795 W. Alameda Parkway
Lakewood, Colorado 80228

PPPO-03-10018960-22

Dear Mr. Henderson:

HISTORIC AMERICAN ENGINEERING RECORD FOR SELECTED PROCESSING AND SUPPORT FACILITIES AT THE PORTSMOUTH GASEOUS DIFFUSION PLANT, PIKE COUNTY, OHIO

Please find enclosed for your information the U.S. Department of Energy (DOE) submittal of the *Historic American Engineering Record (HAER) for Selected Processing and Support Facilities at the Portsmouth Gaseous Diffusion Plant, Pike County, Ohio* (internal DOE document number DOE/PPPO/03-0610&D3) (HAER Report). This HAER Report has been completed as part of the ongoing National Historic Preservation Act of 1966 compliance conducted by the U.S. Department of Energy (DOE) in fulfilling their mitigation commitments under the Comprehensive Environmental Response, Compensation, and Liability Act, as defined in the Process Buildings Record of Decision. The report was developed following guidance contained in the 1990 Secretary of the Interior's *Standards and Guidelines for Architectural and Engineering Documentation: HABS/HAER Standards*, and discussion with the Collection Manager, Heritage Documentation Programs, National Park Service (NPS), Washington, DC.

The Portsmouth Gaseous Diffusion Plant (PORTS), Piketon, Ohio, was a part of the U.S. Cold War nuclear weapons complex. PORTS primary Cold War-era mission was the production of highly enriched uranium (HEU) by the gaseous diffusion plant (GDP) for defense/military purposes. PORTS was the last of three GDPs to be constructed, the first being in Oak Ridge, Tennessee, and the second in Paducah, Kentucky. PORTS was the largest producer of HEU, enriched to the highest levels, and its production of HEU spanned the longest period.

The HAER Report addresses the PORTS facilities including core processing facilities directly involved in the production of HEU and support facilities. The HAER Report includes specific information for each of the following facilities at PORTS:

- X-220A Instrumentation Tunnels (HAER No. OH-142-A)
- X-300 Plant Control Facility (HAER No. OH-142-B)
- X-326 Process Building (HAER No. OH-142-C)
- X-330 Process Building (HAER No. OH-142-D)

- X-333 Process Building (HAER No. OH-142-E)
- X-342A Feed, Vaporization, and Fluorine Generation Facility and X-342B Fluorine Storage Building (HAER No. OH-142-F)
- X-344A Uranium Hexafluoride Gas Sampling Facility (HAER No. OH-142-G)
- X-100 Administration Building (HAER No. OH-142-H)
- X-103 Auxiliary Office Building (HAER No. OH-142-I)
- X-104 Guard Headquarters (HAER No. OH-142-J)
- X-108B Security Portal (North Portal) (HAER No. OH-142-K)
- X-111A and X-111B Special Nuclear Material Monitoring Portals (HAER No. OH-142-L)
- X-230J2 South Environmental Sample Station (HAER No. OH-142-M)
- X-300A Process Monitoring Building (Computer Building) (HAER No. OH-142-N)
- X-344B Maintenance Storage Building (Ash Storage Facility) (HAER No. OH-142-O)
- X-530 Electrical Switchyard Complex (X-530A, X-530B, X-530C, X-530D, X-530E, X-530F, X-530G) (HAER No. OH-142-P)
- X-600 Steam Plant (HAER No. OH-142-Q)
- X-611 Water Treatment Plant (HAER No. OH-142-R)
- X-612 Elevated Water Tank (HAER No. OH-142-S)
- X-614A Sewage Pumping Station (HAER No. OH-142-T)
- X-626-2 Cooling Tower (HAER No. OH-142-U)
- X-700 Converter Shop and Chemical Cleaning Facility (HAER No. OH-142-V)
- X-705 Decontamination Building (HAER No. OH-142-W)
- X-710 Technical Services Building (HAER No. OH-142-X)
- X-720 Maintenance and Stores Building (HAER No. OH-142-Y)
- X-744H Bulk Storage Building (HAER No. OH-142-Z)
- X-750 Mobile Equipment Maintenance Garage (HAER No. OH-142-AA

If you have any questions or require additional information, please contact Amy Lawson of my staff at (740) 897-2112.

Sincerely,

JOEL BRADBURNE

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Date: 2022.02.02 14:48:02 -05'00'

Joel B. Bradburne
Manager
Portsmouth/Paducah Project Office

Enclosure:

Historic American Engineering Record (HAER) for Selected Processing and Support Facilities at the Portsmouth Gaseous Diffusion Plant, Pike County, Ohio

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PORTSMOUTH GASEOUS DIFFUSION PLANT
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142
HAER OH-142

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT

HAER No. OH-142

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio PORTS is located at Ohio State Plane South coordinates at easting 326804.49 ft, northing 4319653.19 ft and at Universal Transverse Mercator Zone 17N easting 1826335.62 m, northing 367804.22 m. The coordinate represents the approximate center of PORTS. This coordinate was obtained on November 3, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1952-1956
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission (AEC) oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy (DOE) was established, overseeing operations at PORTS.
Present Use:	Shut down, uranium enrichment processing facility presently undergoing decontamination and decommissioning (D&D).
Significance:	The Portsmouth Gaseous Diffusion Plant, Piketon, Ohio, was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly-enriched uranium (HEU) by the gaseous diffusion plant (GDP) for defense/military purposes. PORTS was the last of three GDPs to be constructed, the first being in Oak Ridge, Tennessee, and the second in Paducah, Kentucky. Paducah processed low-enriched uranium to provide fuel for nuclear reactors. HEU was processed at only two facilities, Oak Ridge and PORTS. PORTS was the largest producer of HEU, enriched to the highest levels, and its production of HEU spanned the longest period.
Project Information:	Fluor B&W Portsmouth LLC, Fluor-BWXT Portsmouth LLC, and Los Alamos Technical Associates, Inc./Parallax Portsmouth, LLC photographed and documented historic buildings at the PORTS site between 2006 and 2017. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions of the historic facilities at PORTS. This Historic American Engineering Record (HAER) was completed in 2021.

Numerous facilities were constructed at the site throughout the history of PORTS. A description of the site's facilities, including drawings and a discussion of the phases of site development, is found in the 2011 *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio*. Facilities that were directly essential to the "core," or primary, enrichment operations conducted at PORTS during the Cold War era are identified as "core" facilities. Facilities that operated in support of the work performed at core facilities at PORTS during the Cold War are identified as processing support facilities. Facilities that were engaged in the mission of PORTS during the Cold War era as either core processing facilities or processing support facilities are eligible for listing in the National Register of Historic Places. HAER documentation has been completed for each of the PORTS core processing facilities and processing support facilities listed below.

The selection of PORTS core processing facilities and processing support facilities for completion of HAER documentation is recorded in the 2011 *Portsmouth Gaseous Diffusion Plant, Pike County, Ohio: Recommended Cold War Era Mission Documentation Model*. Building surveys and engineering records were completed in accordance with guidelines and procedures outlined in the *Secretary of the Interior's Standards and Guidelines for Architectural and Engineering Documentation: HABS/HAER Standards*. The HAER documentation supports DOE's commitment to preserve the plant's history in words, diagrams, and images of various structures and facilities that make up PORTS and to mitigate adverse impacts from demolition of GDP facilities.

PORTS facilities for which HAER documentation has been completed include core processing facilities directly involved in the production of HEU and support facilities. The processing support facilities are utilitarian in design, largely nondescript in appearance, and in many cases performed basic industrial support functions. However, the application of these basic industrial support functions within the context of PORTS' mission is an essential component of the ability to interpret and understand the PORTS site and its role in the Cold War.

- X-220A Instrumentation Tunnels (HAER No. OH-142-A)
- X-300 Plant Control Facility (HAER No. OH-142-B)
- X-326 Process Building (HAER No. OH-142-C)
- X-330 Process Building (HAER No. OH-142-D)
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- X-614A Sewage Pumping Station (HAER No. OH-142-T)
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- X-720 Maintenance and Stores Building (HAER No. OH-142-Y)
- X-744H Bulk Storage Building (HAER No. OH-142-Z)
- X-750 Mobile Equipment Maintenance Garage (HAER No. OH-142-AA)

Each of these facilities are discussed in separate reports, with the exception of the X-342A Feed, Vaporization, and Fluorine Generation Facility and the X-342B Fluorine Storage Building, which are discussed together in a single report, as are the X-111A and X-111B Special Nuclear Monitoring Portals. Also grouped together in a single report are the facilities that are part of the X-530 Electrical Switchyard Complex (i.e., X-530A, B, C, D, E, F, and G).

Part I. Historical Information

A. Construction of PORTS:

The Atomic Energy Commission selected an approximate 4,000-acre tract of land in the midst of rolling farm hills along the Scioto River in Southern Ohio (See Appendix A, Figure 1). Unlike the property adjacent to it, the PORTS site was flat; ideal for the government's intended purpose. PORTS is located near the intersection of U.S. Highway 23 and State Route 32/124, about 4 miles southeast of the village of Piketon, 25 miles north of Portsmouth, 22 miles south of Chillicothe, 23 miles west of Jackson, 75 miles south of Columbus, and about 85 miles east of Cincinnati.

In 1952, it was announced that Goodyear Tire and Rubber Company would be AEC’s operator of PORTS. Goodyear Tire assigned 28 of its key personnel to develop the Goodyear Atomic Corporation.

PORTS was designed on the primary basis that its production rate would be approximately one-half of the expanded Oak Ridge-Paducah combination, the other two uranium enrichment facilities. It was also part of the design philosophy to provide for sufficient flexibility, wherever the economics justified it, to permit efficient combined operation of any two of the three sites in case the third was rendered inoperable for any extended period. The chief implication of this design criteria was the inclusion at the new site of sufficient flow capacity in the top stages to permit efficient operation under production conditions equivalent to those of the Oak Ridge-Paducah combination.

The gaseous diffusion process at all three plants occurred in the same manner. Compressors forced pressurized uranium hexafluoride (UF_6) gas through a long series of pervious barriers. These barriers are housed inside converters. Each converter and its compressor comprise a “cascade” and each converter within a cell constitutes a single stage. PORTS consisted of five types of stages and had approximately the same ultimate production capacity as the expanded Oak Ridge Plant but with nearly 800 fewer stages. A more detailed description and illustration of the PORTS gaseous diffusion cascade within the operations at PORTS is provided later in this text.

Eight architect engineering firms shared in the design of the plant. Approximately 12,000 architectural-engineering drawings were used during construction—enough to cover approximately 2.5 acres. In addition, general engineering drawings totaled roughly 40,000, along with 16,000 more detailed shop drawings.

Groundbreaking for the plant occurred on November 18, 1952. To provide a suitable area for constructing the process and auxiliary buildings, a tract of land roughly 4,000 to 6,000 linear feet was graded to minimum slope for surface drainage. Altogether, site grading required 9 million cubic yards (cy) of excavation and backfill. There were strict guidelines on the type of backfill that could be used, the method in which the fill was compacted, and the final density of the fill. A well-compacted base was important for buildings that measured in acres instead of square feet. The assurance of a minimum of settlement was essential because of the miles of piping which would be mounted in the buildings.

At this early stage of the project, a number of activities occurred almost simultaneously. Roads were built around and through the site to allow easy access to construction locations. "Track alleys," needed for plant operation, were constructed to facilitate movement of materials and supplies into buildings using tracks. In addition to the track alleys, 22 miles of railroad track and 25 miles of road were laid inside the plant area. The proximity of rail lines figured heavily in the plant site selection process, as rail service was critical for the success of the construction project as well as long-term operation.

Approximately 100,000 tons of structural steel was used in the framework of the main buildings (See Appendix A, Figure 2). Receiving, unloading, and sorting the thousands of tons of steel at the site on schedule called for efficient teamwork. Standard lumber carriers transferred most of the material to the contractors' job locations.

The three process buildings were of a standard industrial type with concrete foundations and floors, structural steel frames, siding, and steel deck roof with built-up roofing. Functional and plain, lined sheets of corrugated siding were bolted to the steel structures. In constructing ground floors of the process buildings, wire mesh was put into place, and then concrete poured to form a continuous slab 6 to 8" thick. Concrete was struck off by a finishing machine, which advanced the process and decreased labor cost. However, finishing to exact dimensions had to be completed by hand.

The process building roofs were nearly flat with just enough slope for roof drainage. The roof was constructed by spot welding a metal decking to the structural steel, on which 1" fiberglass insulation was laid, covered with four-ply built-up roofing, and finished with a wearing course of cement and gravel.

One of the largest and most important operations in the construction work was the fabrication and assembly of the thousands of feet of piping for the process buildings. Piping conveyed the gas from one stage to another in the gaseous diffusion cascade. Altogether, the plant required 620,000 linear feet of automatic and hand-welding on pipes ranging from $^1/_4$" to 4½" in diameter. Prefabrication of more than 100,000 individual piping assemblies and 225,000 pipe hanger assemblies provided great savings in time and money. At peak effort, 1,200 welders were employed.

Because of the highly corrosive nature of uranium gases, all steel piping had to be lined with pure nickel. In addition, cleanliness control was essential since the process gas is so highly reactive that it combines and reacts with almost every substance, forming solids that could clog the system. Sections of pipe were dipped in chemical reagents in huge cleaning vats to remove foreign matter. Each piece of pipe was handled carefully to avoid contamination with dirt, dust, or water. After dipping and cleaning, the ends of the pipes were sealed to prevent matter from entering until piping was welded in place. Process building floors were not only swept but vacuum cleaned to be spotless. The air pressure inside the buildings was kept higher than the air pressure outside to keep dust from getting in.

Since the gaseous diffusion process produced great quantities of heat, principally “heat of compression,” cooling towers were constructed for each of the process buildings to remove the heat. The cooling towers released 20 million gallons/day of evaporated water (steam) into the atmosphere.

The towers were one of the reasons that an adequate water supply was important to the location of the new plant. A pumping station at the Scioto River in Piketon with a daily pumping capacity of 40 million gallons was erected to furnish the plant with water. The water was piped to the plant through a pipeline to the plant’s water treatment plant, where it was then distributed throughout the site.

Power for the plant was generated by the Ohio Valley Electric Corporation and was delivered to the plant by two double-circuit lines at a nominal 330,000 volts that was in 1956 equal to the all-time high voltage record in the United States. Each circuit had a capacity of 1,000,000 kilowatts for line sections 50 to 75 miles in length. At the plant, the circuits fed into substations that consisted of switchyards, switch houses, and control houses. At the time, the two on-site switchyards required the largest oil circuit breakers ever used in this country. Once the enormous amount of power was stepped down by transformers in the switchyards, it was sent to the thousands of electrical motors and other machines within the plant by way of underground ducts containing a network of conduit, cable, and wiring running from the substation.

The building of the plant entailed 69 million work hours from as many as 22,500 workers at the peak of construction in 1954. More than 7.5 million cy of earth had been moved and 1,200 acres of land cleared. In the first year of construction, an astonishing 35,000 tons of steel were erected and 190,000 cy of cement poured. Site wide, 500,000 tons of crushed stone was distributed. To complete the construction phase, staggering amounts of materials were required, including 14,500 tons of railroad rails; 600 miles of pipe (all sizes); 1,065 miles of copper tubing; 4,600 miles of electrical wiring; and 620,000' of welding. In addition, during the construction phase, the 1.2 million gallons of water per day were supplied by three wells.

The transformation of the PORTS landscape from rural southern Ohio Appalachian farmland to an industrial expanse occurred over the course of approximately two years. A series of panoramic views shows the progression of PORTS construction from February 1953 to October 1954 (Appendix A, Figures 3 through 6).

B. Description and Historical Significance of PORTS:

Built from 1952 to 1956, PORTS was one of three GDPs built during World War II and the early years of the Cold War. In 1952, as a result of its successful record with the U.S. Government, the Peter Kiewit Sons’ Construction Company was selected by the AEC to build PORTS. Designed to produce HEU for nuclear weapons related purposes, the facility was a significant component of the nation's nuclear weapons complex. Like its sister enrichment plants at Oak Ridge, Tennessee, and Paducah, Kentucky, PORTS was an engineering marvel. The resources required to build the plant were significant. The main process buildings required some 600 miles of piping, 1,000 miles of copper tubing, 620,000 linear feet of welding, 100,000 tons of structural steel, and more than 500,000 cy of concrete. Nearly twice the amount of steel was used for the original construction of the main process buildings as was used for construction of the steel skeleton of the Empire State Building, which required 57,000 tons of steel.

To deliver power to the plant's vast cascade system, the AEC contracted for the construction of two separate power plants, each representing the largest such plants of their type in the world. Two electrical switchyards constructed at PORTS received power from the power plants. When in operation, the two electrical switchyards at the plant site provided up to 2,200 megawatts of power – enough to light up New York City at the time the plant was constructed in the 1950s.

Working around the clock, technicians enriched uranium-235 on an industrial scale. The operation was so successful that within ten years the AEC had produced more enriched uranium than was needed for the nation's nuclear weapons arsenal. Over time, advances in enrichment technology, as well as concerns about energy conservation, management of nuclear waste, and competition from foreign sources of enriched uranium all contributed to the reduced demand for enriched uranium from the gaseous diffusion process. Production at PORTS began winding down in the 1990s, and in 2001, PORTS began to operate in "cold-standby" condition. In "cold-standby," PORTS was kept in a ready condition in which operations could be resumed in a period of 18 to 24 months if the need arose. In 2006, the plant transitioned from "cold standby" to "cold shutdown" to prepare for the eventual D&D cleanup project.

C. Historical Background of the AEC and Uranium Processing in the United States:
On August 1, 1946, with the stroke of President Harry S. Truman's pen, the Atomic Energy Act was signed, and the newly formed AEC assumed its civilian duties of fostering peacetime nuclear science.

A parallel, but daunting task had also been given to the AEC and challenges lay ahead. The Cold War era, which began with the Yalta Conference in 1945 and continued until the collapse of the Soviet Union in 1991, called for focus on support of national defense and lessened the time and put resources toward the goal of research and installation of non-military uses for the atom. For the security of the nation, weapons development and production took precedence and quickly created a growing need for enriched uranium.

The need for increased production would become even more apparent in the years that followed. In 1949, it was discovered that the Soviet Union had detonated a nuclear device, prompting the AEC to discuss the need for developing a thermonuclear weapon for national security. After much discussion within the government, President Truman settled the debate and made the imperative decision that work must begin on such a weapon. More motivation for augmenting production goals came when the United States sent forces to aid South Korea during the Korean War in response to Communist China's advancement in North Korea.

The urgency of the situation and the imminent possibility of exhausting the country's enriched uranium production capacity at existing facilities dictated that expansion begin immediately. Because the key production sites across the country relied on one another for different functions of uranium processing, modifications and additions to a number of facilities became necessary.

Prior to construction of PORTS, six key production sites each played a vital role in supporting the government's weapons production program. In addition to its role of gaseous diffusion for separating uranium-235 from uranium-238, at the Oak Ridge, Tennessee, Gaseous Diffusion Plant (Oak Ridge), the Oak Ridge Y-12 facility enriched lithium-6, a necessary component to increase the yield of thermonuclear weapons. The Los Alamos National Laboratory in New Mexico was established in 1943 as part of the Manhattan Project for a single purpose: to design and build an atomic bomb. The Jumbo reactors, K-East and K-West, at the Hanford site near Richland, Washington, (Hanford) were the largest reactors built to produce plutonium at the time, and greatly improved the government's ability to meet the supplementary demands for defense purposes. During this time, Hanford also erected the most advanced chemical separation facility on site to enhance plutonium production. The Paducah, Kentucky, facility (Paducah) would meet the increased demand for (low) enriched uranium. The Savannah River Site, located near Aiken, South Carolina, contributed materials used in the nuclear weapons manufacturing process, primarily tritium and plutonium-239. The Feed Material Production Center in Fernald, Ohio, (Fernald) was a uranium processing facility that fabricated high-purity uranium metal products ("feed materials").

To complement the enriched uranium production capabilities of the Oak Ridge and Paducah GDPs, a third site was needed to be able to produce enriched uranium-235 by the process of gaseous diffusion. In addition to the goal of having new gaseous diffusion capability to enhance production at the other two sites, the third site had to meet the "security through dispersion" requirement that called for the site to be located at least 150 miles away from both the Oak Ridge and Paducah plants. This would place the new site in a "strategically safe" zone.

The Paducah site, built in 1951, had been chosen partially because it was constructed on land already owned by the government. While this decision was certainly affected by time constraints imposed due to the Korean War, selection of the third site could be addressed with more time and consideration. The chronic labor strikes and lack of adequate housing at the Paducah location caused construction delays, and these problems were well noted by AEC personnel seeking the third site.

As early as June 1951, the AEC requested that Oak Ridge staff begin planning for a third uranium enrichment facility to augment production from the Oak Ridge and Paducah plants. A nationwide search for a location began in October 1951. In the initial phase of site evaluation, Stone & Webster Engineering, the site survey contractor, considered a limited set of criteria. The primary criteria for judging the merit of a location included: (1) readily available and cost-efficient means of producing significant amounts of electricity, (2) a nearby and adequate water supply, (3) access to a necessary labor force while meeting essential transportation requirements, and (4) location in a region where climate and weather would not impede operations and would provide a large area of mainly flat terrain.

By December 1951, the site survey had focused on seven areas: three in the Ohio River Valley; and one each in the Kansas City, Missouri area; Birmingham, Alabama area; Shreveport, Louisiana area; and one in the Neosho River Valley area of Oklahoma. Of these, only the Ohio River areas had adequate power supply for the plant during early operation before the planned dedicated power plants were operational.

Focused on the three Ohio River Valley areas at Louisville, Kentucky; Cincinnati, Ohio; and Portsmouth-Chillicothe, Ohio, in early 1952, the contractor began a second, more detailed evaluation of potential sites in the region. Louisville and Cincinnati were strong candidates, but Portsmouth was considered a weak third choice due to a deficient highway system and remoteness from a major population center.

However, by March 1952, Louisville had been eliminated due to widespread protests from area business and civic groups who did not want an “Atomic Plant” in their community. Cincinnati emerged as the primary candidate location, but demands from labor unions in the area discouraged the AEC from locating in that city. Despite this concern, by April 1952 the AEC authorized further planning for a Cincinnati plant.

On July 7, 1952, the U.S. Congress passed the First Supplemental Appropriations Act, Fiscal Year 1953, which allotted $2.9 billion to fund the estimated construction costs to expand the nation’s facilities for producing fissionable materials. President Truman signed into law an estimated $1.2 billion to be used for construction of a new GDP and granted authority for its inception on July 15, 1952. Work to locate a site for the new enrichment plant actually began a year before the President signed the bill authorizing the construction, but no site had been selected at the time the law was enacted.

In early July 1952, the AEC selected Peter Kiewit Sons’ Company as construction contractor for the new plant and directed the company to negotiate with unions in Cincinnati, Louisville, and Portsmouth. By late July, the Fernald site, located near Cincinnati, had experienced work stoppages over pay issues, and it was anticipated the same issues would affect the planned enrichment facility, if it were to be located near Cincinnati.

By contrast, unions at Portsmouth were eager for the jobs and were willing to make commitments favorable to the AEC. Additionally, there was strong community support for the Portsmouth site, with hundreds of businesses, civic organizations, elected officials, and even churches sending letters of support for the “A-Plant.” Ultimately, these factors were instrumental in site selection. On August 12, 1952, the AEC announced selection of Portsmouth as the location for the new uranium enrichment plant and construction of the plant began later that year.

Part II. Site Information

A. General Description:

PORTS was a part of the U.S. Cold War nuclear weapons complex. PORTS’ primary Cold War era mission was the production of HEU by the GDP for defense/military purposes. PORTS was the last of three GDPs to be constructed, the first being in Oak Ridge, Tennessee, and the second in Paducah, Kentucky. Paducah processed low-enriched uranium (LEU) initially to provide slightly enriched feed to the Oak Ridge and Portsmouth plants and later to provide fuel for nuclear reactors. HEU was processed at only two facilities, Oak Ridge and PORTS. PORTS was the largest producer of HEU, enriched to the highest levels, and its production of HEU spanned the longest period.

The physical preservation of PORTS facilities is not possible due to the environmental challenges posed by the contaminated status of the facilities and the necessary task of environmental restoration. DOE is preserving the unique story of PORTS through documentation and other interpretive measures.

B. Operations at PORTS:

Once built, the huge complex, with more than 130 buildings, became much like its own small city within the plant site (Appendix A, Figure 7). Services such as a police force and a fire department (complete with emergency equipment), a water treatment facility, a sewage treatment system, an electrical switchyard, a dispensary (hospital), transportation provisions, maintenance shops, offices, and laboratories, all centered around the three huge uranium processing buildings. Office space accommodated those working in finance, human resources, training, and support functions.

The first production operation at PORTS began in 1954. On March 20, 1956, it was announced that the plant was in full operation, approximately six months ahead of the four years it was scheduled to take. The final cost of the plant was $750 million, $470 million less than the original estimated cost of $1.2 billion.

At PORTS, uranium was enriched using a process called gaseous diffusion. The gaseous diffusion process took place in the X-330, X-333, and X-326 Process Buildings. Through the process of diffusion, UF_6 gas is passed through a series of enrichment stages to produce enriched, or diffused, uranium-235 and undiffused uranium-238. The process of uranium enrichment increases the proportion of uranium-235 to that of uranium-238. Enriched uranium is any uranium that contains more than 0.711 percent uranium-235. Routine LEU production was between 2.5 to 5 percent uranium-235.

The gaseous diffusion process requires the use of UF_6 to separate the uranium-238 and uranium-235 isotopes. During diffusion, UF_6 gas is forced through a series of porous membranes, or "barriers," with microscopic openings. Barriers are used to achieve separation in the gaseous diffusion process. To maximize the amount of separation achieved, the porous barrier material must meet exacting standards so that "diffusive" flow occurs. Uranium-235 moved through the barriers more easily, increasing the concentration of uranium-235 as it moved through the process. The tendency for uranium-235 to pass through the barrier more quickly is the basis for the gaseous diffusion process.

The basic separation equipment for gaseous diffusion is a "stage." At PORTS, a stage consisted of a converter that contains porous separation media, a gas cooler, a compressor to move the UF_6 gas through the converter, and interconnecting piping and control valves to contain and control the gas flows. One stage was capable of only very slight enrichment. Stages operated in a cascading system, and thousands of stages in the process buildings were connected in series to produce HEU. The X-333 contained 640 stages, the X-330 building contained 1,100 stages, and the X-326 building contained 2,340 stages. Overall, there were 4,080 separation stages at PORTS.

Stages were grouped into "cells," which were the smallest groups of stages that could be removed from service, bypassed, and shut down for maintenance or other purposes. There were 12 stages per cell in most of X-326 and 200 cells. Ten of the X-326 cells at the south end of the building comprised the "purge cascades," each containing six stages per cell. Here, product gas was separated for withdrawal and light gasses were removed from the UF_6 stream. X-330 had 10 stages per cell and 110 total cells. X-333 had eight stages per cell and a total of 80 cells.

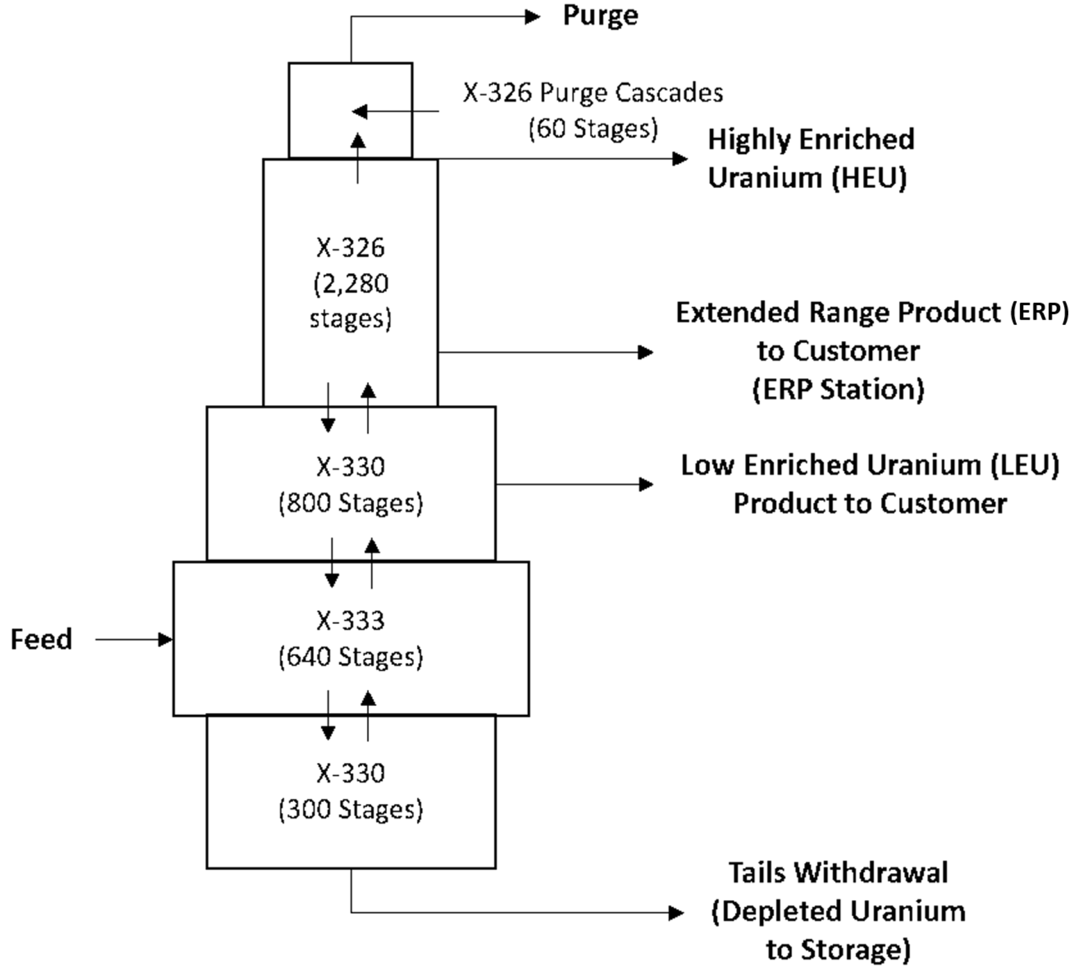
Cells were further grouped into "units," which were groups of cells that shared common auxiliary systems. X-326 housed 10 units, X-330 had 11 units, and X-333 had 8 units. Within a unit, equipment sizes and operating conditions were the same. There were five equipment sizes at PORTS, the X-25 size (Size 8), the X-27 size (Size 7), the ‘0’ size (X-29), the ‘00’ size (X-31) and the ‘000’ size (X-33). The ‘000’ size was the largest equipment size and the X-25 size was the smallest.

The process equipment, piping, and instrument lines that contained process gas were enclosed by cell housing and bypass housing. The cell housing for the X-326 Process Building was metal. For X-330 and X-333, the cell housings had steel frames and transite siding. The tops of the housing had removable latches that allowed for equipment removal.

Feed material entered the uranium enrichment process at the X-333 Process Building. After cascading through the X-333 and X-330 Process Buildings, the uranium enrichment process continued in the X-326 Process Building. Products were typically withdrawn from the cascade at three points. LEU was withdrawn from X-330, extended range product was withdrawn from X-326 using either the Extended Range Product Station in X-326 or the Low Assay Withdrawal Station in the X-333, and HEU was withdrawn from the X-326 purge and product area.

The waste (or “tails”) stream of the enrichment process was withdrawn from the gaseous diffusion cascade and packaged into storage cylinders. The PORTS tails withdrawal station was located in the northeast corner of the X-330 Process Building.

A diagram showing the gaseous diffusion cascade at PORTS is shown below.



PORTS Gaseous Diffusion Cascade

Through the remainder of the 1950s, Goodyear Atomic Corporation activities at PORTS centered on production of weapons grade material, as well as fuel for nuclear marine propulsion. After more than a decade of hurried production for defense, however, the United States government found itself in charge of vast stockpiles of nuclear weapons and nuclear materials.

In the 1960s, the mission of PORTS changed from enriching uranium for nuclear weapons to one focused on producing fuel for commercial nuclear power plants. PORTS still produced HEU for the U.S. Naval submarine reactor program until 1991. PORTS and its sister facility in Paducah worked in tandem to enrich uranium for use in commercial nuclear power plants until 2001. The Paducah plant enriched uranium-235 up to 2.75 percent and then shipped it to PORTS to be further enriched to approximately 4 to 5 percent for nuclear power reactors.

Throughout its life, PORTS experienced many changes to update equipment, modify processes, and increase efficiency of production. Two significant programs were initiated in 1973: the Cascade Improvement Program and the Cascade Upgrade Program. These multi-year initiatives increased PORTS production by 65 percent.

As a result of the 1992 Energy Policy Act, in July 1993, the United States Enrichment Corporation (USEC), a quasi-government agency, leased and operated the uranium enrichment operations from DOE at PORTS and the Paducah Gaseous Diffusion Plant. Regulatory oversight of the enrichment plants officially transferred from DOE to the NRC in March 1997. USEC completed the privatization process in July 1998 and became USEC Inc., an investor-owned corporation.

In May 2001, USEC completed a previously announced program to consolidate enrichment operations at Paducah and terminate gaseous diffusion production operations at PORTS. In August 2001, DOE contracted with USEC to maintain PORTS in a cold standby mode that would retain a re-start capability at the facility, if necessary, within 18 to 24 months to prevent any potential disruptions in the international enriched uranium market. DOE terminated the cold standby program at the end of Fiscal Year 2005. The PORTS facilities were then transitioned into cold shutdown status in preparation for eventual D&D.

Following the end of the Cold War in 1991, DOE began to focus on environmental cleanup of defense nuclear facilities. Years of nuclear materials production has left DOE with the monumental challenge of D&D of the various materials plants that supported the nation's nuclear weapons and energy programs during the Cold War. An extensive environmental cleanup program began at PORTS in 1989 upon agreement between DOE, the Ohio Environmental Protection Agency (EPA), and the U.S. EPA.

Part III. Sources of Information

Benedict, Mason and Clarke Williams. *Engineering Developments in Gaseous Diffusion Process*. New York: McGraw-Hill Books Company, Inc., 1949.

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Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Hudson, Karen E.*Portsmouth Gaseous Diffusion Plant, Pike County, Ohio: Recommended Cold War Era Mission Documentation Model*. Prepared by Cultural Resource Analysts, Inc., Lexington, KY, 2011.

Appendix A: Historical Photographs

Figure 1: View of the Land Acquired for PORTS Construction (1953)

Figure 2: Peter Kiewit Sons' Workers amid the Framework of One of the Processing Facilities (1953)

PORTSMOUTH GASEOUS DIFFUSION PLANT CONSTRUCTION

February 13, 1953

March 12, 1953

April 15, 1953

May 12, 1953

June 12, 1953

July 16, 1953

Figure 3: Panoramas Showing PORTS Construction Progression February 1953 to July 1953

PORTSMOUTH GASEOUS DIFFUSION PLANT CONSTRUCTION

August 13, 1953

September 15, 1953

October 13, 1953

November 13, 1953

December 17, 1953

Figure 4: Panoramas Showing PORTS Construction Progression August 1953 to December 1953

PORTSMOUTH GASEOUS DIFFUSION PLANT CONSTRUCTION

January 18, 1954

February 12, 1954

March 15, 1954

April 13, 1954

May 18, 1954

Figure 5: Panoramas Showing PORTS Construction Progression January 1954 to May 1954

PORTSMOUTH GASEOUS DIFFUSION PLANT CONSTRUCTION

June 16, 1954

July 14, 1954

August 16, 1954

September 13, 1954

October 18, 1954

Figure 6: Panoramas Showing PORTS Construction Progression June 1954 to October 1954

Figure 7: Aerial View of PORTS (2006)

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-220A INSTRUMENTATION TUNNELS
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-A

HAER OH-142-A

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-220A INSTRUMENTATION TUNNELS

HAER No. OH-142-A

<u>Location:</u> Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio

The X-220A Instrumentation Tunnels are located at Ohio State Plane South coordinates at easting 1826635.644081 ft, northing 369322.928354564 ft and at Universal Transverse Mercator Zone 17N, easting 326903.5371 m, northing 4320114.541 m. The coordinates represent the approximate center of the X-300 Plant Control Facility. These coordinates were obtained on November 4th, 2019 by plotting the building's location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.

<u>Date of Construction:</u> 1954

<u>Designer/Builder:</u> Peter Kiewit Sons' Construction Company

<u>Previous Owner:</u> N/A

<u>Present Owner:</u> The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.

<u>Present Use:</u> Supports and carries the power cables that link the X-300 Plant Control Facility, switchyards, and process buildings.

<u>Significance:</u> The X-220A Instrumentation Tunnels serve as a buried corridor used to carry the piping and wiring for control instruments and communications equipment between the process buildings and the X-300 Plant Control Facility. The tunnels also served other miscellaneous communications, electrical wiring, and piping systems at PORTS. The X-220A Instrumentation Tunnels are significant to PORTS for their ability to physically and electronically connect the process buildings and switchyards with the main X-300 Plant Control Facility. A main function of the tunnels was to provide operators in the X-300 Plant Control Facility with instant monitoring capabilities through the indicating and control instruments in each process building. PORTS was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.

<u>Project Information:</u> Fluor-BWXT Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous

historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-220A Instrumentation Tunnels HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are two appendices: Appendix A and Appendix B, consisting of survey photographs and historical drawings, respectively.

Construction History of the X-220A Instrumentation Tunnels:
The X-220A Instrumentation Tunnels were built in the original phase of construction of PORTS, which occurred from 1952 to 1956. Historical drawings of building plans are included in Appendix B (Figures 7 through 8).

Part II. Site Information

Description of the X-220A Instrumentation Tunnels:
The X-220A Instrumentation Tunnels consist of a buried corridor used to carry the piping and wiring for control instruments and communications equipment between the process buildings and the X-300 Plant Control Facility (Appendix A, Photograph A-1). Five branches of the tunnels extend westward. Two of these branches serve the X-326 Process Building with the remaining three extending to the X-330 Process Building. Another south branch extends through the X-330 Process Building and connects with the control house of the X-530 Electrical Switchyard. A branch to the north extends along the north side of Twentieth Street and turns west through the center of the X-333 Process Building and terminates in the X-533 Electrical Switchyard control room.

The X-220A Instrumentation Tunnels are constructed of reinforced concrete flooring, walls, and ceilings (Figures 2-6). The concrete is approximately 1 foot thick with a waterproof membrane on the top of the tunnels. The tunnels are approximately 8' wide by 8' tall. The tunnels parallel the X-326 Process Building and X-330 Process Building for most of their length, measuring to a total length of approximately 4,400' long. In certain places, up to three tunnels were built side-by-side, splitting off at points to service their various buildings. Racks line each wall of the tunnels and consist of shallow cement-asbestos trays 3" deep and 18" wide. The racks rest on adjustable brackets affixed to the walls of the tunnels and support piping and wiring running the length of the tunnels. Manual access is preserved in the center of the corridor for maintenance. Lighting is provided to the tunnels by ceiling-mounted waterproof fixtures every 20'. Tunnel floors slope slightly to allow for drainage of any seeping water into a sump pump.

Primary access to the X-220A Instrumentation Tunnels was provided through at least seven headhouses spaced fairly evenly along the tunnel corridor. The headhouses are small, above-ground, reinforced-concrete structures with a metal entry door at ground level and a shaft with a ladder reaching down into the tunnel on the interior. Where tunnels were built side-by-side, headhouses extended for the tunnels' entire width, with separate rooms accessing each individual tunnel. The walls of the headhouses are approximately 8" thick and ceilings are 7' tall. The utilitarian structures have no stylistic detailing and feature slightly sloped flat roofs. Some headhouses feature electric exhaust vents protruding from the roof to provide ventilation to the tunnels below. Additional fresh air is supplied to the tunnels from the X-300 Plant Control Facility and from the control rooms at the terminals of the tunnel branches. Secondary access to the tunnels is provided through manhole covers spaced approximately 250' apart for the length of each tunnel, and at branch intersections and changes in alignment.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio,* DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

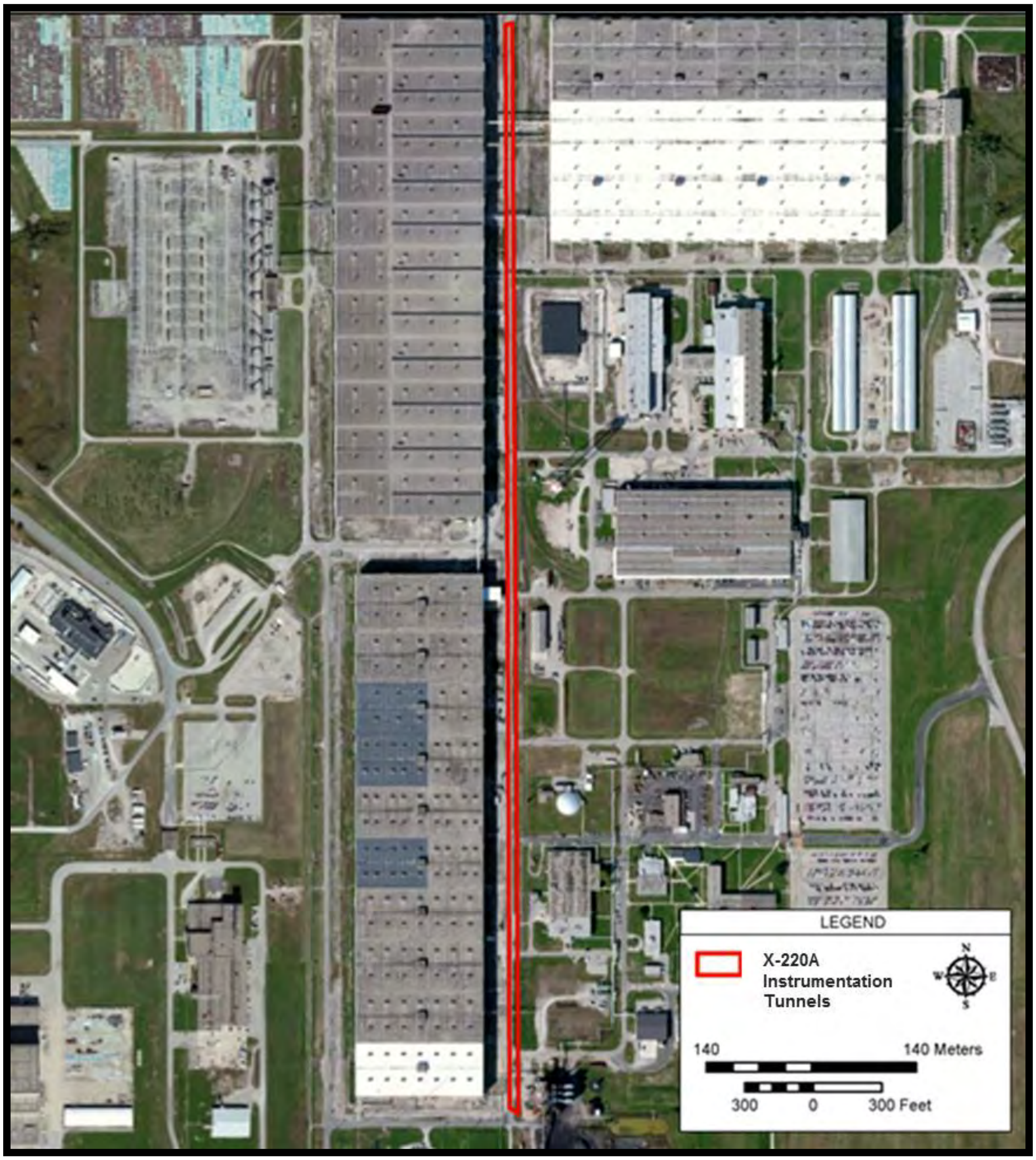

Figure 1: Location and Orientation of Instrumentation Tunnels

Figure 2: X-220A Instrumentation Tunnels, August 2014, Direction Unknown

Figure 3: X-220A Instrumentation Tunnels, August 2014, Direction Unknown

Figure 4: X-220A Instrumentation Tunnels, August 2014, Direction Unknown

Figure 5: X-220A Instrumentation Tunnels, August 2014, Direction Unknown

Figure 6: X-220A Instrumentation Tunnels, August 2014, Direction Unknown

Appendix B: Historical Drawings

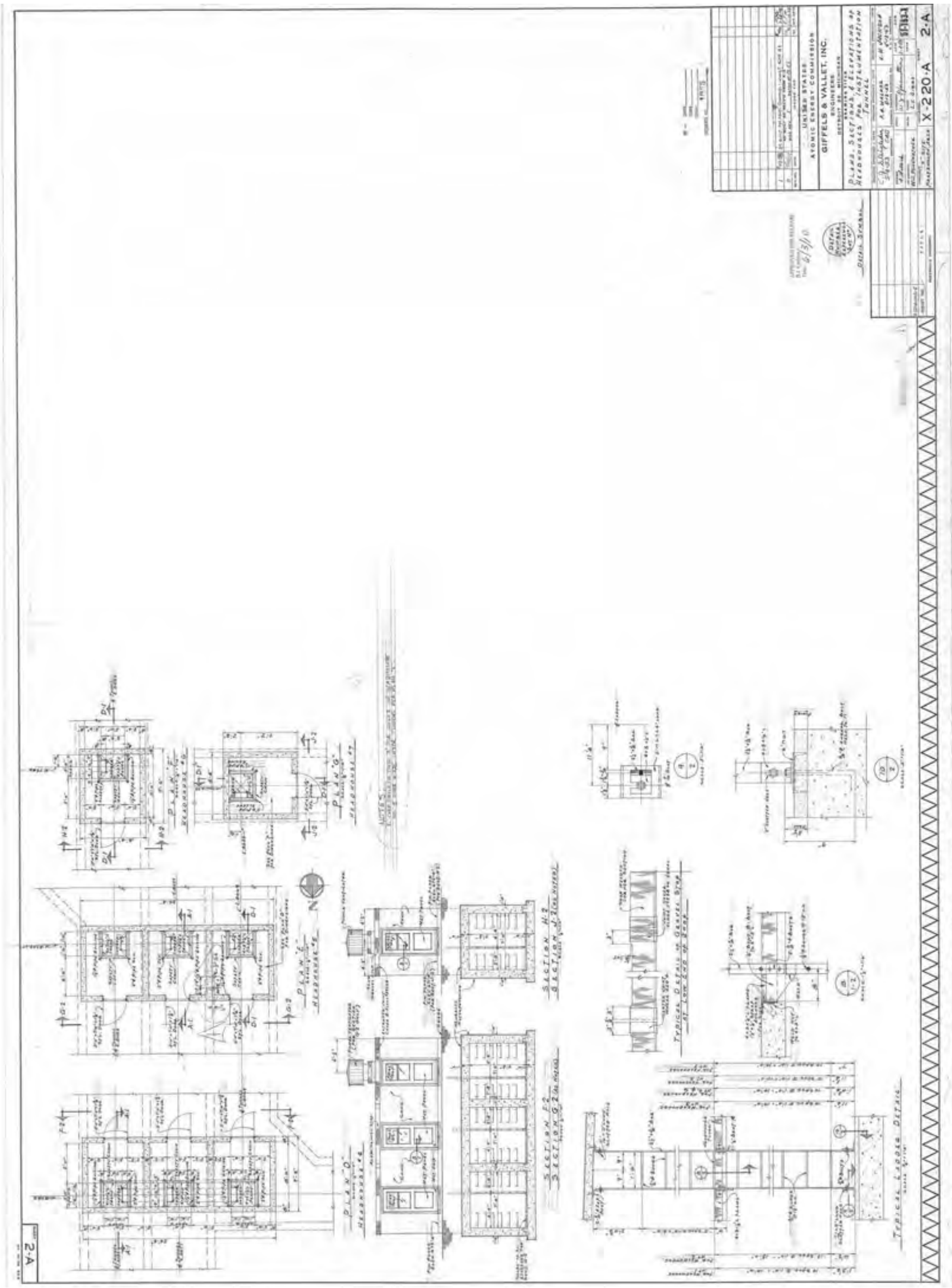

Figure 7: Plans, Sections and Elevations of Headhouses for Instrumentation Tunnel

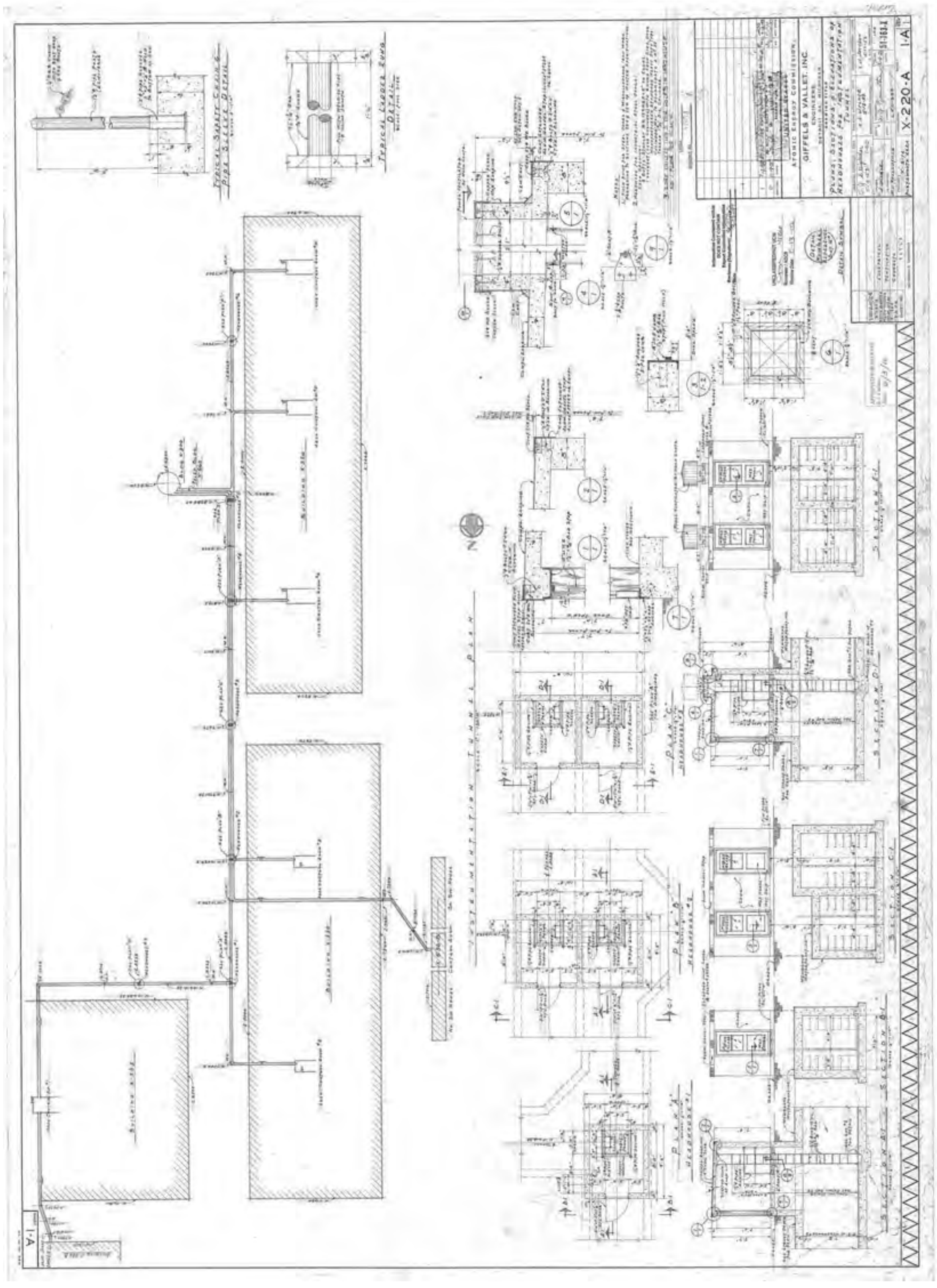

Figure 8: Plans, Sections and Elevations of Headhouses for Instrumentation Tunnel

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-300 PLANT CONTROL FACILITY
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-B
HAER OH-142-B

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-300 PLANT CONTROL FACILITY

HAER No. OH-142-B

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-300 Plant Control Facility Building is located at Ohio State Plane South coordinates at easting 1826909.840476 ft, northing 368267.797102893 ft and at Universal Transverse Mercator Zone 17N easting 326981.8147 m, northing 4319791.602 m. The coordinate represents the approximate center of the X-300 Plant Control Facility Building. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1954
Designer/Builder:	Peter Kiewit Sons’ Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	Although PORTS is no longer operating in an enrichment capacity, the X-300 Plant Control Facility continues to monitor operations vital to dispersing power throughout PORTS, including communications and other necessary functions.
Significance:	The X-300 Plant Control Facility is the control center for all plant operations; without it, it would not have been able to perform its critical Cold War mission. It houses the personnel and equipment needed for the coordination, supervision, and direction of the gaseous diffusion process. This building is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS’ primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014 and in November of 2017. Gray & Pape, Inc., Cincinnati, Ohio, served as primary authors of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-300 Plant Control Facility Building HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-300 Plant Control Facility:
Peter Kiewit Sons' Company awarded the subcontract for construction of the X-300 Plant Control Facility to Chism and Miller, Inc., of Springfield, Illinois, for all construction work with the exception of the instrumentation, process controls, alarm systems, and communication systems, which were installed by Peter Kiewit Sons' Company. Construction work on the facility began in November 1953 (Appendix B, Figures 5 through 14).

During construction, 155 tons of reinforcing steel and 1,736 cubic yards of concrete were used in the construction of the walls, flooring, footings, columns, and roof slab. Additionally, 4,500 concrete blocks were used to create interior wall partitions. Upon completion of concrete pouring, the structure was waterproofed and backfilled. Interior finishes and electrical and mechanical work were undertaken concurrently with the waterproofing and backfilling, with all being complete by November 1954. The process control equipment, alarm systems, and communication equipment were then installed by Peter Kiewit Sons' Company. All work was essentially completed by November 1955, with the final turnover of the facility to the operating contractor occurring on February 10, 1956.

Historical drawings of building plans are included in Appendix C (Figures 15 through 19).

Part II. Site Information

Description of the X-300 Plant Control Facility:
The X-300 Plant Control Facility is a large circular domed, concrete building located in the east-central portion of PORTS, just east of the X-326 Process Building. The main structure of the X-300 Plant Control Facility is approximately 100' in diameter and features approximately 16,000 square feet of floor space between the main floor and the basement (Figures 1 through 4).

The X-300 Plant Control Facility essentially operates as the "nerve center" of PORTS. Personnel in the X-300 Plant Control Facility monitor the operating conditions vital to the production cascade and power systems. In case of an emergency, operators in the X-300 Plant Control Facility have the ability to sectionalize, shut down, and monitor the performance of process systems after the evacuation of operating personnel. Operators also monitor and adjust the power capacity to the entire facility and provide communications to the plant, including radio, Private Automatic Exchange system, conventional telephones, plant public address systems, and evacuation alarm systems.

The X-300 Plant Control Facility is housed in one of the few buildings at PORTS that features a full poured-concrete basement. Building power equipment, communications equipment, and air conditioning and ventilation equipment are located in the basement. Control and instrumentation tunnels extend from the basement of the X-300 Control Facility to each of the process buildings. These tunnels were used as a means of entry for communication, control, and instrumentation cables from the six area control rooms, the switch houses, and the telephone building.

The circular building features reinforced concrete walls, no window openings, and a domed roof covered with 18" concrete panels and a spray-applied plastic coating. The building was designed to be Class I Blast Resistant. The building also features a wing on the northeast that follows the curved wall of the main structure. The wing uses the same construction methods as the main building to ensure appropriate blast resistance, including the plastic coating on the wing's flat concrete roof. The wing houses the main rectangular entry with solid metal blast doors. A metal access hatch is located just north of the wing that allows secondary access to the basement level. The X-220A Instrumentation Tunnels carry the wiring and cables that allow the X-300 Plant Control Facility to monitor and communicate with the process buildings. The tunnels terminate in an arc around the northwest portion of the basement foundation. A concrete addition with large vents is located on the west side of the building.

The round shape of the X-300 Plant Control Facility serves a dual purpose. In addition to providing blast resistance, the curved walls also provide facility personnel with an unobstructed view of the control panel layout and panel-mounted equipment. The first floor contains the central control room, three offices, restrooms, a kitchen, janitor's facilities, and the specially designed entry wing. The three offices are located in the southeast section of the building and extend from the circular outer wall to approximately halfway to the center point of the building. The offices open onto the main control room floor facing the control panel layout. A communications console is located in the sunken center of the first floor facing the control panels. The panels themselves follow the curve of the building with separate panels for each of the three process buildings (X-326, X-330, and X-333), occupying approximately three quarters of the circular wall. Within this arc in the northwest quadrant of the building on the first floor, a sunken floor area houses power control instrument panels and power communications consoles. Two small concrete stairwells access this pit from either side of the record desk near the center of the building. Between the two sets of stairs are three communications consoles from which every panel in the room can be seen. The first floor features a suspended metal acoustical ceiling with typical inset troffer-type fluorescent lighting fixtures and recessed can lights. Flooring on the first floor consists primarily of asphalt tiles and polished concrete. Two floor openings are located on the northwest of the sunken area and are covered with metal grates.

Part III. Sources of Information

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Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

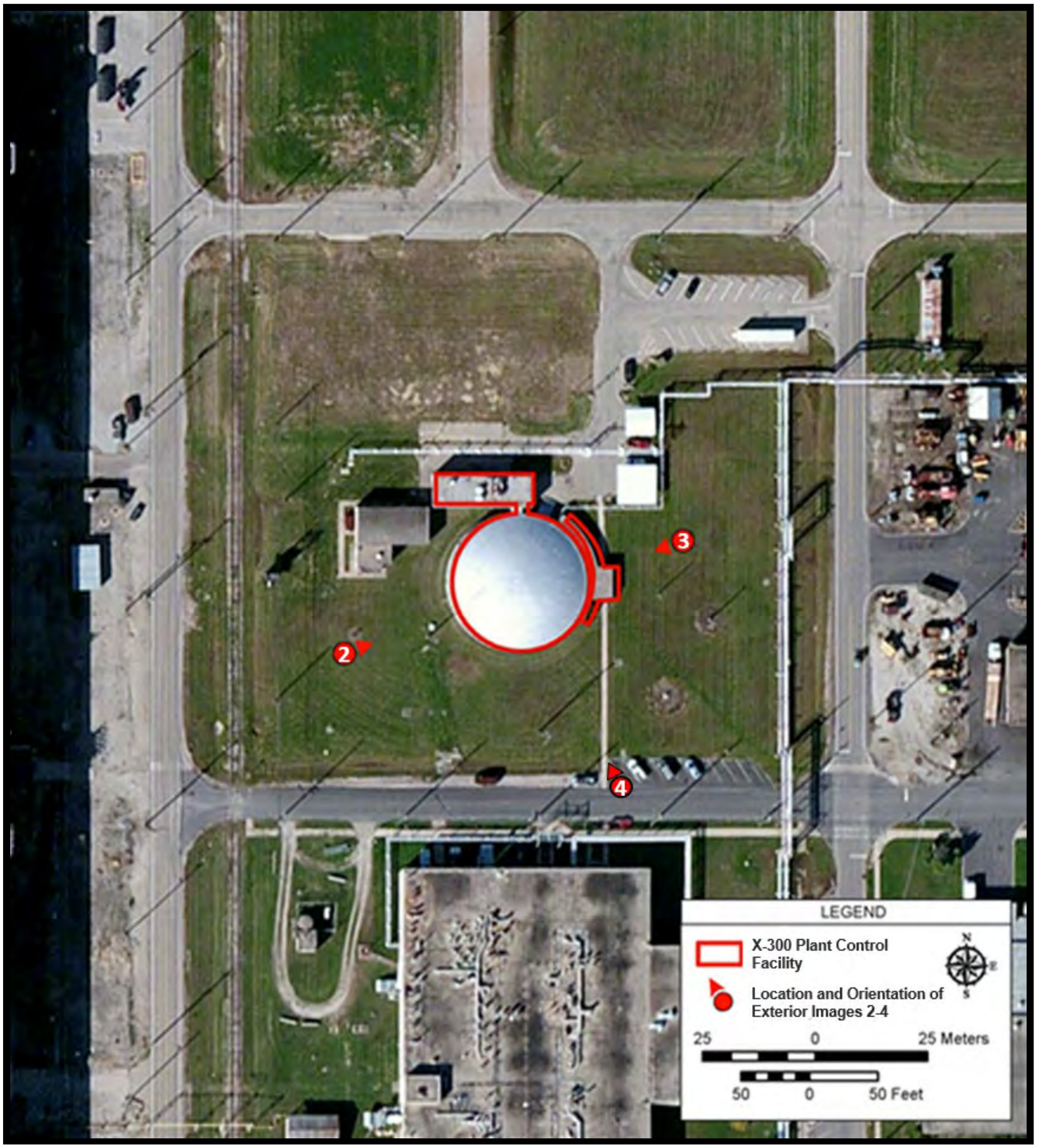


Figure 1: Location and Orientation of Exterior Photographs (A-2 through A-4)

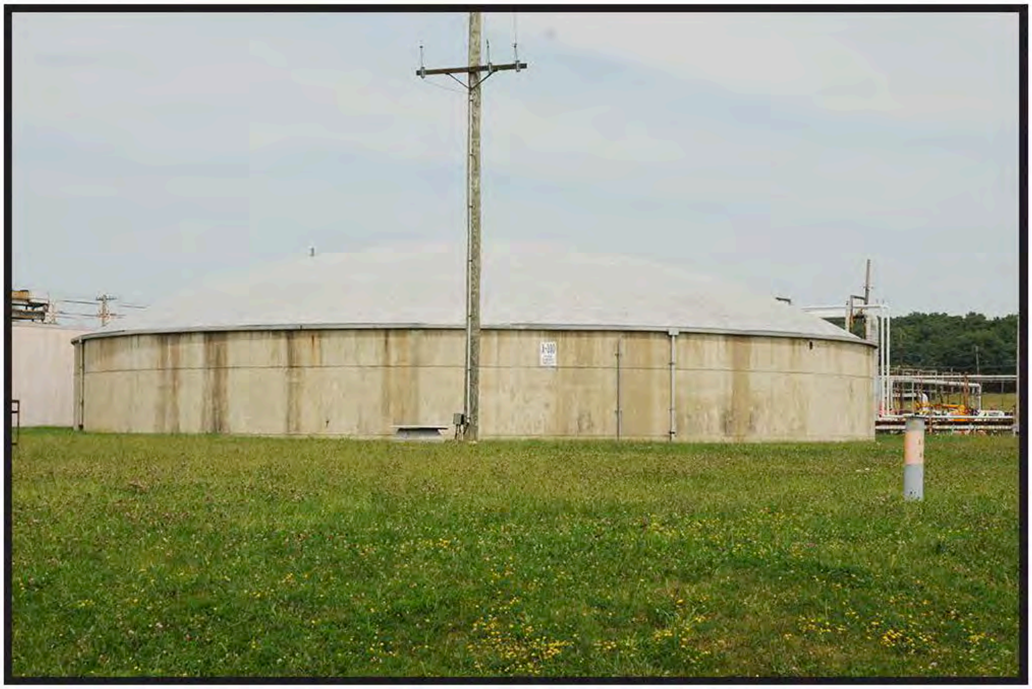


Figure 2: South Side of the X-300 Plant Control Facility, August 2014, Facing Northeast

Figure 3: East Side of the X-300 Plant Control Facility, August 2014, Facing West

Figure 4: South Side of the X-300 Plant Control Facility, November 2017, Facing Northwest

Appendix B: Historical Photographs

Figure 5: Construction Photo of the X-300 Plant Control Facility, January 1954

Figure 6: Construction Photo of the X-300 Plant Control Facility, January 1954

Figure 7: Construction Photo of the X-300 Plant Control Facility, January 1954

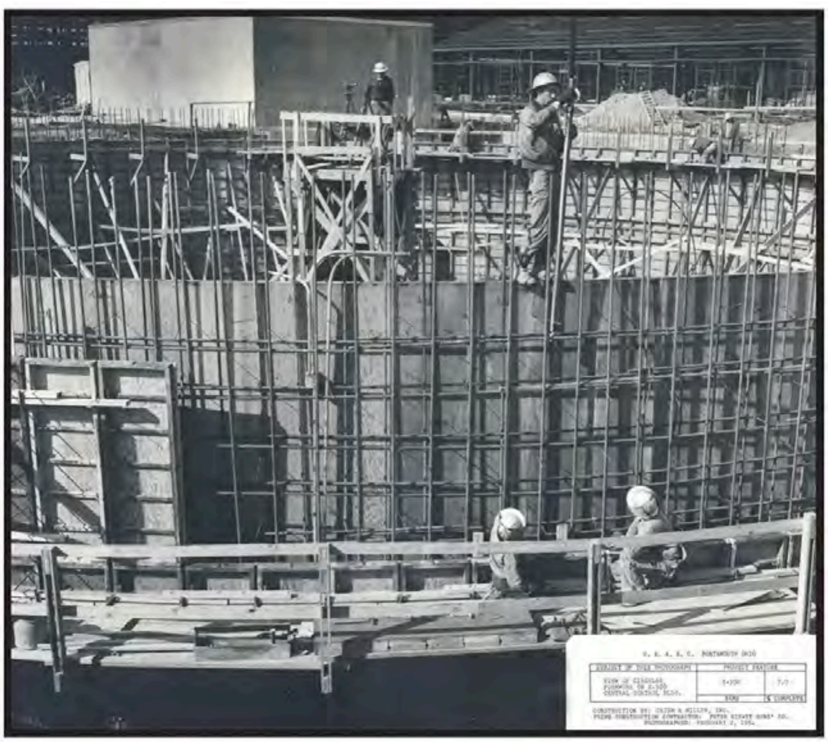


Figure 8: Construction Photo of the X-300 Plant Control Facility, January 1954

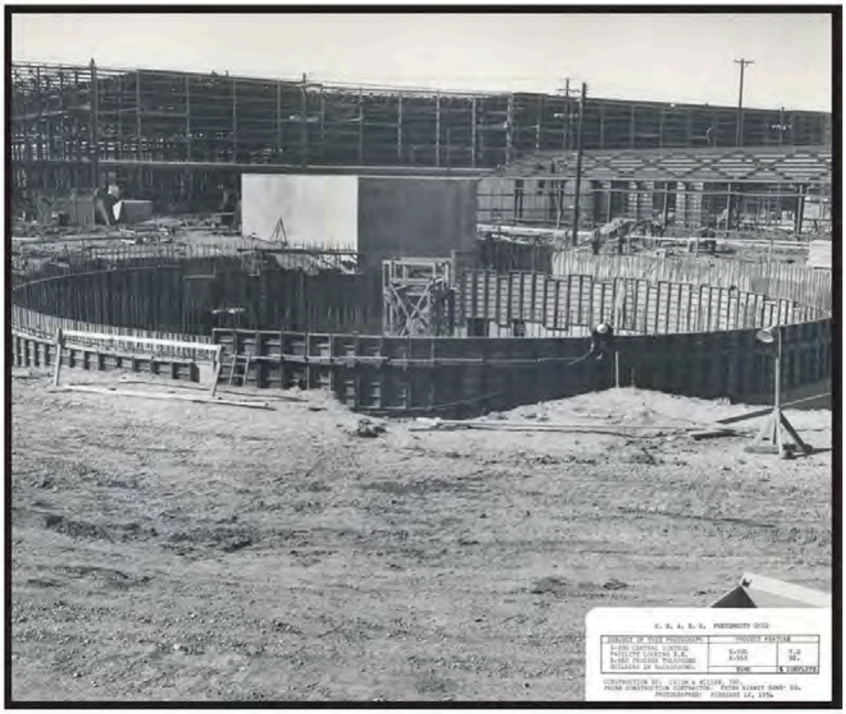


Figure 9: Construction Photo of the X-300 Plant Control Facility, January 1954

Figure 10: Construction Photo of the X-300 Plant Control Facility, March 1954

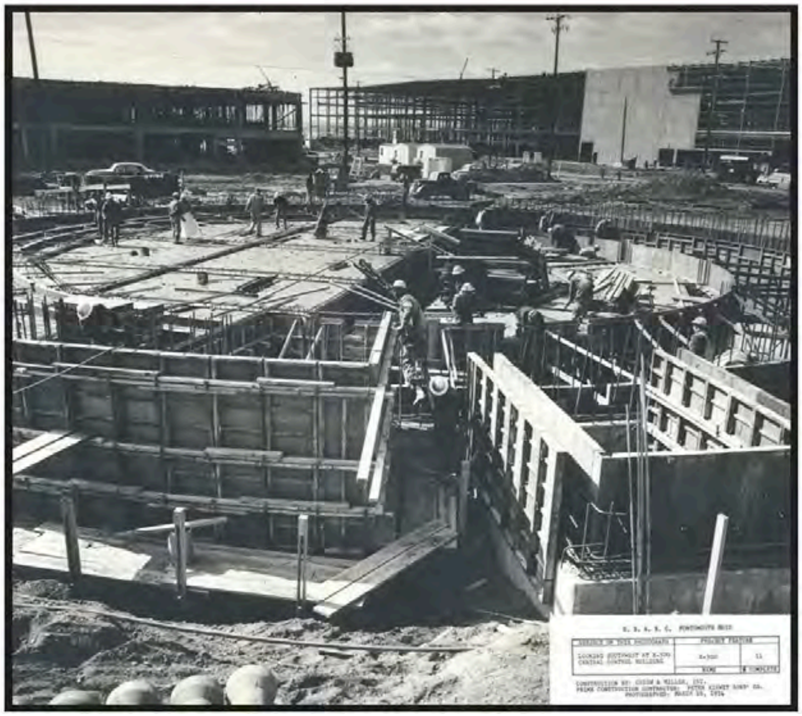


Figure 11: Construction Photo of the X-300 Plant Control Facility, March 1954

Figure 12: Construction Photo of the X-300 Plant Control Facility, March 1954

Figure 13: Construction Photo of the X-300 Plant Control Facility, May 1954

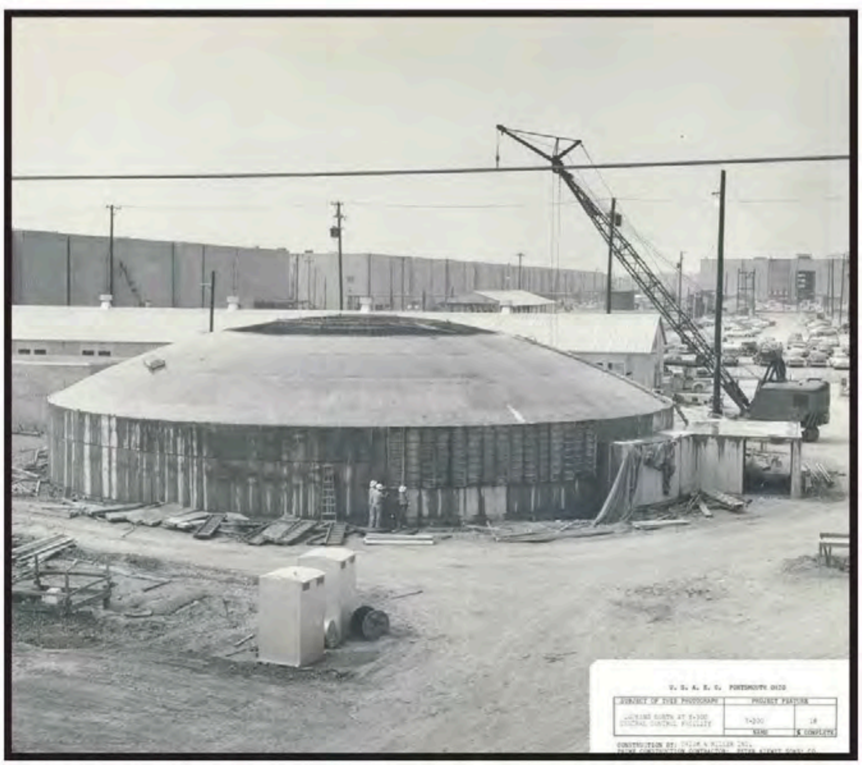


Figure 14: Construction Photo of the X-300 Plant Control Facility, May 1954

Appendix C: Historical Drawings

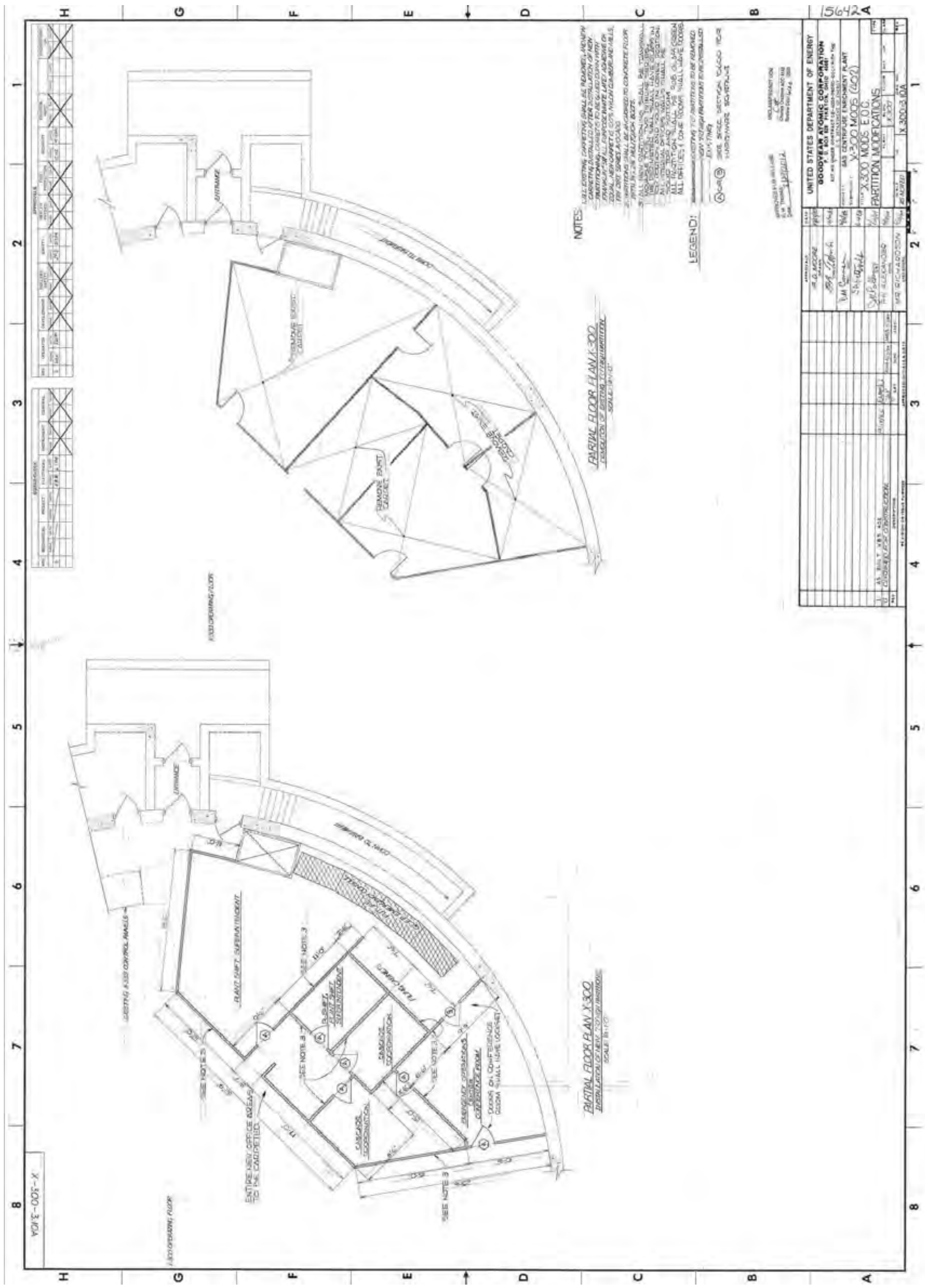


Figure 15: Partition Modifications

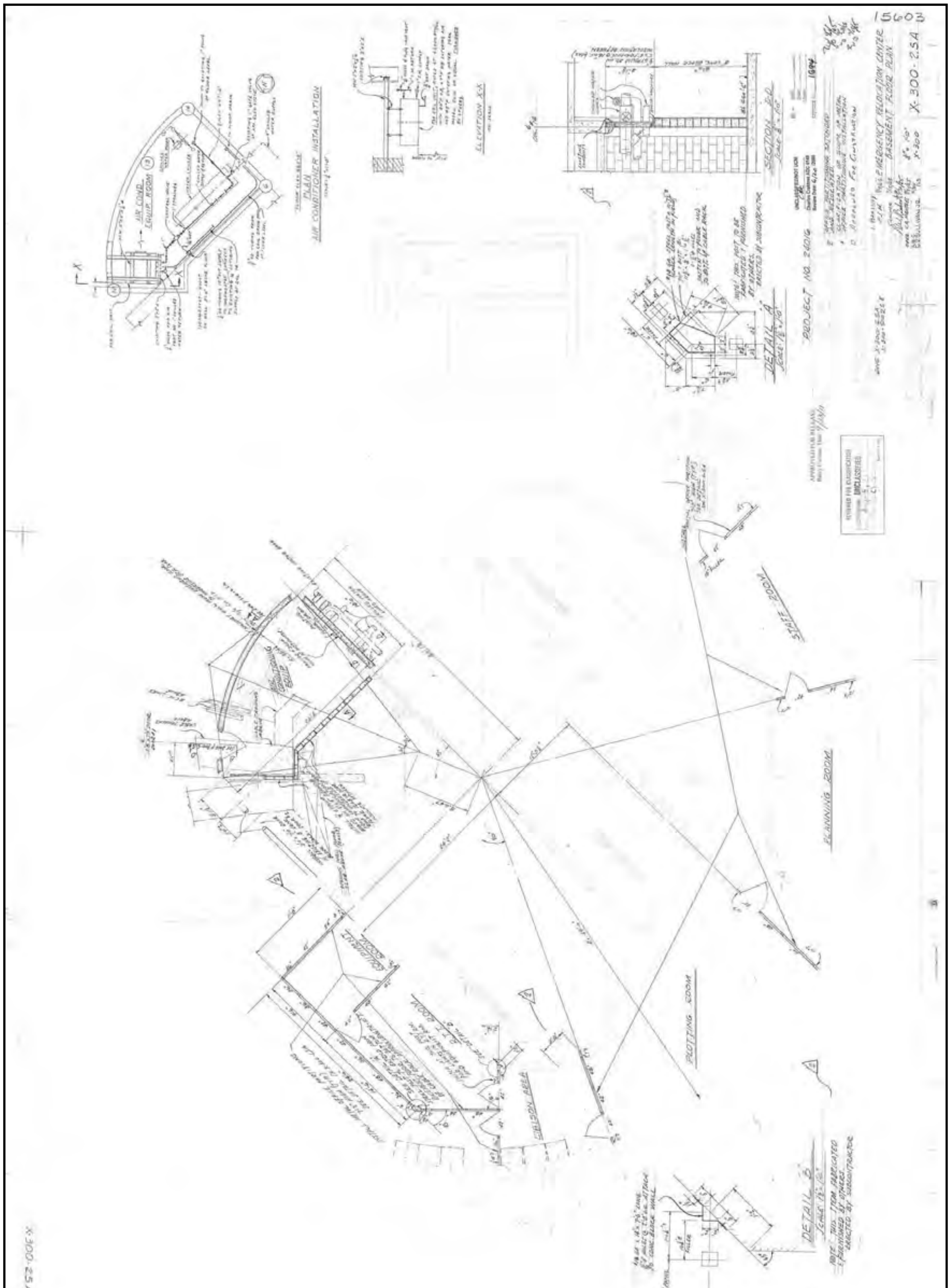


Figure 16: Basement Floor Plan

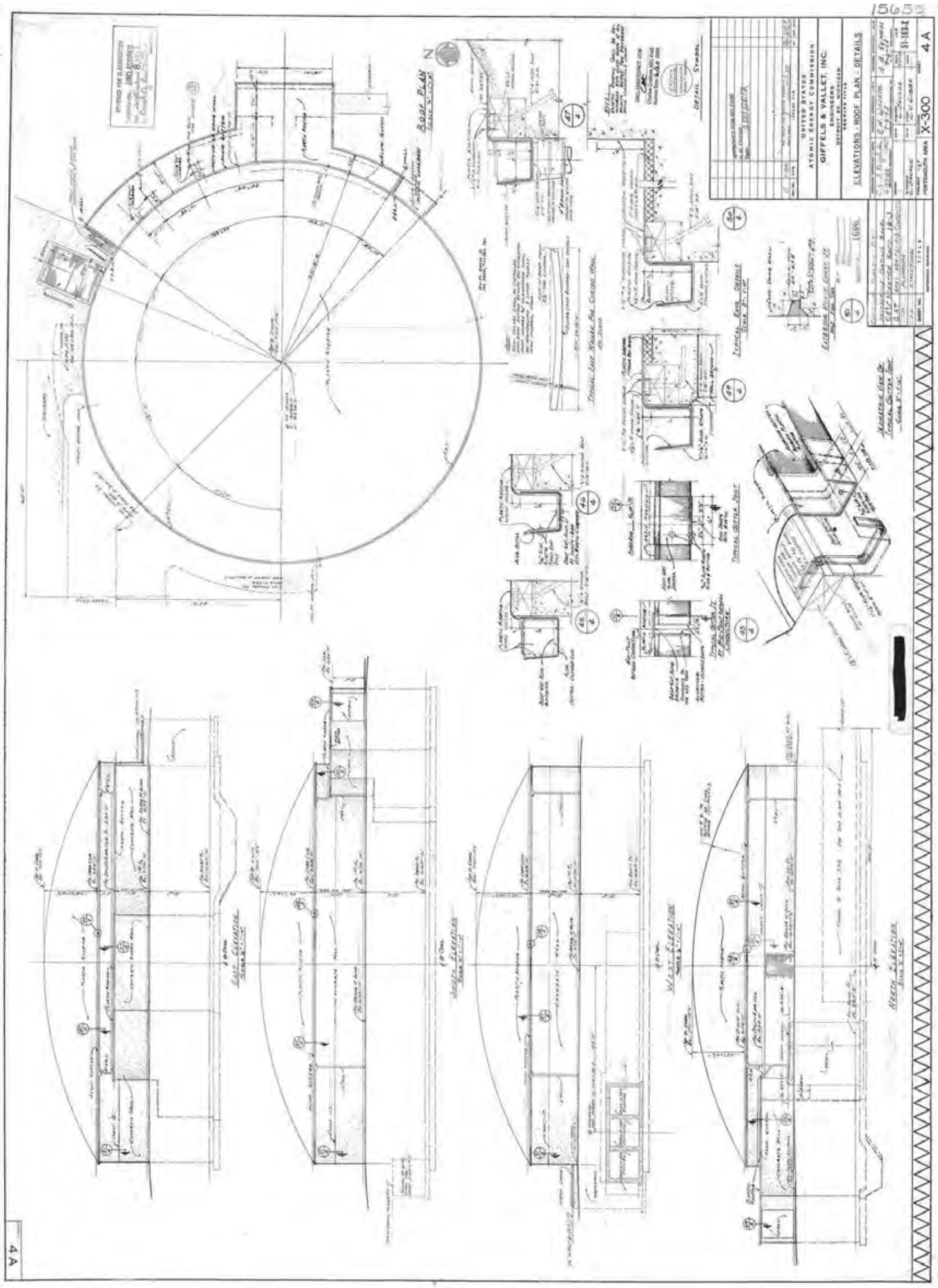


Figure 17: Elevations - Roof Plan - Details

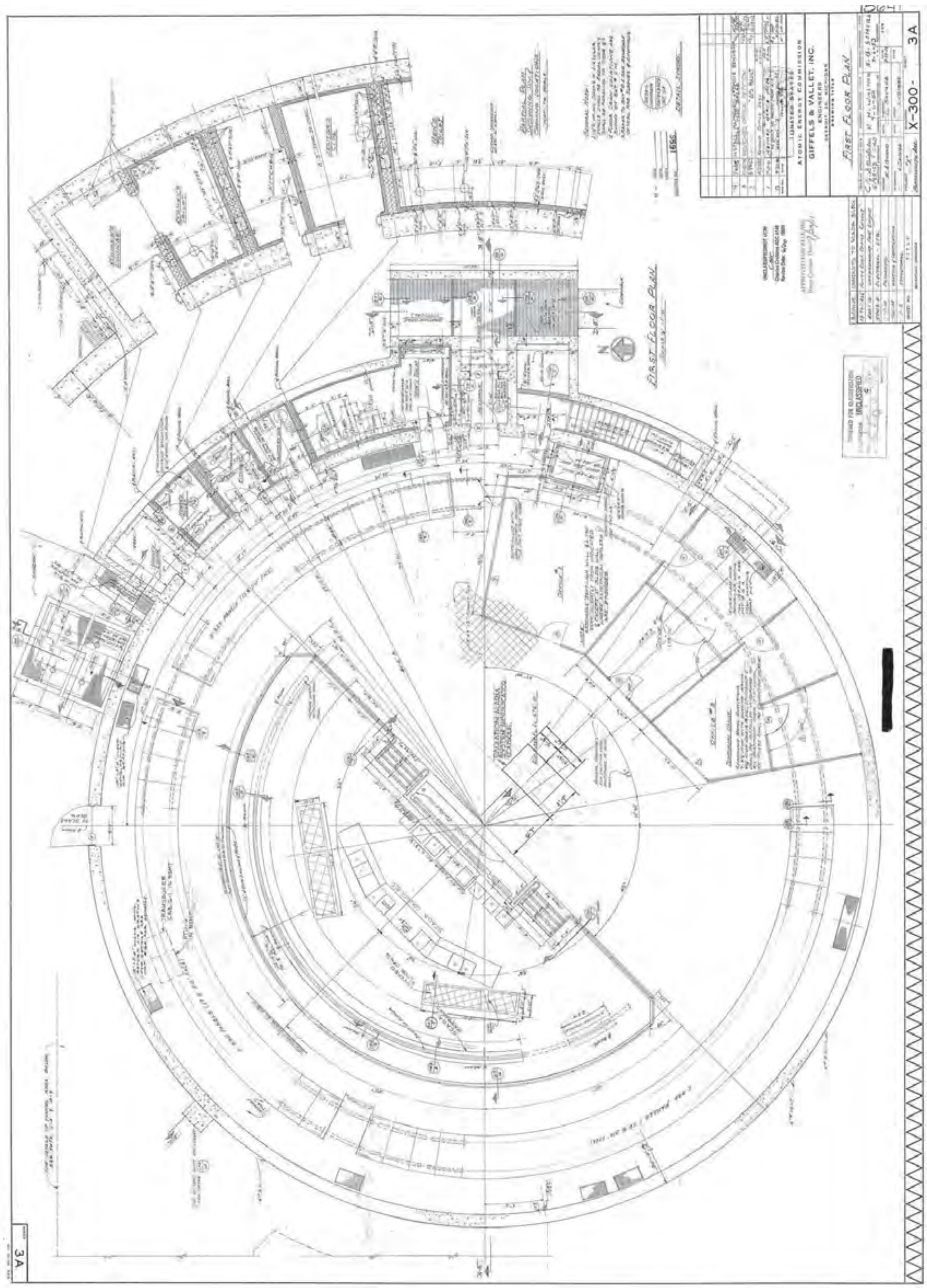


Figure 18: First Floor Plan

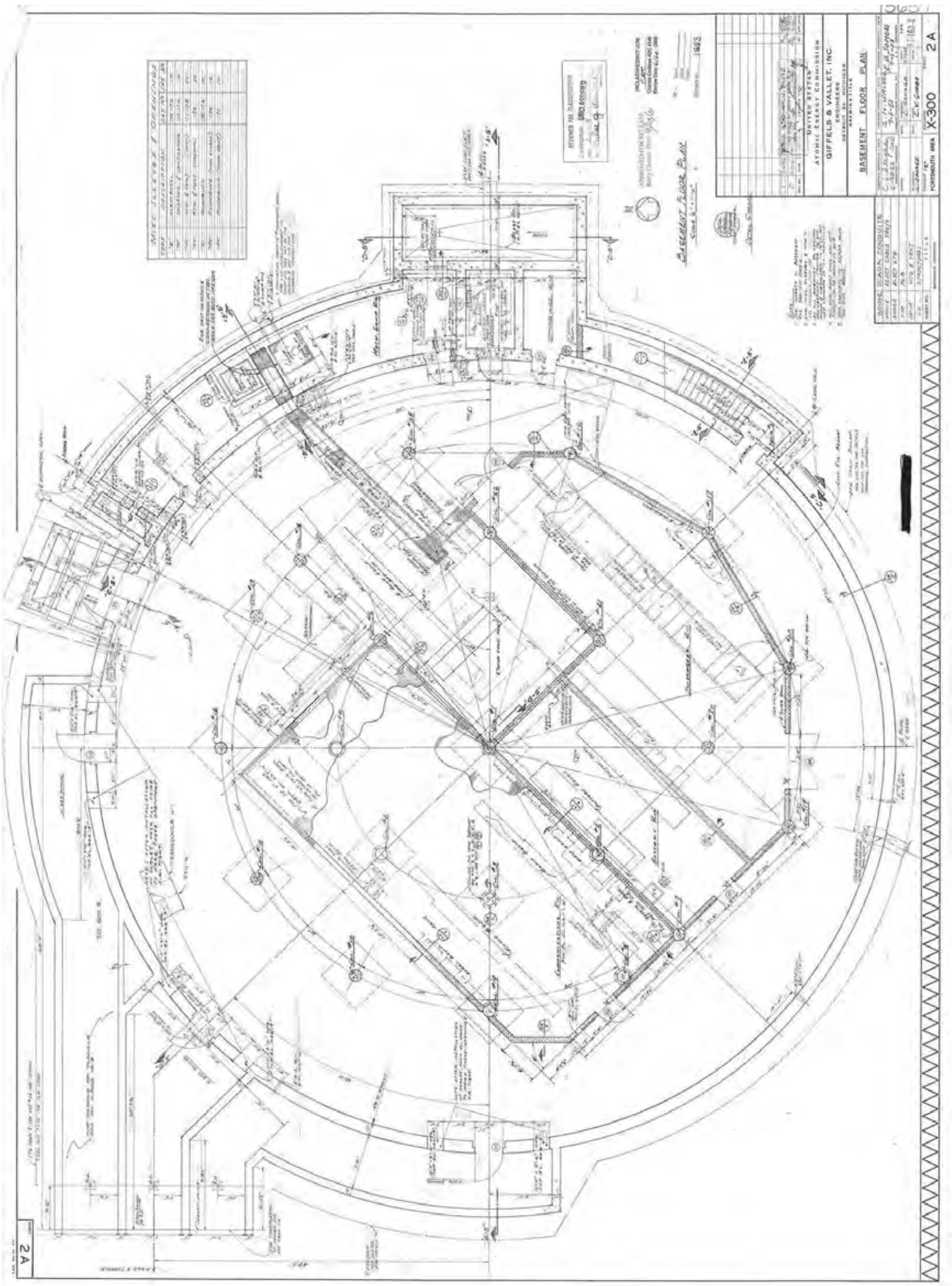


Figure 19: Basement Floor Plan

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-326 PROCESS BUILDING
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-C
HAER OH-142-C

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-326 PROCESS BUILDING

HAER No. OH-142-C

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-326 Process Building is located at Ohio State Plane South coordinates at easting 1826284.790795 ft, northing 368131.651456062 ft and at Universal Transverse Mercator Zone 17N easting 326790.6404 m, northing 4319753.241 m. The coordinate represents the approximate center of the X-326 Process Building. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1956
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy (DOE) was established, overseeing operations at PORTS.
Present Use:	Uranium enrichment no longer occurs within the X-326 Process Building. The building is no longer in use and is awaiting demolition.
Significance:	The X-326 Process Building housed the final phase of the uranium-235 enrichment process, enriching the uranium to the highest enrichment in the DOE complex. This building is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium (HEU) by the gaseous diffusion process for defense/military purposes. Uranium was enriched at PORTS from 1954 until May 2001. From the end of the Cold War in 1991 until production ceased in 2001, PORTS enriched uranium for the longest period of time and to the highest levels within the DOE complex.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-326 Process Building HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-326 Process Building:
Historic photographs of the X-326 Process Building construction are provided in Appendix B. Peter Kiewit Sons' Company was the primary contractor and awarded a number of subcontracts for the construction of the X-326 Process Building. Taylor-Wheless Company, of Milwaukee, Wisconsin, performed the site preparation for the X-326 Process Building, which included stripping, excavation, and placement of fill dirt (Figure 6). By early July 1953, Ferro Construction Company, of Cincinnati, Ohio, had begun excavating for the foundations and underground installations (Figures 7 through 11). Ultimately, they moved 45,423 cubic yards of earth and 11,666 cubic yards of backfill. During excavation activities, workers maintained a semi-finished work area at all times by removing any unnecessary earth from the work area. All excavation had been completed by the end of November 1953.

The Ferro Construction Company was also responsible for performing concrete work for the footers, walls, piers, grade beams, elevator pits, instrumentation tunnels, and the basement Area Control Rooms. They began work in July 1953 and completed all concrete work on the job in February 1954. Ultimately, they poured 17,584 cubic feet of concrete. A separate contract provided for the construction of concrete floors and equipment foundations. The first pour for the ground floor began in January 1954. The ground floor required 26,828 cubic yards of concrete and 563 tons of reinforcing steel. The final pour of the floor occurred on May 21, 1954. The cell floor slab work commenced in January 1954 and ended in July 1954. It required 1,305,595 square feet of wooden forms, 30,076 cubic yards of concrete, and 1,604 tons of reinforcing steel. Concrete work for the process equipment foundations began on February 25, 1954, and ended on September 9, 1954. The equipment foundations required 206,000 square feet of forms, 4,092 cubic yards of concrete, and 275 tons of reinforcing steel.

The United States Steel Corporation, of Cleveland, Ohio, won the contract to furnish and erect the structural steel frame of the X-326 Process Building (Figures 12 through 14). They also erected 20 electric bridge cranes and forty lube oil tanks in the X-326 Process Building. Structural steel work commenced in September 1953. The work progressed from north to south, with all structural steel work completed by mid-April 1954. Specifications called for field connections made with high tensile bolts. This was a relatively new technique, and it required special techniques and close supervision. Altogether, the steel framing required 162,000 machine bolts and 401,000 high tensile bolts. Erection of the bridge cranes and oil lube tanks occurred simultaneously with the construction of each bay. Each crane had a lifting capacity of 5 tons. The cranes were designed to safely lift and transport the motors, converters, compressors, and condensers beneath their travel paths.

Construction of the roof began shortly after the commencement of structural steel work. In December 1953, Brown and Kerr, of Chicago, Illinois, began installing the metal roof deck and built-up roofing. They built-up the roof with vapor seal, insulation and flashing, gutters, downspouts, and roof sumps. They also installed vertical and horizontal copper expansion covers and removed and replaced bent plates. The roof required 1,246,700 square feet of steel deck, 54,000' of board lumber, and 1,258,599 square feet of roofing. Brown and Kerr completed the job in May 1954.

Elwin G. Smith Company, Inc., of Pittsburgh, Pennsylvania, furnished and installed the corrugated cement asbestos siding, corner finishes, special shapes, flashings, sealers, fasteners, and the sealing of explanation joints and flashing. They began work at the northwest corner of the building on

December 18, 1953. Upon completion of the north wall of the X-326 Process Building, work continued from north to south, with workers installing siding on both sides of the building simultaneously. Workers fastened the siding to the building with lead-headed bolts with zinc alloy collar nuts and neoprene sealer. By January 1954, much of the siding work was complete (Figure 15). When the R.G. Smith Company completed the work in June 1954, they had installed 427,000 square feet of siding.

As siding installation continued, workers poured concrete for the ground floor (Figure 16). Shortly before completion of the siding, Goodyear Atomic Corporation, the plant's operating contractor, began installing the process equipment (Figures 17 through 21). They initiated work in mid-March 1954 and continued through early February 1956. The X-326 Process Building would require a total of 2,340 compressors, 2,340 electric motors, and 2,340 converters.

Historical drawings of building plans are included in Appendix C (Figures 22 through 29).

Part II. Site Information

Description of the X-326 Process Building:
The X-326 Process Building is located immediately south of the X-330 Process Building (Appendix A, Figures 1 through 5) and housed the final phase of the uranium enrichment process. The uranium enrichment process was initiated in the X-333 Process Building and continued in series to the X-330 and X-326 Process Buildings. The X-326 Process Building was used for the highest uranium enrichment phase, at PORTS and within the DOE complex, and enriched product withdrawal. Part of the building was used to produce commercial grade nuclear material (i.e., low-enriched uranium [LEU] product) for use in nuclear power reactors for electric power generation. A portion of HEU produced was used for nuclear navy reactor propulsion. Uranium was enriched at PORTS until May 2001. From the end of the Cold War in 1991 until production ceased in 2001, PORTS produced only LEU for commercial power plants.

Like the other two process buildings (X-330 and X-333), the equipment in the X-326 Process Building is on two floors, with the auxiliary equipment, support equipment, and control rooms on the first floor, also known as the operating floor or ground floor. The diffusion process equipment is located on the second floor, known as the cell floor.

The smallest of the process buildings at PORTS, the X-326 Process Building measures 2,230' long by 552' wide, stands 62' tall, and encloses an area of about 29 acres (Appendix A, Figures 1 through 5). The height of the building allowed for the installation of duct work, piping, and conduit in the area below the cell floor, as well as vehicular travel.

The west side of the X-326 Process Building features a truck alley with an imbedded railroad spur that facilitated transfer of supplies and equipment. A series of truck entrances along the sides of the building further facilitate the movement of vehicles into and out of the building. The overall appearance of the building is rather non-descript. It is, essentially, an immense, rectangular box with no stylistic details. The exterior walls of the X-326 Process Building are covered with large, white asbestos cement tiles, also known as transite. A series of elevator shafts protrude from the sides of the X-326 throughout the length of the building. The north side of the building features exhaust ducts and metal louvered openings at the filter rooms. There are no windows in the X-326 Process Building; however, "port holes" within the building can be propped open to allow air flow. Employees and equipment enter and exit the X-326 Process Building via the X-111A and B monitoring portals.

The interior finish of the building was designed for cleanliness and sanitation. All the plastered masonry walls within the building were coated with acid-resistant paint to facilitate decontamination activities. Labels were applied to each of the structural columns in the process buildings, as well as stairways and platforms. Each of the cells and their supporting equipment were labeled, as were electrical panels and equipment. Labels were used for worker safety, maintenance, and operations.

Part III. Operations and Process

A. Operations:

At PORTS, uranium was enriched using a process called gaseous diffusion. Through the process of diffusion, gaseous uranium hexafluoride (UF_6) is passed through a conversion system to produce enriched, or diffused, uranium-235 and undiffused uranium-238. The process of uranium enrichment increases the proportion of uranium-235 to that of uranium-238. Enriched uranium contains uranium-235 at approximately 4 to 5 percent of the total uranium mass.

The gaseous diffusion process requires the use of UF_6 to separate the uranium-238 and uranium-235 isotopes. During diffusion, UF_6 gas is forced through a series of porous membranes, or "barriers" with microscopic openings. Barriers are used to achieve separation in the gaseous diffusion process. To maximize the amount of separation achieved, the porous barrier material must meet exacting standards, so that "diffusive" flow occurs. Uranium-235 moved through the barriers more easily, increasing the concentration of uranium-235 as it moved through the process. The tendency for uranium-235 to pass through the barrier more quickly is the basis for the gaseous diffusion process.

The basic separation equipment for gaseous diffusion is a "stage." At PORTS, a stage consisted of a converter that contains porous separation media, a gas cooler, a compressor to move the UF_6 gas through the converter, and interconnecting piping and control valves to contain and control the gas flows. One stage was capable of only very slight enrichment. Stages operated in a cascading system, and thousands of stages in the process buildings were connected in series to produce HEU. The X-326 Process Building contains 2,340 stages.

Stages were grouped into "cells," which were the smallest groups of stages that could be removed from service, bypassed, and shut down for maintenance or other purposes. There are 12 stages per cell in most of the cells in the X-326 Process Building, and the building houses 200 cells.

Cells were further grouped into "units," which were groups of cells that shared common auxiliary systems. Each operating unit within the building was divided into two groups of ten cells. The 200 cells in the X-326 Process Building are grouped into 10 units. Ten of the cells in the south end of the building comprise the "purge cascades," each containing six stages per cell.

The process equipment, piping, and instrument lines that contained process gas are enclosed by cell housing and bypass housing. The cell housing for the X-326 process equipment is metal, and the top of the housing has removable hatches that allow for equipment removal.

Feed material entered the uranium enrichment process at the X-333 Process Building. After cascading through the X-333 and X-330 Process Buildings, the uranium enrichment process continued in the X-326 Process Building. The X-326 Process Building contains the smallest pieces of gaseous diffusion equipment at PORTS. The two sizes of process equipment in the X-326 Process Building are referred to as the X-27 size, which is the larger of the two sizes, and the X-25 size, which is the smaller of the two sizes. The X-27 and the X-25 facilities were designed to operate independently or together.

The X-326 Process Building also contains the purge and product area. Purging separated and removed light gas contaminants that leaked into the system during the diffusion process. In effect, the X-326 Process Building combined the gaseous diffusion facilities that were found in the K-25 and K-27 installations at the former Oak Ridge Gaseous Diffusion Plant, now the East Tennessee Technology Park.

The waste, or tails stream, of the enrichment process was withdrawn from the gaseous diffusion cascade and packaged into storage cylinders. The PORTS Tails Withdrawal Station is located in the northeast corner of the X-330 Process Building.

B. First Floor:

The first floor of the X-326 Process Building supports the withdrawal and process auxiliary systems, electric power unit substations, control centers for the process equipment, and enclosed areas for operational use. A series of 22 air intake filter rooms extend along the outside walls at roughly 100' intervals. The east wall of the first floor features three drive-through elevators, each with its own accompanying stairway. The elevator shafts protrude on the outside of the building.

Enclosed areas within the X-326 Process Building consist of cinder block structures that stand 10 or 12' in height. They each have a flat, metal deck or concrete slab roof. These enclosures are located along the length of the building. They include Area Control Rooms 4, 5, and 6, a maintenance area, the atmospheric exhaust area, battery rooms, and the withdrawal and purification facilities. Lube oil and coolant system pits are also located on the first floor.

The three control areas of the X-326 Process Building each have their own control room. These rooms include their own office, men's and women's lounge and restrooms, and a datum station. Floors in these areas are covered with either asphalt tiles or are simply bare concrete. A basement that provides access to the underground instrument tunnel system is located below each Area Control Room. Floors in the Area Control Room basements consist of unfinished concrete.

C. Second Floor (Cell Floor):

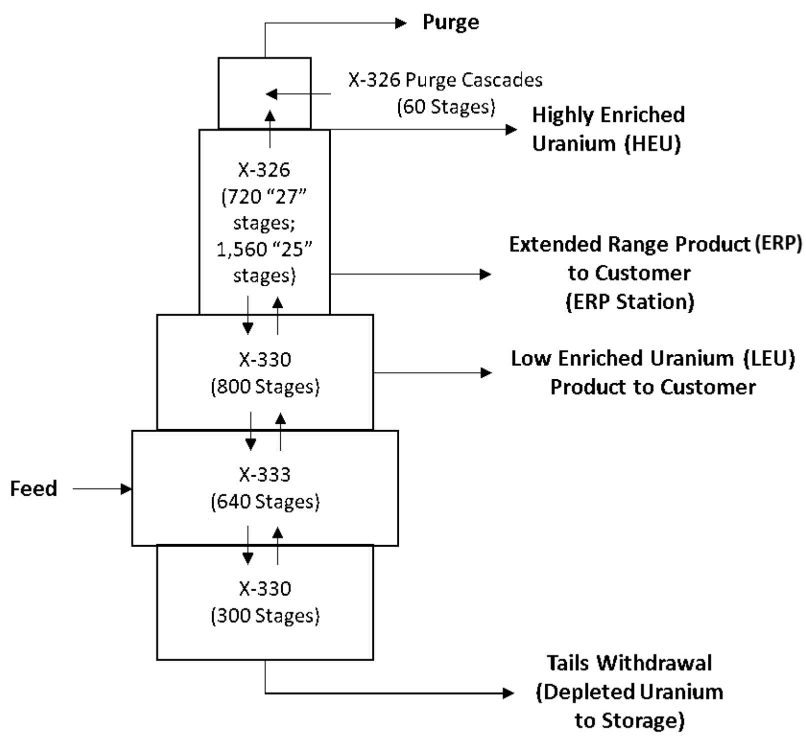
The process equipment is located on the cell floor. The X-27 equipment contains three units (60 cells and 720 stages) and the X-25 contains approximately seven units (130 cells and 1,560 stages). The 10 six-stage "purge cells" are part of the X-25 size equipment and were specially designed to remove light gases from the UF_6 stream.

Access to the cell roofs and overhead valves and equipment is accomplished via steel stairways, ladders, platforms, and catwalks. There are 20 separate stairways per unit. There are also a number of stairways that lead to the roof of the building. In addition to stairways, there are several freight elevators that provided transportation between the first and second floors. Withdrawal and storage of the high assay (HEU) product gas transpired in the Product Withdrawal Station, located in the southwest corner of the X-326 Process Building. Within the Product Withdrawal Station is a gaseous UF_6 purification room that consists of a gravity-type system with a tall column that extends above the cell floor. This tower-like structure is enclosed within masonry walls. There are stairs and platforms around the tower to enable workers to operate and maintain the mechanical equipment. There were two withdrawal streams at the Product Withdrawal Station. One withdrawal stream was from the product gas. The product gas was placed in cylinders for brief storage prior to purification. The purified product was then further processed to make the desired radioactive metal. The other withdrawal stream was valved into other parts of the gaseous diffusion cascade. Ninety to 97 percent uranium-235 was withdrawn during HEU production, and 2 to 5 percent uranium-235 was withdrawn at either the Extended Range Product (ERP) or Low Assay Withdrawal stations.

The ERP Station is located in the northeast corner of the X-326 Process Building and was designed for withdrawal of various enrichments. The ERP station was capable of withdrawing two separate product streams of different enrichments simultaneously. Because of the shift of plant mission toward LEU, the ERP station was primarily used for LEU withdrawal.

The final stage of the diffusion cascade occurred in the Purge and Product Area. The Purge and Product Area contains the 10 six-stage purge cells where the product gas was separated for withdrawal and light gasses were removed from the UF_6 stream. The separative equipment is located on the cell floor.

A diagram showing the gaseous diffusion "cascade" at PORTS is shown below.



PORTS Gaseous Diffusion "Cascade"

D. Structural Design:

The X-326 Process Building is divided longitudinally by transverse roller-type expansion joints located between each of the ten building units. Engineers designed the columns and framing to accommodate 92' wide crane bays above each of the cells with 20 to 22' wide intermediate braced bays for pipe galleries. Steel trusses, located above the crane bays, provide support for roof purlins (horizontal boards supporting roof rafters). The building's flat, steel deck roof rests atop the purlins. Engineers designed the building's frame to withstand wind loads of 20 pounds per square foot and roof live loads (variable weights on a structure) of 30 pounds per square foot.

The cell floor of the X-326 Process Building is supported by girders and beams, which are connected to the roof support columns and intermediate ground story columns. The remainder of the floor consists of 6½" of reinforced concrete. The ground floor slab measures 6" in thickness and rests atop a compacted stone base.

The basements under the control room areas consist of reinforced concrete walls and columns. These structures rest atop rectangular concrete footers. A reinforced concrete beam and girder slab rests atop the basement walls and columns. This slab comprises the floor of the control rooms.

Part IV. Sources of Information

Benedict, Mason and Clarke Williams. *Engineering Developments in Gaseous Diffusion Process*. New York: McGraw-Hill Books Company, Inc., 1949.

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Department Of Energy. Highly *Enriched Uranium: Striking a Balance, A Historical Report on the United States Highly Enriched Uranium Production, Acquisition, and Utilization Activities from 1945 to September 30, 1996*, Revision 1. Washington, D.C.: National Nuclear Security Administration, U.S. Department of Energy, 2001.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Portsmouth Gaseous Diffusion Plant Virtual Museum – accessed at http://www.portsvirtualmuseum.org/ operated and managed by Fluor-BWXT Portsmouth for DOE.

Appendix A: Survey Photographs

Figure 1: Location and Orientation of Exterior Photographs (2 through 5)

Figure 2: North Side of the X-326 Process Building, August 2014, Facing Southwest

Figure 3: North Side of the X-326 Process Building, August 2014, Facing Southeast

Figure 4: South Side of the X-326 Process Building, August 2014, Facing Northwest

Figure 5: South Side of the X-326 Process Building, August 2014, Facing Northeast

Appendix B: Historical Photographs

Figure 6: Excavation and Grading Work for the X-326 Process Building, July 1953

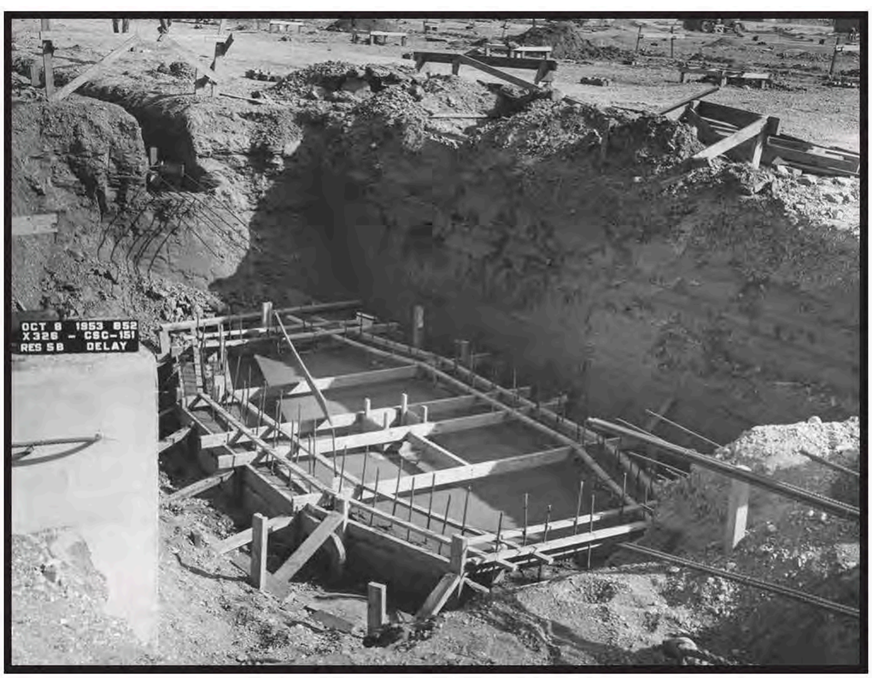


Figure 7: Work Delay Photo for the X-326 Process Building, October 1953

Figure 8: Foundation Work for the X-326 Process Building, October 1953

Figure 9: Work Delay Photo for the X-326 Process Building, October 1953

Figure 10: Excavation and Foundation Work for the X-326 Process Building, October 1953

Figure 11: Work Delay Photo for the X-326 Process Building, September 1953

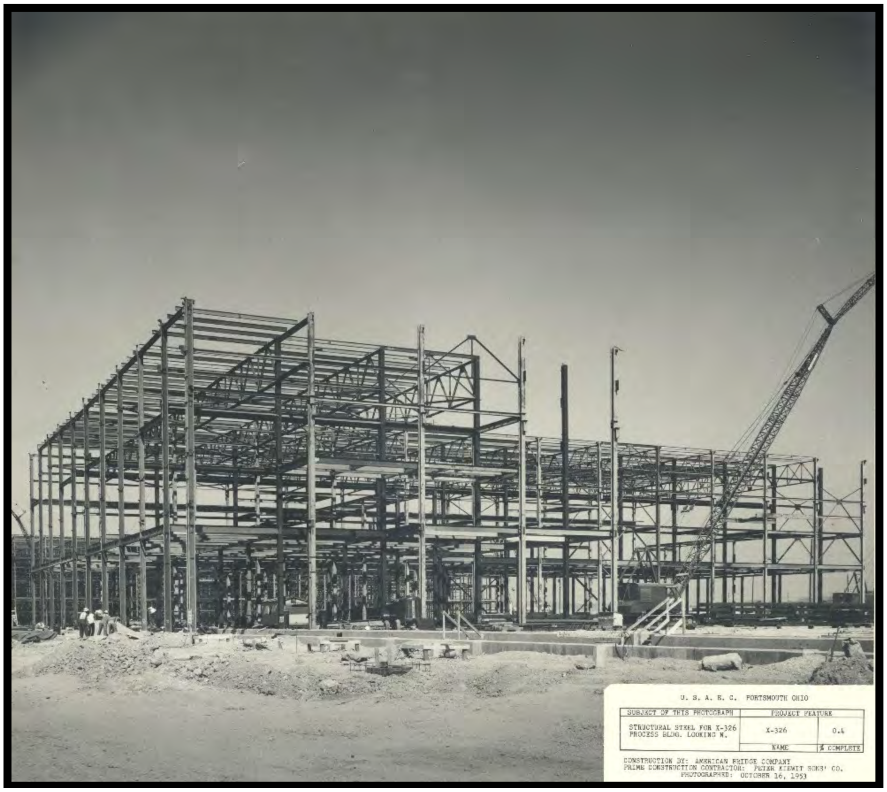


Figure 12: Structural Steel Work for the X-326 Process Building, Looking North, October 1953

Figure 13: Looking North at the X-326 Process Building, December 1953

Figure 14: Overall View of the X-326 Process Building, January 1954

Figure 15: Overall View of the Process Area, January 1954

Figure 16: Looking East at Ground Floor of the X-326 Process Building, February 1954

Figure 17: Looking East at Cell Floor of X-326 Process Building, April 1954

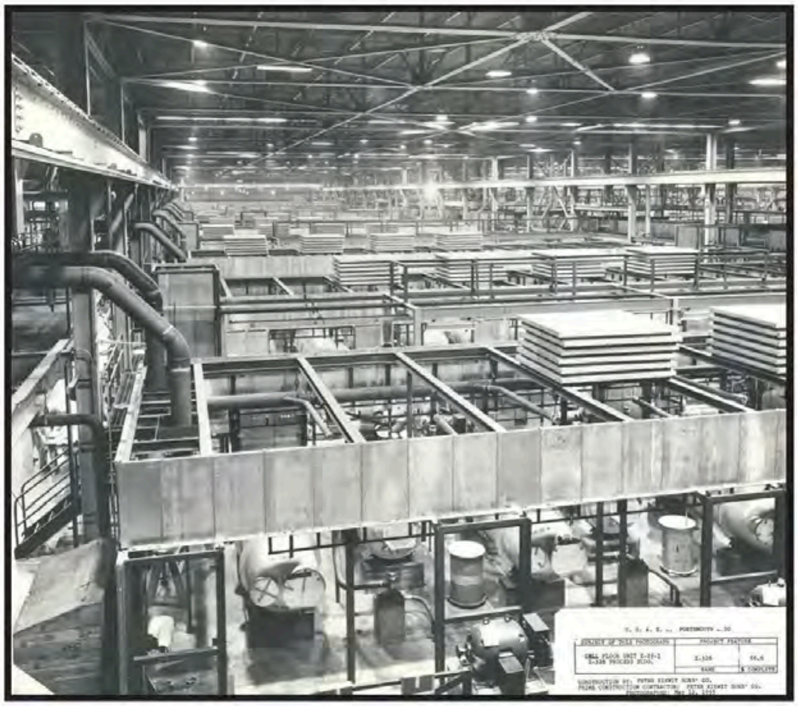


Figure 18: Cell Floor Unit X-25-1 in the X-326 Process Building, May 1955

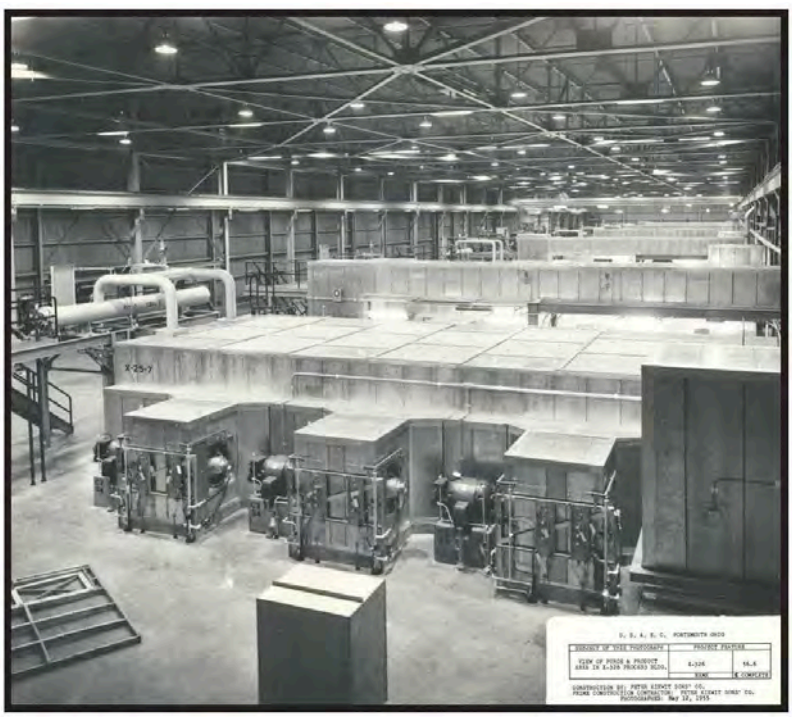


Figure 19: View of Purge and Product Area in X-326 Process Building, May, 1955

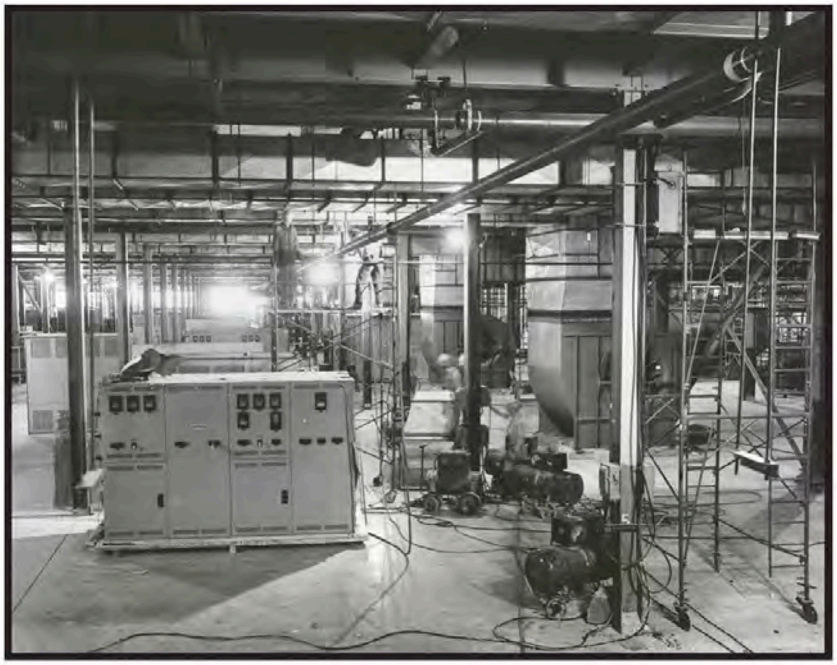


Figure 20: Interior View of the X-326 Process Building, May 1955

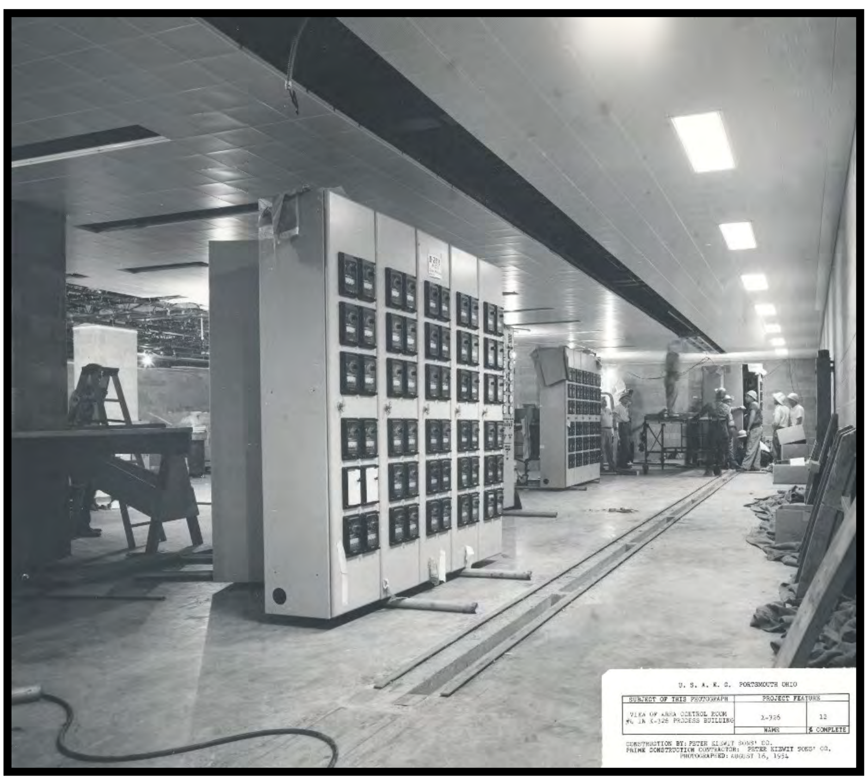


Figure 21: View of the Area Control Room Number 4 in the X-326 Process Building, August 1954

Appendix C: Historical Drawings

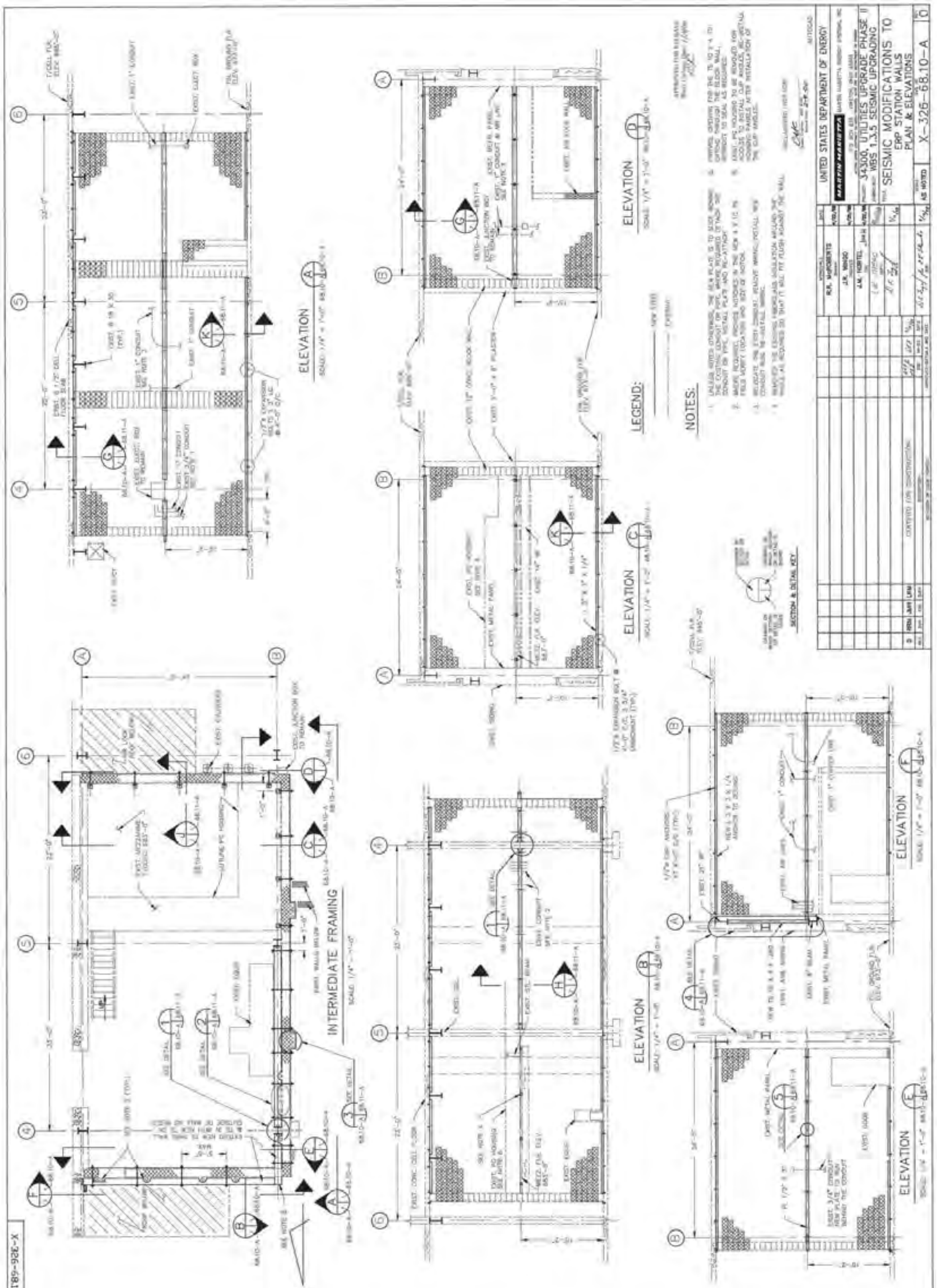


Figure 22: Seismic Modifications to ERP Station Walls, Plan and Elevations

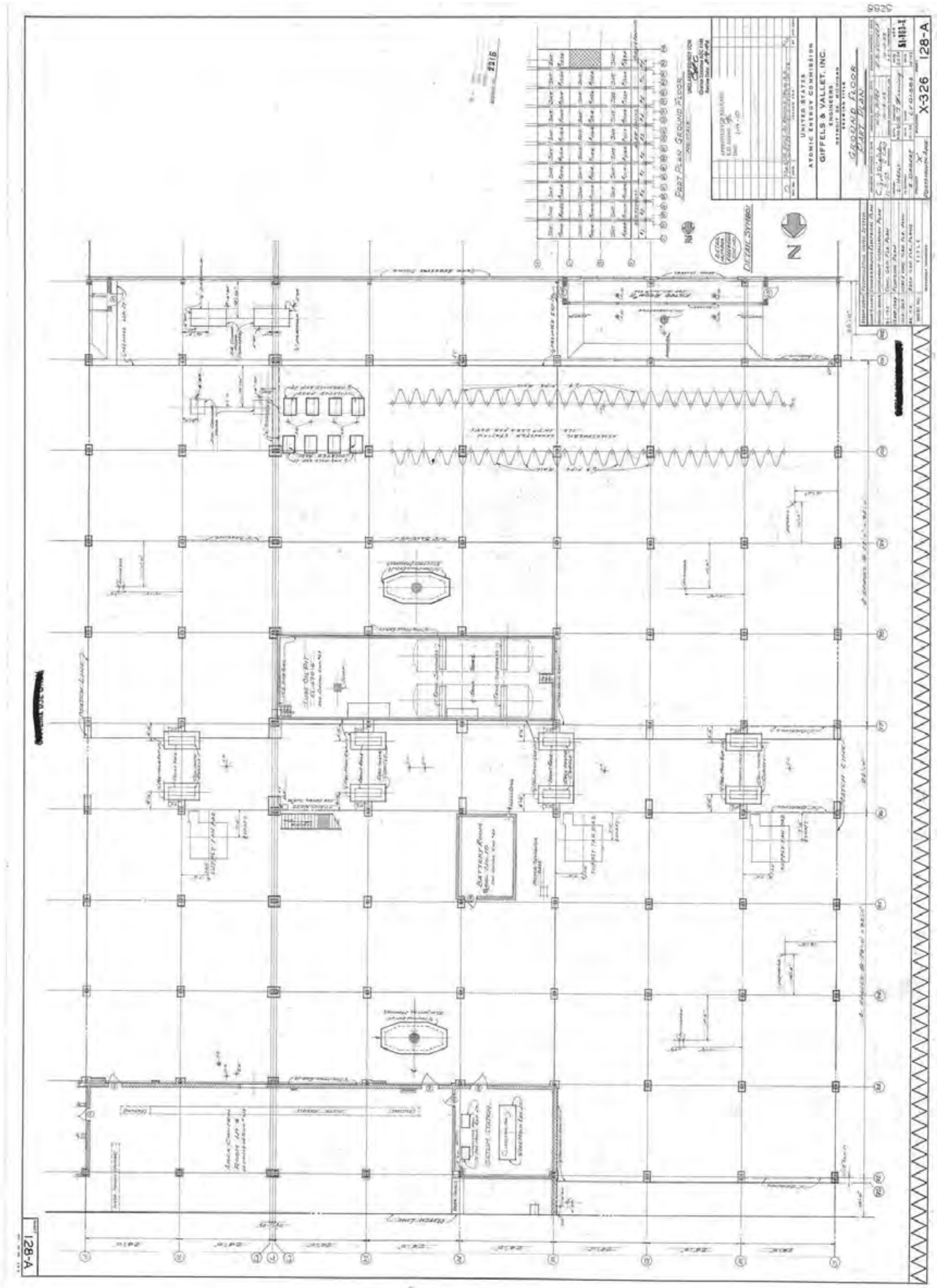


Figure 23: Ground Floor Part Plan

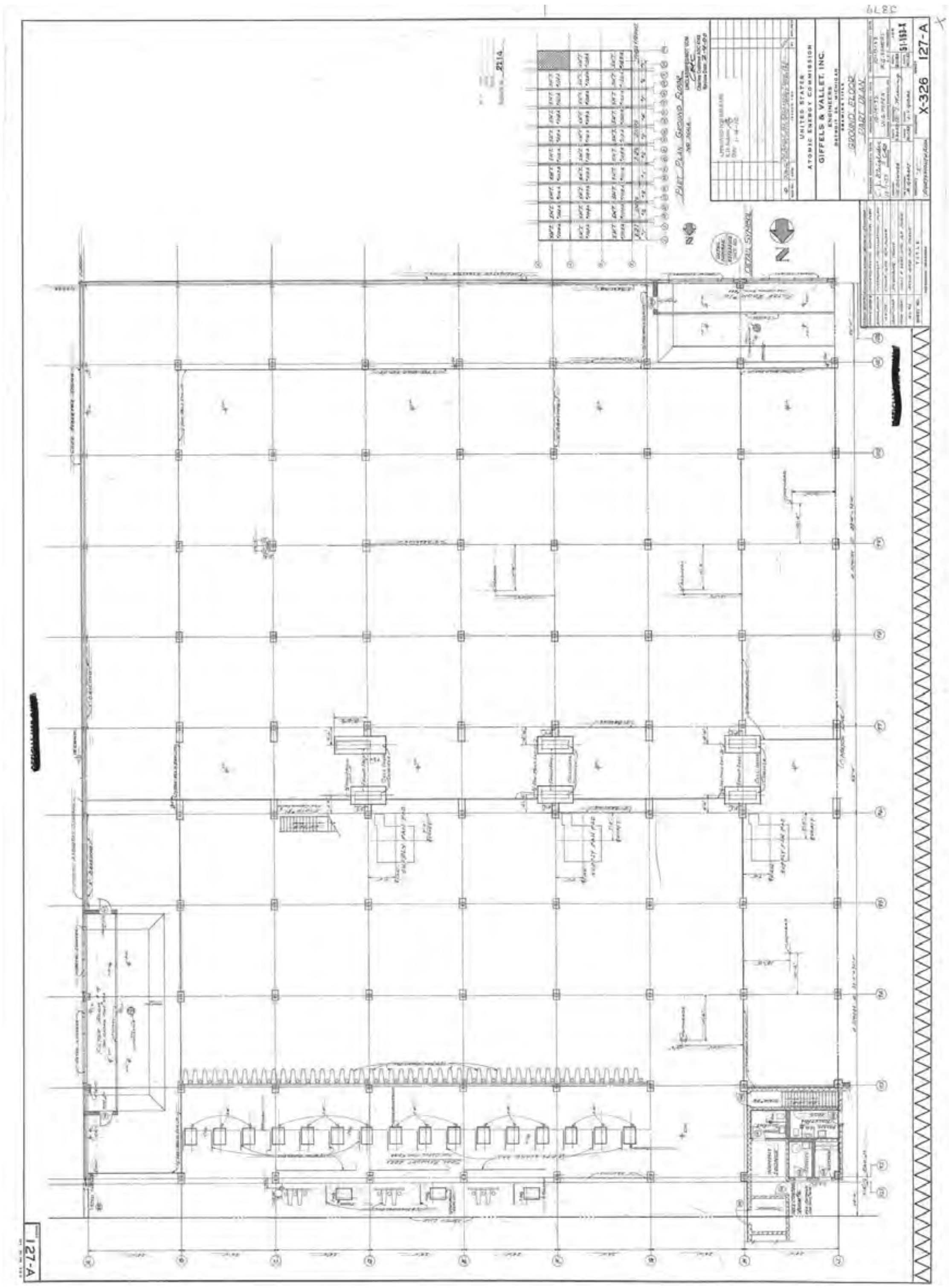


Figure 24: Ground Floor Part Plan

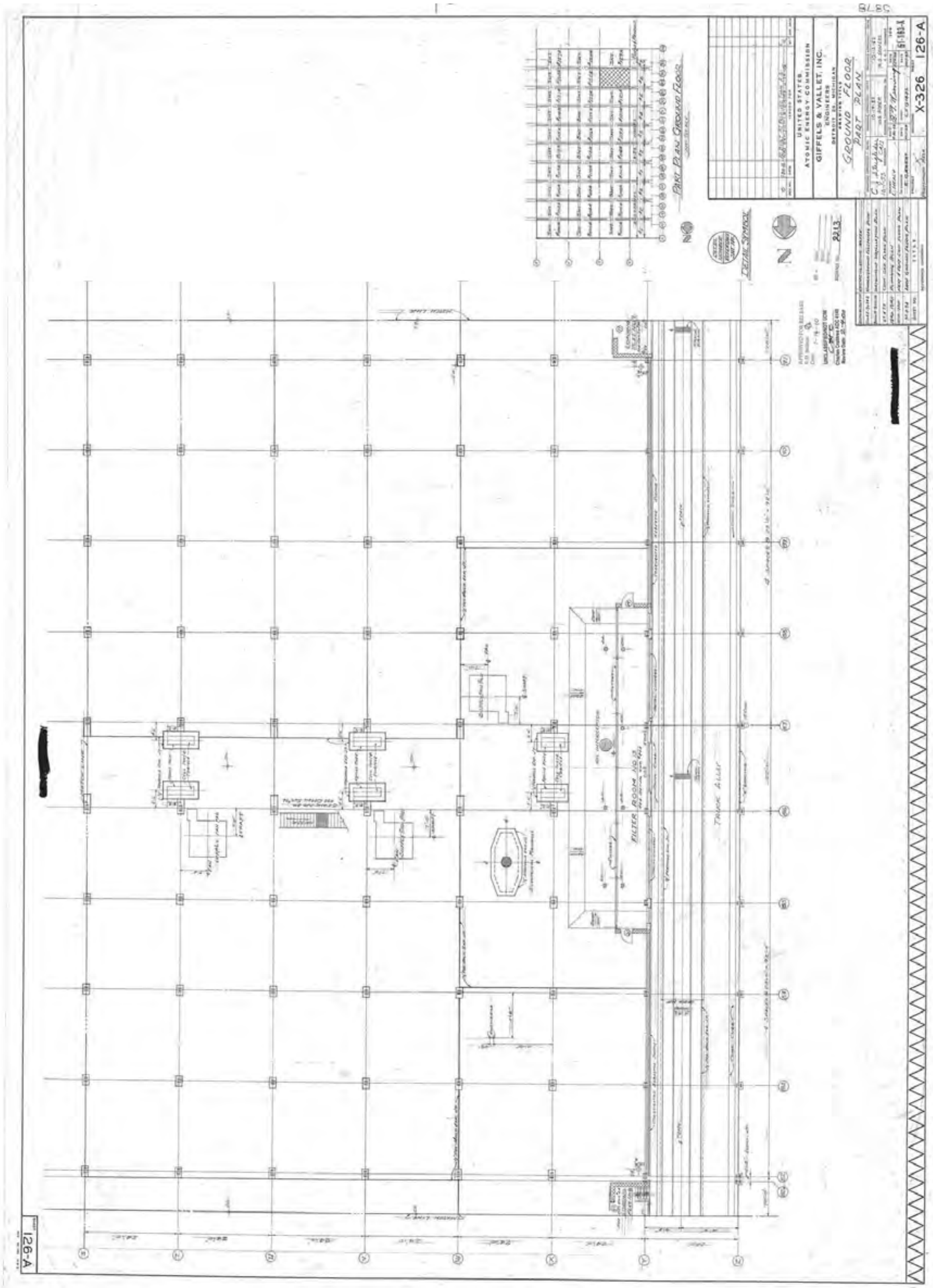


Figure 25: Ground Floor Part Plan

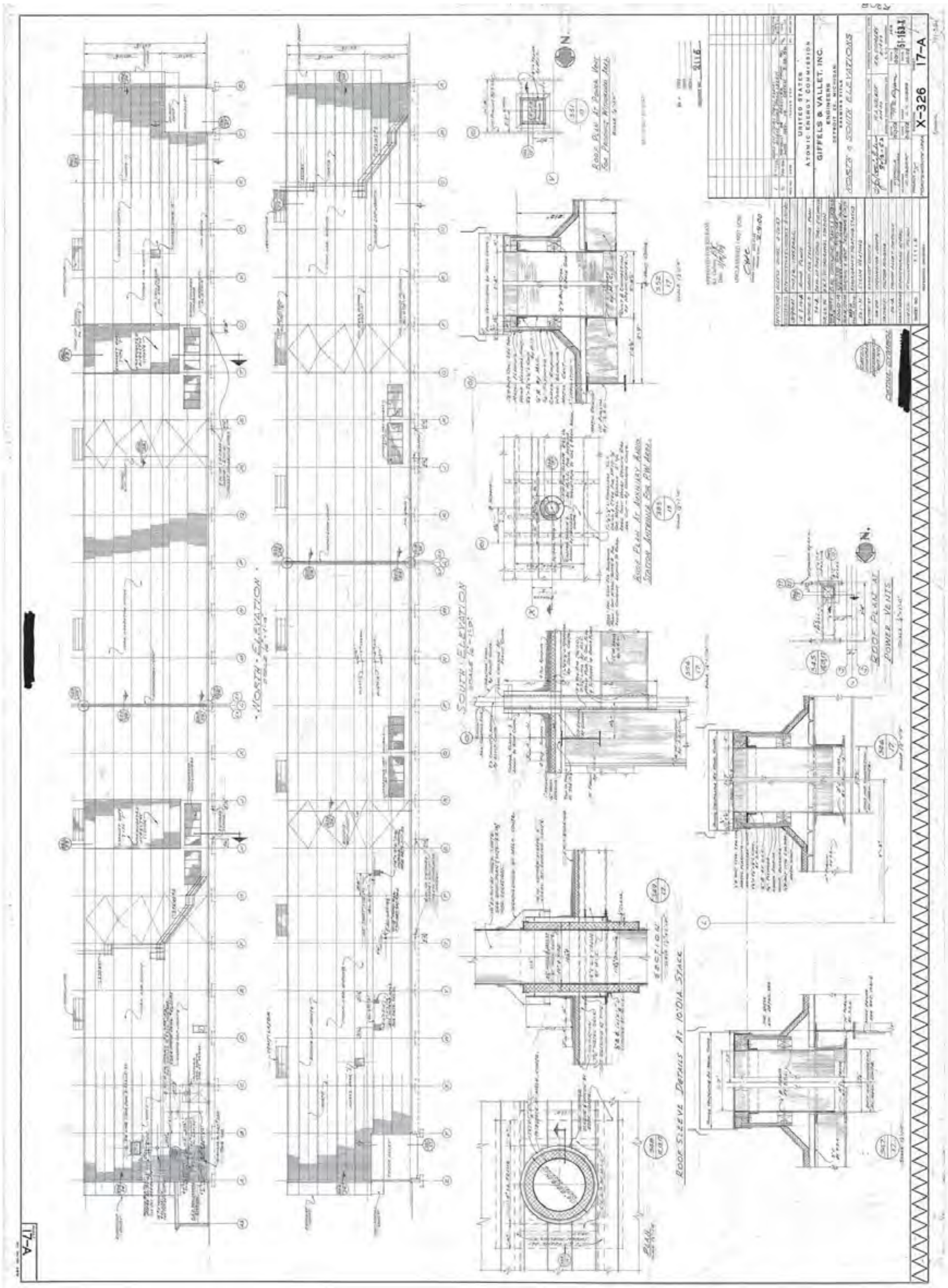


Figure 26: North and South Elevations

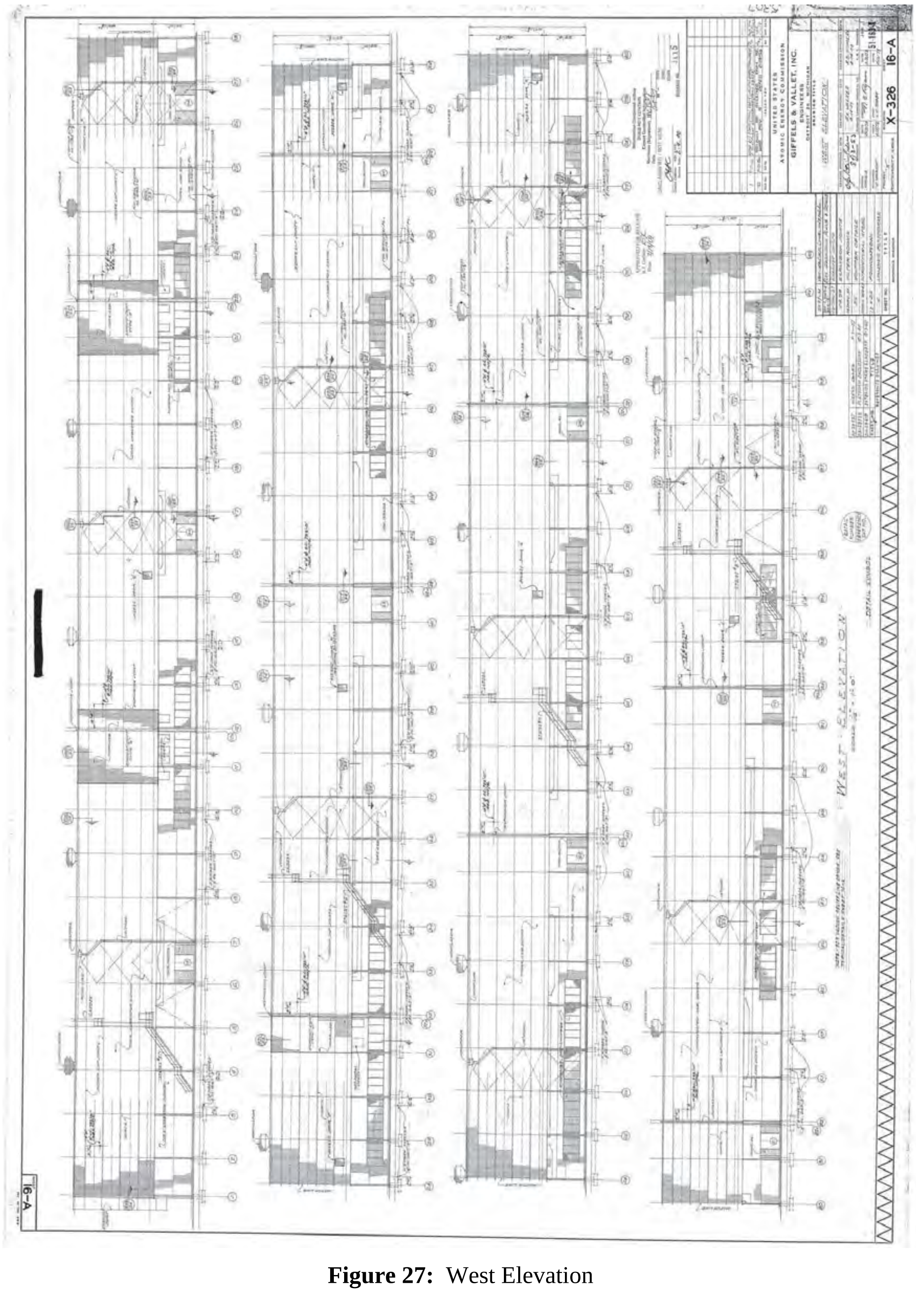


Figure 27: West Elevation

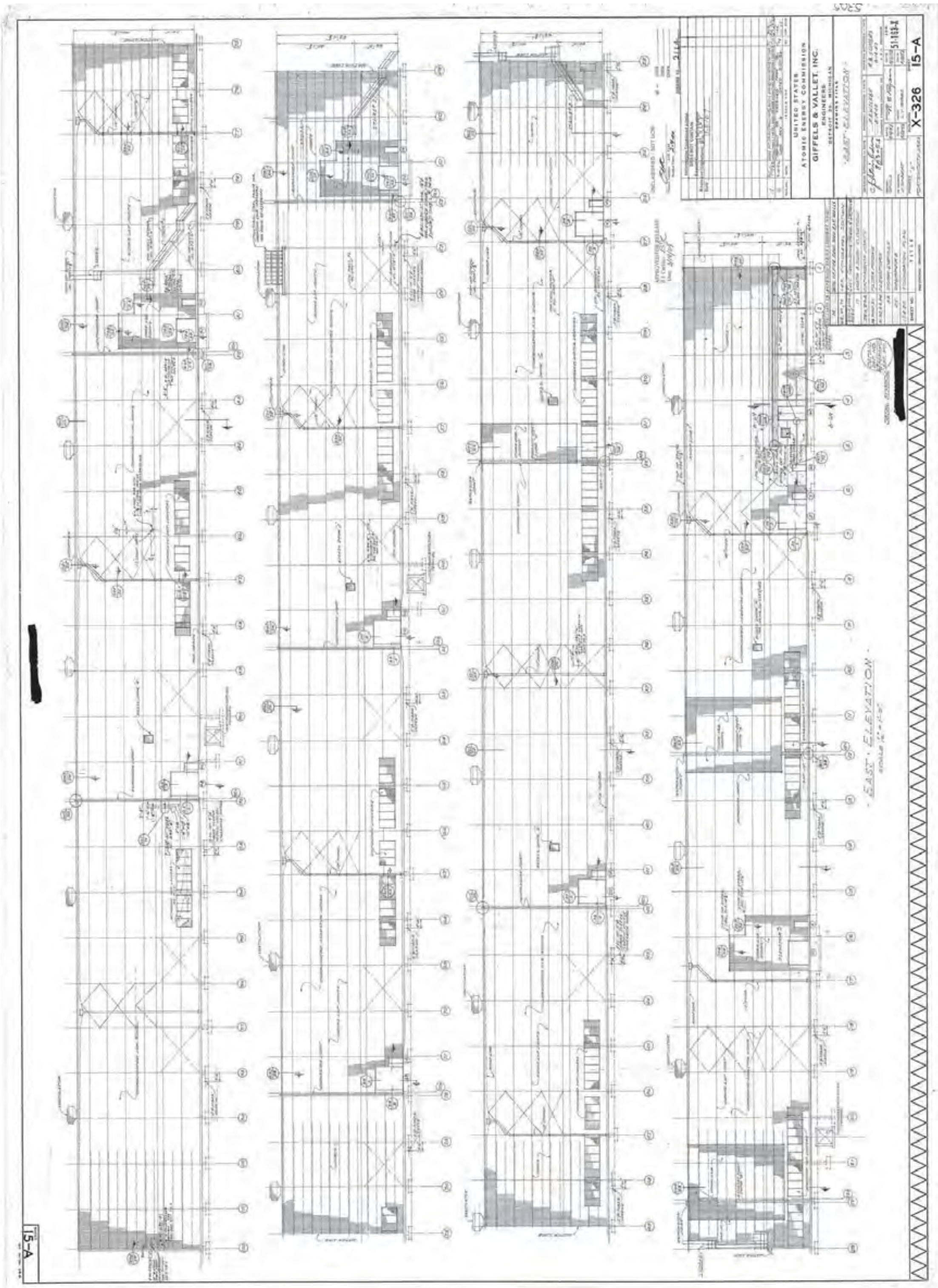


Figure 28: East Elevation

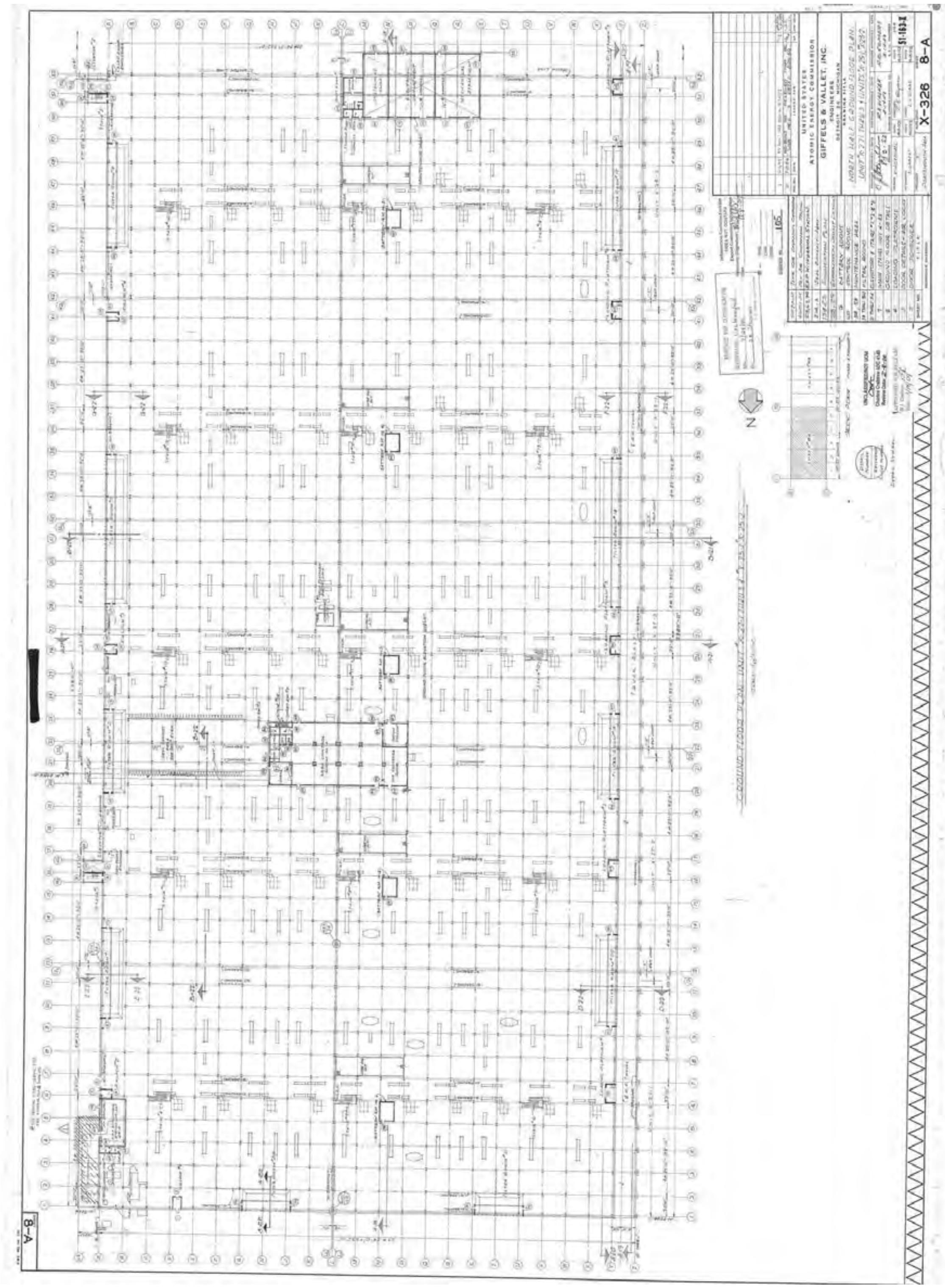


Figure 29: North Half Ground Floor Plan

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-330 PROCESS BUILDING
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-D
HAER OH-142-D

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-330 PROCESS BUILDING

HAER No. OH-142-D

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-330 Process Building is located at Ohio State Plane South coordinates at easting 1826240.272329 ft, northing 370619.269871948 ft and at Universal Transverse Mercator Zone 17N easting 326789.5391 m, northing 4320511.599 m. The coordinate represents the approximate center of the X-330 Process Building. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1955
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission (AEC) oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy (DOE) was established, overseeing operations at PORTS.
Present Use:	Uranium enrichment no longer occurs within the X-330 Process Building. The building is no longer in use and is awaiting demolition.
Significance:	The X-330 Process Building housed process equipment for the intermediate phase of uranium enrichment, enriching to levels between those of X-333 and X-326, the lower and upper ends of the PORTS diffusion cascade. This building is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium (HEU) by the gaseous diffusion process for defense/military purposes. Uranium was enriched at PORTS from 1954 until May 2001. PORTS enriched uranium for the longest period of time and to the highest levels within the DOE complex.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-330 Process Building HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-330 Process Building:
The X-330 Process Building was built under a lump-sum subcontract. Peter Kiewit Sons' Construction Company awarded subcontracts for foundation work and underground installations, structural steel, roofing, siding, exterior doors, freight elevators, acoustic tile, refrigeration systems, glass and glazing, and numerous other tasks necessary for the building's operations. Stripping of the building area in preparation for laying the foundation began in November 1952 by Peter Kiewit Sons' Company. The Penker Construction Company began installation of the concrete footings, piers, grade beams, and walls in March 1953. Approximately 19,000 cubic yards of concrete and 920 tons of reinforcing steel were used in this work, which was complete by November 1953. Pouring of the ground floor slab was completed in February 1954.

The R. C. Mahon Company furnished and erected approximately 23,000 tons of structural steel. Construction of the steel structure began in May 1953 at the north end of the building and proceeded toward the south. Brown and Kerr installed the metal roof deck and built-up roofing. These activities began in July 1953 and were complete by April 1954. Furnishing and installation of all corrugated cement-asbestos siding and related work was performed by Standard Asbestos Manufacturing and Insulating Company. This work was completed during July 1953 through February 1954.

Peter Kiewit Sons' Company laid masonry blocks, face tiles, and ceilings from September 1953 through April 1954. Subcontracts were awarded for tasks such as lathing, plastering, painting, and the installation of tile ceilings, ceiling suspension systems, and exterior doors. Installation of interior electrical systems, plumbing, heating and ventilation, air conditioning, and alarm systems was complete by December 1954, as was the installation of air drying equipment, compressors, motors, converters, process gas and auxiliary piping, and instrumentation. The building was completed and turned over to the AEC in July 1955.

Historical photographs for the X-330 Process Building are provided in Appendix B (Figures 6 through 31). Historical drawings of building plans are provided in Appendix C (Figures 32 through 42).

Part II. Site Information

Description of the X-330 Process Building:
The X-330 Process Building is located just west of the X-333 Process Building and just north of the X-326 Process Building. The X-330 Process Building housed the intermediate phase of the uranium enrichment process. The uranium enrichment process was initiated in the X-333 Process Building and then continued in series to the X-330 and X-326 Process Buildings. The X-330 Process Building was used for the intermediate phase of uranium enrichment and for the withdrawal of waste materials, known as "tails." Uranium was enriched at PORTS until May 2001. From the end of the Cold War in 1991 until production ceased in 2001, PORTS produced only low enriched uranium (LEU) for commercial power plants.

Like the other two process buildings (X-333 and X-326), the equipment in the X-330 Process Building was on two floors, with the auxiliary equipment, support equipment, and control rooms on the first floor, also known as the operating floor or ground floor. The diffusion process equipment was located on the second floor, known as the cell floor. Two Area Control Rooms are located on the first floor. A basement is located below each Area Control Room and provides access to the underground instrument tunnel system.

Measuring 2,176' long by 640' wide, the X-330 Process Building has a combined floor space of 64 acres (two stories) (Appendix A, Figures 1 through 5). It is the second largest of the three process buildings at PORTS. The building stands 66' in height and includes the cell floor at 22', 6" above the ground floor level. The cell floor supports the operating equipment for the many cells that occupy the building.

The design of the X-330 Process Building is based on the C-331 Building at Paducah, KY, PORTS "sister" facility that was completed one year prior to PORTS. The X-330 Process Building is comprised of 11 building units, which house the X-29 and X-31 Facilities. The 11 units are divided by transverse roller-type expansion joints spaced at intervals of 196'. Altogether there are 22 bays across the length of the X-330 Process Building. The framing is arranged to provide an open span of 75'. A travelling crane spans the width of the building.

Engineers designed the X-330 Process Building specifically to house gaseous diffusion equipment, process auxiliaries, and support equipment. Process auxiliaries (e.g., steam, nitrogen and dry air distribution; coolant transport and recovery; heating and ventilation; electrical power) are ancillary systems used to facilitate the primary enrichment process. Support equipment (e.g., computer and communication equipment, sanitary and sewage utilities, security equipment) assist in process building operations, but are not directly associated with the enrichment process. Like the other two process buildings, the exterior of the X-330 Process Building is covered with large, white, corrugated cement asbestos tiles, also known as transite tiles. There are no windows in the building; however, "port holes" within the building can be propped open to allow air flow. Large vents are positioned atop the roof, which consists of a flat metal deck that is covered with insulation and gravel.

The building also includes a depressed truck alley with a railroad spur imbedded in the paving. The alley and spur enter the building at the northwest corner. The truck alley and the railroad spur were used for the delivery and pickup of process equipment. The cell floor extends over the truck alleys, and hatches under each crane bay allowed heavy process equipment to be lifted to the cell floor for installation or storage. Additional truck access doors are located along the other three sides of the building.

The metal roof deck is supported by steel trusses over the crane bays and by steel beams and framing over the pipe galleries. Engineers designed the framing for the building to withstand wind loads of 20 pounds per square foot and live loads on the roof at 30 pounds per square foot.

Part III. Operations and Process

A. Operations:

At PORTS, uranium was enriched using a process called gaseous diffusion. Through the process of diffusion, gaseous uranium hexafluoride (UF_6) is passed through a conversion system to produce enriched, or diffused, uranium-235 and undiffused uranium-238. The process of uranium enrichment increases the proportion of uranium-235 to that of uranium-238. Enriched uranium contains uranium-235 at approximately 4 to 5 percent of the total uranium mass.

The gaseous diffusion process requires the use of UF_6 to separate the uranium-238 and uranium-235 isotopes. During diffusion, UF_6 gas is forced through a series of porous membranes, or "barriers" with microscopic openings. Barriers are used to achieve separation in the gaseous diffusion process. To maximize the amount of separation achieved, the porous barrier material must meet exacting standards so that "diffusive" flow occurs. Uranium-235 moved through the barriers more easily, increasing the concentration of uranium-235 as it moved through the process. The tendency for uranium-235 to pass through the barrier more quickly is the basis for the gaseous diffusion process.

The basic separation equipment for gaseous diffusion is a "stage." At PORTS, a stage consisted of a converter that contains porous separation media, a gas cooler, a compressor to move the UF_6 gas through the converter, and interconnecting piping and control valves to contain and control the gas flows. One stage was capable of only very slight enrichment. Stages operated in a cascading system, and thousands of stages in the process buildings were connected in series to produce HEU. The X-330 Process Building contains 1,100 stages.

Stages were grouped into "cells," which were the smallest groups of stages that could be removed from service, bypassed, and shut down for maintenance or other purposes. There are 10 stages per cell in the X-330 Process Building, and the building housed 110 cells.

Cells were further grouped into "units," which were groups of cells that shared common auxiliary systems. The 110 cells in the X-330 Process Building are grouped into 11 units.

The process equipment, piping, and instrument lines that contained process gas were enclosed by cell housing and bypass housing. The cell housing for the X-330 process equipment has a steel frame and transite siding, and the top of the housing has removable hatches that allow for equipment removal.

Feed material entered the uranium enrichment process at the X-333 Process Building. After cascading through the X-333 Process Building, the uranium enrichment process continued in the X-330 Process Building. The X-330 Process Building contains intermediate sized equipment that is smaller than the equipment in the X-333 Process Building but larger than the equipment in the X-326 Process Building. The two sizes of process equipment in the X-330 Process Building are referred to as the X-31 size (i.e., "00"), which is the larger of the two sizes, and the X-29 size (i.e., "0"), which is the smaller of the two sizes.

In the X-330 Process Building, one unit with X-29 sized equipment and two units with X-31 sized equipment served as the stripping section of the cascade. The stripping section consists of the stages located below the feed point of the cascade. From the X-29 sized unit, waste material was withdrawn from the cascade at the PORTS Tails Withdrawal Station. The PORTS Tails Withdrawal Station is located in the northeast corner of the X-330 Process Building. The waste, or tails, from the gaseous diffusion process consisted of depleted process gas. Depleted process gas from the enrichment process was withdrawn from the gaseous diffusion cascade, compressed, and condensed into a liquid that flowed by gravity to cylinders located on scales. Cranes were used to move these cylinders to cooling areas and load them for transport.

B. First Floor:

The first floor of the X-330 Process Building supports the auxiliary systems, electrical power substations, the control centers for the main process equipment, and numerous enclosed areas that were used for operational purposes. Each of the 11 units includes their own battery rooms and open pits for lube-oil equipment. The south end of the first floor also housed nitrogen plant and the main portion of the plant's dry air production facility. Additionally, the first floor housed the Interim Purge system which was utilized to bring the plant on line prior to completing of the Purge Cascade in X-326. The design of the enclosures for the various rooms within the X-330 Process Building follows the same basic plan as that for the X-326 and X-333 Process Buildings. All building finishes were designed for cleanliness and sanitation.

C. Second Floor (Cell Floor):

All of the process equipment is located on the cell floor. The X-29 equipment contains six units (60 cells and 600 stages) and the X-31 contains 5 units (50 cells and 500 stages). Engineers called for reinforcing of the concrete floor to withstand temperature changes and load transfers at the joints.

The cell floor is divided according to functionality, as well as for expansion. Each of the 11 units includes ten cells of ten operating units, also known as stages. Altogether, the X-330 Process Building houses 1,100 stages. These stages were split into enriching stages and stripping stages. The enriching stages were used to further enrich gaseous UF_6 from the X-333 Process Building, which then entered the X-326 Process Building. The stripping stages were used to remove waste materials from the gaseous diffusion cascade.

The east side of the building includes three booster stations and three freight elevators. The three booster stations were used for increasing the pressure of process gas. Two of the booster stations were dedicated to accelerating the flow of enriched gaseous UF_6. One of these two stations transmitted gas to the X-333 Process Building and the other delivered gas to the X-326 Process Building. The third booster station was used to boost the stream of depleted UF_6 gas to X-333.

Access between the ground and cell floors was facilitated by steel stairways, ladders, platforms, and catwalks. Each building unit features three sets of stairs. Each of the 22 bays includes its own electric, overhead crane. Each crane has a lifting capacity of 15 tons.

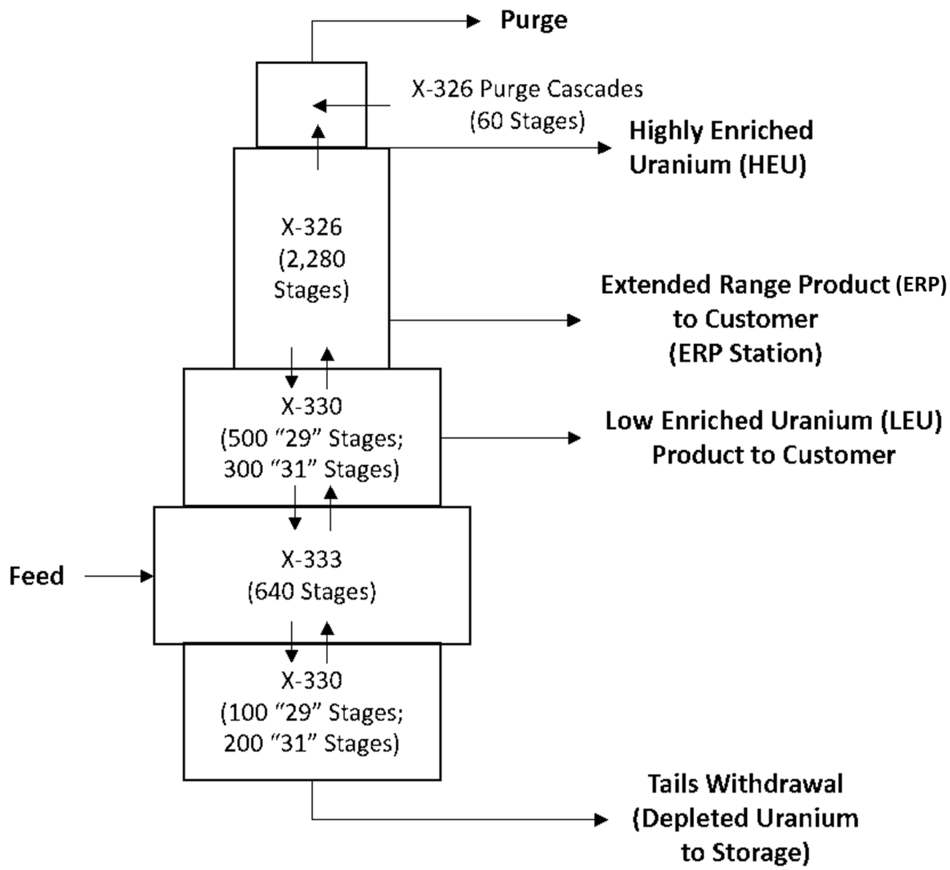
The evacuation system within the X-330 Process Building provided a means for the removal of process gas and light gas contaminants. Evacuation piping is connected to the process piping at each cell and extends to the cold-trapping and surge-drum storage facilities on the first floor of the building. An evacuation station is connected to the evacuation piping. At the evacuation station, process gas and air was withdrawn from the piping and equipment, and pumped into cold-traps or into storage.

Gas evacuated from the system entered into a recovery process. The gas recovery system (Cold Recovery) solidified the UF_6 while venting the light gas impurities. The recovered UF_6 was returned to a gaseous state to be held in drums and later returned to the diffusion cascade.

Steam was supplied to the X-330 Process Building in order to heat the process gas pipe enclosures, the cell enclosures, and the interplant process gas tie-line enclosures. A steam heating system was used to prevent the gas from condensing inside the process piping. In emergency situations, the temperature of the cell enclosures could be increased using unit heaters. A heater could provide heat to five cells and the heating system could heat ten cells simultaneously. The uranium enrichment process was initiated in X-333 Process Building and continued in series to X-330 and X-326 Process Buildings. Materials were withdrawn from the cascade at the following four locations:

- X-326 Product Withdrawal Station (90 to 97 percent uranium-235 during HEU production, 2.0 to 5.0 percent uranium-235 during LEU production)
- X-326 Extended Range Product Station (0.7 to 5.0 percent uranium-235)
- X-333 Low Assay Withdrawal Station (1.0 to 5.0 percent uranium-235)
- X-330 Tails Withdrawal Facility (0.2 to 0.3 percent uranium-235 and 1.0 to 5.0 percent uranium-235).

A diagram showing the gaseous diffusion “cascade” at PORTS is shown below.



PORTS Gaseous Diffusion “Cascade”

Part IV. Sources of Information

Benedict, Mason and Clarke Williams. *Engineering Developments in Gaseous Diffusion Process*. New York: McGraw-Hill Books Company, Inc., 1949.

Department Of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

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Department Of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3, Piketon, OH: U.S. Department of Energy, 2014.

Department Of Energy. *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0207&D4. Piketon, OH: U.S. Department of Energy, October 2011.

Department Of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio,* DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Department Of Energy. Highly *Enriched Uranium: Striking a Balance, A Historical Report on the United States Highly Enriched Uranium Production, Acquisition, and Utilization Activities from 1945 to September 30, 1996*, Revision 1. Washington, D.C.: National Nuclear Security Administration, U.S. Department of Energy, 2001.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Portsmouth Gaseous Diffusion Plant Virtual Museum – accessed at http://www.portsvirtualmuseum.org/ operated and managed by Fluor-BWXT Portsmouth for DOE.

Appendix A: Survey Photographs

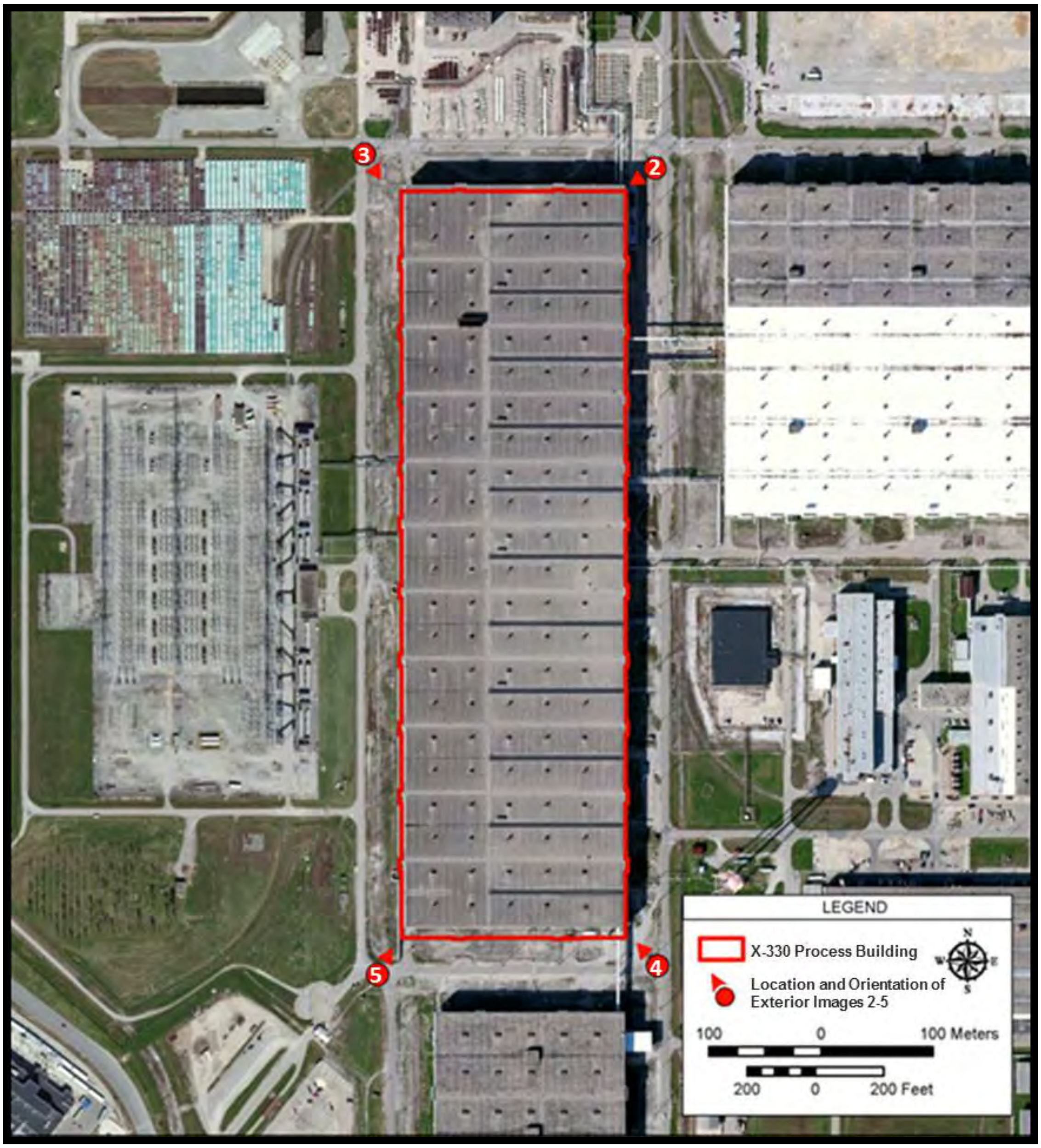


Figure 1: Location and Orientation of Exterior Photographs (Figures 2 through 5)

Figure 2: North Side of the X-330 Process Building, August 2014, Facing Southwest

Figure 3: North Side of the X-330 Process Building, August 2014, Facing Southeast

Figure 4: South Side of the X-330 Process Building, August 2014, Facing Northwest

Figure 5: South Side of the X-330 Process Building, August 2014, Facing Northeast

Appendix B: Historical Photographs

Figure 6: Steel Framework of the X-330 Process Building, June 1953

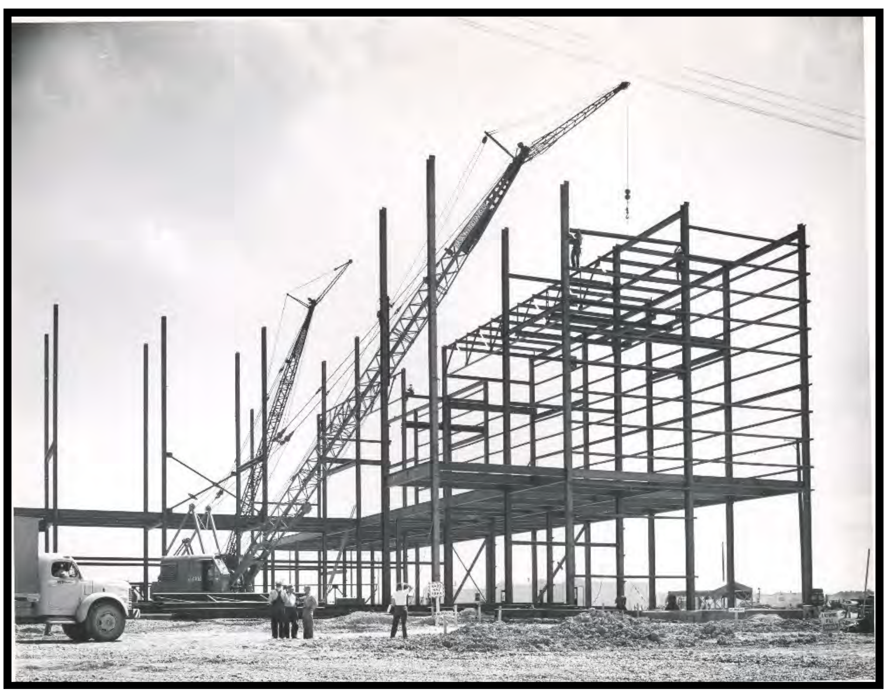


Figure 7: Steel Framework of the X-330 Process Building, June 1953

Figure 8: Grading and Construction for the X-330 Process Building, June 1953

Figure 9: Steel Framework Construction of the X-330 Process Building, August 1953

Figure 10: Foundation Construction of the X-330 Process Building, August 1953

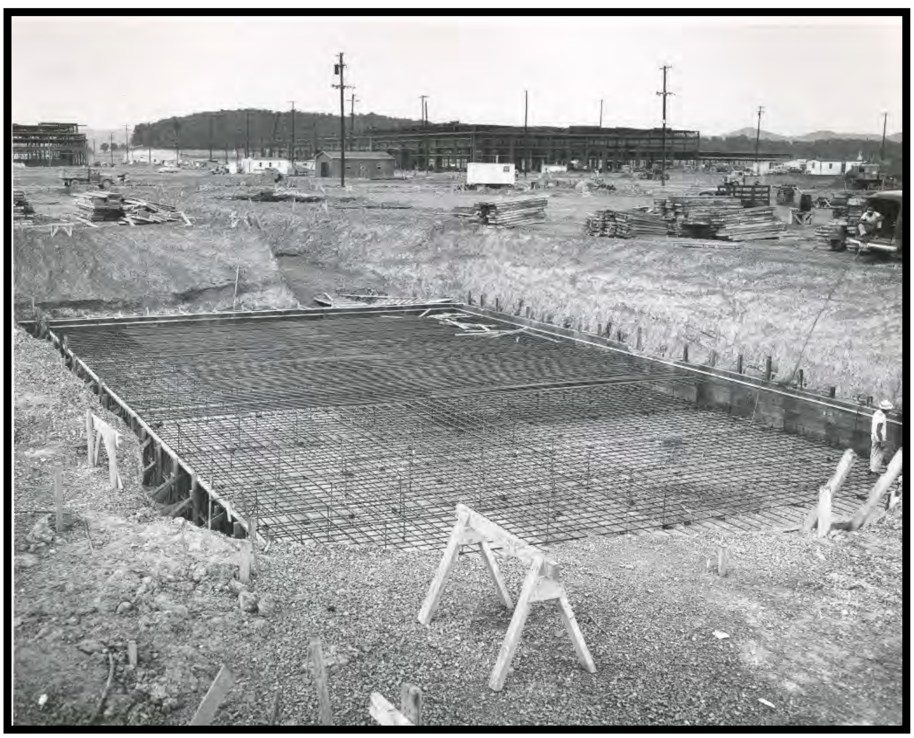


Figure 11: Foundation Construction of the X-330 Process Building, August 1953

Figure 12: Foundation Construction of the X-330 Process Building, August 1953

Figure 13: Foundation Construction of the X-330 Process Building, August 1953

Figure 14: Foundation Construction of the X-330 Process Building, August 1953

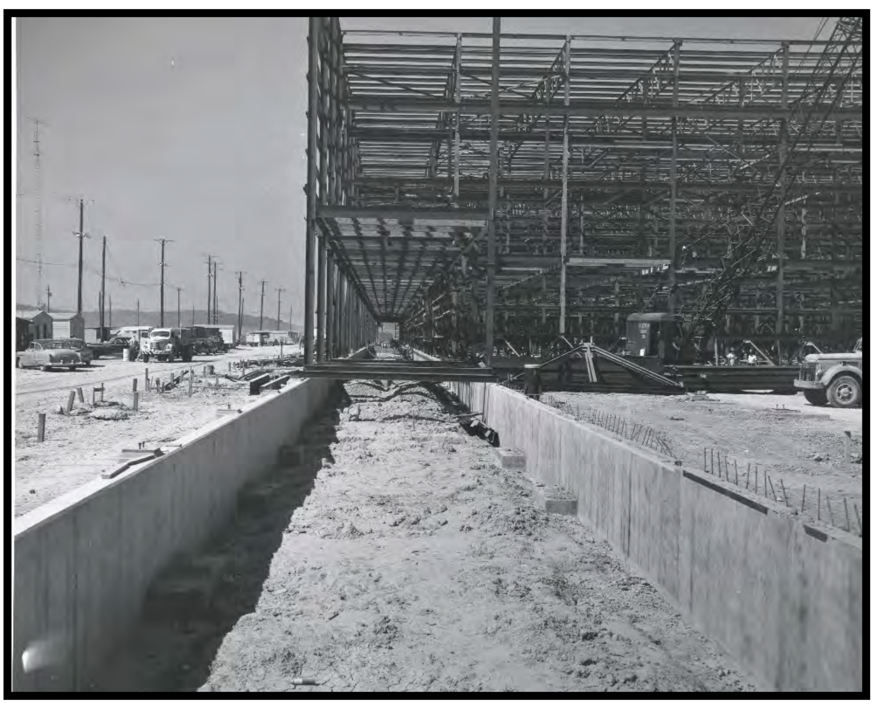


Figure 15: Foundation Construction of the X-330 Process Building, August 1953

Figure 16: Excavation and Grading Work for the X-330 Process Building, August 1953

Figure 17: Foundation Construction of the X-330 Process Building, August 1953

Figure 18: Foundation Construction of the X-330 Process Building, August 1953

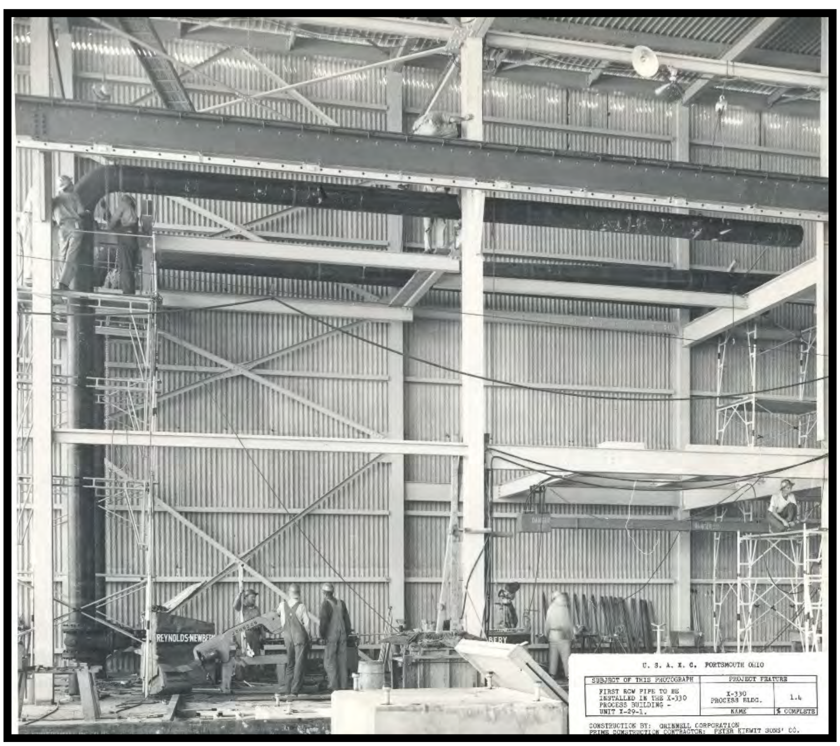


Figure 19: Construction of Unit 29-1 in the X-330 Process Building, August 1953

Figure 20: Looking North at the Construction of the X-330 Process Building, August 1953

Figure 21: Looking East at the Interior of the X-330 Process Building, August 1953

Figure 22: Foundation Construction of the X-330 Process Building, September 1953

Figure 23: Foundation Construction of the X-330 Process Building, September 1953

Figure 24: Construction of the X-330 Process Building, October 1953

Figure 25: Construction of the X-330 Process Building, January 1954

Figure 26: Cell Floor Construction of the X-330 Process Building, January 1954

Figure 27: Cell Floor Construction of the X-330 Process Building, January 1954

Figure 28: Cell Floor of the X-330 Process Building, January 1954

Figure 29: Converter Installation in the X-330 Process Building, February 1954

Figure 30: Looking West at the Cell Floor of the X-330 Process Building, February 1954

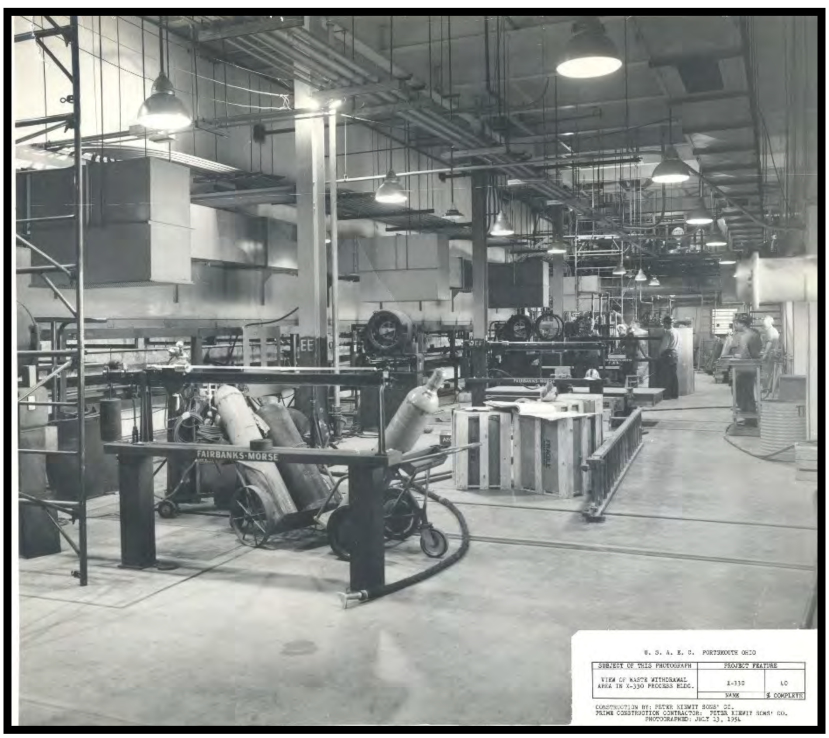


Figure 31: Waste (Tails) Withdrawal Area in the X-330 Process Building, July 1954

Appendix C: Historical Drawings

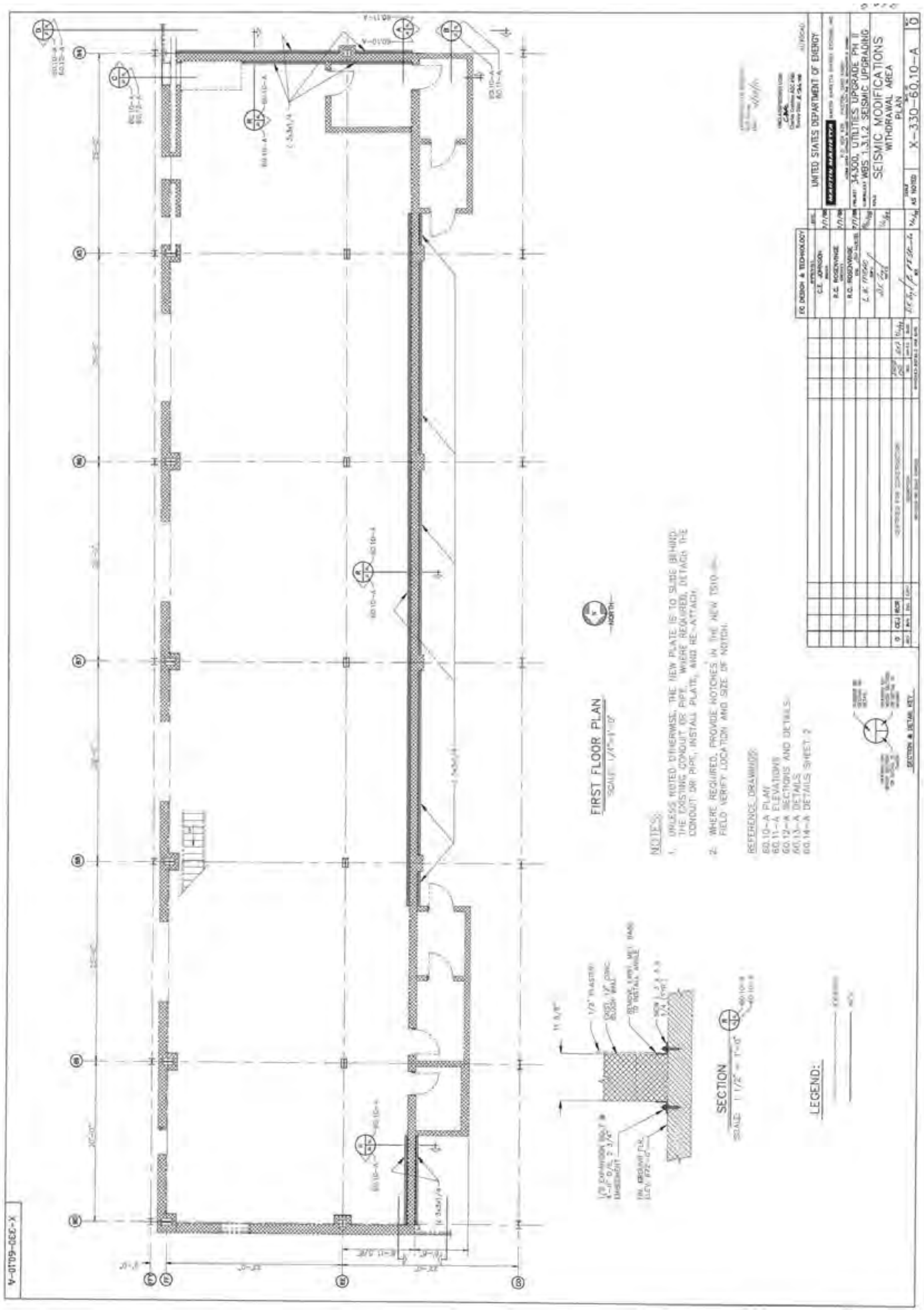


Figure 32: Seismic Modifications

Figure 33: Building Access Plan - North

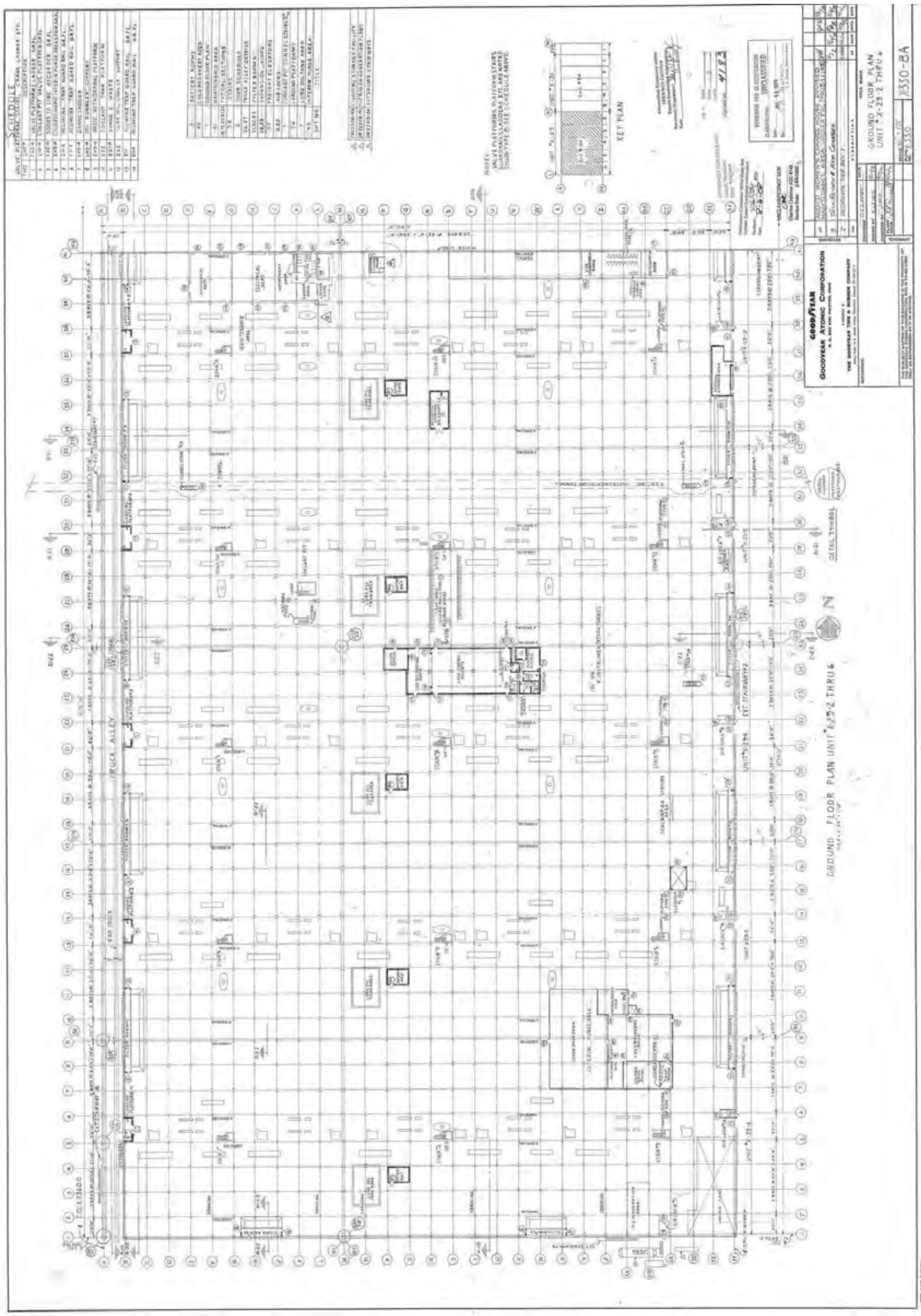


Figure 34: Ground Floor Plan

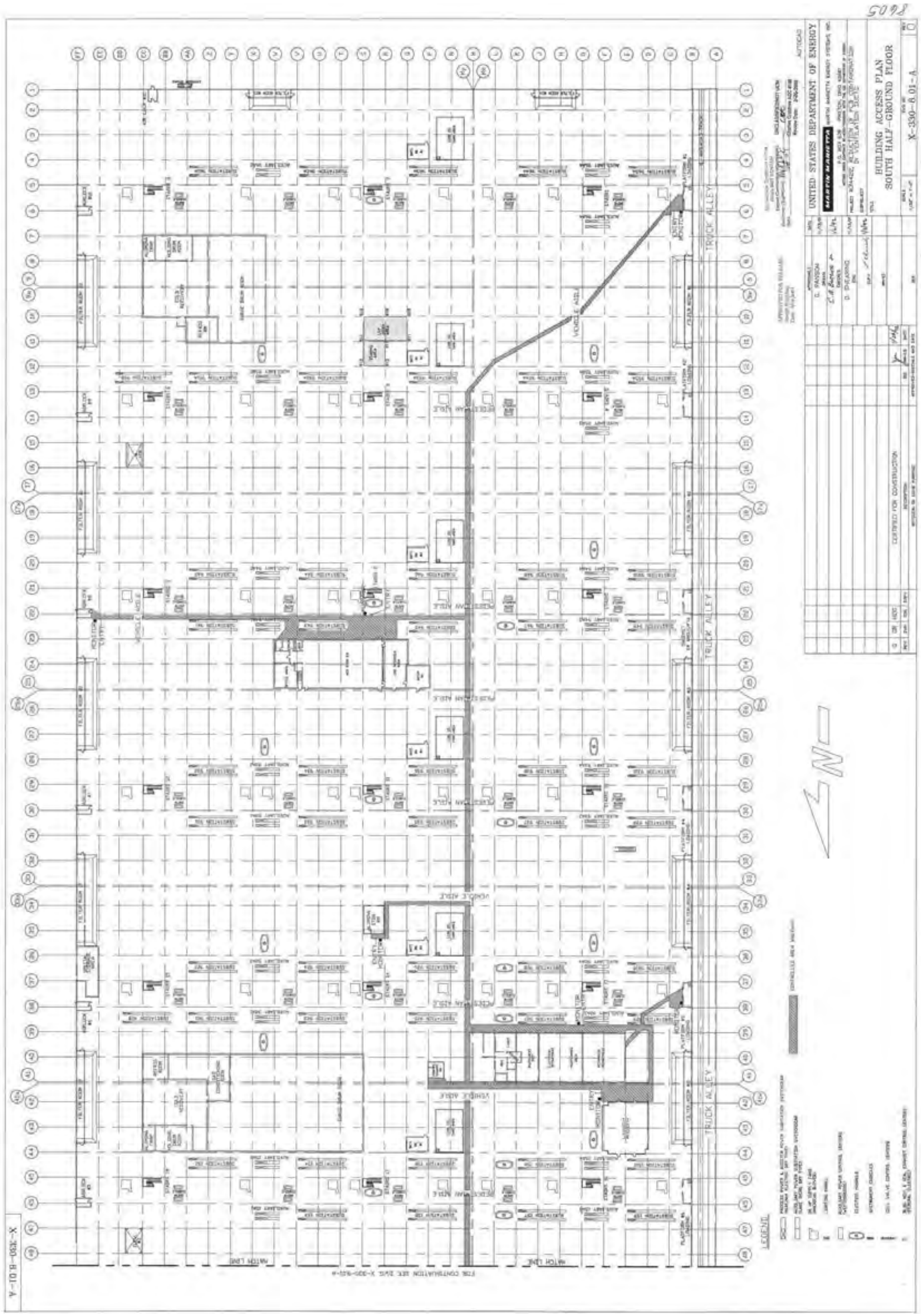


Figure 35: Building Access Plan - South

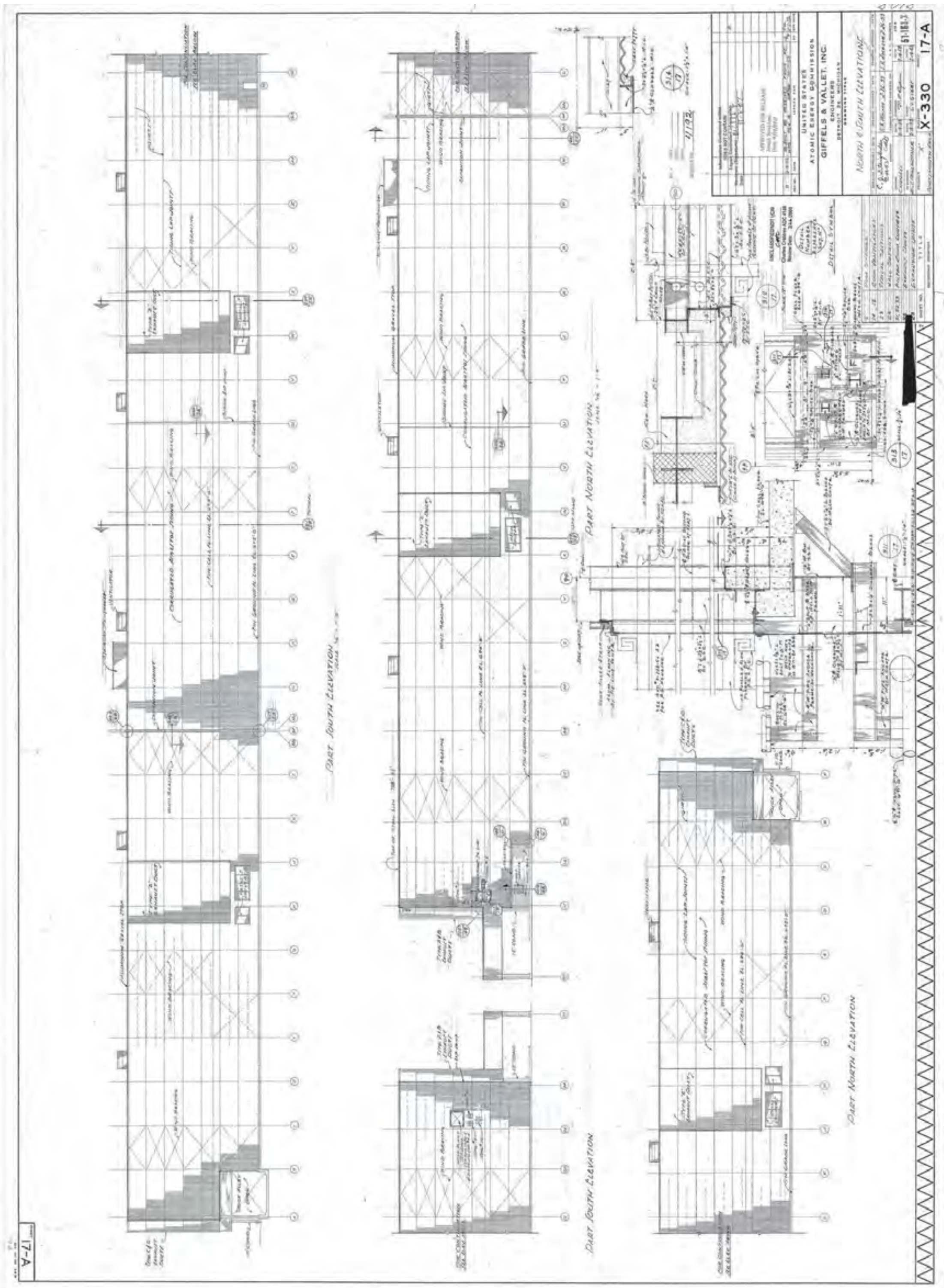


Figure 36: North and South Elevations

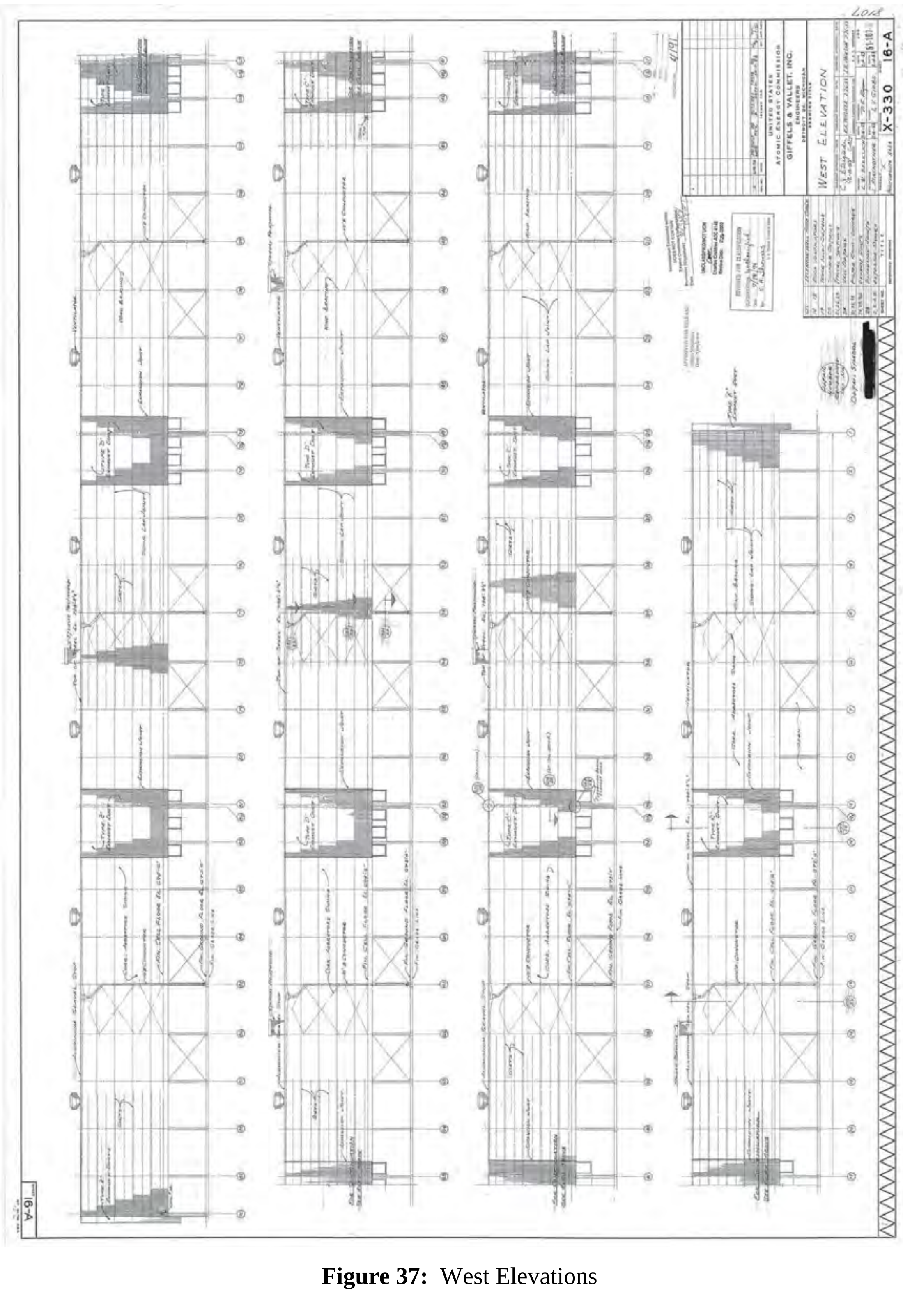


Figure 37: West Elevations

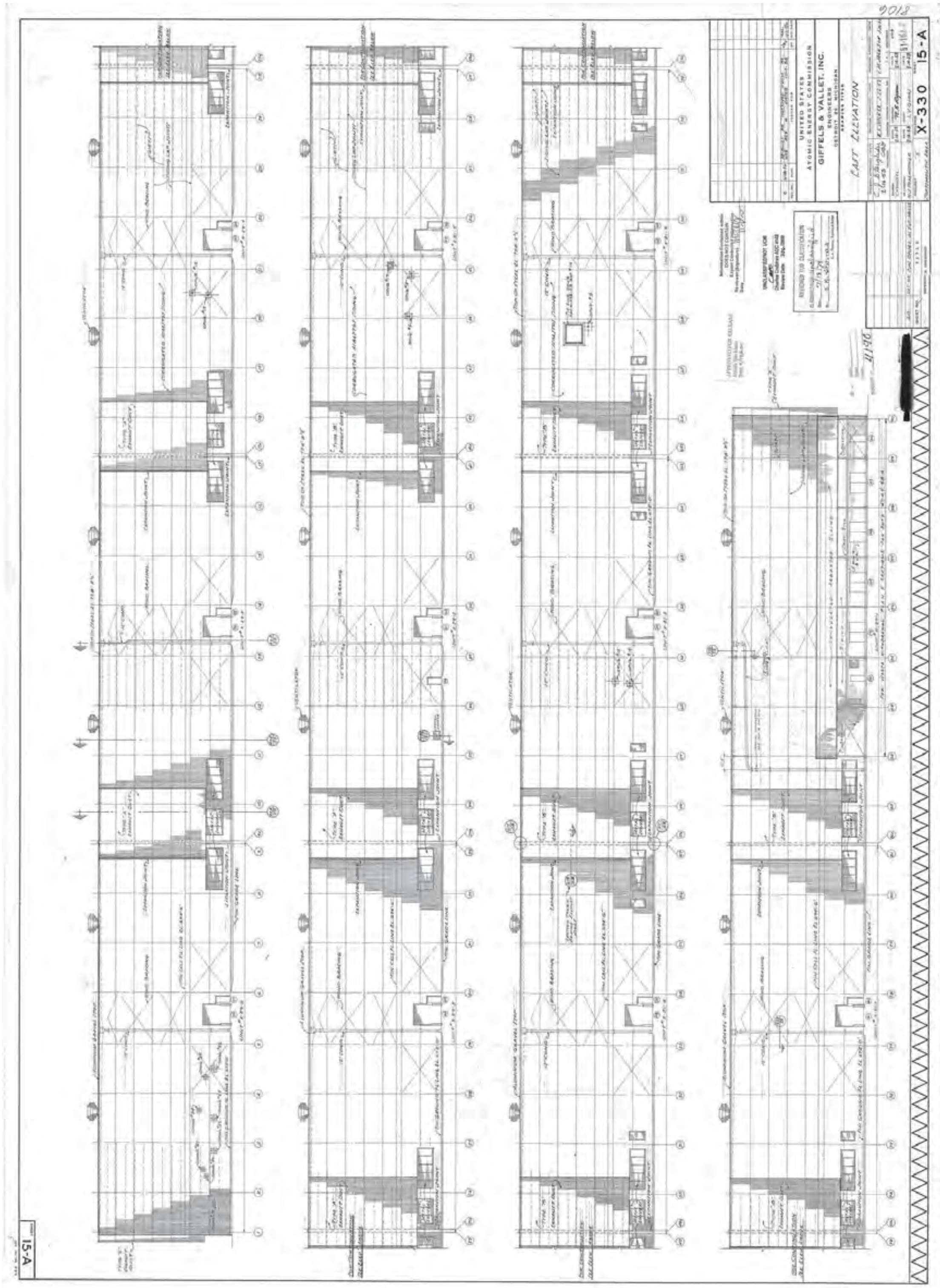


Figure 38: East Elevations

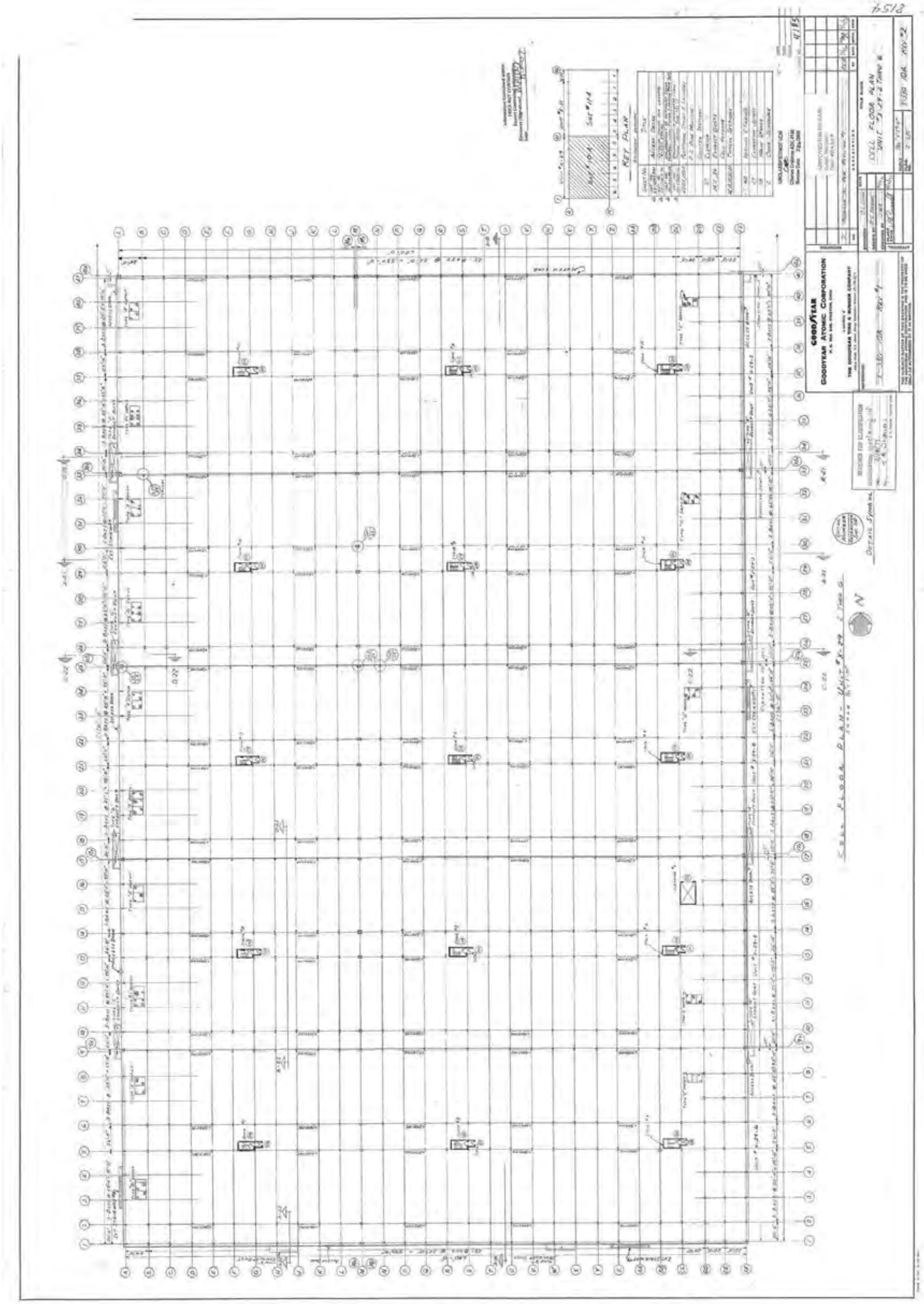


Figure 39: Cell Floor Plan

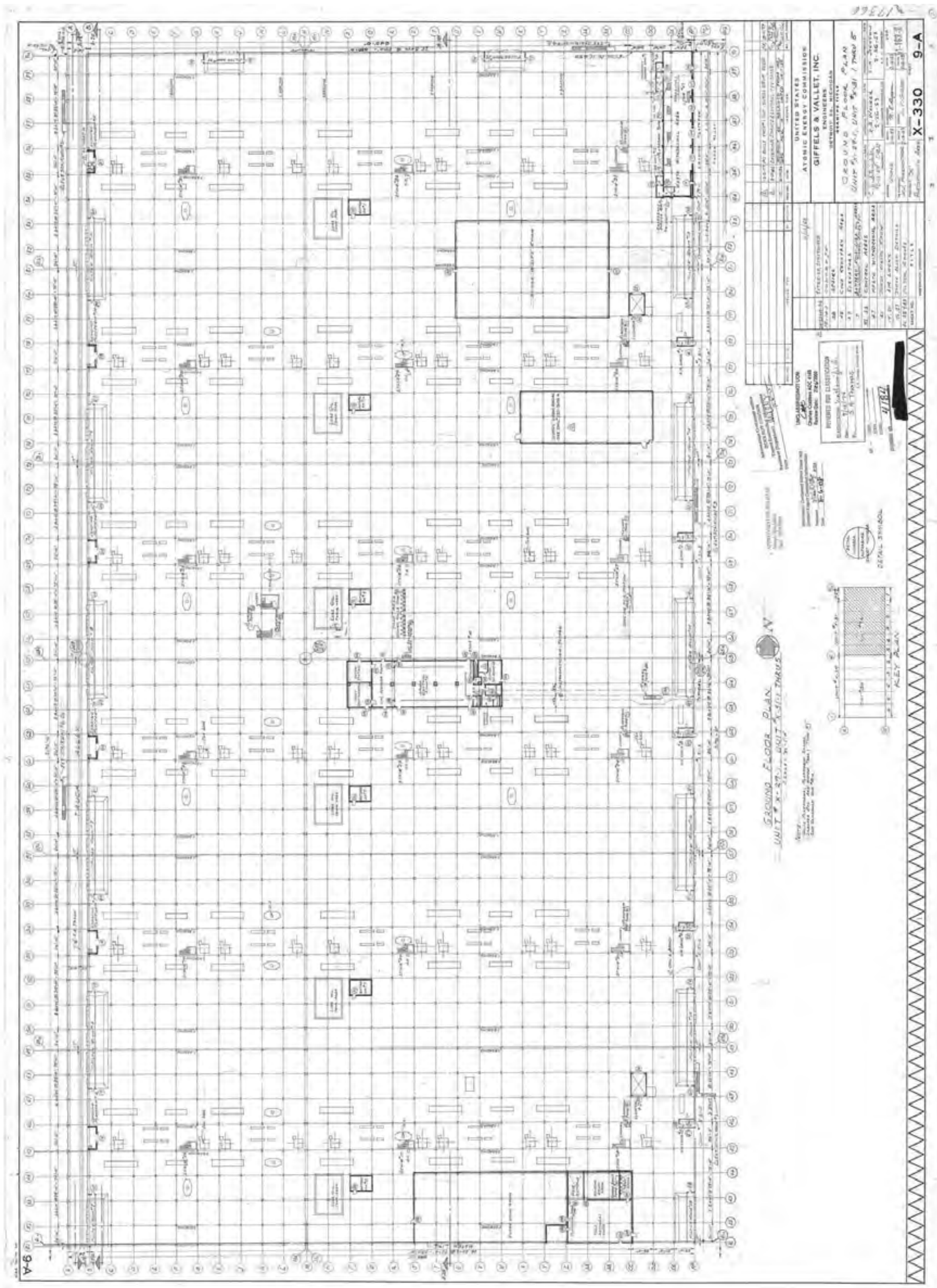


Figure 40: Ground Floor Plan

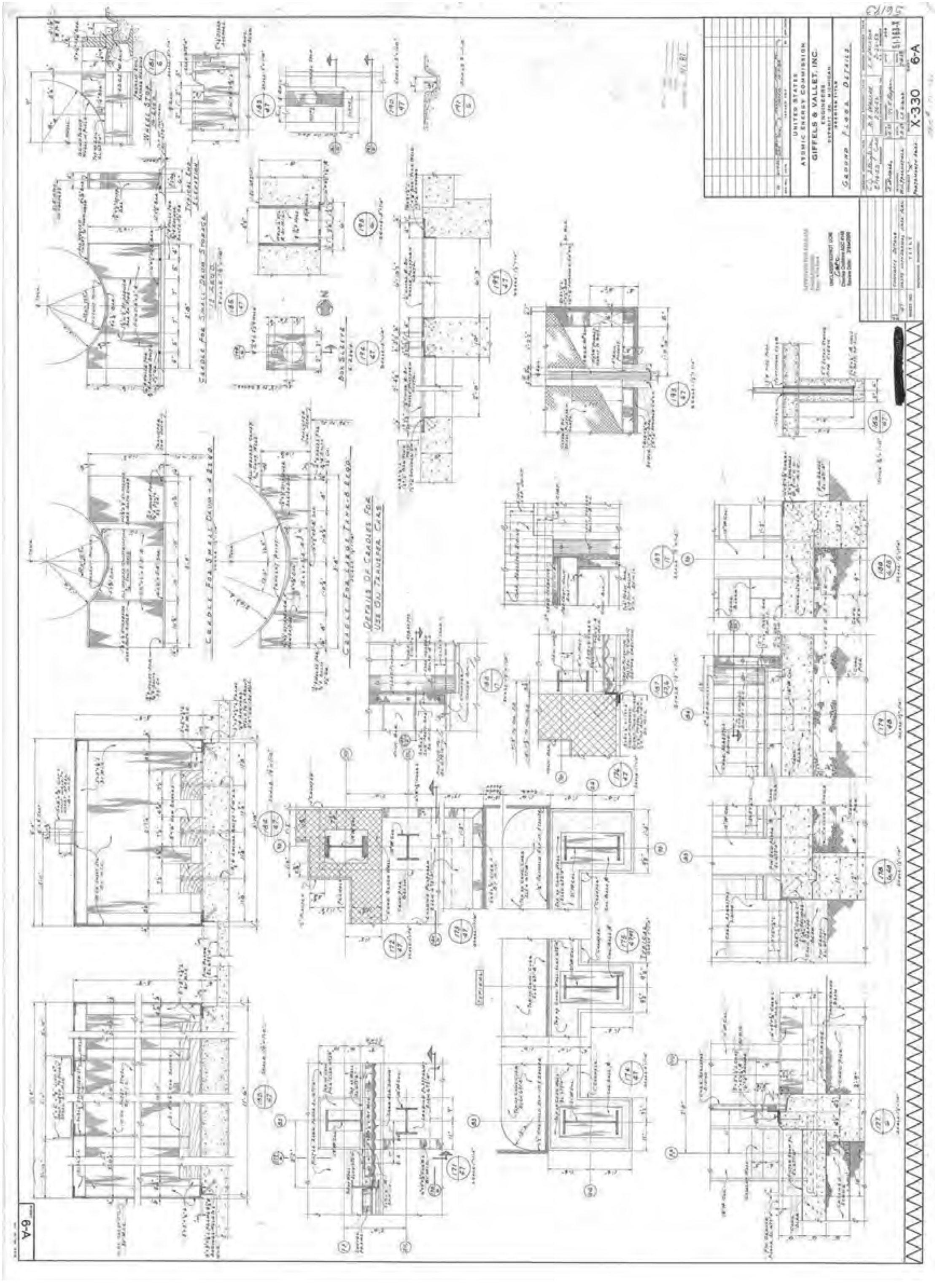


Figure 41: Ground Floor Details

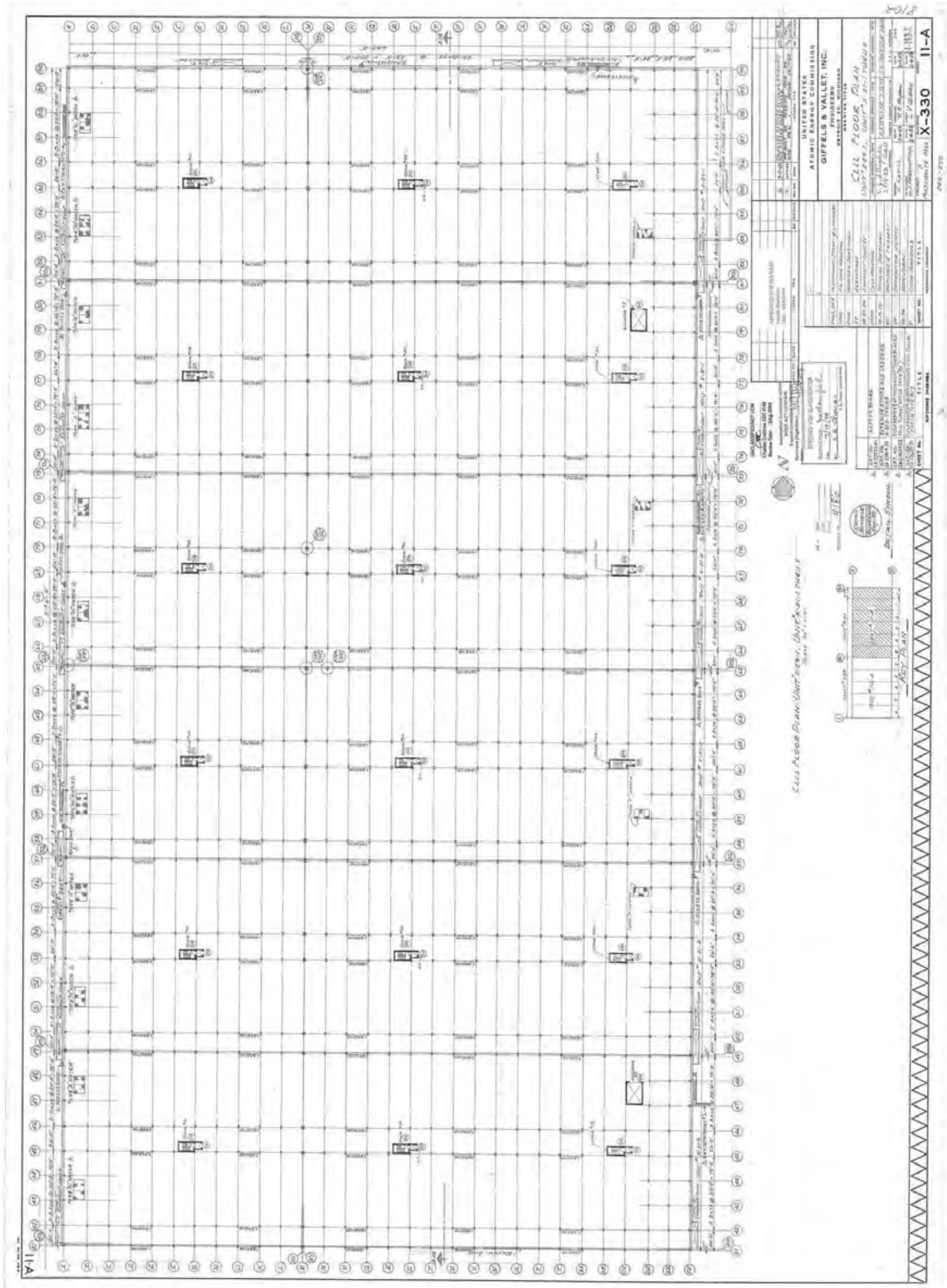


Figure 42: Cell Floor Plan

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-333 PROCESS BUILDING
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-E
HAER OH-142-E

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-333 PROCESS BUILDING

HAER No. OH-142-E

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-333 Process Building is located at Ohio State Plane South coordinates at easting 1827545.162650 ft, northing 371204.126471854 ft and at Universal Transverse Mercator Zone 17N easting 327190.1529 m, northing 4320683.302 m. The coordinate represents the approximate center of the X-333 Process Building. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1955
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission (AEC) oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy (DOE) was established, overseeing operations at PORTS.
Present Use:	Uranium enrichment no longer occurs within the X-333 Process Building. The building is no longer in use and is awaiting demolition.
Significance:	The X-333 Process Building was used for the initial phase of the uranium enrichment process, low assay withdrawal, production, and distribution of plant dry air, and the cold recovery system. Enriched uranium from X-333 was further processed in the cascade in X-330 and X-326. This building is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium (HEU) by the gaseous diffusion process for defense/military purposes. Uranium was enriched at PORTS from 1954 until May 2001. From the end of the Cold War in 1991 until production ceased in 2001, PORTS enriched uranium for the longest period of time and to the highest levels within the DOE complex.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant,

HAER no. OH-142. This X-333 Process Building HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-333 Process Building:
The X-333 Process Building was built under a lump-sum subcontract. Peter Kiewit Sons' Construction Company awarded subcontracts for foundation work and underground installations, structural steel, roofing, siding, exterior doors, freight elevators, acoustic tile, refrigeration systems, glass and glazing, and numerous other tasks necessary for the building's operations.

The Eichleay Corporation began installation of the concrete footings, piers, grade beams, and walls in October 1953. Approximately 48,000 cubic yards of concrete were used in this work. The concrete floor was poured by October 1954 and required approximately 34,300 cubic yards of concrete and 548 tons of reinforcing steel. Column-encasement forming began in March 1954 and completed in September later that year. Column-encasement required over 10,000 cubic yards of concrete and 240 tons of reinforcing steel. Final pouring of the cell floor slab was in November 1954, which required approximately 47,000 cubic yards of concrete and 1,700 tons of reinforcing steel. Concrete pouring for the process equipment foundations was completed in December 1954, requiring approximately 7,400 cubic yards of concrete and 160 tons of reinforcing steel.

Bethlehem Steel Company erected the structural steel, which began in January 1954 and was complete by early September of that year. Approximately 36,000 tons of structural steel was erected. Brown and Kerr installed the metal roof deck, roof insulation, built-up roofing, gravity ventilators, and related sheet metal. These activities began in March 1954 and were complete by October 1954. Furnishing and installation of all corrugated cement-asbestos siding and related work was performed by Corrugated Asbestos Constructors. This work was completed during March through November 1954.

Peter Kiewit Sons' Company laid masonry blocks, face tiles, and ceilings from June 1954 through January 1955. Subcontracts were awarded for tasks such as lathing, plastering, painting, and the installation of tile ceilings, ceiling suspension systems and exterior doors. Installation of interior electrical systems, plumbing, heating and ventilation, air conditioning and alarm systems was complete by November 1955, as was the installation of air drying equipment, compressors, motors, converters, process gas and auxiliary piping, and instrumentation. The building was completed and turned over to the AEC in November 1955.

Historical photographs of the building's construction are located in Appendix B (Figures 10 through 21). Historical architectural drawings are located in Appendix C (Figures 22 through 30).

Part II. Site Information

A. Description of the X-333 Process Building:
The X-333 Process Building is located immediately east of the X-330 Process Building. The X-333 Process Building housed the initial phase of the uranium enrichment process and then continued in series to the X-330 and X-326 Process Buildings. The X-333 Process Building was used for the initial phase of the uranium enrichment process, low assay withdrawal, production and distribution of plant dry air, and the cold recovery system. Uranium was enriched at PORTS until May 2001. From the end of the Cold War in 1991 until production ceased in 2001, PORTS produced only low enriched uranium (LEU) for commercial power plants.

The building measures 970' wide by 1,456' long, stands 82' tall, and covers 32½ acres. It is comprised of eight, connected building units, and constitutes the largest building at the PORTS reservation. The equipment and systems within the X-333 Process Building are similar to those of the former K-33 Building at the Oak Ridge Gaseous Diffusion Plant. The X-333 Process Building, however, does not include the surge volume area or the feed vaporization facilities found within the K-33 facility.

Designed specifically for housing gaseous diffusion equipment, the X-333 Process Building is purely functional in its design and appearance (Appendix A, Figures 2 through 5). There are no stylistic details found anywhere on the building. From the outside, the building appears much like an immense box with no windows. The building is covered with large, white, corrugated cement asbestos panels, also known as transite panels. All interior finishes were kept to a minimum, as cleaning and sanitation took priority over appearance (Figures 6 through 9).

There are truck entrances in the north and south sides of the building, and railroad spurs within the depressed truck alleys in the east and west ends of the building. The east spur was used largely for construction purposes, while the west spur was required for the movement of converters and other equipment during the operation of the X-333 Process Building.

Like the other two process buildings (X-326 and X-330), the equipment in the X-333 Process Building is on two floors, with the auxiliary equipment, support equipment, and control rooms on the first floor, also known as the operating floor or ground floor. Process auxiliaries (e.g., steam, nitrogen and dry air distribution; coolant transport and recovery; heating and ventilation; electrical power) are ancillary systems used to facilitate the primary enrichment process. Support equipment (e.g., computer and communication equipment, sanitary and sewage utilities, security equipment) assist in process building operations, but are not directly associated with the enrichment process. The diffusion process equipment is located on the second floor, known as the cell floor.

The height between the ground floor and the cell floor allows for 12' of clearance for ground floor operations, as well as clearance for the installation of electrical work, mechanical duct work, and piping. The extreme height of the first floor enabled the numerous trades of construction workers to proceed with their tasks simultaneously. The building's height between the cell floor and the roof structure provides for clearance for the cell housings, which required the use of overhead cranes for changing out converters and supporting equipment.

Part III. Operations and Process

A. Operations:

At PORTS, uranium was enriched using a process called gaseous diffusion. Through the process of diffusion, gaseous uranium hexafluoride (UF_6) is passed through a conversion system to produce enriched, or diffused, uranium-235 and undiffused uranium-238. The process of uranium enrichment increases the proportion of uranium-235 to that of uranium-238. Enriched uranium contains uranium-235 at approximately 4 to 5 percent of the total uranium mass.

The gaseous diffusion process requires the use of UF_6 to separate the uranium-238 and uranium-235 isotopes. During diffusion, UF_6 gas is forced through a series of porous membranes, or "barriers" with microscopic openings. Barriers are used to achieve separation in the gaseous diffusion process. To maximize the amount of separation achieved, the porous barrier material must meet exacting standards so that "diffusive" flow occurs. Uranium-235 moved through the barriers more easily, increasing the concentration of uranium-235 as it moved through the process. The tendency for uranium-235 to pass through the barrier more quickly is the basis for the gaseous diffusion process.

The basic separation equipment for gaseous diffusion is a "stage." At PORTS, a stage consisted of a converter that contains porous separation media, a gas cooler, a compressor to move the UF_6 gas through the converter, and interconnecting piping and control valves to contain and control the gas flows. One stage was capable of only very slight enrichment. Stages operated in a cascading system, and thousands of stages in the process buildings were connected in series to produce HEU. The X-333 Process Building contains 640 stages.

Stages were grouped into "cells," which were the smallest groups of stages that could be removed from service, bypassed, and shut down for maintenance or other purposes. There are eight stages per cell in the cells in the X-333 Process Building, and the building housed 80 cells.

Cells were further grouped into "units," which were groups of cells that shared common auxiliary systems. Each operating unit within the building was divided into two groups of 10 cells. The 80 cells in the X-333 Process Building are grouped into eight units.

The process equipment, piping, and instrument lines that contained process gas were enclosed by cell housing and bypass housing. The cell housing for the X-333 process equipment has a steel frame and transite siding. The tops of the housings have removable hatches that allow for equipment removal.

Feed material entered the uranium enrichment process at the X-333 Process Building. The X-333 Process Building contains the largest pieces of gaseous diffusion equipment at PORTS. The size of process equipment in the X-333 Process Building was referred to as the X-33 size (i.e., “000”).

The purge and product area is located in the X-326 Process Building. Purging separated and removed light gas contaminants that leaked into the system during the diffusion process. The waste, or tails stream, of the enrichment process was withdrawn from the gaseous diffusion cascade and packaged into storage cylinders.

In the X-330 Process Building, one unit with X-29 sized equipment and two units with X-31 sized equipment served as the stripping section of the cascade. The stripping section consists of the stages located below the feed point of the cascade. From the X-29 sized unit, waste material was withdrawn from the cascade at the PORTS Tails Withdrawal Station.

The PORTS Tails Withdrawal Station is located in the X-330 Process Building. The waste, or tails, from the gaseous diffusion process consisted of depleted process gas. Depleted process gas from the enrichment process was withdrawn from the gaseous diffusion cascade, compressed, and condensed into a liquid that flowed by gravity to cylinders located on scales. Cranes were used to move these cylinders to cooling areas and load them for transport.

B. First Floor:

All of the auxiliary systems, electrical power substations, and control centers are located on the first floor of the X-333 Process Building. In addition to these supporting systems, the first floor also contains numerous enclosed areas for operating purposes. The building's unit substations and auxiliary equipment are located to the north and south of these enclosures. There are eight of these areas, each corresponding to one of the building's eight units.

Each side of the building includes an air intake or filter room for each of the eight units. Louvers on the exterior walls of the building provide for movement of air into the building. The louvers themselves comprise an entire wall of the filter room. Each room has a removable filter set in a steel frame. Air movement was performed by large intake fans. Air drawn in at the first floor supplied air to both the ground and cell floors.

The majority of the first-floor enclosures, as well as the stairwell enclosures, consist of cinderblock construction. Glazed structural tile was used in areas with specific sanitation requirements. Metal decking was used for the roofs of the maintenance, control area, and filter rooms. Concrete slabs were used for a number of the other X-333 Process Building enclosures.

Finishes within the interior of the X-333 Process Building reflect the need for sanitation and ease of cleaning and maintenance. Most floor surfaces consist of chemically hardened, smooth-finished concrete. The control areas are the only locations within the building that feature asphalt tile floors. All ferrous metal surfaces, such as exposed steel framing and doors, are painted. All the piping within the building is color-coded and marked for quick identification. The design of the enclosures for the various rooms within the X-330 Process Building follows the same basic plan as that for the X-326 and X-333 Process Buildings. All building finishes were designed for cleanliness and sanitation.

C. Second Floor (Cell Floor):

The X-333 Process Building's primary processing equipment is located on the cell floor. The X--33 equipment has eight units (80 cells and 640 stages). The cells extend across the width of the building and are located within a central bay.

The housing for the process equipment was designed to maintain operating temperatures during the gaseous diffusion process. This was accomplished by erecting a cement-asbestos-covered steel frame around the compressors and converters. The booster stations, evacuation station, and outside tie-lines feature similar enclosures.

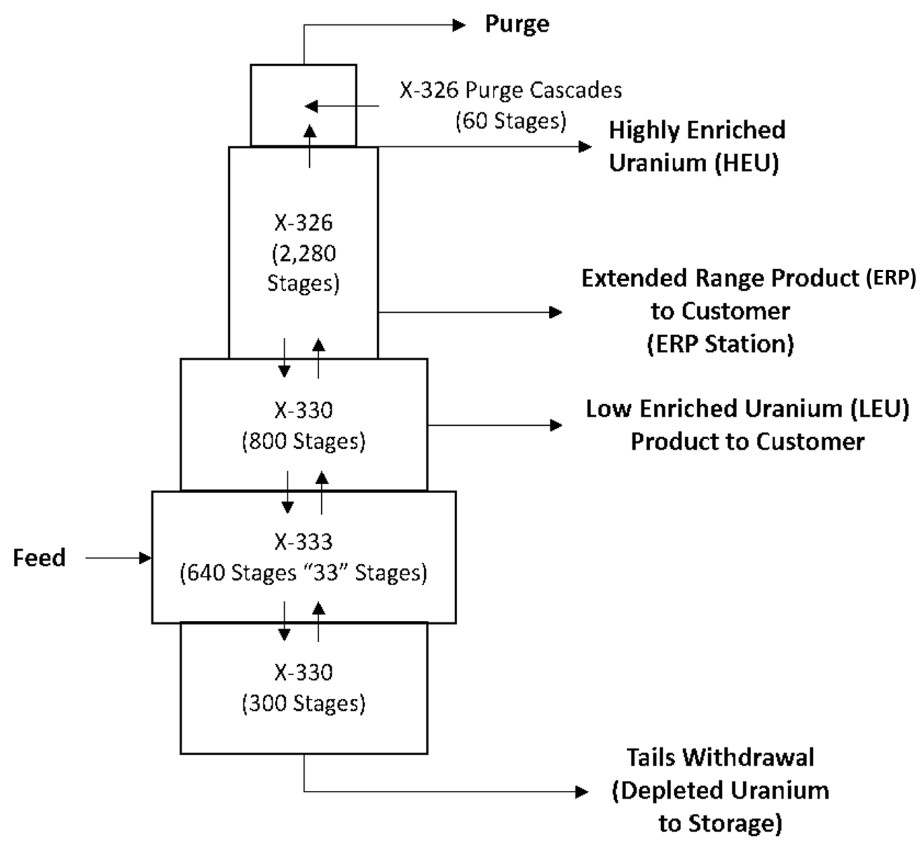
Access to the equipment is provided by a network of ladders, platforms, and catwalks. There are eight stairways that provide access to the roof, and 39 stairways that facilitate movement between the ground and cell floors. Each of the building's 21 bays contains its own overhead, electric crane.

The process units in the X-333 Process Building are very similar to those in the K-33 Building at Oak Ridge and consist of two types. The difference relates to the size of the compressor motors and their electrical switchgear. The overall system is divided into units of cells arranged in series and could accommodate different types of feed material from the feed plant. Originally, the X-342A Feed, Vaporization, and Fluorine Generation Facility served as the solitary source of feed for the gaseous diffusion cascade. However, the X-343 Feed, Vaporization, and Sampling Facility took over as the primary feed source for the cascade after it was completed in 1982.

Process gas removal for maintenance was accomplished via the evacuation system. This system enabled operators to remove gas from any of the cells and main piping system. Gas evacuated from the system entered into a recovery process. The gas recovery system (Cold Recovery) solidified the UF_6 while venting the light gas impurities. The recovered UF_6 was returned to a gaseous state to be held in drums and later returned to the diffusion cascade. The uranium enrichment process was initiated in X-333 and continued in series to X-330 and X-326. Materials were withdrawn from the cascade at the following three locations:

- X-326 Product Withdrawal Station (90 to 97 percent uranium-235 during HEU production, 2.0 to 5.0 percent uranium-235 during LEU production)
- X-326 Extended Range Product Station (0.7 to 5.0 percent uranium-235)
- X-333 Low Assay Withdrawal Station (1.0 to 5.0 percent uranium-235)
- X-330 Tails Withdrawal Facility (0.2 to 0.3 percent uranium-235 and 1.0 to 5.0 percent uranium-235).

A diagram showing the gaseous diffusion "cascade" at PORTS is shown below.



PORTS Gaseous Diffusion "Cascade"

D. Structural Design:

The structural framing of the X-333 Process Building was based on the design used for the K-902 Building Unit within the K-33 at Oak Ridge, and the C-333 Building at Paducah. Some minor alterations to the design were necessary for the building's foundations, which engineers tailored specifically for soil conditions at PORTS. In addition, the X-333 Process Building would feature an interior instrumentation tunnel, as well as auxiliary facilities specific to the X-333.

The immense size of the building created unique conditions with regards to expansion and contraction. To accommodate movement, engineers divided the steel framing into 40 structural units, each separate from the other. The roof structure rests atop purlins (horizontal boards supporting roof rafters), which in turn rest atop trusses and beams.

The ground floor of the X-333 Process Building is comprised of a 6" thick, floating concrete slab that was designed for wheel loads of 7,000 pounds per square foot. In areas that were designed to support heavy transformers, engineers specified 8" concrete. The floor was built with methods and equipment typically used for highway construction, with reinforced, highway-type joints. This type of construction permitted heavy load transfers between expansion joints in the slab.

The cell floor is supported by steel columns that have been encased in a minimum of 1" thick concrete. The cell floor (the 2nd floor) itself was designed to withstand the effects of the cell equipment, which operated at 1,200 rpm, generating a frequency of 20 cycles per second. The exterior framing for the cell floor is comprised of light, steel beams and struts, which support the transite tiles on the side of the building.

Part IV. Sources of Information

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Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Portsmouth Gaseous Diffusion Plant Virtual Museum – accessed at http://www.portsvirtualmuseum.org/ operated and managed by Fluor-BWXT Portsmouth for DOE.

Appendix A: Survey Photographs

Figure 1: Location and Orientation of Exterior and Interior Photographs (A-2 through A-9)

Figure 2: North Side of the X-333 Process Building, August 2014, Facing Southwest

Figure 3: North Side of the X-333 Process Building, August 2014, Facing Southeast

Figure 4: South Side of the X-333 Process Building, August 2014, Facing Northwest

Figure 5: South Side of the X-333 Process Building, August 2014, Facing Northeast

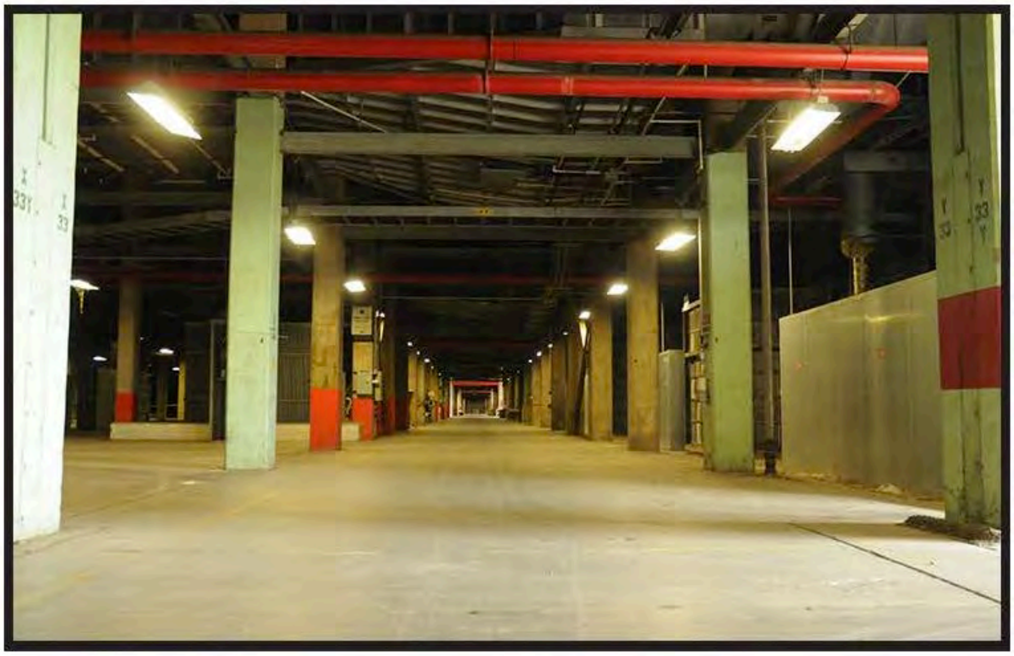

Figure 6: Interior View of the X-333 Process Building, August 2014, Facing West

Figure 7: Interior View of the X-333 Process Building, August 2014, Facing South

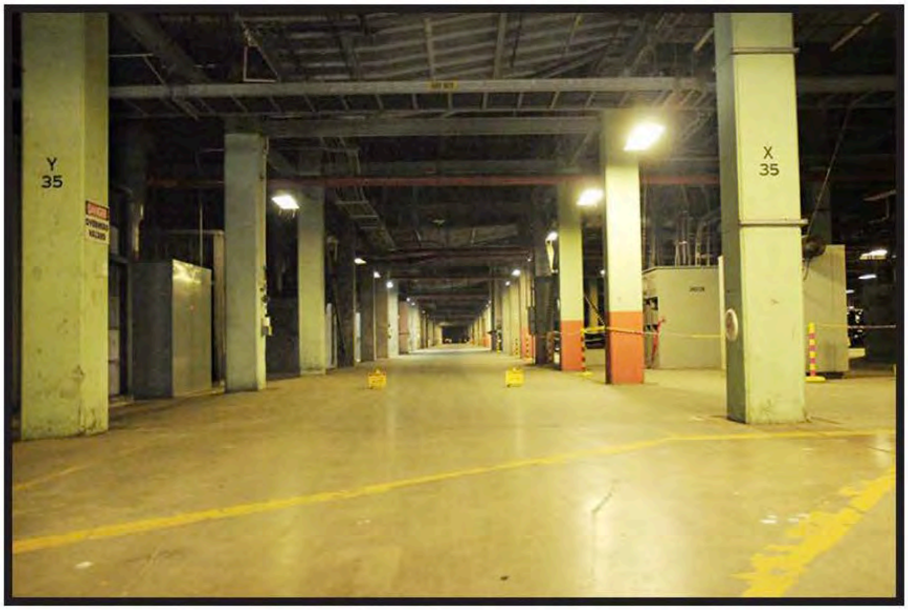

Figure 8: Interior View of the X-333 Process Building, August 2014, Facing East

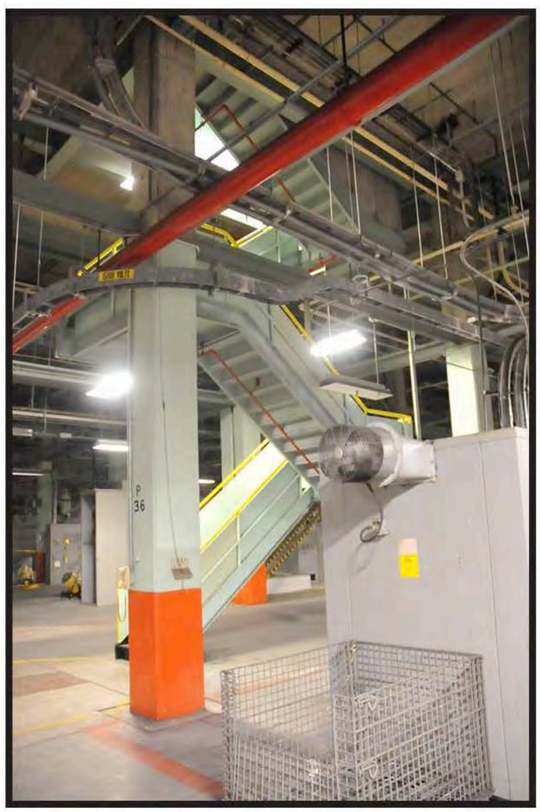

Figure 9: Interior Staircase Leading to the Cell Floor Inside the X-333 Process Building, August 2014

Appendix B: Historical Photographs

Figure 10: Site of the X-333 Process Building, Looking East, August 1953

Figure 11: Overview of the X-333 Process Building Site, January 1954

Figure 12: Steel Framework for the X-333 Process Building, April 1954

Figure 13: Bethlehem Steel Company Iron Workers, June 1954

Figure 14: Bethlehem Steel Company Foremen and Managers, June 1954

Figure 15: View of Ground Floor of the X-333 Process Building, June 1954

Figure 16: View of Cell Floor of the X-333 Process Building, July 1954

Figure 17: Looking Northeast at the X-333 Process Building, September 1954

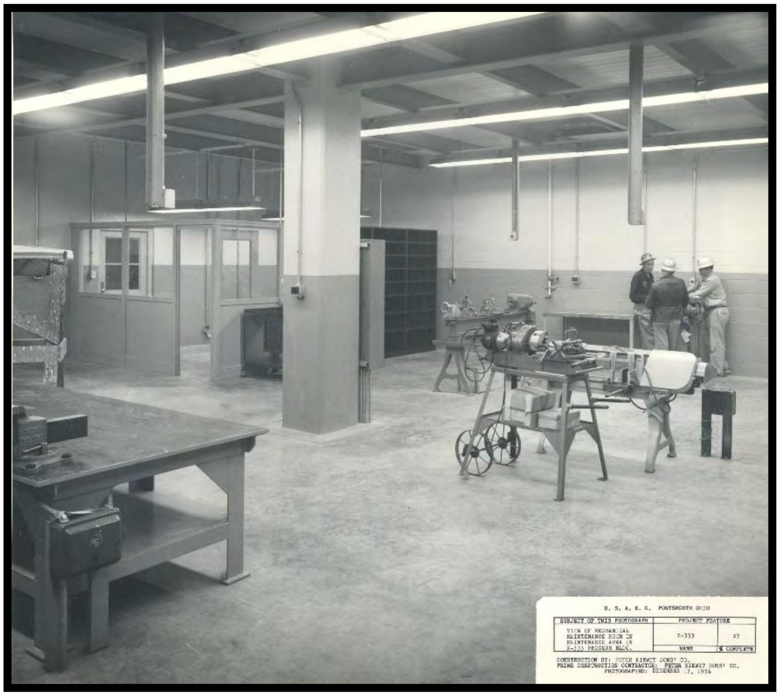

Figure 18: View of Mechanical Maintenance Room in the X-333 Process Building, December 1954

Figure 19: View of the Cell Floor of the X-333 Process Building, January 1955

Figure 20: Looking South at the X-333 Process Building, May 1955, Facing West

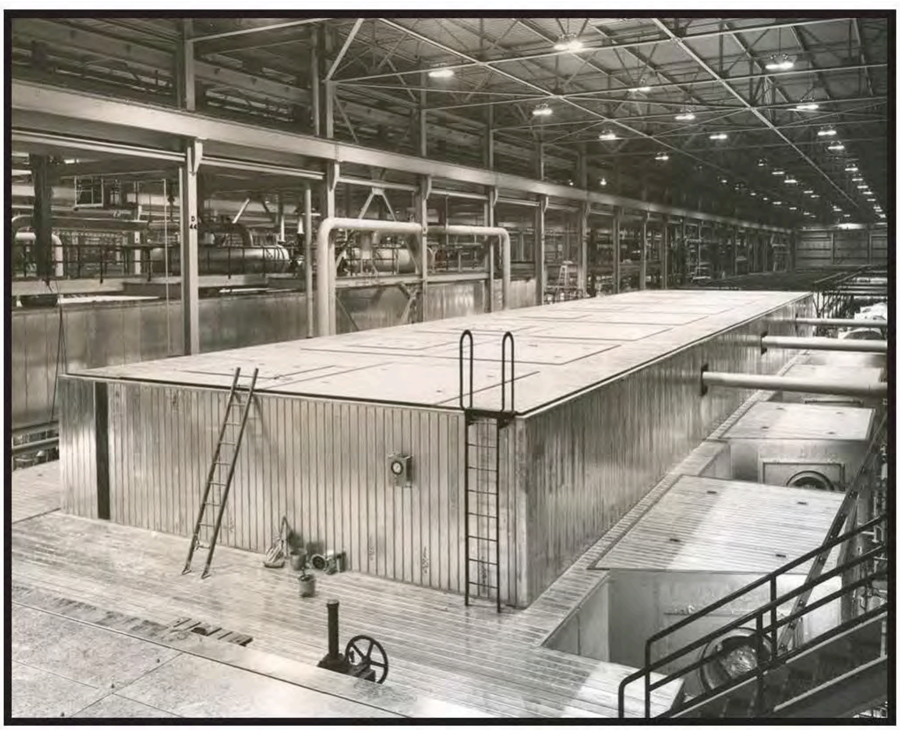

Figure 21: Interior View of the X-333 Process Building, October 1955

Appendix C: Historical Drawings

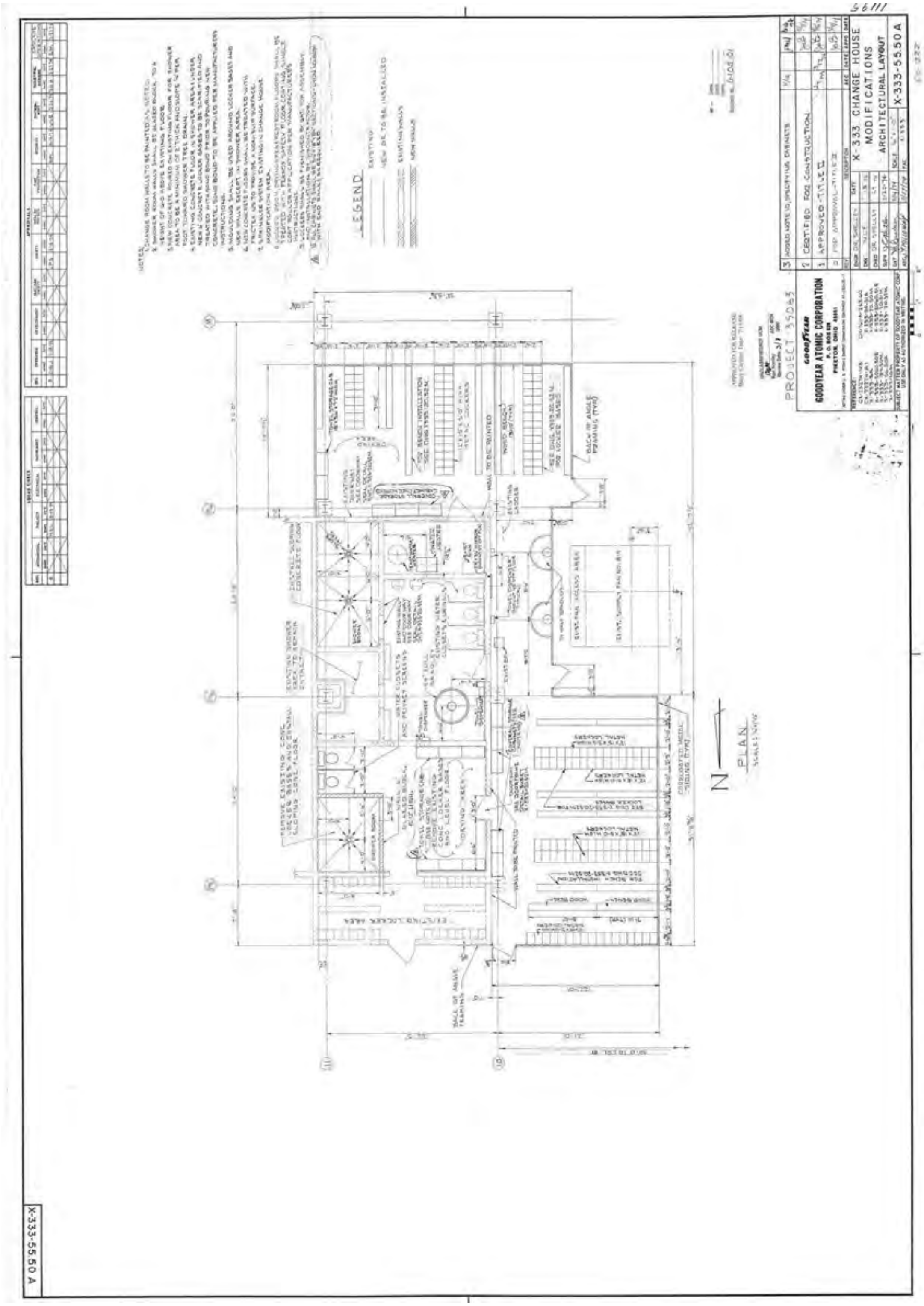

Figure 22: Change House Modifications

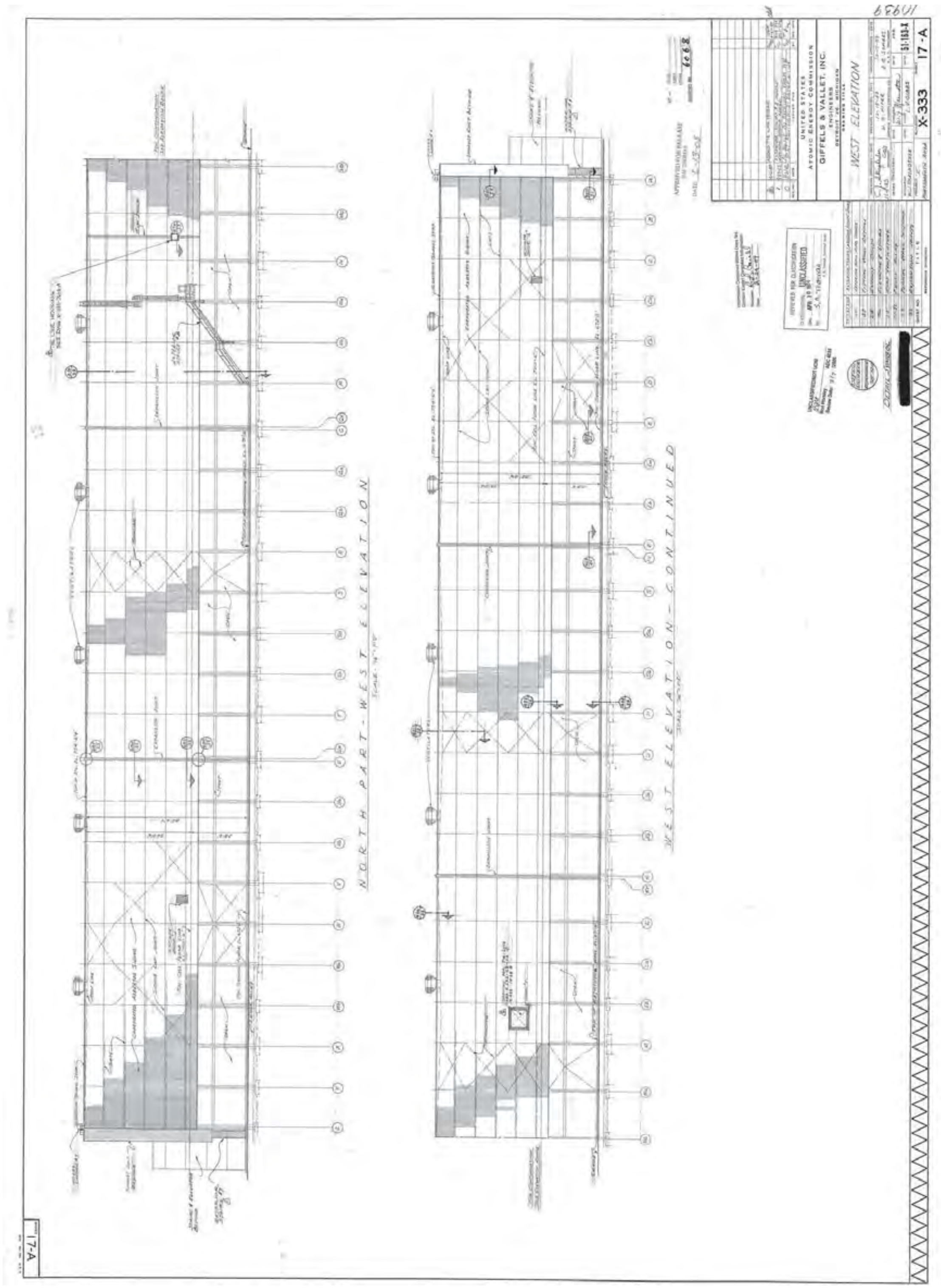

Figure 23: West Elevation

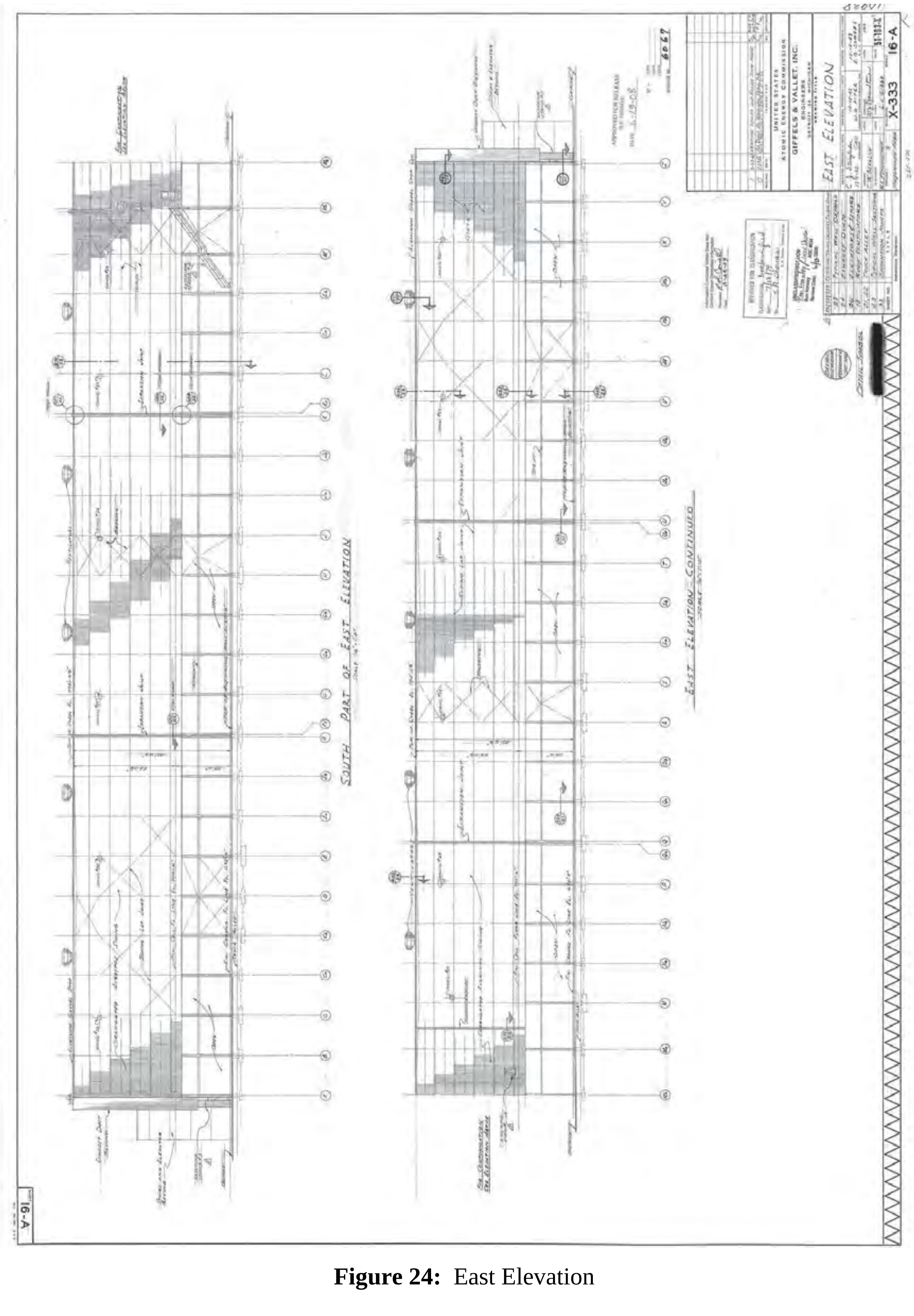

Figure 24: East Elevation

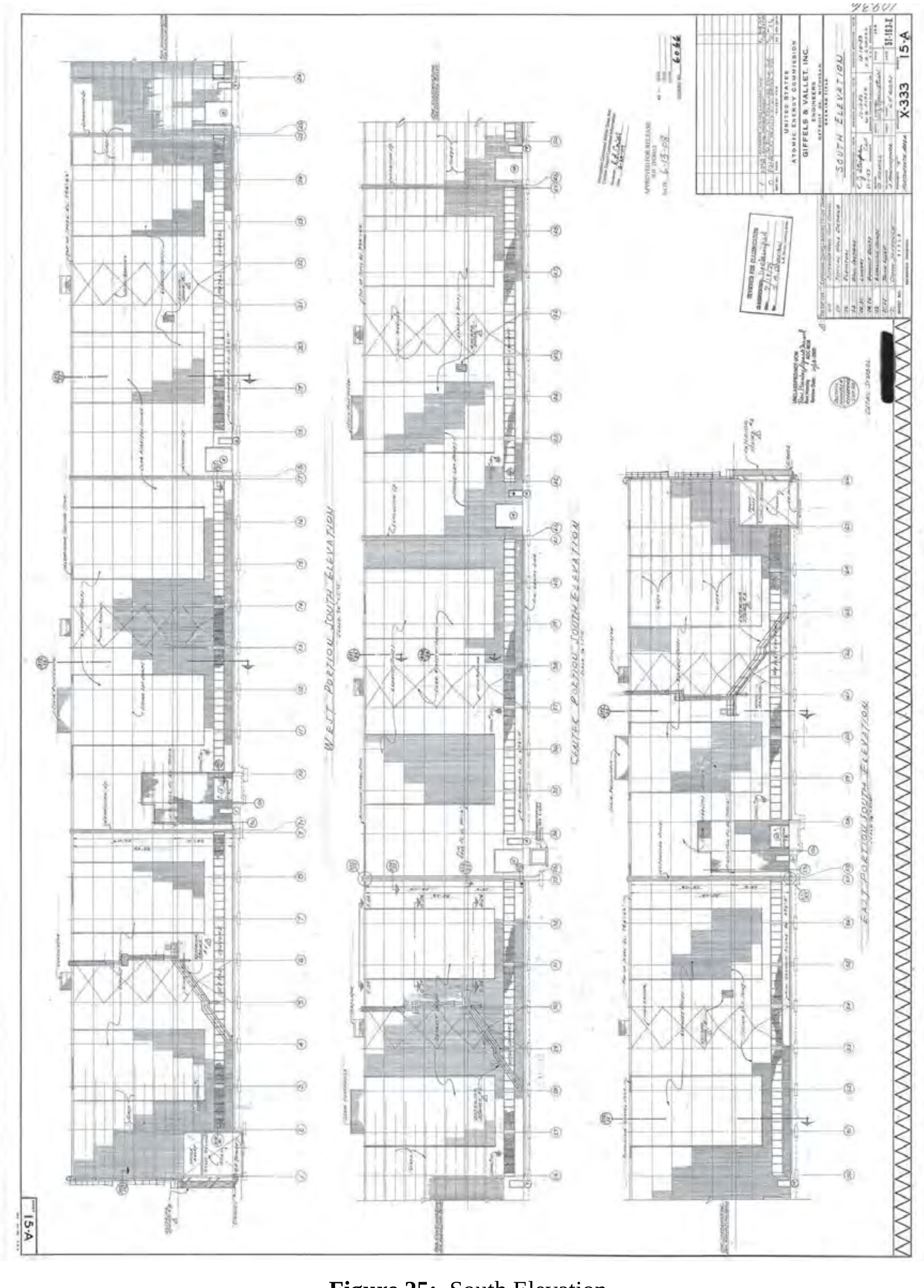

Figure 25: South Elevation

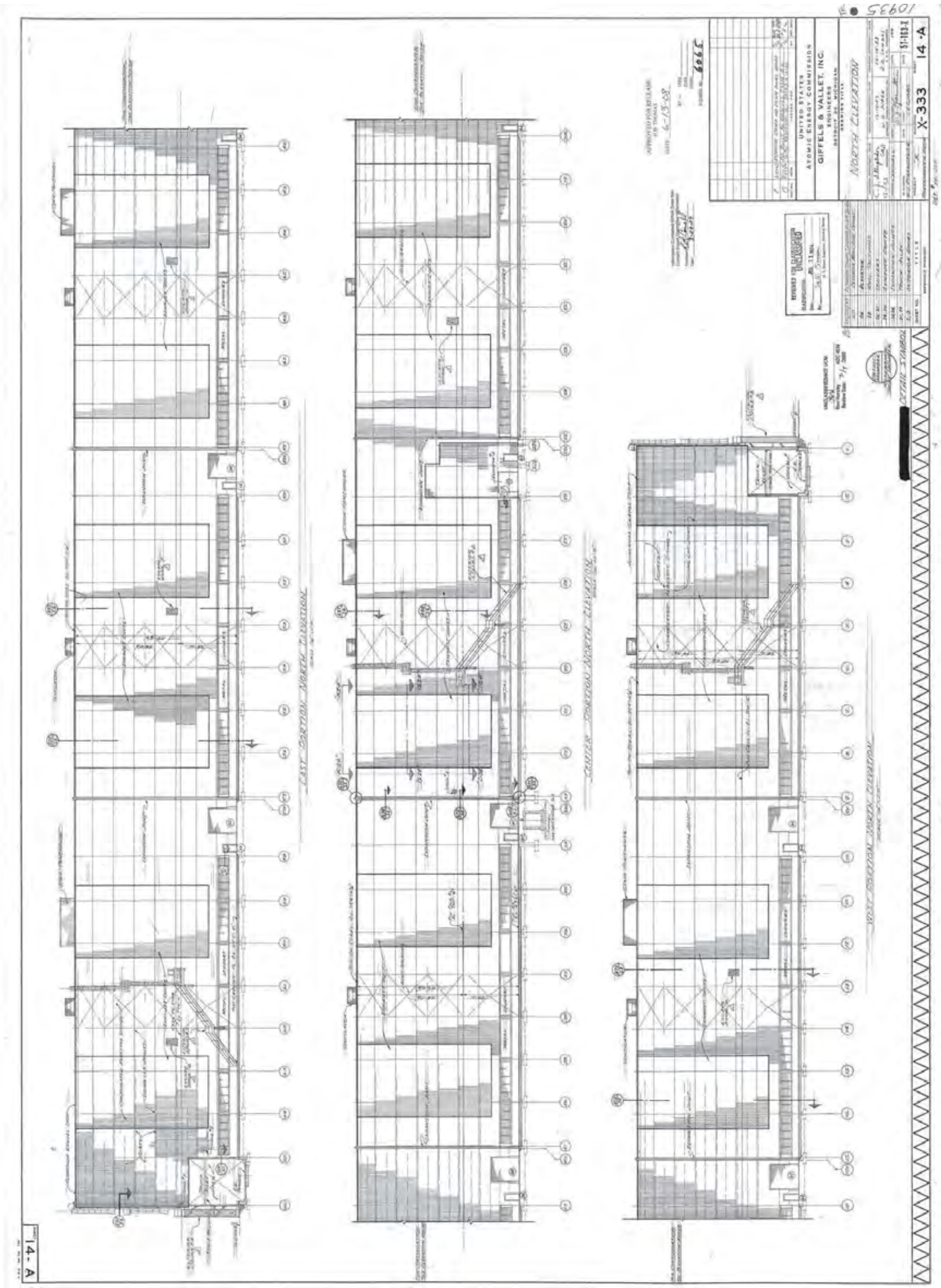

Figure 26: North Elevation

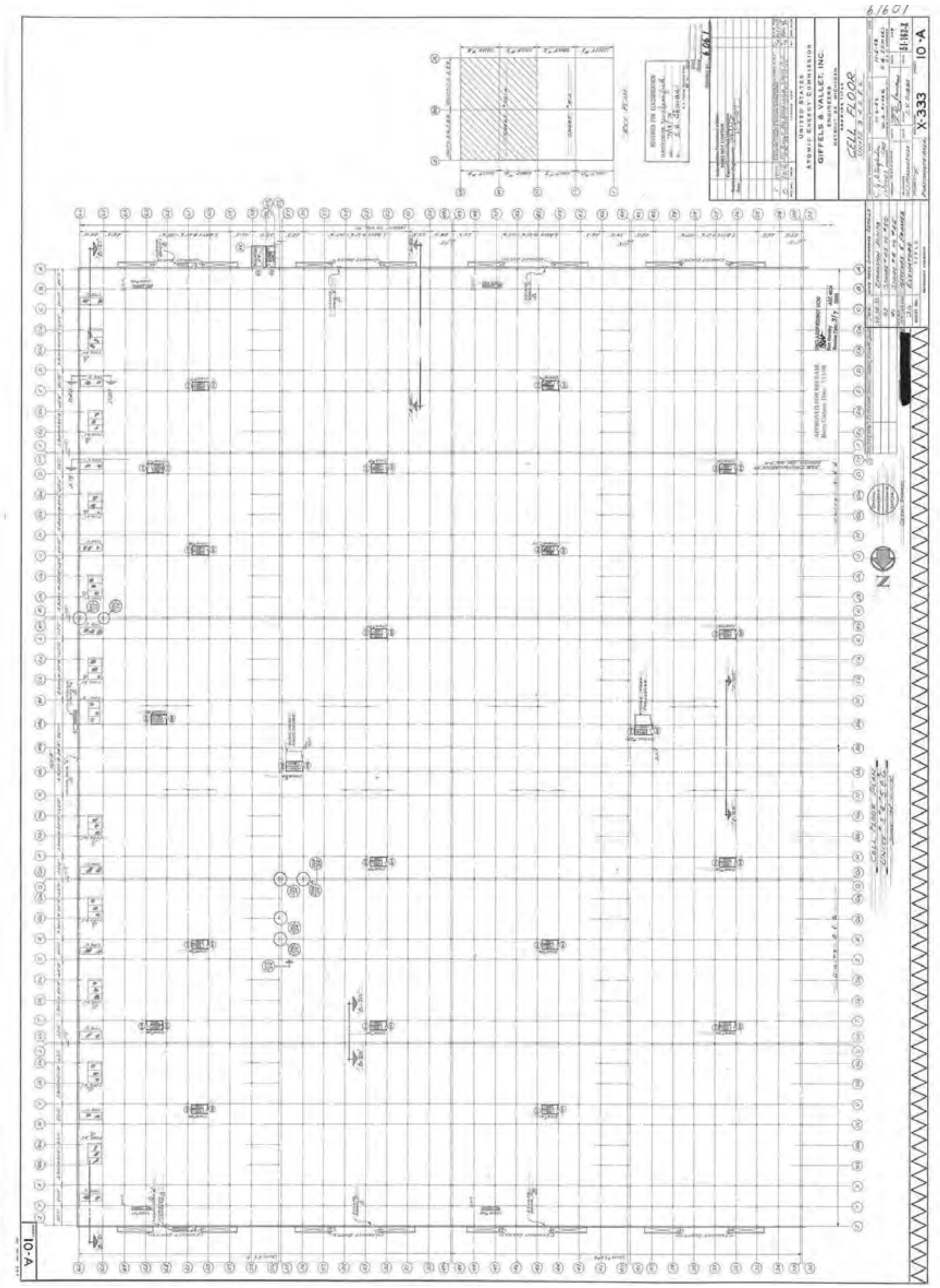

Figure 27: Cell Floor Plan

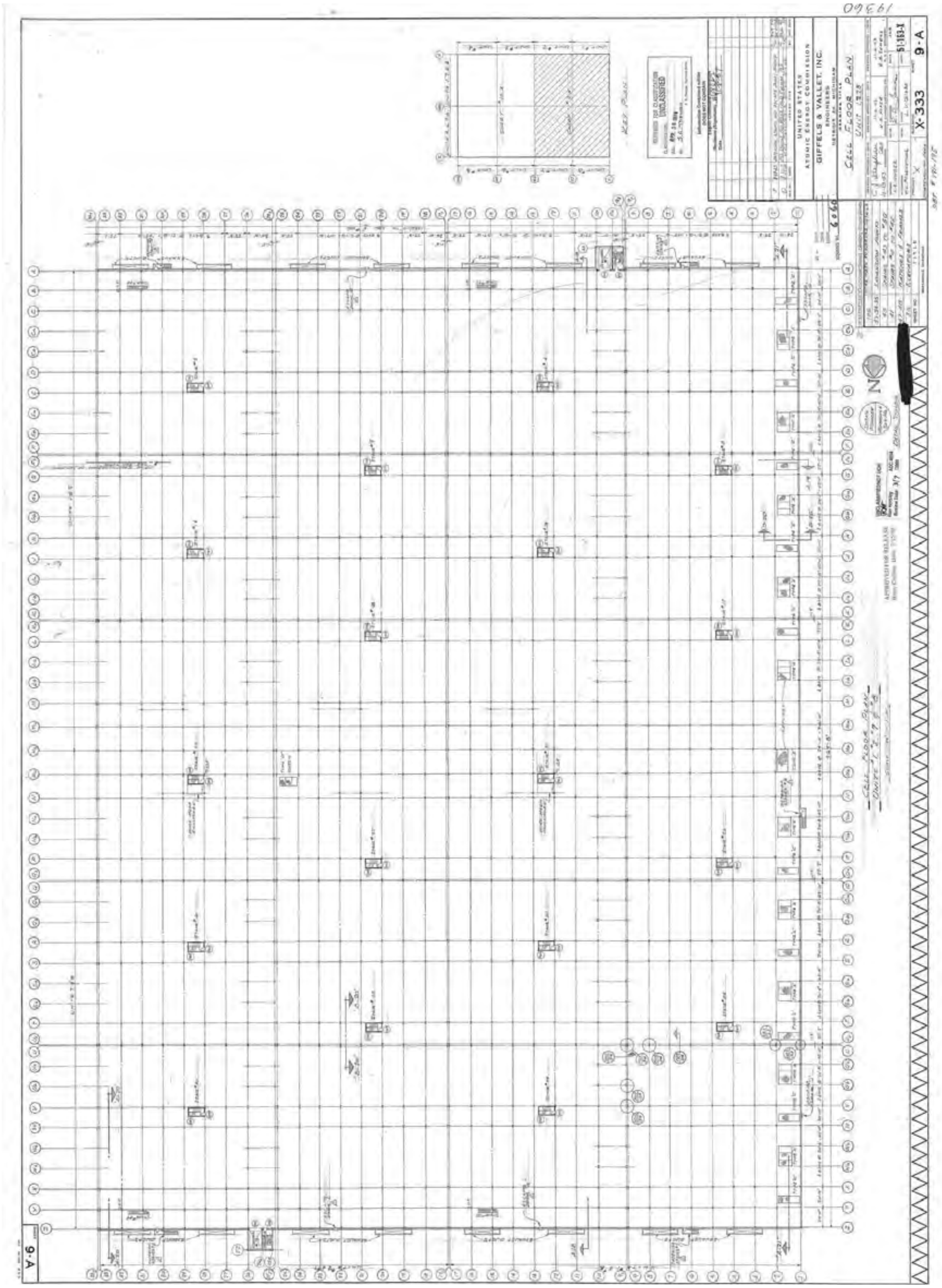

Figure 28: Cell Floor Plan

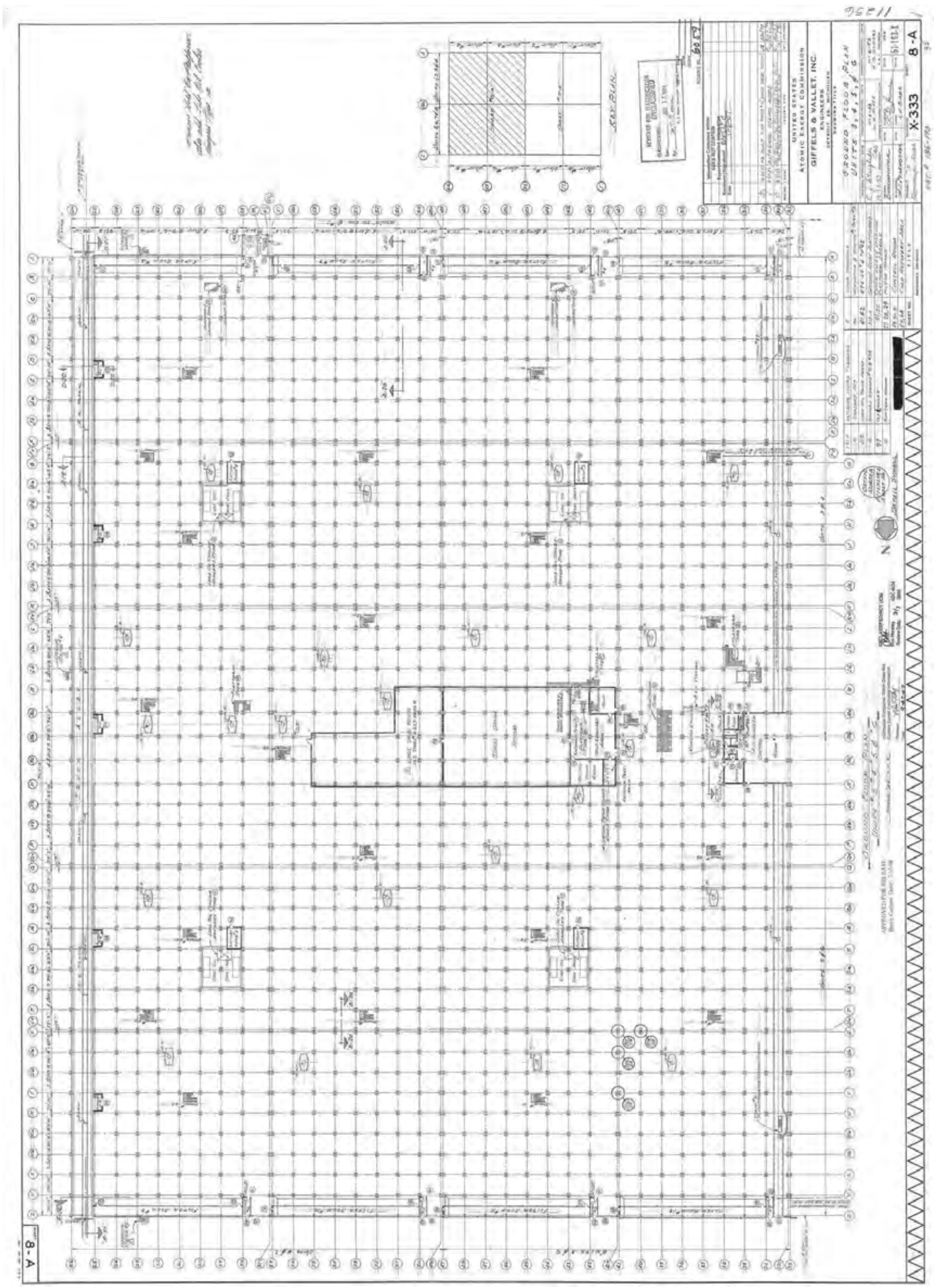

Figure 29: Ground Floor Plan

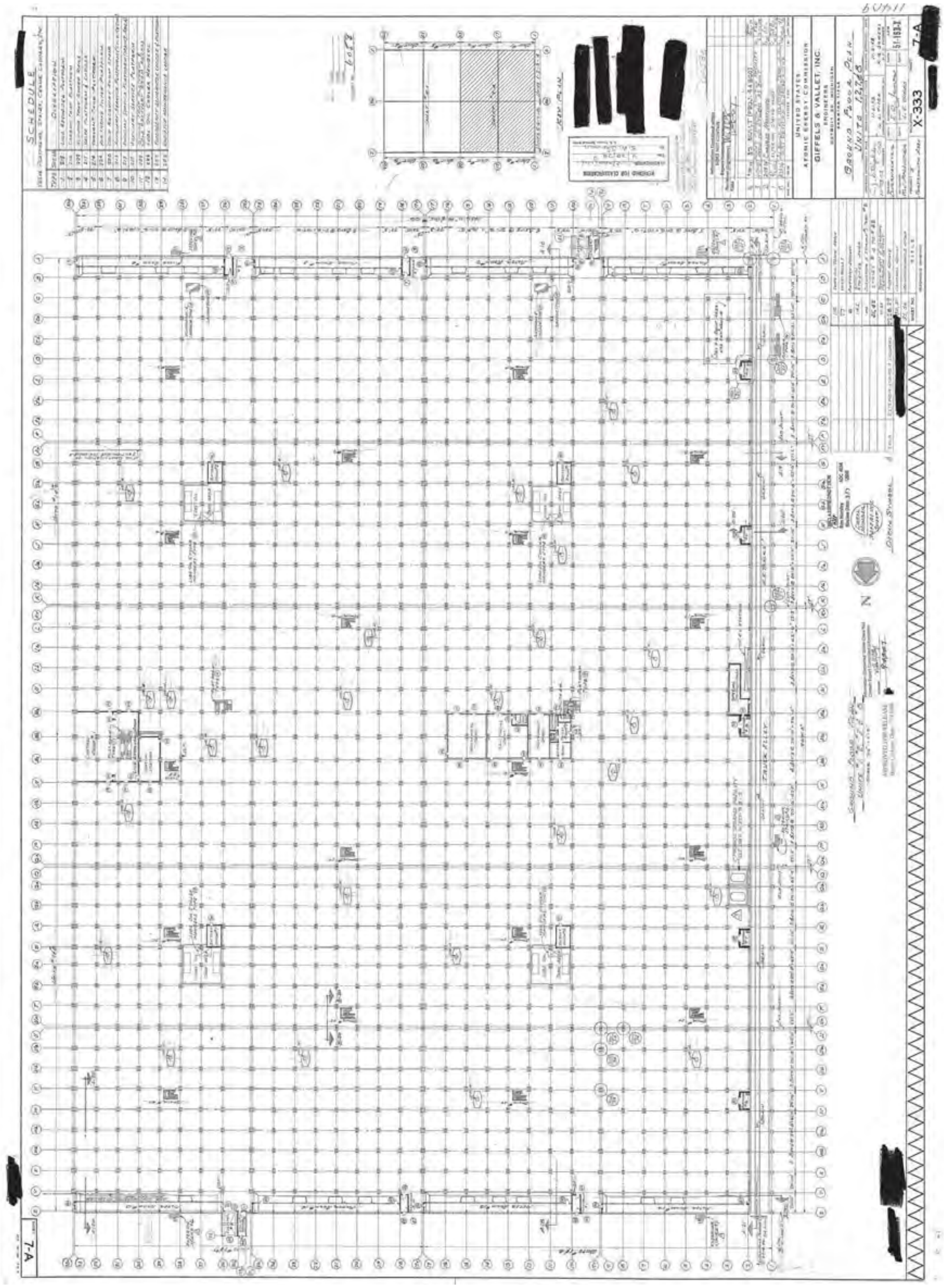

Figure 30: Ground Floor Plan

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-342A FEED, VAPORIZATION, AND FLUORINE GENERATION FACILITY AND X -342B FLUORINE STORAGE BUILDING
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-F
HAER OH-142-F

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-342A FEED, VAPORIZATION, AND FLUORINE GENERATION FACILITY AND THE X-342B FLUORINE STORAGE BUILDING

HAER No. OH-142-F

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-342A Feed, Vaporization, and Fluorine Generation Facility and the X-342B Fluorine Storage Building are located at Ohio State Plane South coordinates at easting 1826320.939582 ft, northing 372246.824734851 ft and easting 1826548.636395 ft, northing 372172.787801038 ft, respectively and at Universal Transverse Mercator Zone 17N easting 326822.281 m, northing 4321007.214 m and easting 326891.3035 m, northing 4320983.509 m, respectively. The coordinates represent the approximate center of both the X-342A Feed, Vaporization, and Fluorine Generation Facility and the X-342B Fluorine Storage Building. These coordinates were obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1954
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy (DOE) was established, overseeing operations at PORTS.
Present Use:	Storage for current site activities and removal of from cylinders
Significance:	The X-342A Feed, Vaporization, and Fluorine Generation Facility fed, vaporized, and sampled uranium for the PORTS enrichment cascade until the X-344A uranium hexafluoride (UF_6) Sampling Facility and the X-343 Feed, Vaporization, and Sampling Facility took over these operations. The gaseous diffusion process requires the use of UF_6 to separate the uranium-238 and uranium-235 isotopes. By manipulating the temperature and pressure of its container, UF_6 can be maintained as a gas, liquid, or solid making it ideal for use in the diffusion process. UF_6 gas is fed to the enrichment cascade in the process buildings. Toward the end of enrichment operations at PORTS, the X-342A Facility primarily generated and purified fluorine and served as backup for the X-344A and X-343 Facilities. The X-342B Fluorine Storage Building stored the fluorine generated by the X-342A Feed, Vaporization, and Fluorine Generation

Facility. These buildings are part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.

Project Information: Fluor-BWXT Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-342A Feed, Vaporization, and Fluorine Generation Facility and the X-342B Fluorine Storage Building HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-342A Feed, Vaporization, and Fluorine Generation Facility and the X-342B Fluorine Storage Building:
The X-342A Feed, Vaporization, and Fluorine Generation Facility and the X-342B Fluorine Storage Building were built during the initial construction phase of PORTS, which occurred from 1952 to 1956. Peter Kiewit Sons' Company awarded the subcontract for installation of the process equipment to George Sheaf & Company of Columbus, Ohio. Excavation activities began in July 1953 (Appendix B, Figures 4 through 6). The site designated for the X-342A Feed, Vaporization, and Fluorine Generation Facility, and the X-342B Fluorine Storage Building was a low point that previously held a natural water course with surface and sub-surface drainage. This required the installation of a drainage blanket of graded stone, pitched to a low point. Additionally, French drains were installed below the drainage blanket. The blanket leads to a main drain. The drain then slopes toward a sump, which in turn pumps water beyond the site. A second 24" drain was installed to carry runoff from the X-330 Process Building to beyond the X-342A Feed, Vaporization, and Fluorine Generation Facility site. Workers began erecting the steel framing in the spring of 1954 (Figures 7 through 10). Workers completed the X-342A Feed, Vaporization, and Fluorine Generation Facility and the X-342B Fluorine Storage Building in September 1954 (Figure 11).

Historical drawings of building plans are provided in Appendix C (Figures 12 through 20).

Part II. Site Information

Description of the X-342A Feed, Vaporization, and Fluorine Generation Facility and the X-342B Fluorine Storage Building:
The X-342A Feed, Vaporization, and Fluorine Generation Facility and the X-342B Fluorine Storage Building are located in the north-central section of PORTS. The X-342A Facility vaporized UF_6 feed material, generated and stored fluorine, and sampled UF_6. The X-342A Facility consists of a feed-vaporizing plant, a fluorine generating plant, and a waste fluorine disposal unit. The X-342B Fluorine Storage Building stored the fluorine generated in the X-342A Facility. A third component of the overall facility includes the X-342C Waste Hydrogen Fluoride Neutralization Pit, which stored waste hydrogen fluoride.

The process of uranium enrichment increases the proportion of uranium-235 to that of uranium-238. The gaseous diffusion process requires the use of UF_6 to separate the uranium-238 and uranium-235 isotopes. By manipulating the temperature and pressure of its container, UF_6 can be maintained as a gas, liquid, or solid making it ideal for use in the diffusion process. UF_6 gas is fed to the enrichment cascade in the process buildings.

The X-342A Facility received steel cylinders, each containing 10 tons of UF_6. Workers transferred the UF_6 cylinders to steam-heated vaporizers. The vapor passed through a piping system to the PORTS process buildings. PORTS later added higher assay feed material to the process after it was converted to UF_6 in the X-344 facility. This material consisted of a combination of uranium tetrafluoride, or "green salt," and material from the X-342A Feed, Vaporization, and Fluorine Generation Facility.

The X-342A Feed, Vaporization, and Fluorine Generation Facility is a utilitarian steel-frame building, with two stories on the south half and one story on the north side (Appendix A, Figures 1 through 3). The building covers an area of 14,300 square feet. The building features a poured concrete slab foundation with concrete piers, walls clad in corrugated cement-asbestos siding, and a flat metal-deck roof covered with insulation and built-up material. Window openings are located in the northern end of the east façade and the eastern end of the north façade. They are also located in the lunchroom and office area. All windows consist of steel industrial sash. Louvered vents are located at various locations on the building. Entries to the building are equally spaced on the south façade. The entries feature metal doors with two lights on the upper panels and large rolling steel doors. These large openings provide access for truck shipments and a rail pass-through. Several exhaust fans and a large exhaust stack stand approximately 60' tall. Above-ground pipes extend from the east side of the X-342A Feed, Vaporization, and Fluorine Generation Facility to the PORTS process buildings.

The ground floor interior of the X-342A Feed, Vaporization, and Fluorine Generation Facility is separated into 17 areas. The space is dominated by the receiving and vaporizing bay, or process area, which occupies the entire southern portion of the building. The northwest quarter of the building features a storage and maintenance area, fluorine cell rooms, and an electrical room. The northeast quarter of the facility houses sodium fluoride traps and compressor room, and a disposal room. To the north of these rooms are offices, a lunchroom, and men's and women's restrooms and locker rooms. The second floor is occupied by a platform in the vaporizer area, a fan room, plenum fan room, and filtered heater room. Interior building finishes are functional, consisting of interior concrete block partitions, suspended ceilings of inverted steel decking in the personnel-use rooms and centrally-located control room, and concrete flooring, with the exception of ceramic tile in the shower and toilet rooms, and asphalt tile in the office and lunchroom.

The X-344A UF_6 Sampling Facility extends from the west and north sides of the X-342A Feed, Vaporization, and Fluorine Generation Facility. The X-343 Feed, Vaporization, and Sampling Facility, which was completed in 1982, and the X-344A UF_6 Sampling Facility eventually took over the feed, vaporization, and sampling of uranium. The X-342A Facility remained in place as a backup for these processes, as well as to generate and purify fluorine. From 1982 to 1983, the X-342A Facility was shut down, while its 12 steam vaporizers were replaced with two autoclaves.

The X-342B Fluorine Storage Building is located approximately 120' east of the X-342A Feed, Vaporization, and Fluorine Generation Facility. It occupies an area of approximately 1,525 square feet. The building houses three large fluorine storage tanks, each with a capacity of 1,000 cubic feet. The X-342B Fluorine Storage Building is a one-story utilitarian structure with a poured concrete slab foundation. The building's steel frame walls rest atop reinforced concrete footings. The upper portions of the walls are clad with cement-asbestos tiles. The top of the building is covered with a low pitched, flat steel-deck. Louvered vents, located in the south side of the building, comprise the only openings within the X-342B Fluorine Storage Building. Entries are located on each corner of the building. They consist of metal doors with glass on the upper panels, and louvered vents on the lower panels. A 23' steel exhaust stack, located to the north of the building, vents air from within the building. Exhaust fans draw air through the louvered vents in the south wall. Piping connects the storage tanks to the neighboring X-342A Feed, Vaporization, and Fluorine Generation Facility.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio*, DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Department Of Energy. Highly *Enriched Uranium: Striking a Balance, A Historical Report on the United States Highly Enriched Uranium Production, Acquisition, and Utilization Activities from 1945 to September 30, 1996*, Revision 1. Washington, D.C.: National Nuclear Security Administration, U.S. Department of Energy, 2001.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Portsmouth Gaseous Diffusion Plant Virtual Museum – accessed at http://www.portsvirtualmuseum.org/building-x342.htm, operated and managed by Fluor-BWXT Portsmouth for DOE.

Appendix A: Survey Photographs

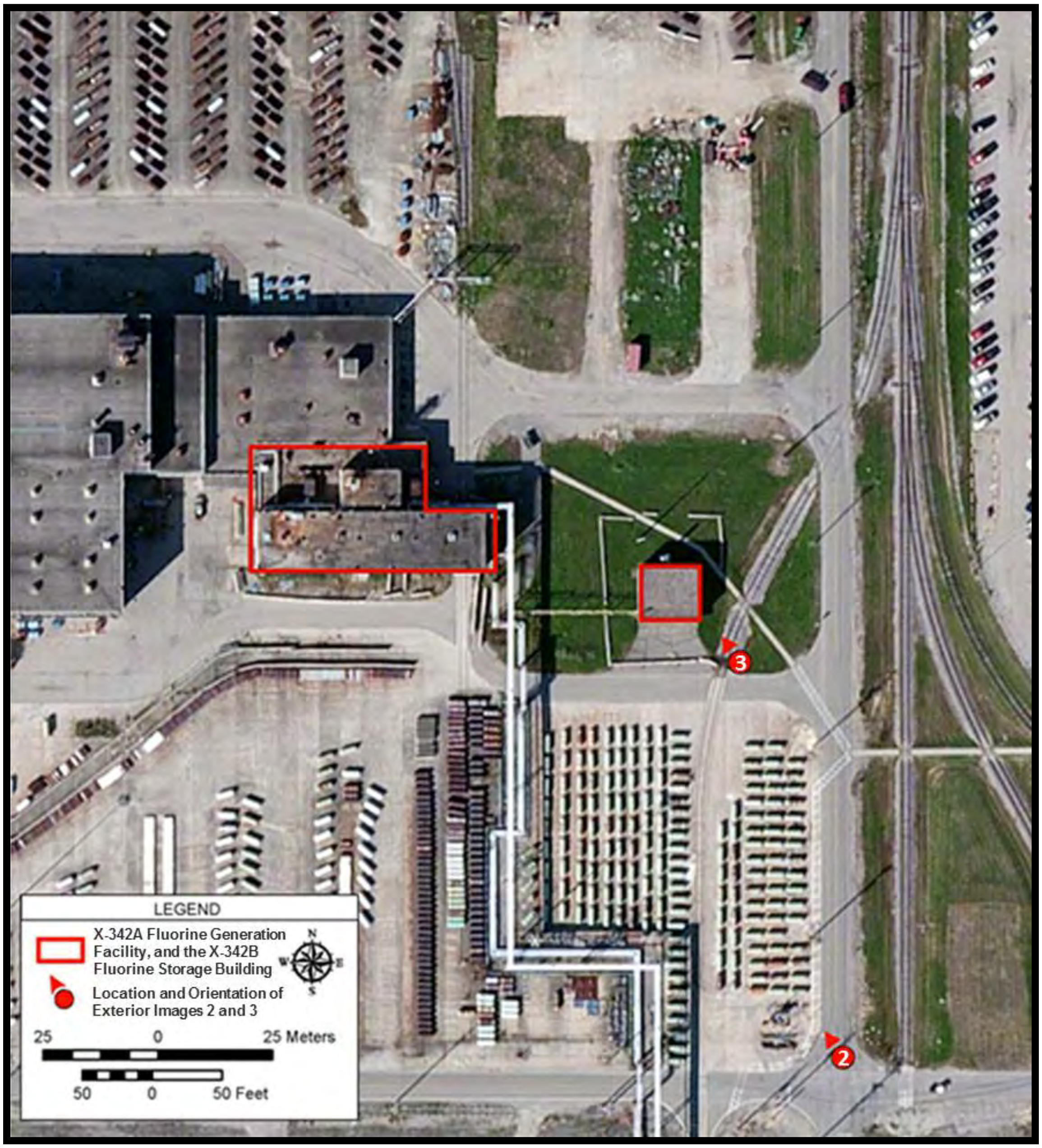

Figure 1: Location and Orientation of Exterior Photographs (1 and 3)

Figure 2: South Side of the X-342A Feed Vaporization and Fluorine Generation Facility and the X-342B Fluorine Storage Building, August 2014, Facing Northwest, Cylinders in the Foreground

Figure 3: South Side of the X-342A Feed Vaporization and Fluorine Generation Facility and the X-342B Fluorine Storage Building, August 2014, Facing Northwest

Appendix B: Historical Photographs

Figure 4: The X-342A Feed, Vaporization, and Fluorine Generation Facility and the X-342B Fluorine Storage Building Construction Site, September 1953

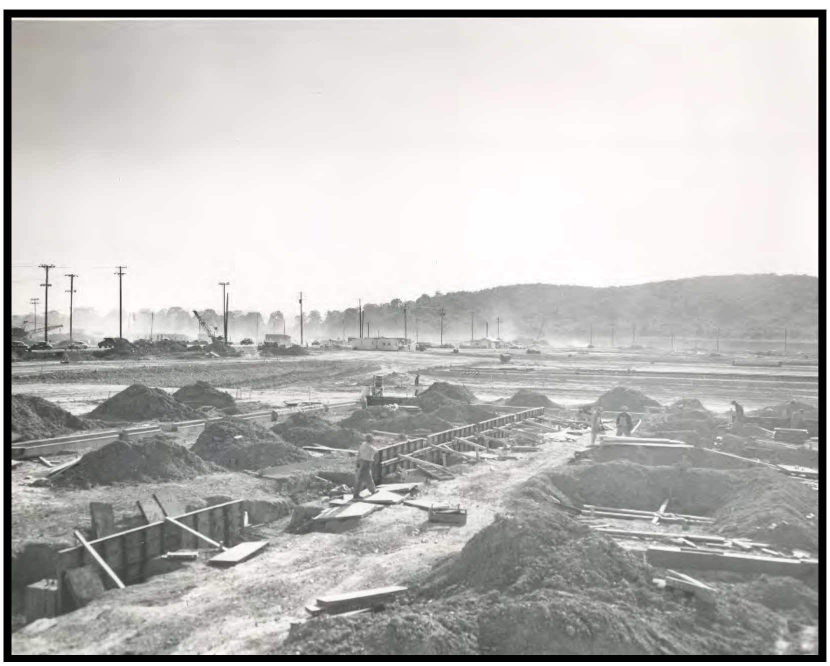

Figure 5: The X-342A Feed Vaporization Building and X-342B Fluorine Storage Facility Construction Site, October 1953

Figure 6: Looking Southwest at the X-342A Feed, Vaporization and Fluorine Generation Facility, November 1953

Figure 7: Steel Framework for the X-342A Feed, Vaporization, and Fluorine Generation Facility and the X-342B Fluorine Storage Building, February 1954

Figure 8: Steel Framework for the X-342B Fluorine Storage Building, February 1954

Figure 9: Steel Framework for the X-342B Fluorine Storage Building, April 1954

Figure 10: The X-342A Feed, Vaporization, and Fluorine Generation Facility, April 1954

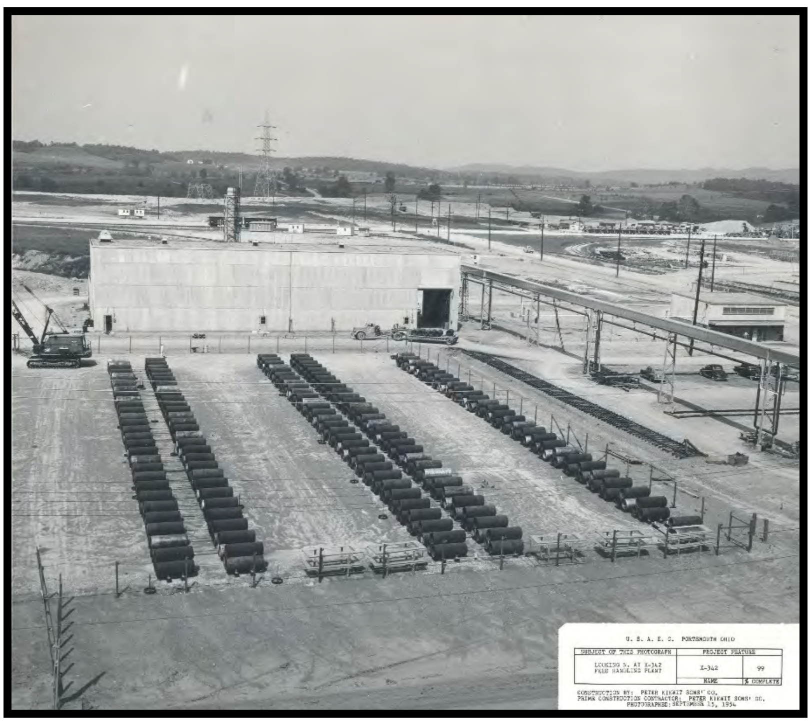

Figure 11: Looking North at the X-342A Feed, Vaporization, and Fluorine Generation Facility and the X-342B Fluorine Storage Building, September 1954

Appendix C: Historical Drawings

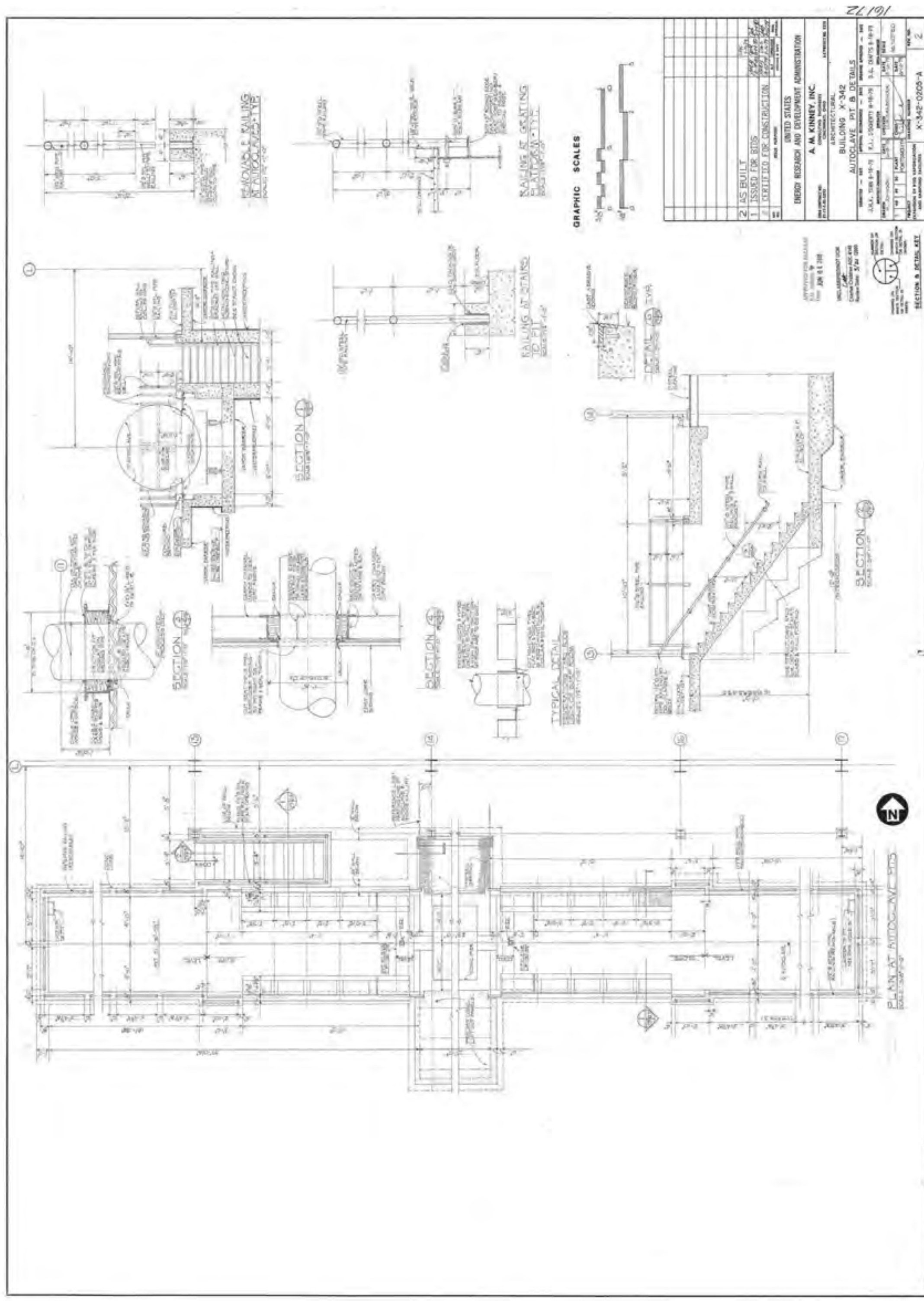

Figure 12: Autoclave Pit and Details

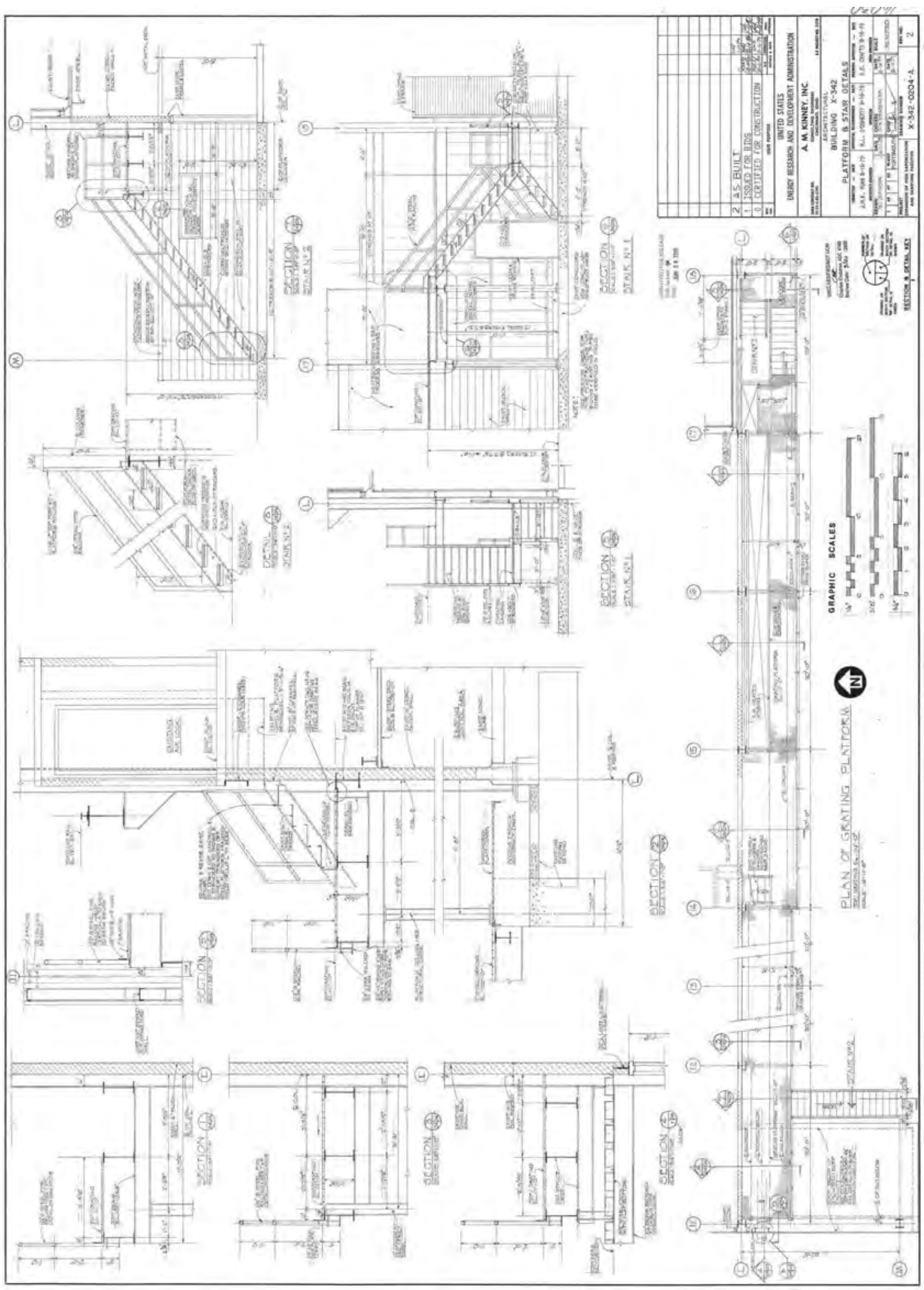

Figure 13: Platform and Stair Details

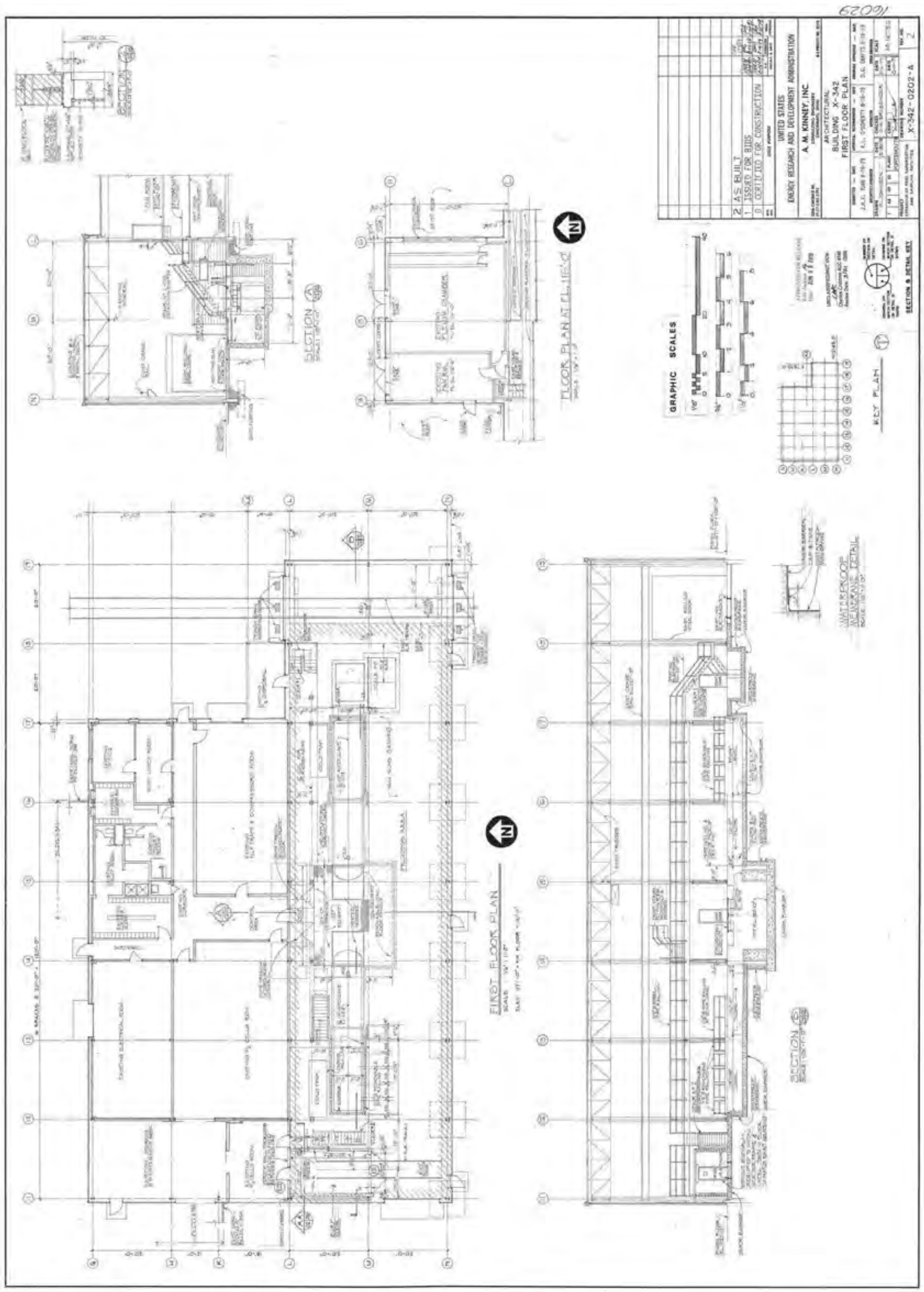

Figure 14: First Floor Plan

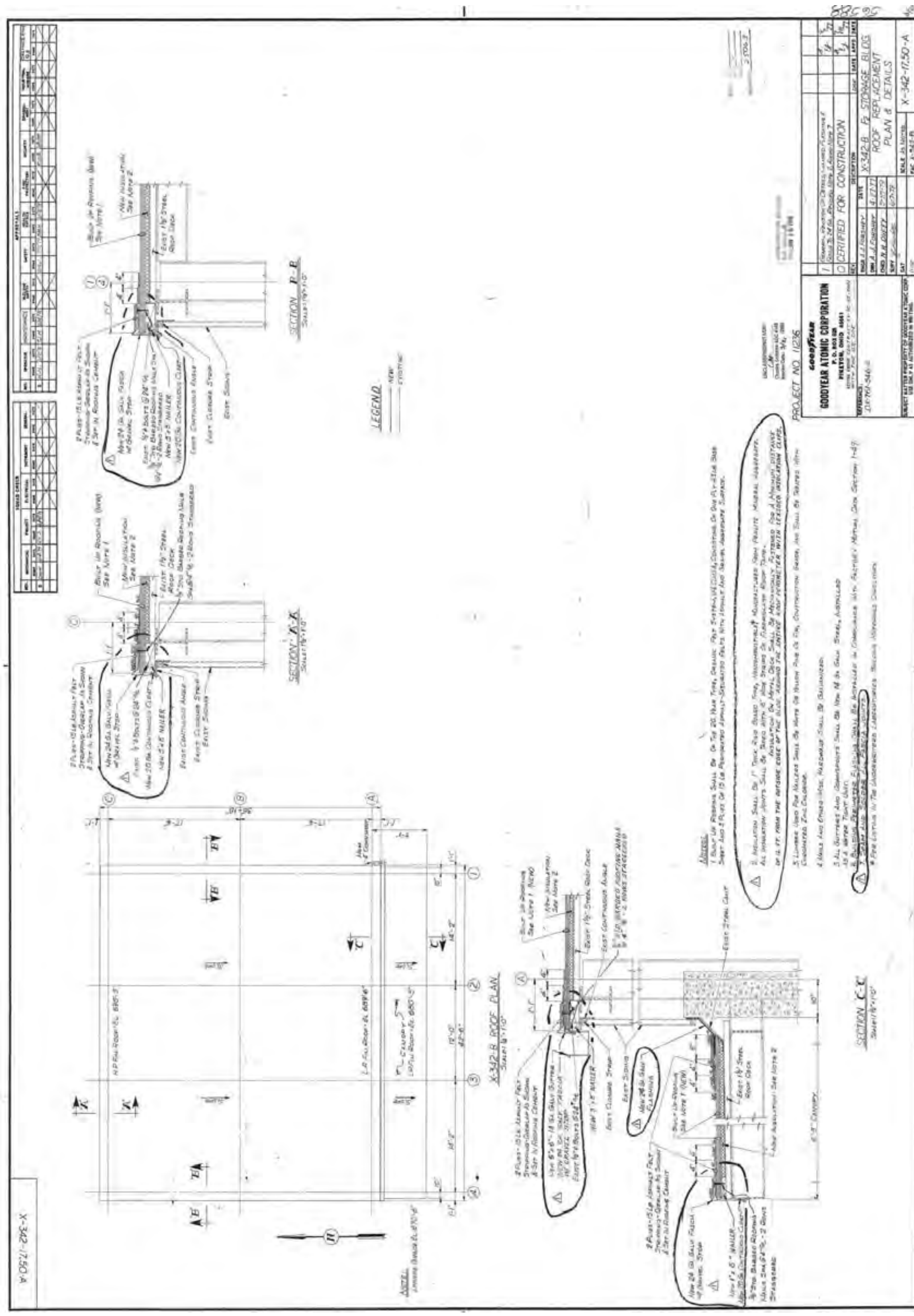

Figure 15: Roof Replacement Plan

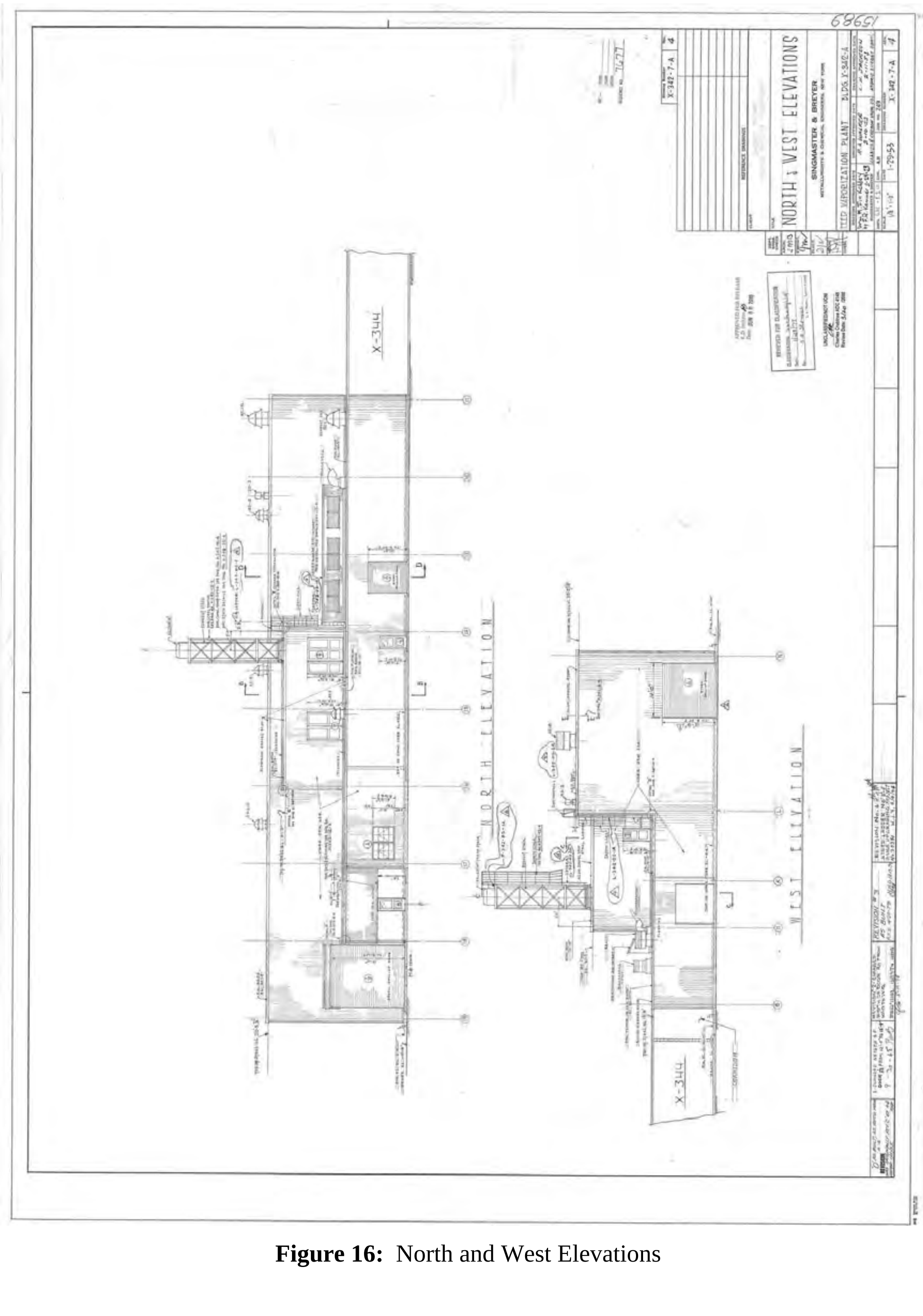

Figure 16: North and West Elevations

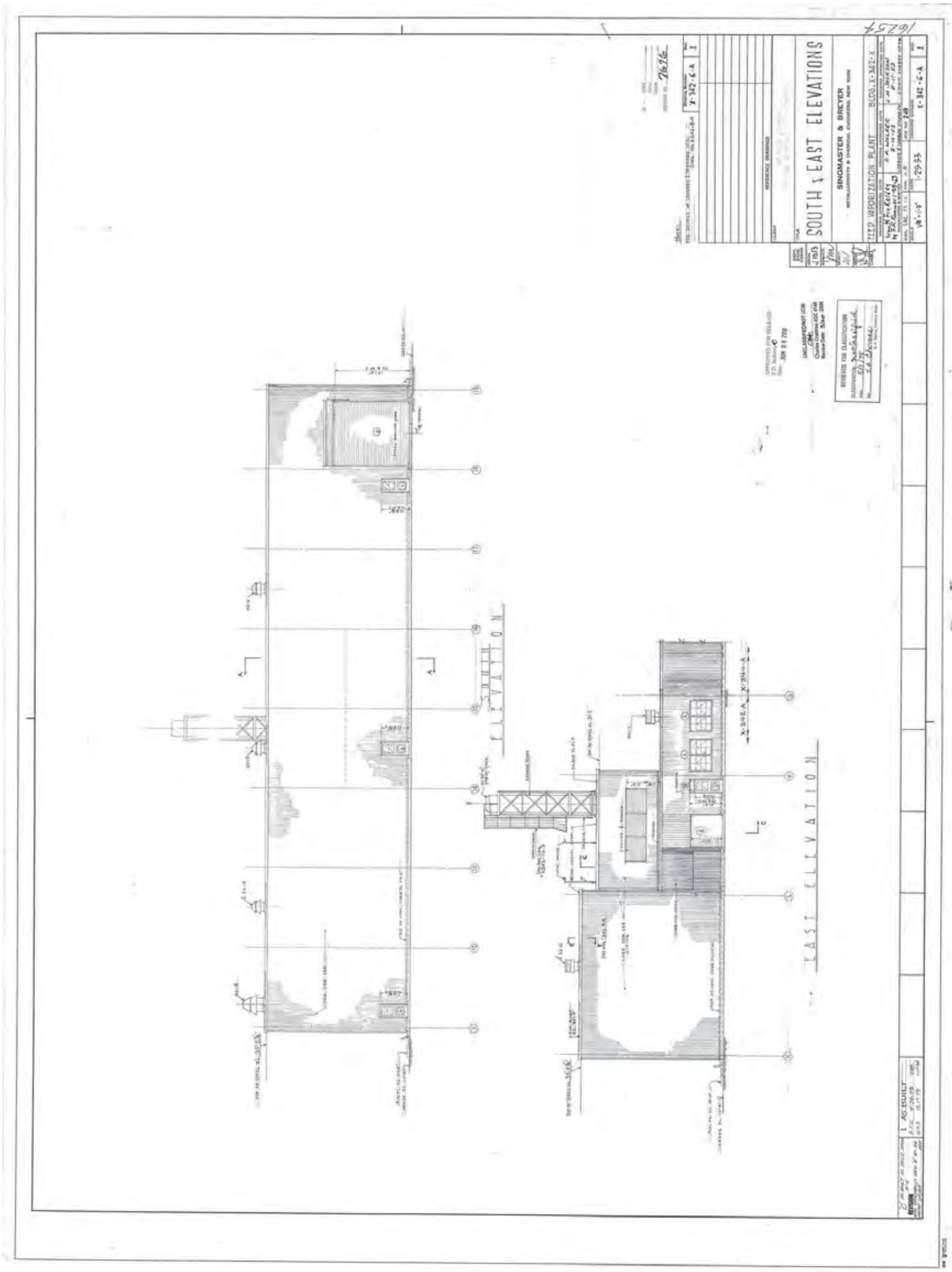

Figure 17: South and East Elevations

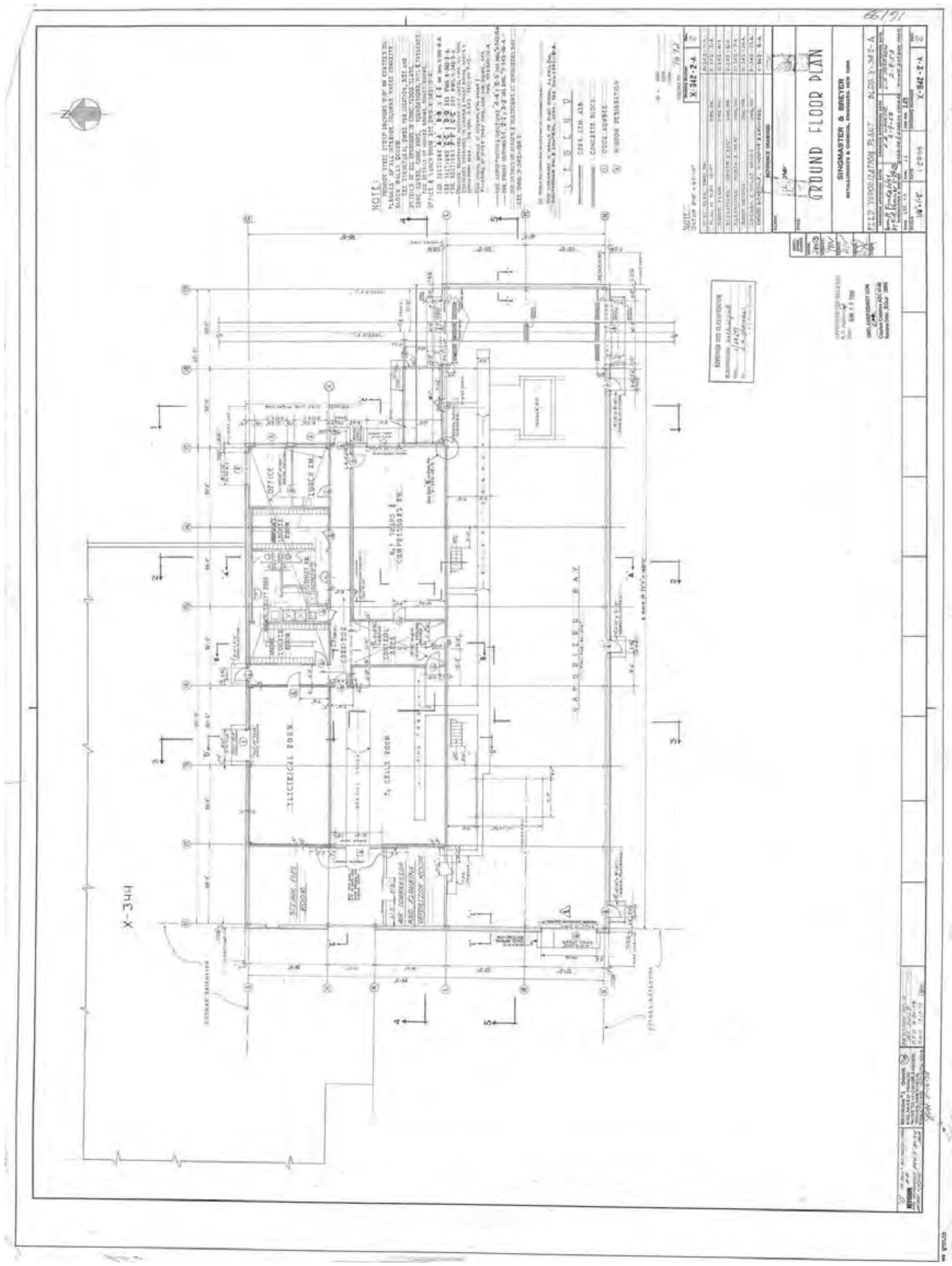

Figure 18: Ground Floor Plan

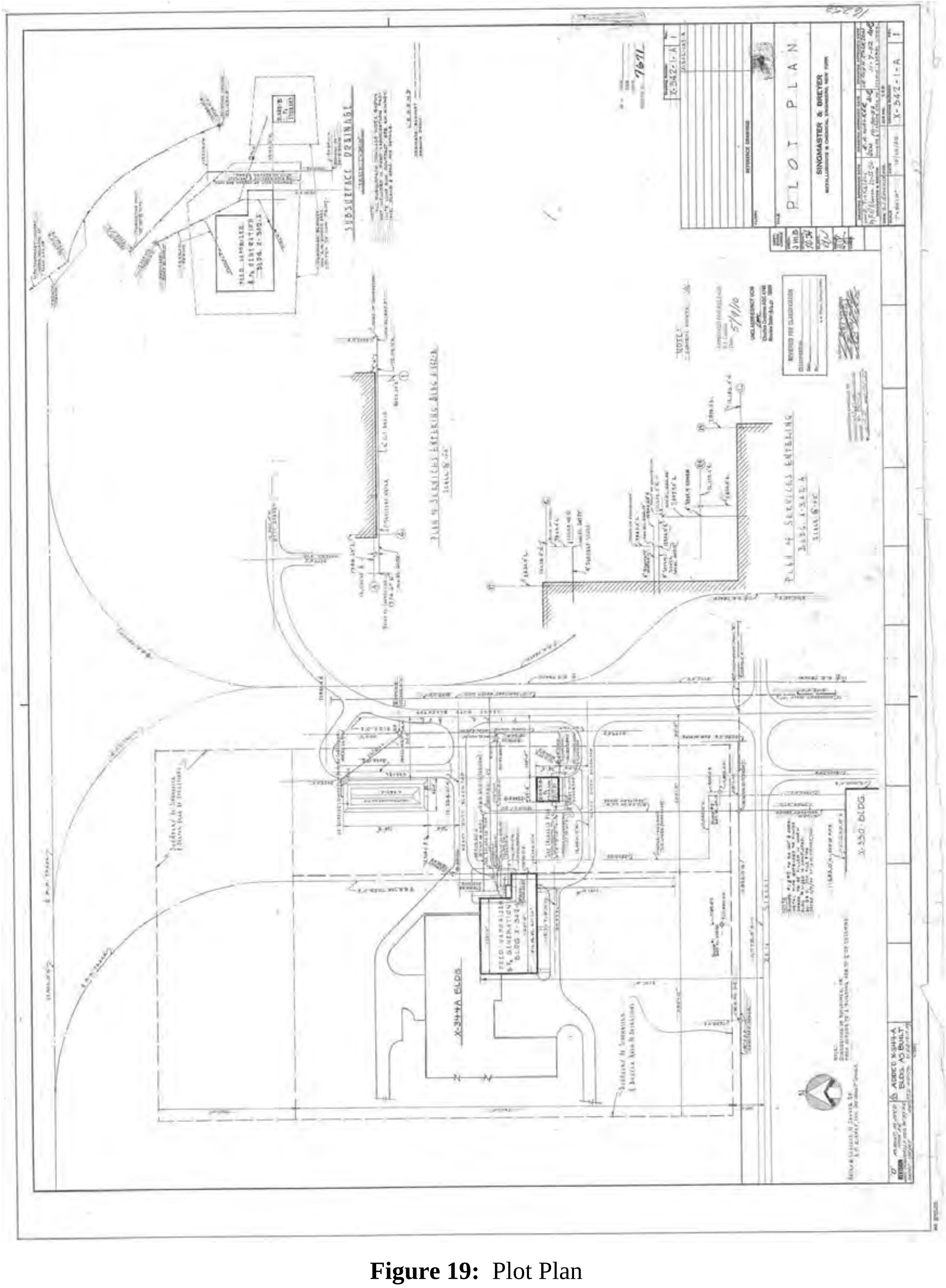

Figure 19: Plot Plan

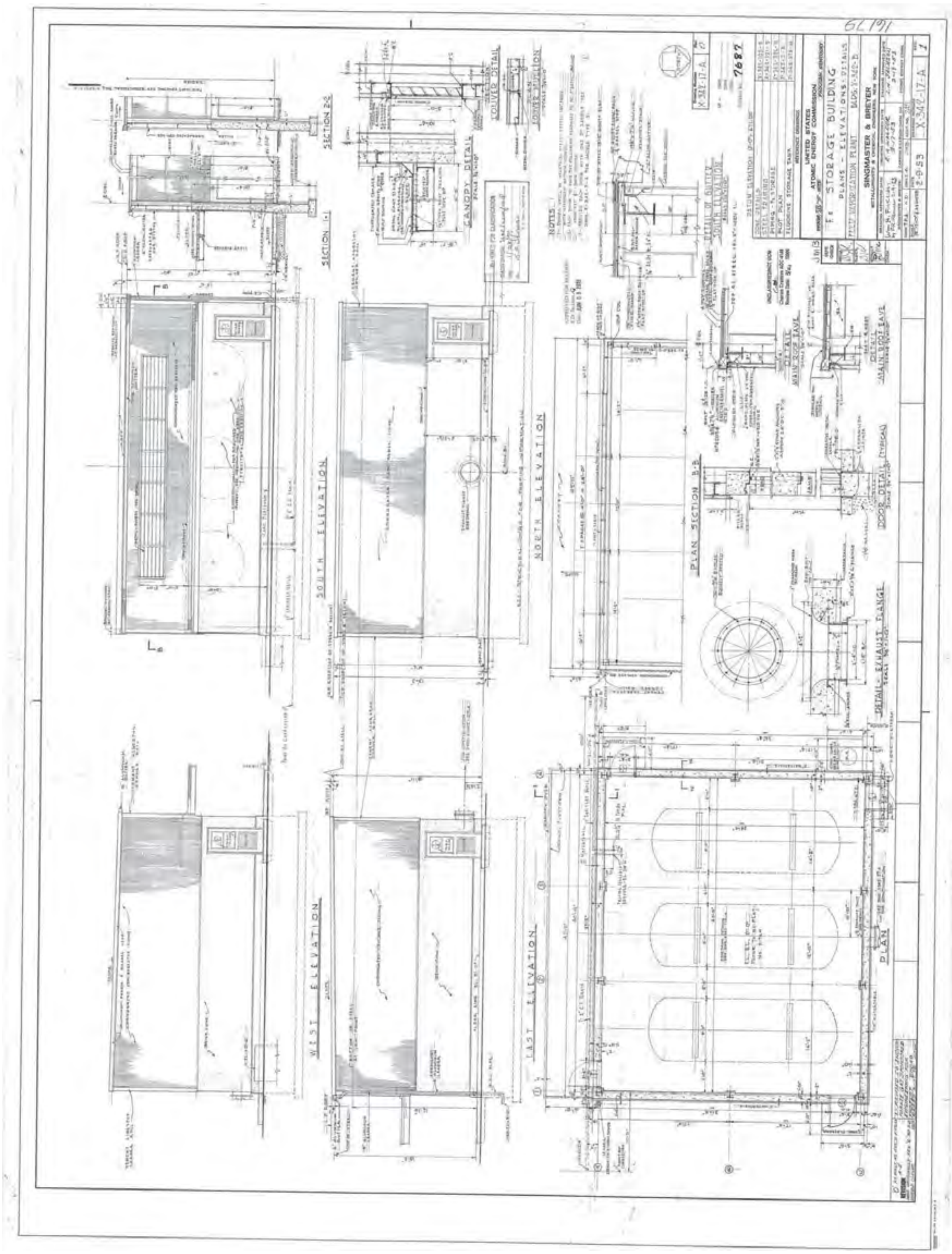

Figure 20: Storage Building

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-344A URANIUM HEXAFLUORIDE GAS SAMPLING FACILITY
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-G

HAER OH-142-G

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-344A URANIUM HEXAFLUORIDE GAS SAMPLING FACILITY

HAER No. OH-142-G

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-344A Uranium Hexafluoride (UF_6) Sampling Facility is located at Ohio State Plane South coordinates at easting 1826069.708714 ft, northing 372270.270827010 ft and at Universal Transverse Mercator Zone 17N easting 326745.8325 m, northing 4321015.619 m. The coordinate represents the approximate center of the X-530 Electrical Switchyard Complex. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1958
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission (AEC) oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	The X-344A UF_6 Sampling Facility supports UF_6 sampling activities, as well as other activities required for the daily operation of PORTS.
Significance:	Originally, the X-344A UF_6 Sampling Facility housed 40 fluorine generators and a flame tower, which were used to convert uranium tetrafluoride to UF_6, critical to PORTS uranium enrichment mission. The X-344 Project was a general expansion of the existing fluorine-generating and feed-vaporization plant of which the X-344A comprised the major added structure and the new fluorine facility and components. Abandoned in 1962, the X-344A Facility was converted to serve as the shipping and receiving point for low assay uranium. This building is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014 and in November 2017. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For

additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-344A UF_6 Sampling Facility HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-344A UF_6 Sampling Facility:

In March 1956, the AEC awarded the contract for the X-344A Facility to the Blount Brothers Construction Company of Montgomery, Alabama. The facility was built during final major phase of PORTS construction, which occurred from 1952 to 1956. Prior to contracting with Blount Brothers, Peter Kiewit Sons' Company performed the initial grading, backfilling, and site work (Appendix B, Figures 6 through 9).

Blount Brothers subcontracted the X-344A Facility's electrical work to Walter Truland Corporation of Washington, D.C. The James F. O'Neil Company, of New Orleans, Louisiana, received a subcontract to perform all mechanical work for the X-344A Facility. The O'Neil Company in turn awarded a subcontract for heating and ventilation work to James F. Dye, location unknown. The Breeding Insulation Company, of Knoxville, Tennessee, won a subcontract to install insulation around mechanical piping and equipment. The Minneapolis-Honeywell Company, of Minneapolis, Minnesota, received a subcontract for control work, and the Taylor Instrument Company, of Rochester, New York, won a subcontract to install instrumentation for the X-344A Facility.

Blount Brother's forces began pouring concrete for the X-344A Facility on March 30, 1956. Most of the concrete work for the X-344A Facility was complete by January 1957. As work on the concrete slabs and footers continued, the International Steel Company, of Evansville, Indiana, delivered steel to the building site for the X-344A Facility's steel framework. Blount Brothers set the first base plates in place on June 18, 1956. Workers completed all steelwork by November 1956 (Figures 10 through 12).

W. Biddle Walker, location unknown, began installing the metal roof panels in September 1956. Roof work transpired simultaneously with the bolting of the buildings' metal frames. Walker began installation of siding in October 1956.

Mechanical and electrical work commenced in April 1956. J. F. O'Neil Company completed installation of interior underground piping by early September 1956. Electricians completed most of the electrical work by January 1957, and the X-344A Facility was largely complete by this time.

Historical drawings of building plans are provided in Appendix C (Figures 13 through 18).

Part II. Site Information

Description of the X-344A UF_6 Sampling Facility:

The X-344A UF_6 Sampling Facility is located in the north-central portion of PORTS. The X-344A Facility is connected on the west and south sides to the X-342A Feed, Vaporization, and Fluorine Generation Facility. The X-344A Facility was originally used to produce UF_6 feed material from uranium tetrafluoride, also known as "green salt." The higher assay UF_6 feed material, manufactured in the X-344A Facility, was mixed with depleted UF_6. These two facilities combined provided the feed material for the cascades in the PORTS process buildings.

The X-344A Facility is a one-and-two-story, utilitarian building set atop a concrete pier and slab foundation (Appendix A, Figures 1 through 5). The plan of the building results in a ground floor area of approximately 62,700 square feet. The walls consist of steel framing covered with cement-asbestos panels. The X-344A Facility has few window openings. The building, however, has several louvered metal vents. The roof is relatively flat, with a metal-deck and waterproof membrane. Entries to the building consist of multiple, metal doors for pedestrians and multiple rolling metal overhead doors for vehicular and rail access.

The interior of the X-344A Facility contains a variety of equipment used in the manufacturing of UF_6. It also includes a fluorination facility for producing UF_6 from green salt. This facility includes 40 fluorine generators, a flame tower, and the high assay sampling area. In addition, the building includes office space, hot and cold locker and shower rooms, and lunch rooms in both the northwest corner and the northeast corner of the building. The facility now provides for sample and transfer of UF_6 from production cylinders to shipping cylinders.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio*, DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Department of Energy. Highly *Enriched Uranium: Striking a Balance, A Historical Report on the United States Highly Enriched Uranium Production, Acquisition, and Utilization Activities from 1945 to September 30, 1996*, Revision 1. Washington, D.C.: National Nuclear Security Administration, U.S. Department of Energy, 2001.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Portsmouth Gaseous Diffusion Plant Virtual Museum – accessed at http://www.portsvirtualmuseum.org/ operated and managed by Fluor-BWXT Portsmouth for DOE.

Appendix A: Survey Photographs

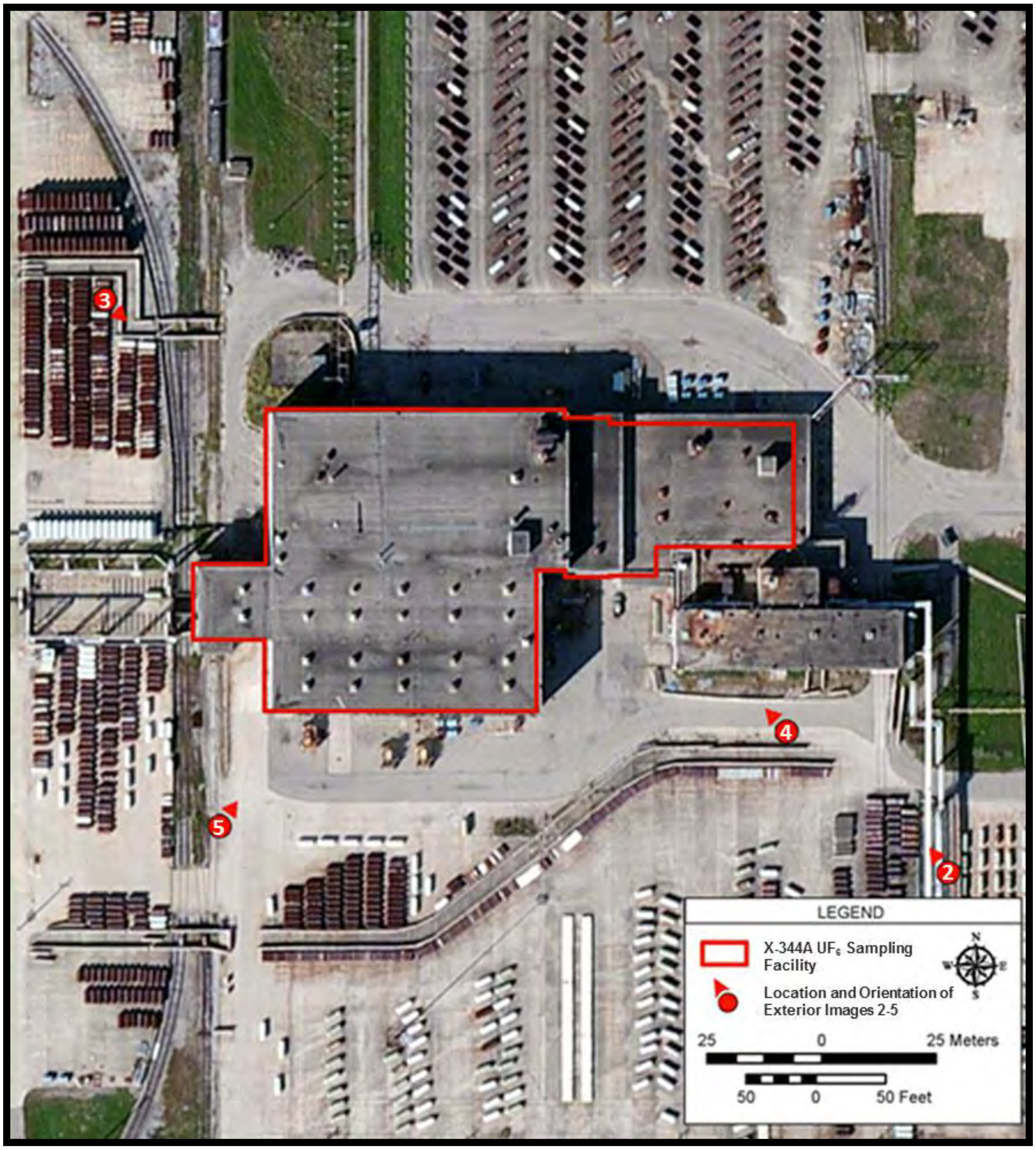

Figure 1: Location and Orientation of Exterior Photographs (2 and 5)

Figure 2: South Side of the X-344A UF_6 Sampling Facility, August 2014, Facing Northwest, Cylinders in the Foreground

Figure 3: North Side of the X-344A UF_6 Sampling Facility, November 2017, Facing Southwest, Cylinders in the Foreground

Figure 4: South Side of the X-344A UF_6 Sampling Facility and X-342A Feed Vaporization and Fluorine Generation Facility, August 2014, Facing Northwest, Cylinders in the Foreground

Figure 5: South Side of the X-344A UF_6 Sampling Facility, August 2014 Facing Northeast, Cylinders in the Foreground

Appendix B: Historical Photographs

Figure 6: Looking Northeast at Site of the X-344A UF_6 Sampling Facility Site, October, 1955

Figure 7: Looking Northeast Showing Construction in West Part of the X-344A UF_6 Sampling Facility Site, June 1956

Figure 8: Looking West Across Reactor Pit for the X-344A UF_6 Sampling Facility, June 1956

Figure 9: General View of X-344A UF_6 Sampling Facility Construction, Looking East, June 1956

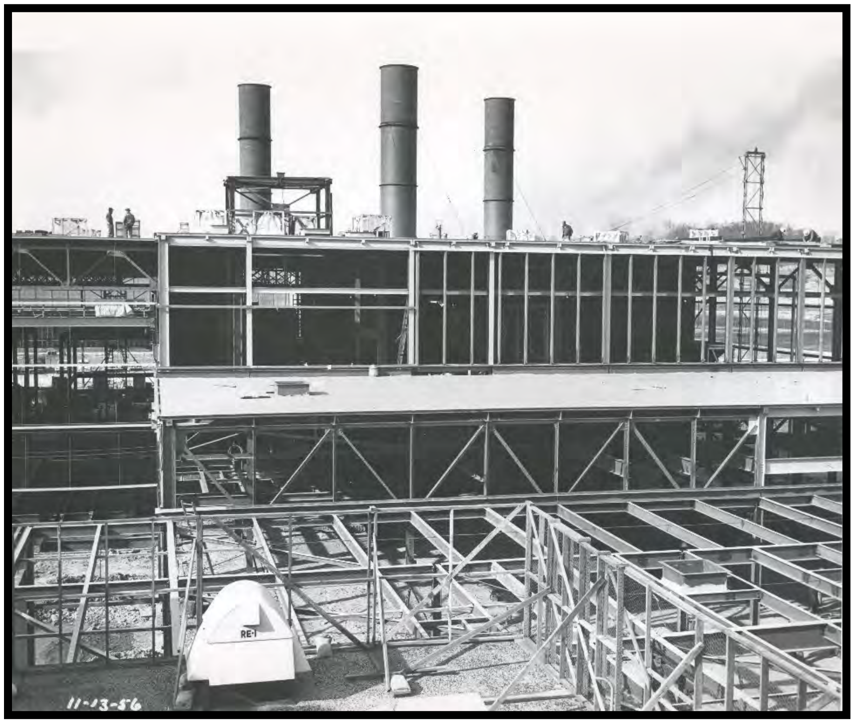

Figure 10: The X-344A UF_6 Sampling Facility, November 1956

Figure 11: The X-344A UF_6 Sampling Facility, November 1956

Figure 12: The X-344A UF_6 Sampling Facility, November 1956

Appendix C: Historical Drawings

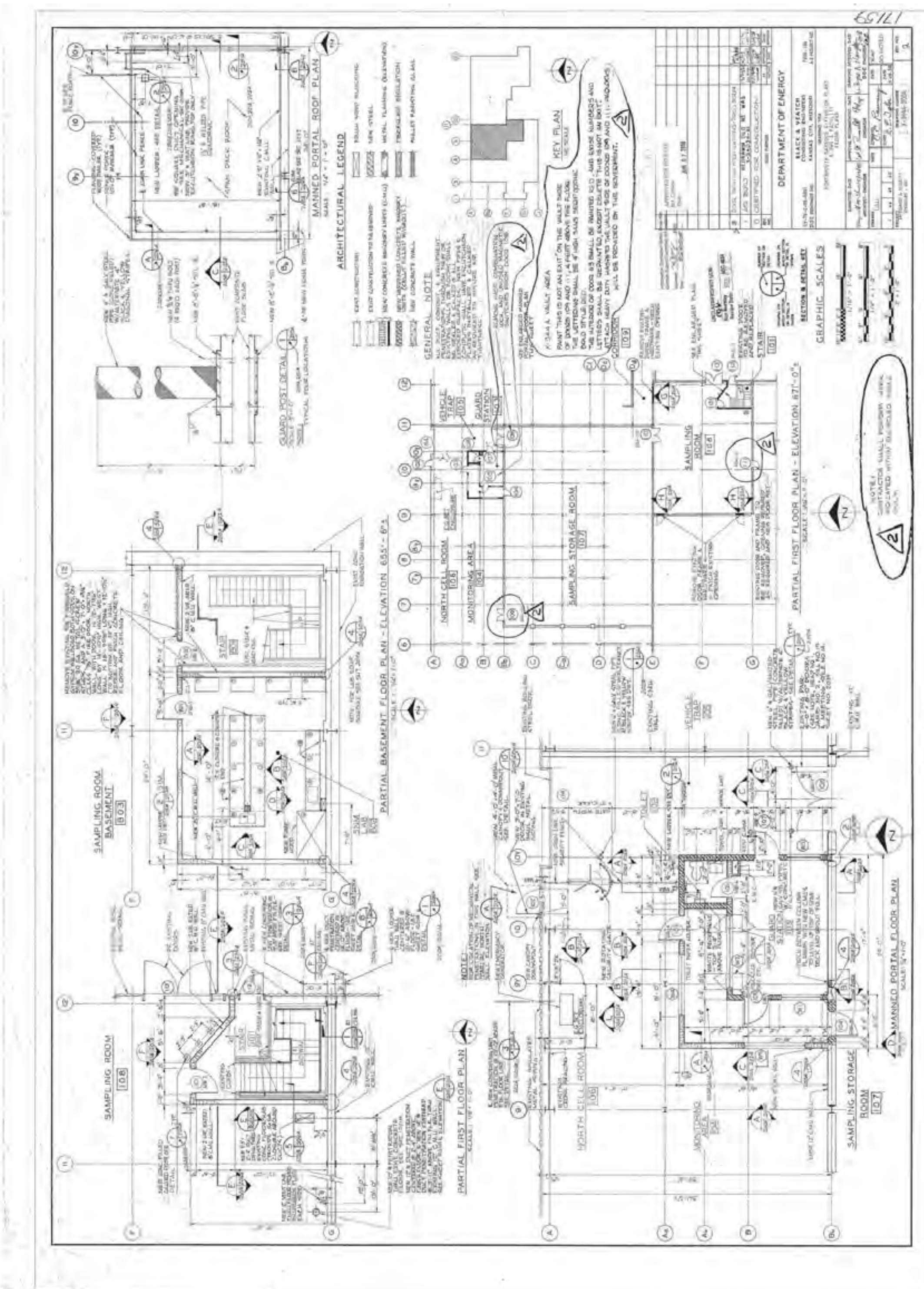

Figure 13: Floor Plans

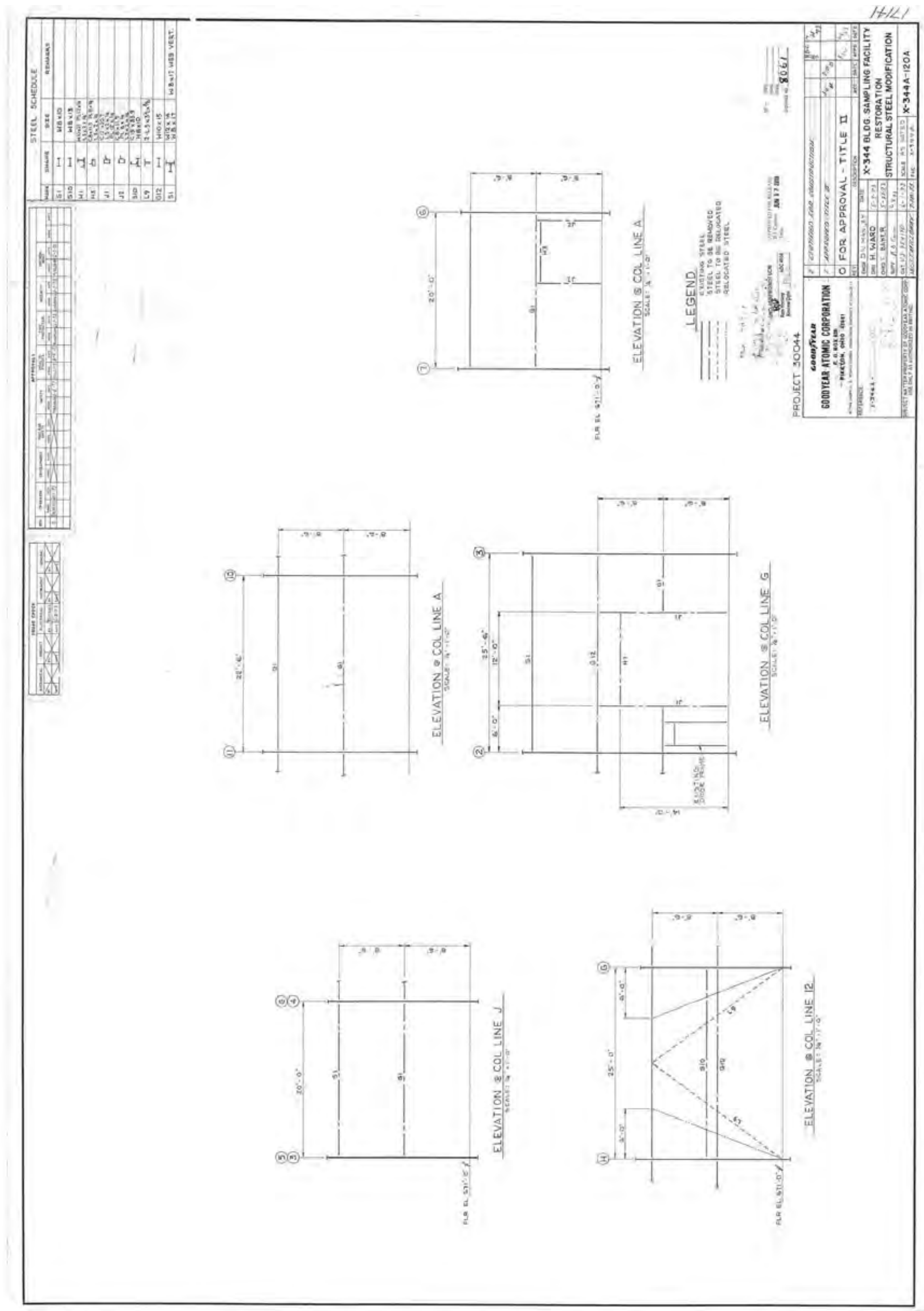

Figure 14: Structural Steel Modification

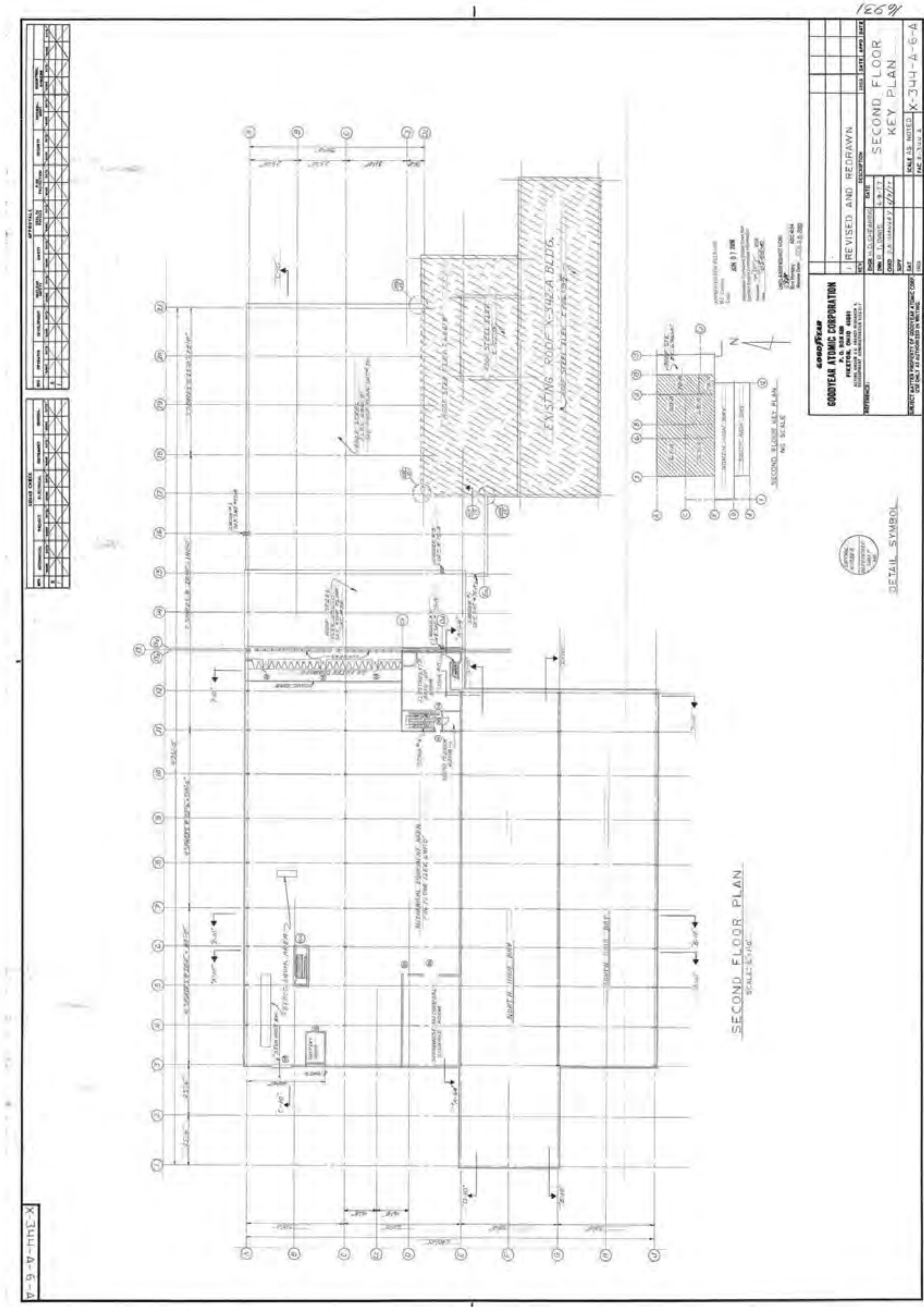

Figure 15: Second Floor Key Plan

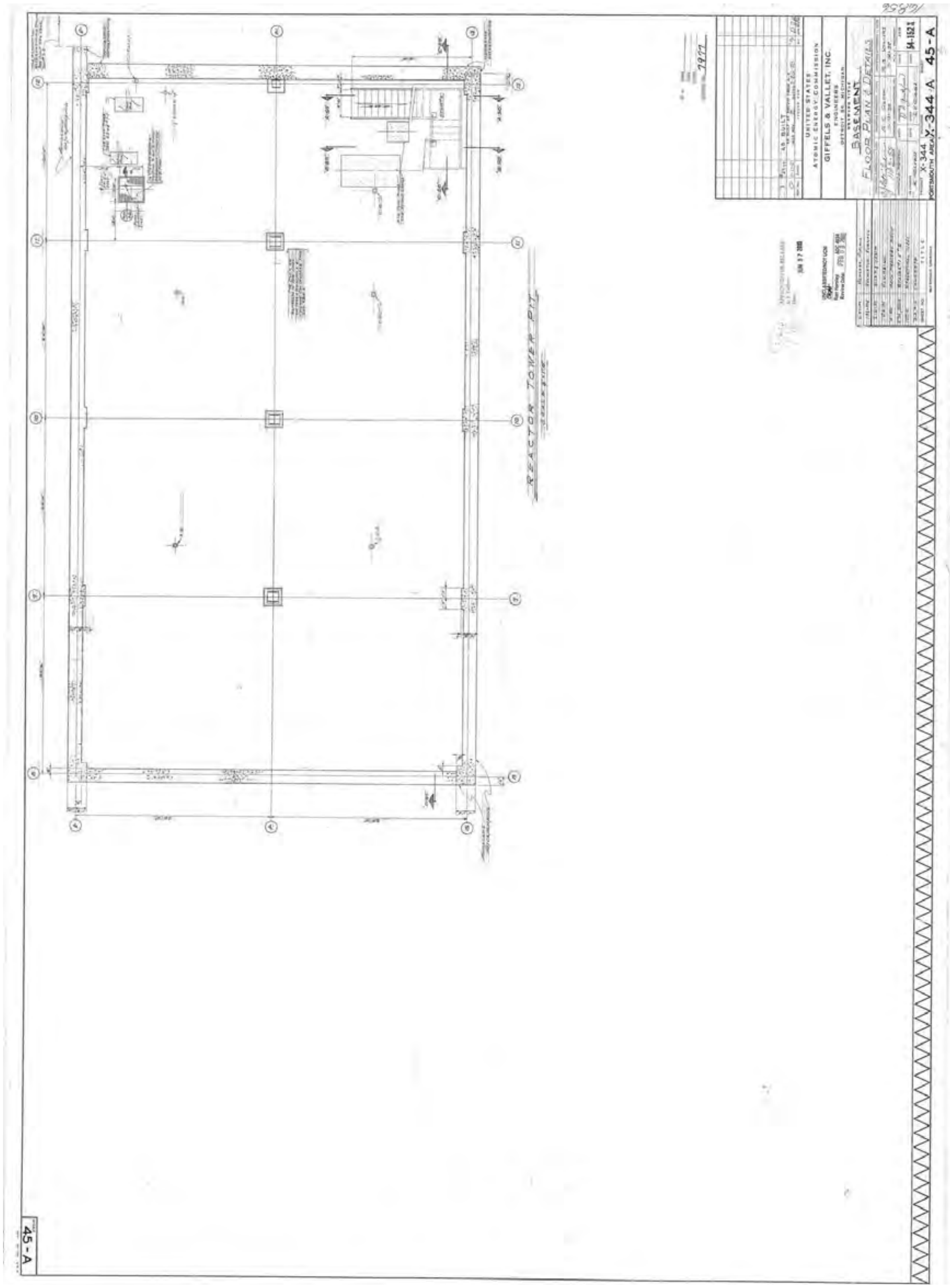

Figure 16: Basement Floor Plan

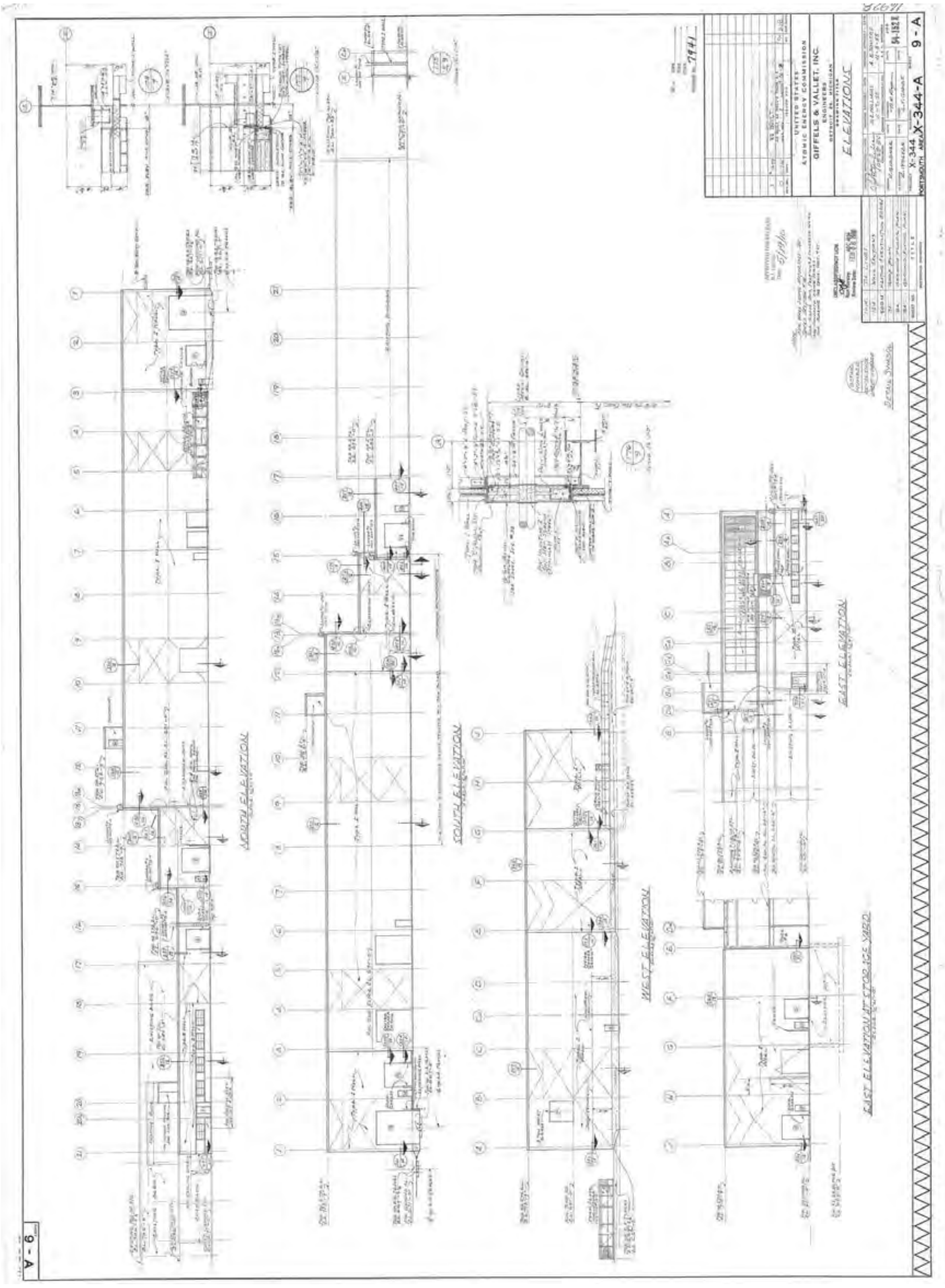

Figure 17: Elevations

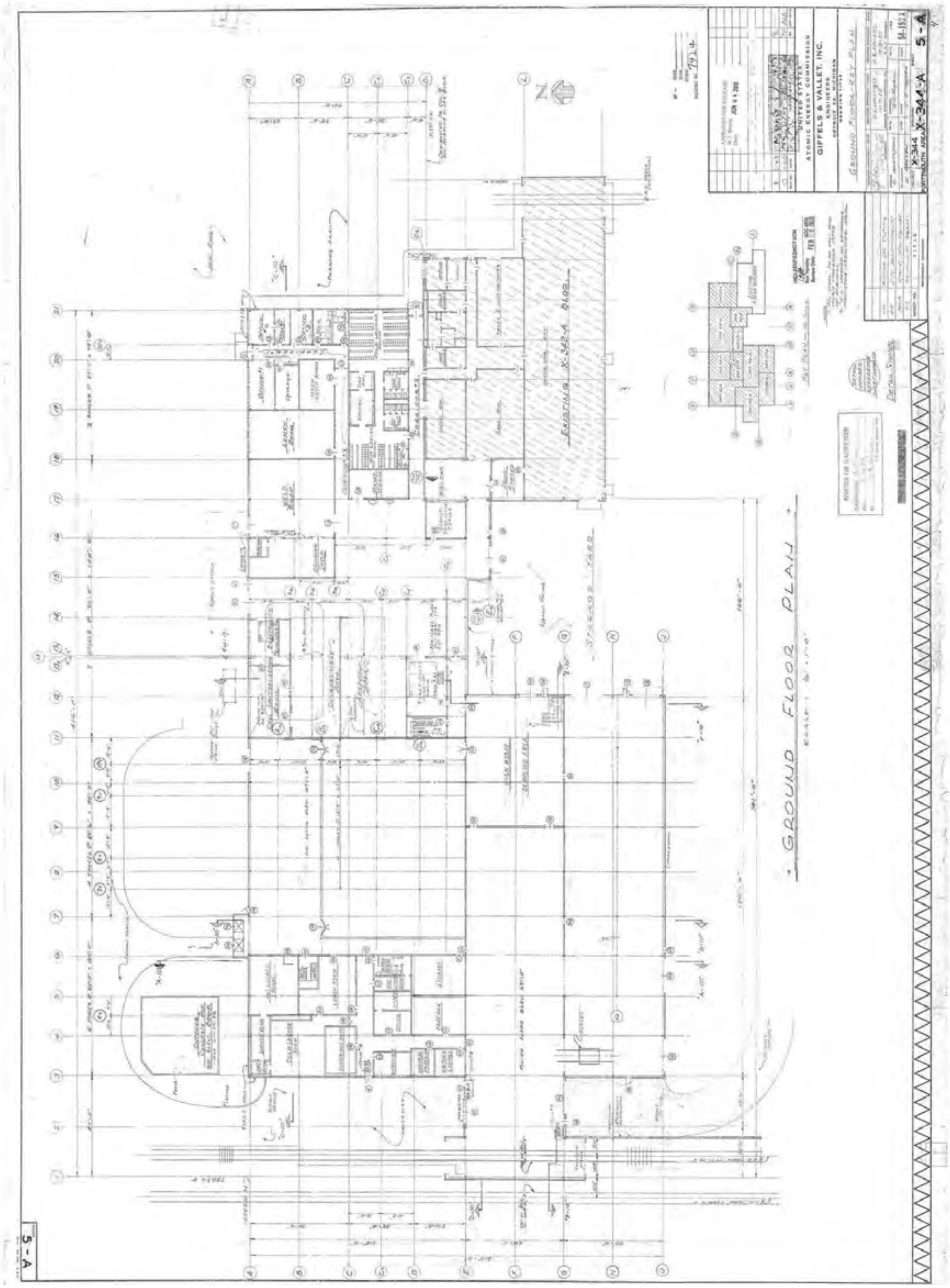

Figure 18: Ground Floor Key Plan

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-100 ADMINISTRATION BUILDING
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-H

HAER OH-142-H

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-100 ADMINISTRATION BUILDING

HAER No. OH-142-H

Location: Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio

The X-100 Administration Building is located at Ohio State Plane South coordinates at easting 1827602.025025 ft, northing 367779.805505409 ft and at Universal Transverse Mercator Zone 17N easting 327190.3215 m, northing 4319639.412 m. The coordinate represents the approximate center of the X-100 Administration Building. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.

Date of Construction: 1954

Designer/Builder: Peter Kiewit Sons' Construction Company

Previous Owner: N/A

Present Owner: The Atomic Energy Commission (AEC) oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.

Present Use: Demolished September 2012

Significance: The former X-100 Administration Building housed administrative staff who oversaw day-to-day operations at PORTS. The two-story building was built with four wings surrounding a secure three-level (basement included) records vault where classified documents and photographs were stored. PORTS was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.

Project Information: Fluor B&W Portsmouth LLC photographed the site in July 2006, December 2010, February 2011, and in August 2012. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-100 Administrative Building HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-100 Administration Building:
The X-100 Administration Building (Appendix A, Figures 1-6) was built in 1954 by the E.C. Corporation, of Knoxville, Tennessee during the initial phase of construction at PORTS (Appendix B, Figures 7-13). LVI Service Inc. demolished the building in September 2012 as a part of site cleanup and closure.

Historical drawings of building plans are included in Appendix C (Figures 14 through 25).

Part II. Site Information

Description of the X-100 Administration Building:
The building provided offices for central files and document records, and housed the offices relating to the administration of operations at PORTS, including a Production Division, Industrial Relations Division, Engineering Division, and general offices of the AEC. The building's location allowed for plant supervisory use, as well as accessibility to members of the public with official business at PORTS.

The X-100 Administration Building was centered on a two-story, squared, reinforced concrete vault structure (Appendix A, Figures 1-6). Radiated from this central block, four, two-story, wood-frame wings clad with asbestos-cement siding were arranged at right angles in a pinwheel fashion. Each wing was at least 240' long and the building as a whole provided 135,000 sqaure feet of floor space. The roof had a slight slope to it and was covered with built-up roofing and gravel. The eaves of the roofline extended slightly over the adjacent walls. Fenestration consisted of banded window openings with steel sash.

The central core of the building had a basement and a penthouse. The wings of the building were built on concrete slabs with concrete pier foundations supporting two rows of structural columns. Each wing was separated from the central core by fire walls consisting of 12" thick concrete block masonry. The center of the core served as a security vault on all three floors. The perimeter walls and adjacent stairwell framing, floors, and roofs of the central core vault were constructed of fire-resistant reinforced concrete. Other interior walls and walls of the four wings were of wood-frame construction and clad in gypsum board on the interior with asbestos siding on the exterior.

The northern wing of the X-100 Administration Building originally housed the Production Division Offices. The eastern wing housed the Industrial Relations Offices. The southern wing housed the AEC Offices, and the western wing housed the Engineering Offices. A freight elevator was located on the south side of the central core facing a parking lot. A print shop, secured communications center, and telephone switchboard were located in one half of the basement. The other half of the basement contained a hydraulic system for the freight elevator and a steam condensate tank. An ambient air monitoring station was located in the penthouse.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3, Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0207&D4. Piketon, OH: U.S. Department of Energy, October 2011.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio,* DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

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Appendix A: Survey Photographs

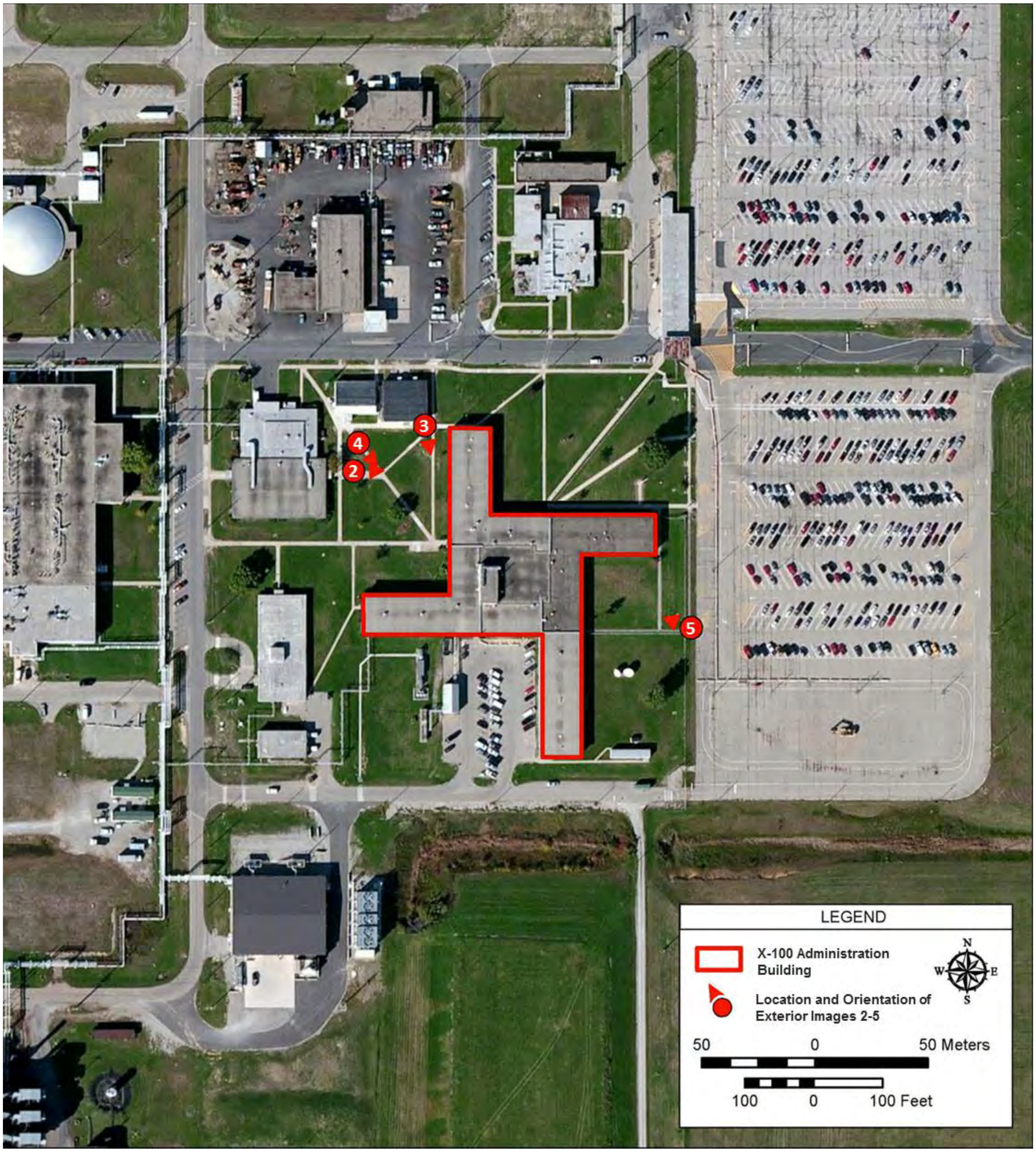

Figure 1: Location and Orientation of Exterior Photographs (2 through 5)

Figure 2: West Side of the X-100 Administration Building, August 2012, Facing Northeast

Figure 3: West Side of the X-100 Administration Building, December 2010, Facing Southeast

Figure 4: West Side of the X-100 Administration Building, February 2011, Facing Southeast

Figure 5: East Side of the X-100 Administration Building, February 2011, Facing Northwest

Figure 6: Aerial View of the X-100 Administration Building, July 2006, Facing West

Appendix B: Historical Photographs

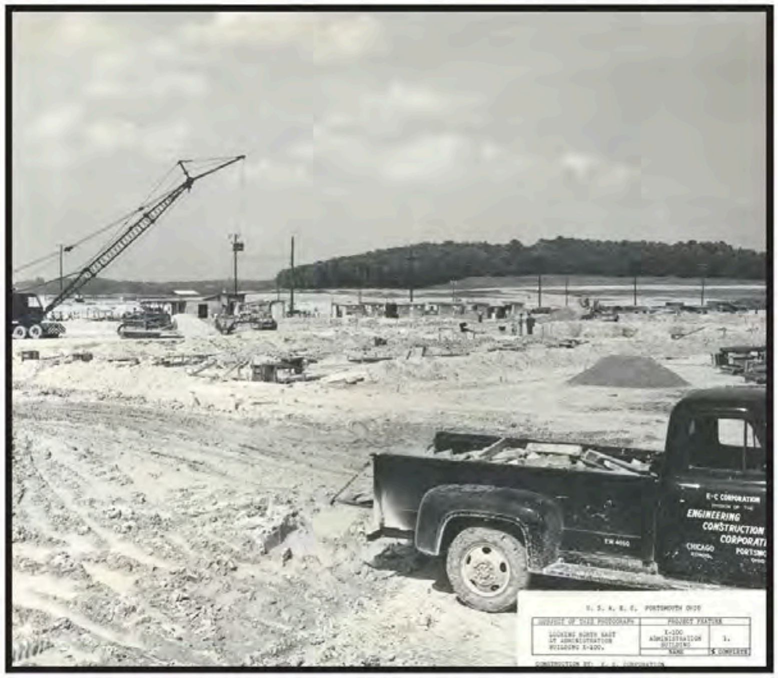

Figure 7: Looking Northeast at X-100 Administration Building, August 12, 1953

Figure 8: Looking East at X-100 Administration Building, October 14, 1953

Figure 9: Looking East at X-101 Dispensary and X-100 Administration Building, December 15, 1953

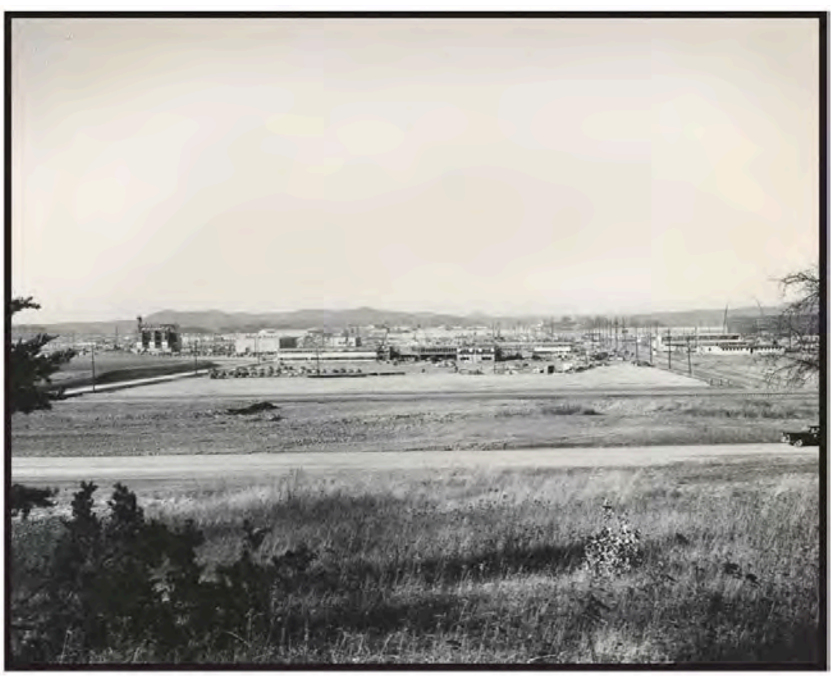

Figure 10: Looking West at X-100 Administration Building, December 1953

Figure 11: The X-101 and X-100 Administration Buildings, Looking East, February 12, 1954

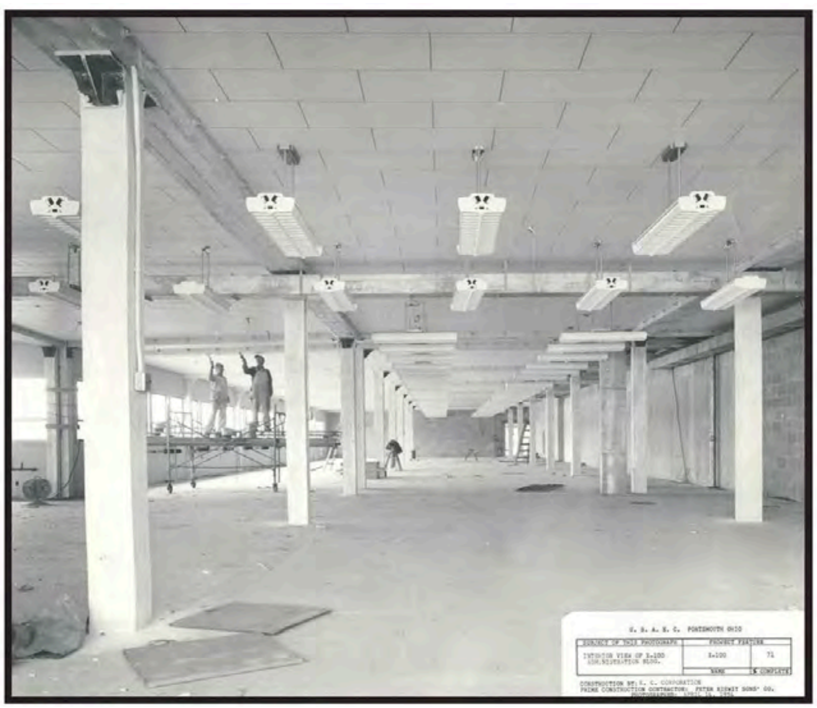

Figure 12: Interior View of X-100 Administration Building, April 14, 1954

Figure 13: Interior View of South Wing of X-100 Administration Building, May 14, 1954

Appendix C: Historical Drawings

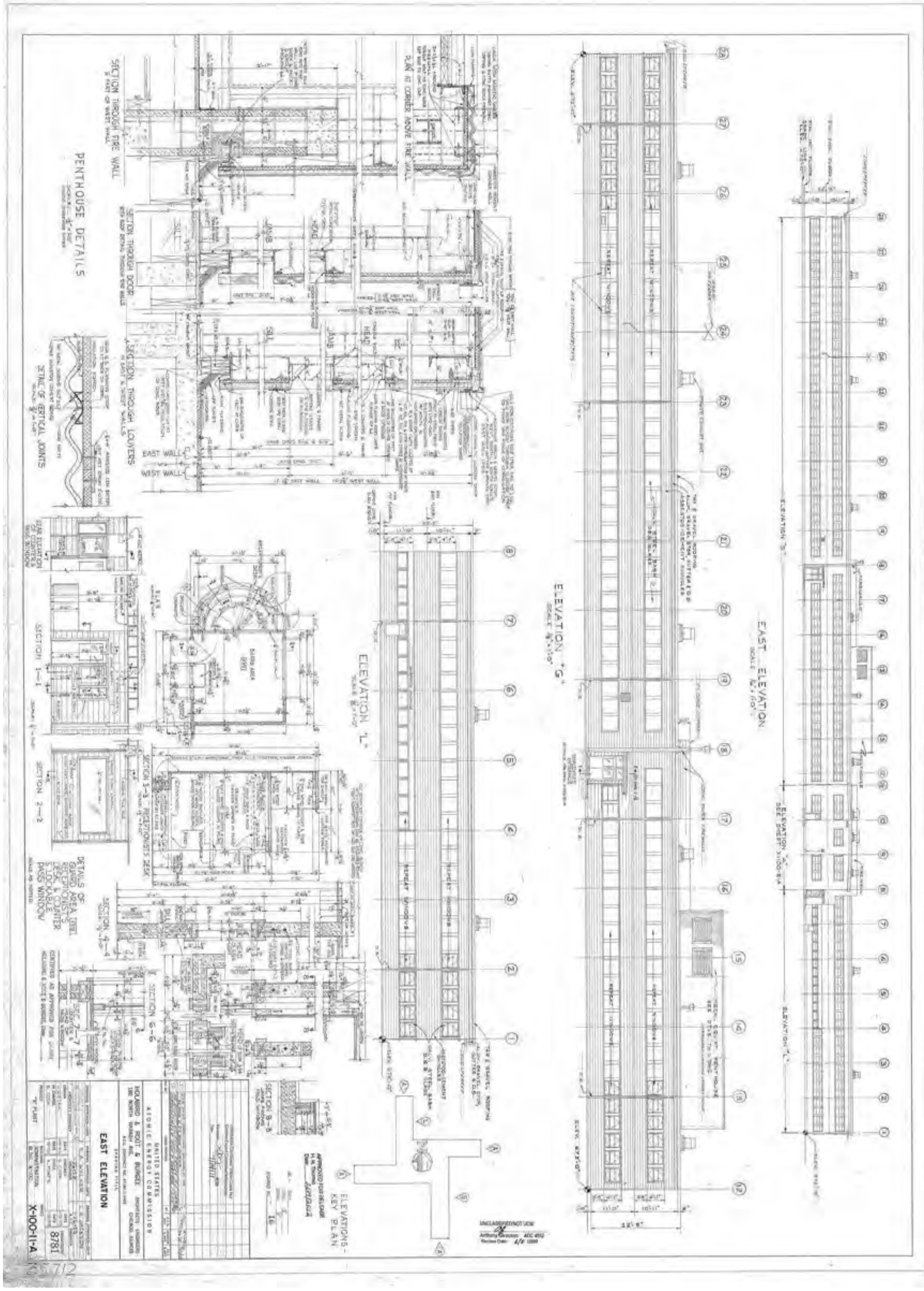

Figure 14: East Elevation

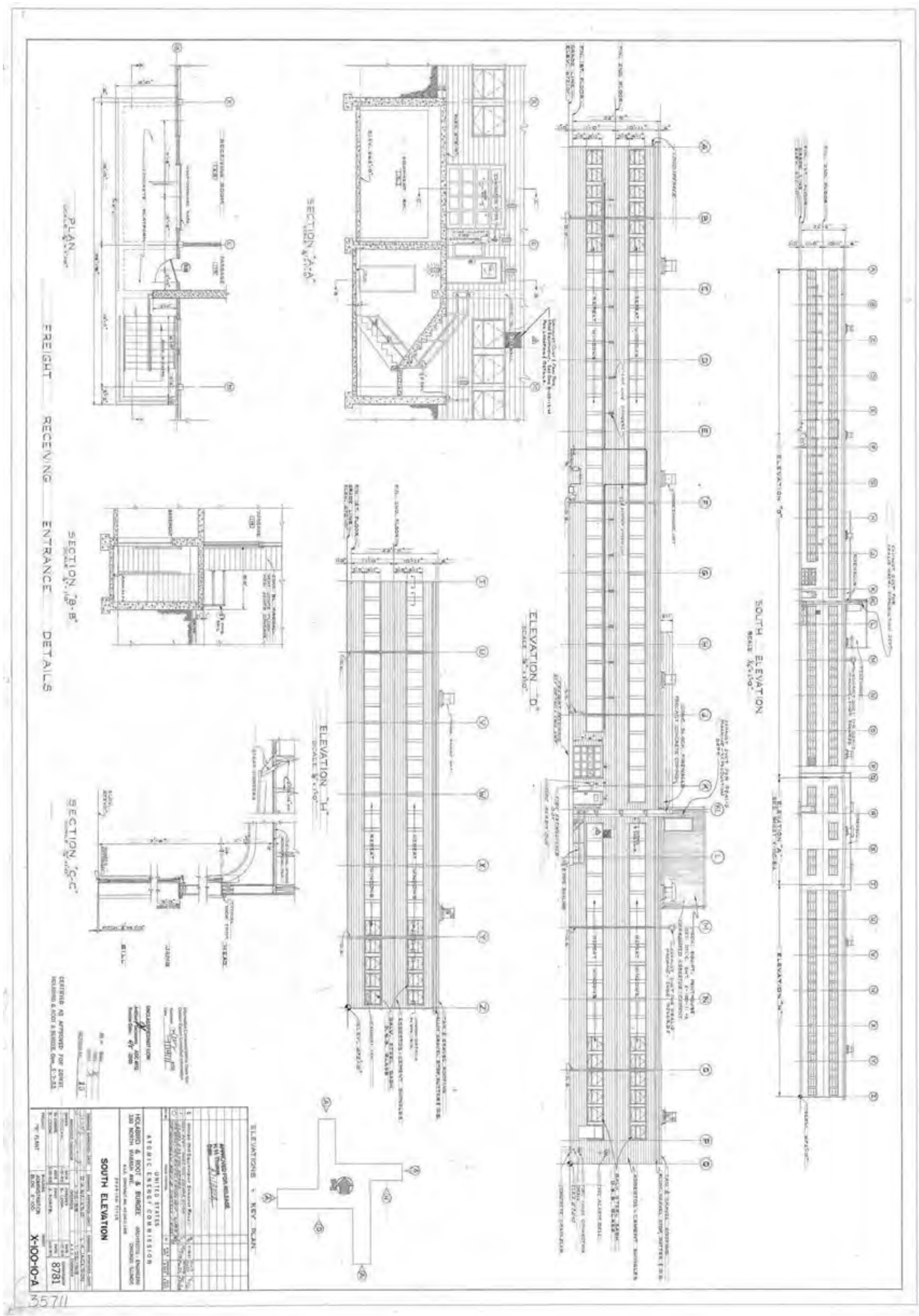

Figure 15: South Elevation

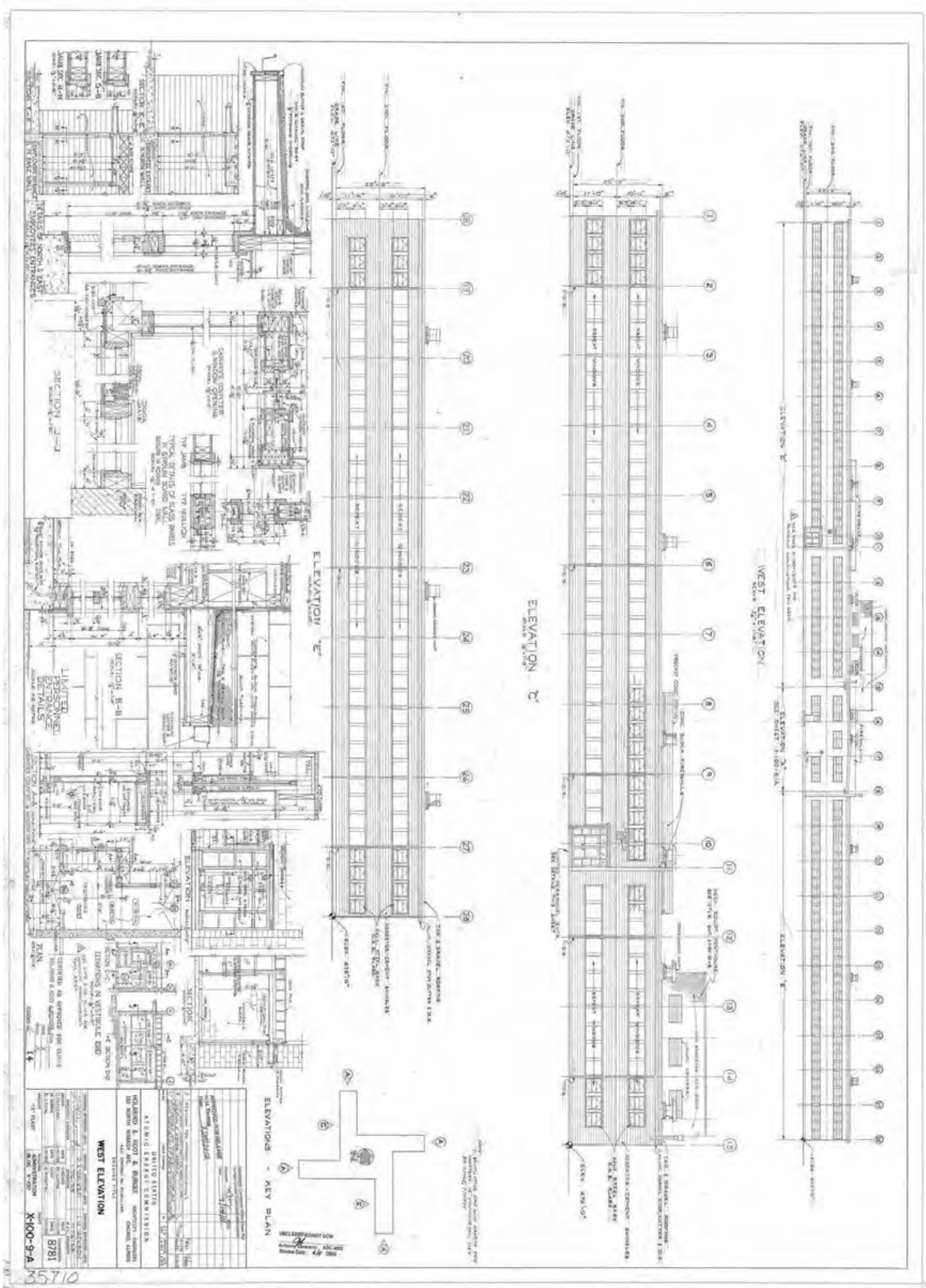

Figure 16: West Elevation

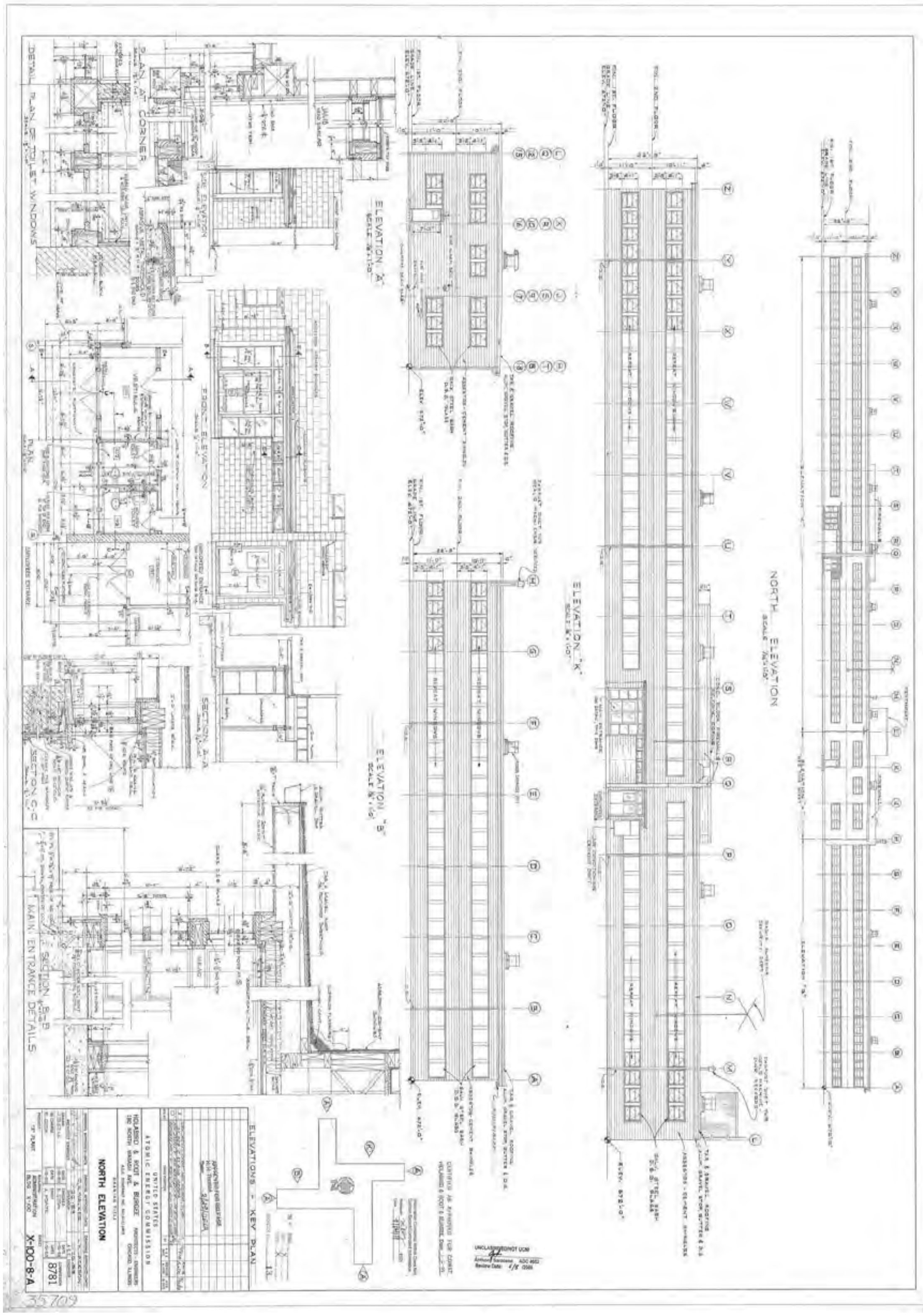

Figure 17: North Elevation

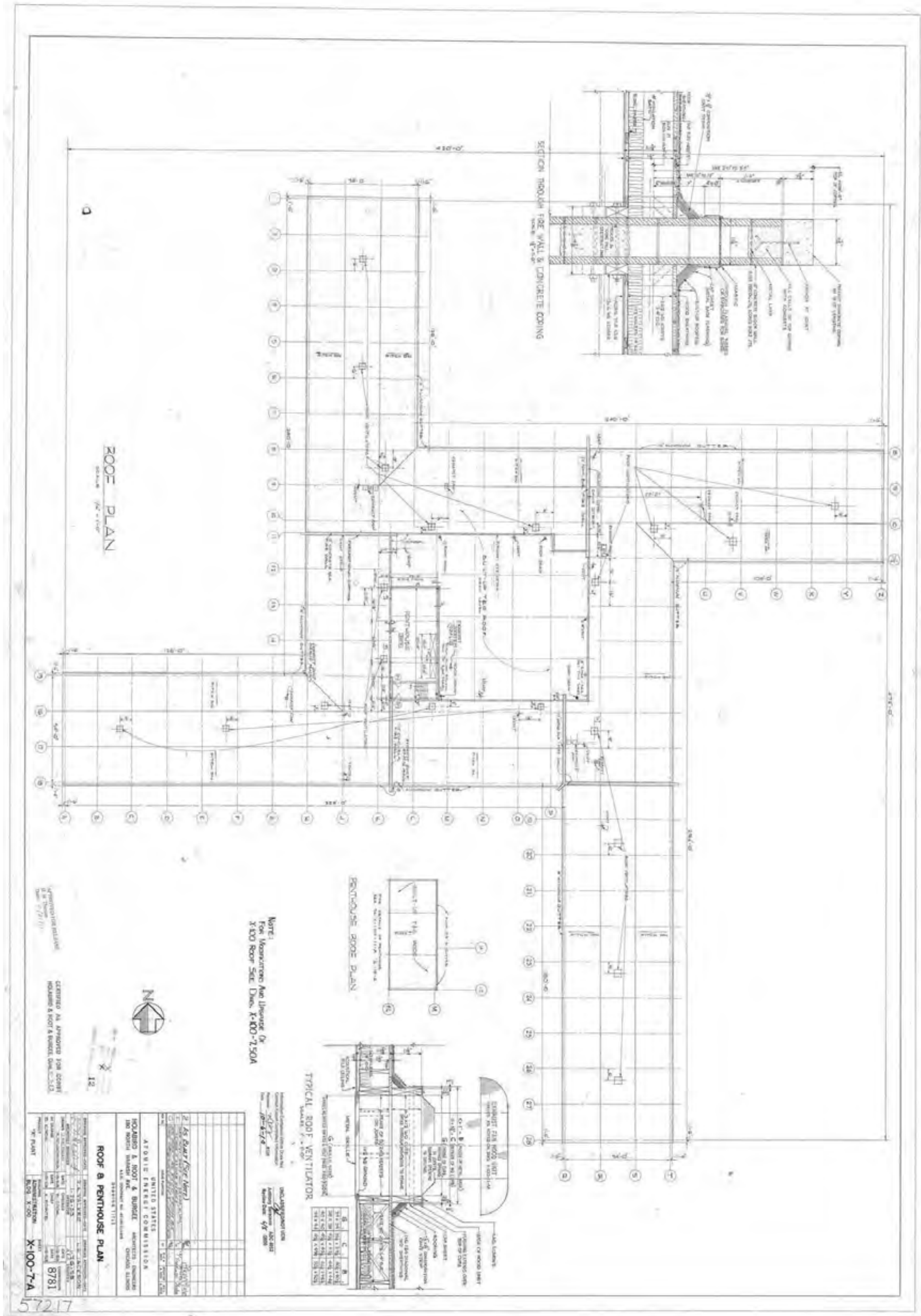

Figure 18: Roof and Penthouse Plan

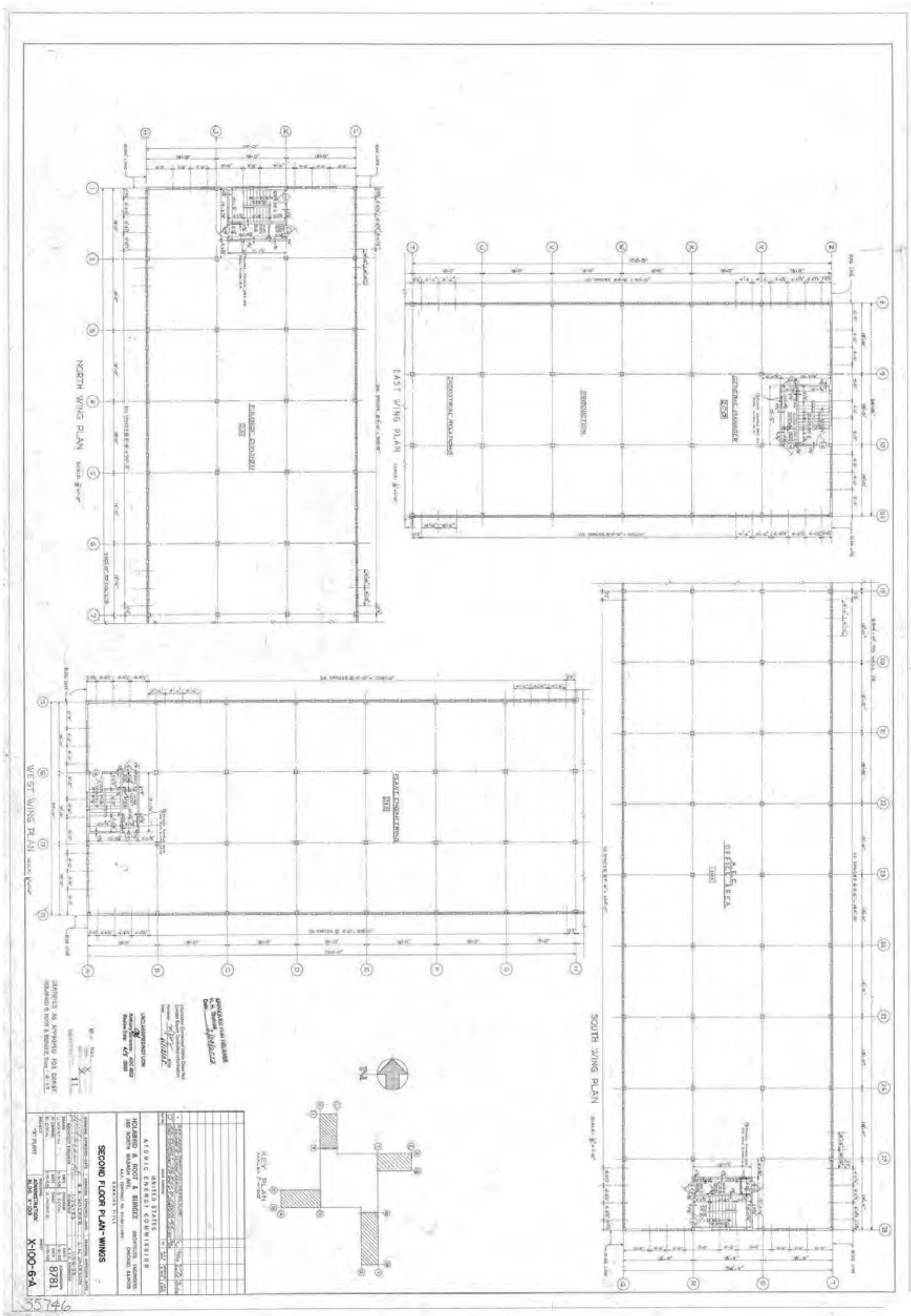

Figure 19: Second Floor Plan – Wings

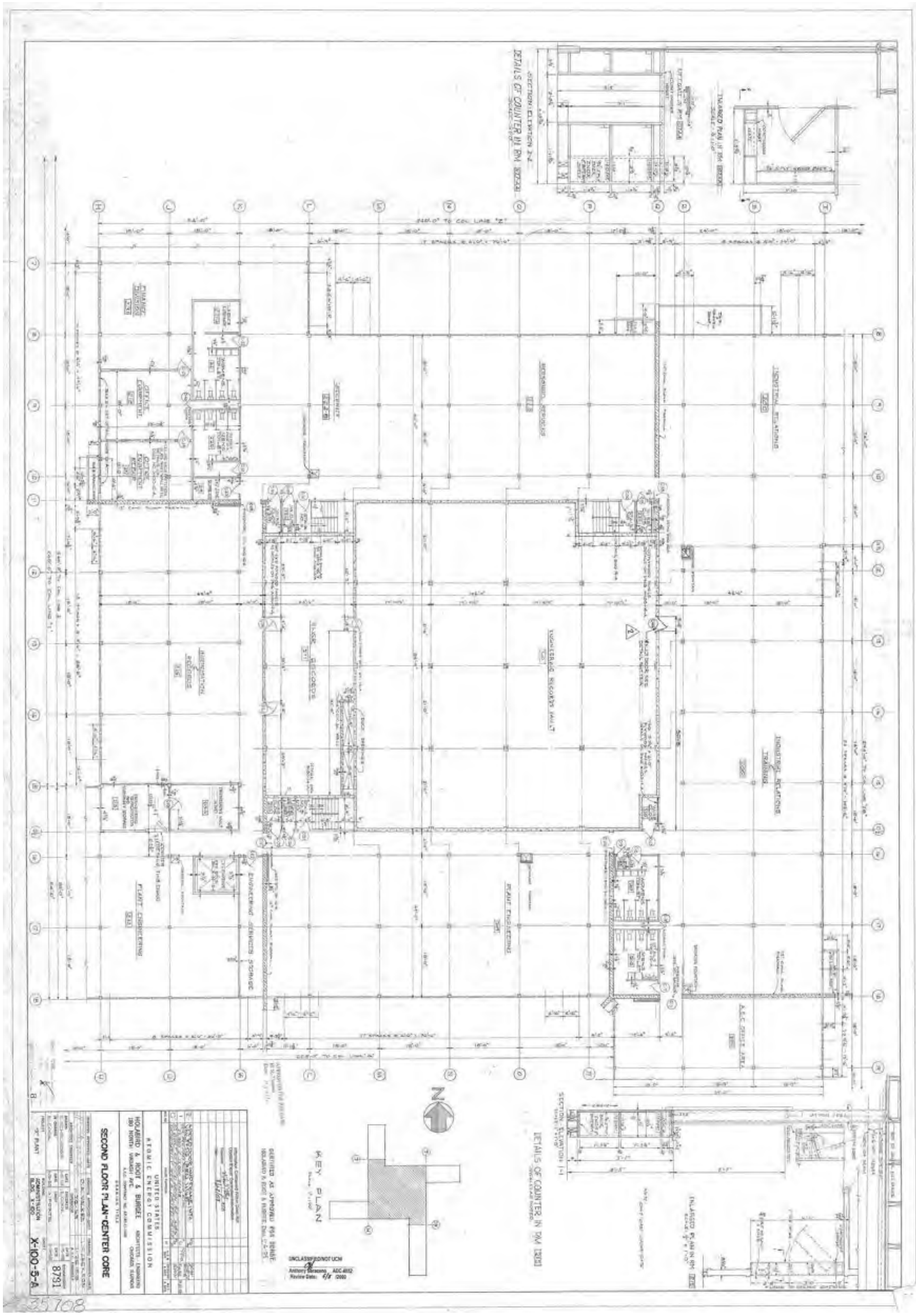

Figure 20: Second Floor Plan – Center Core

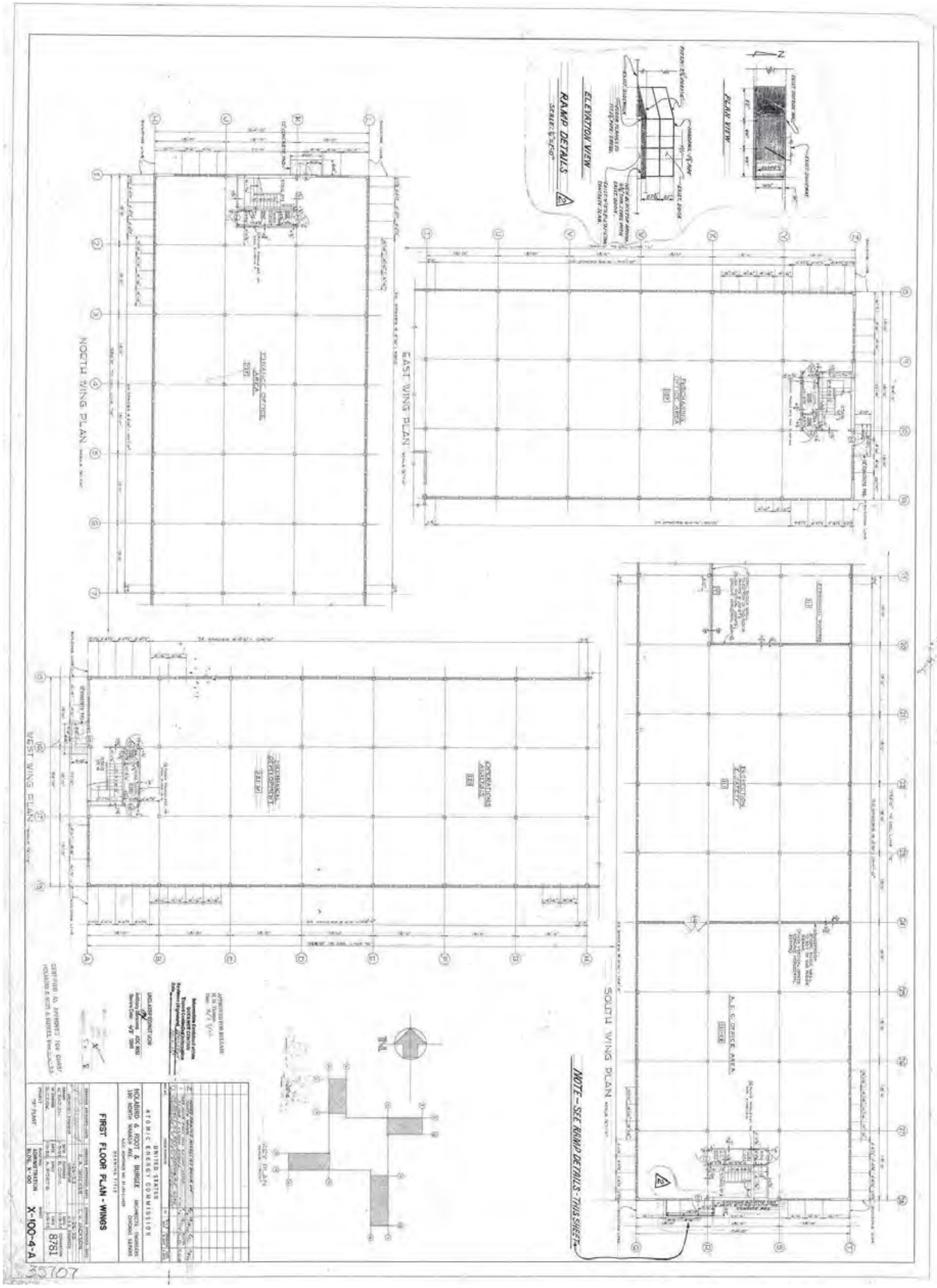

Figure 21: First Floor Plan – Wings

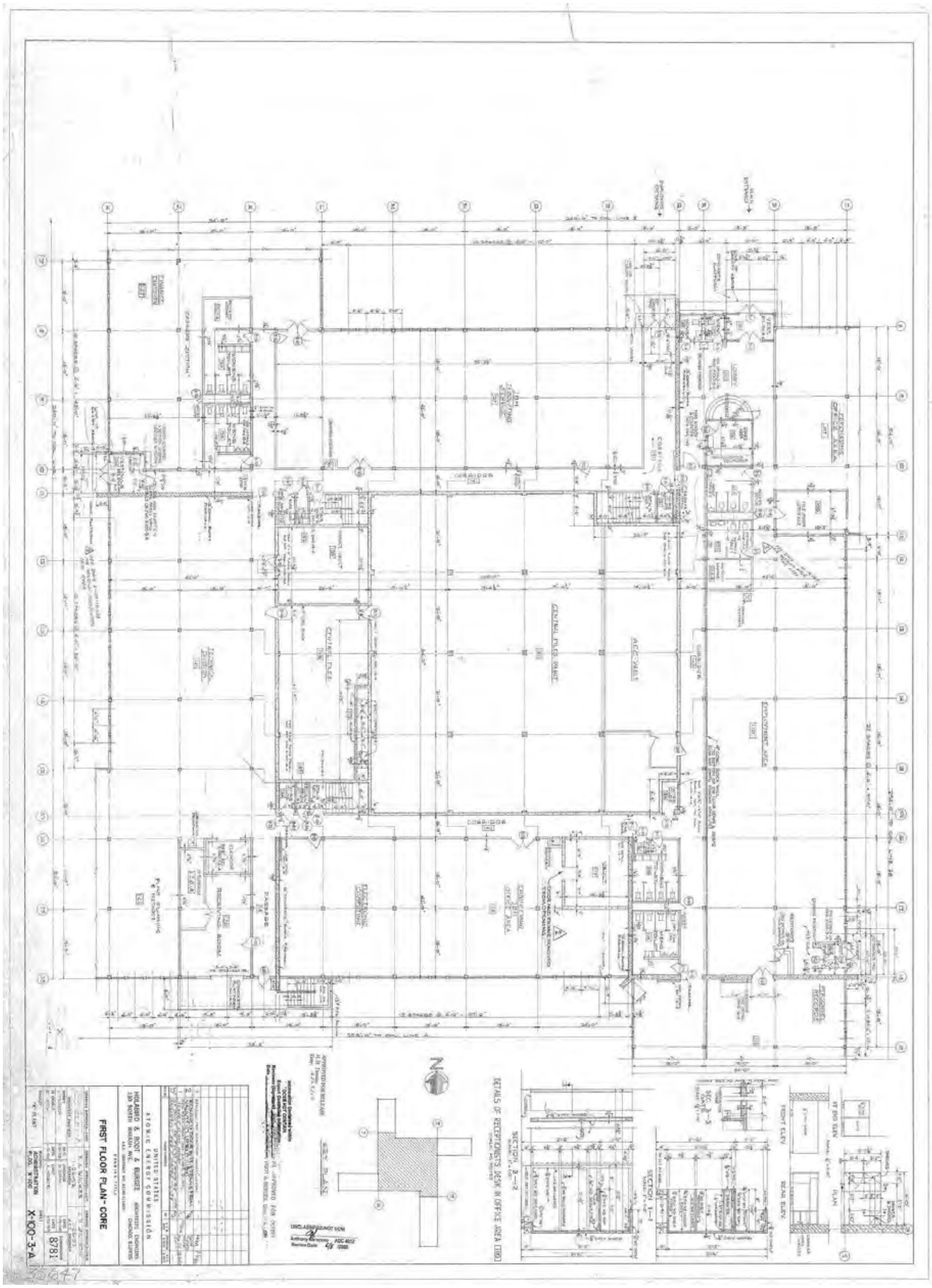

Figure 22: First Floor Plan – Core

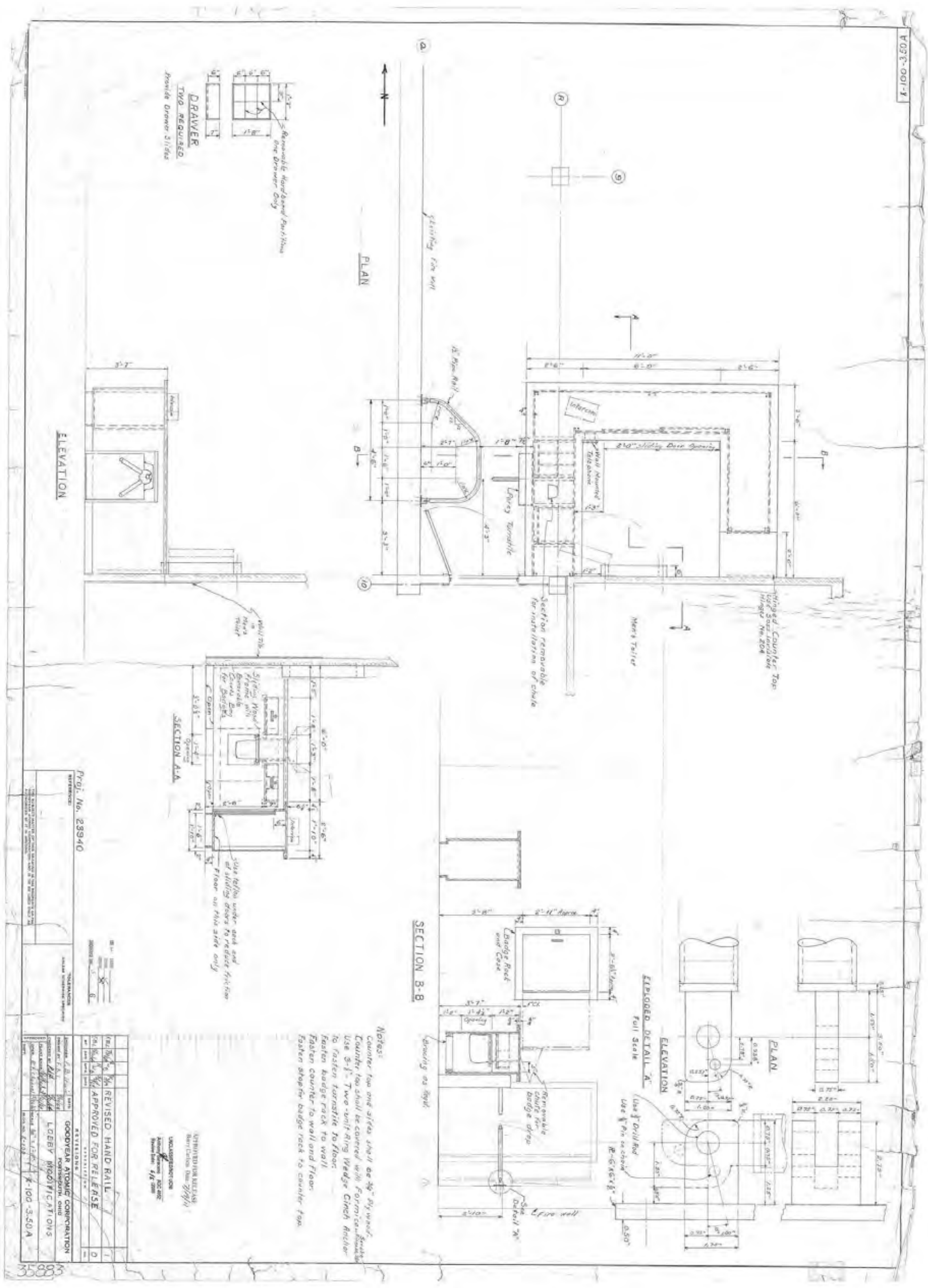

Figure 23: Lobby Modifications

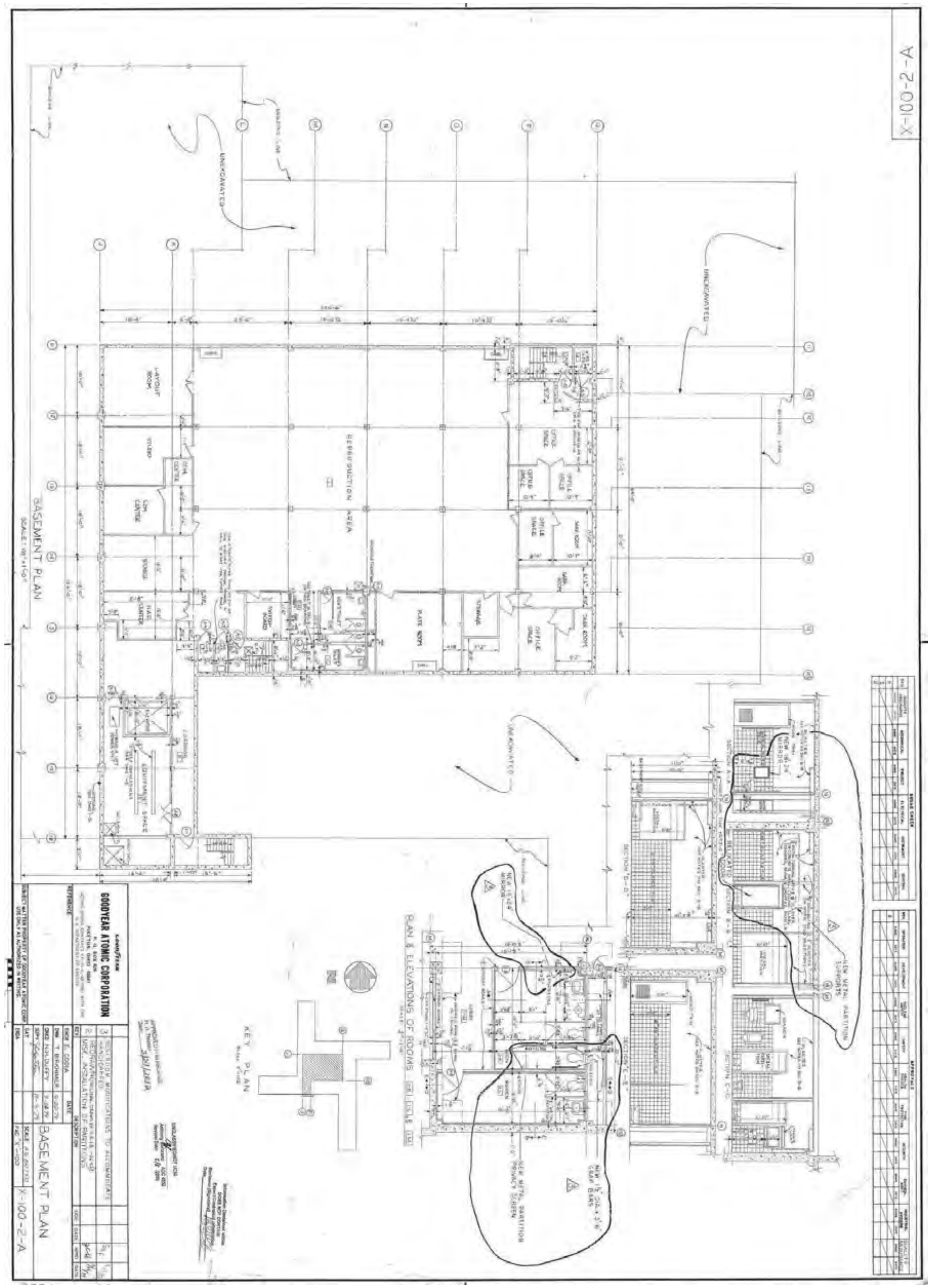

Figure 24: Basement Plan

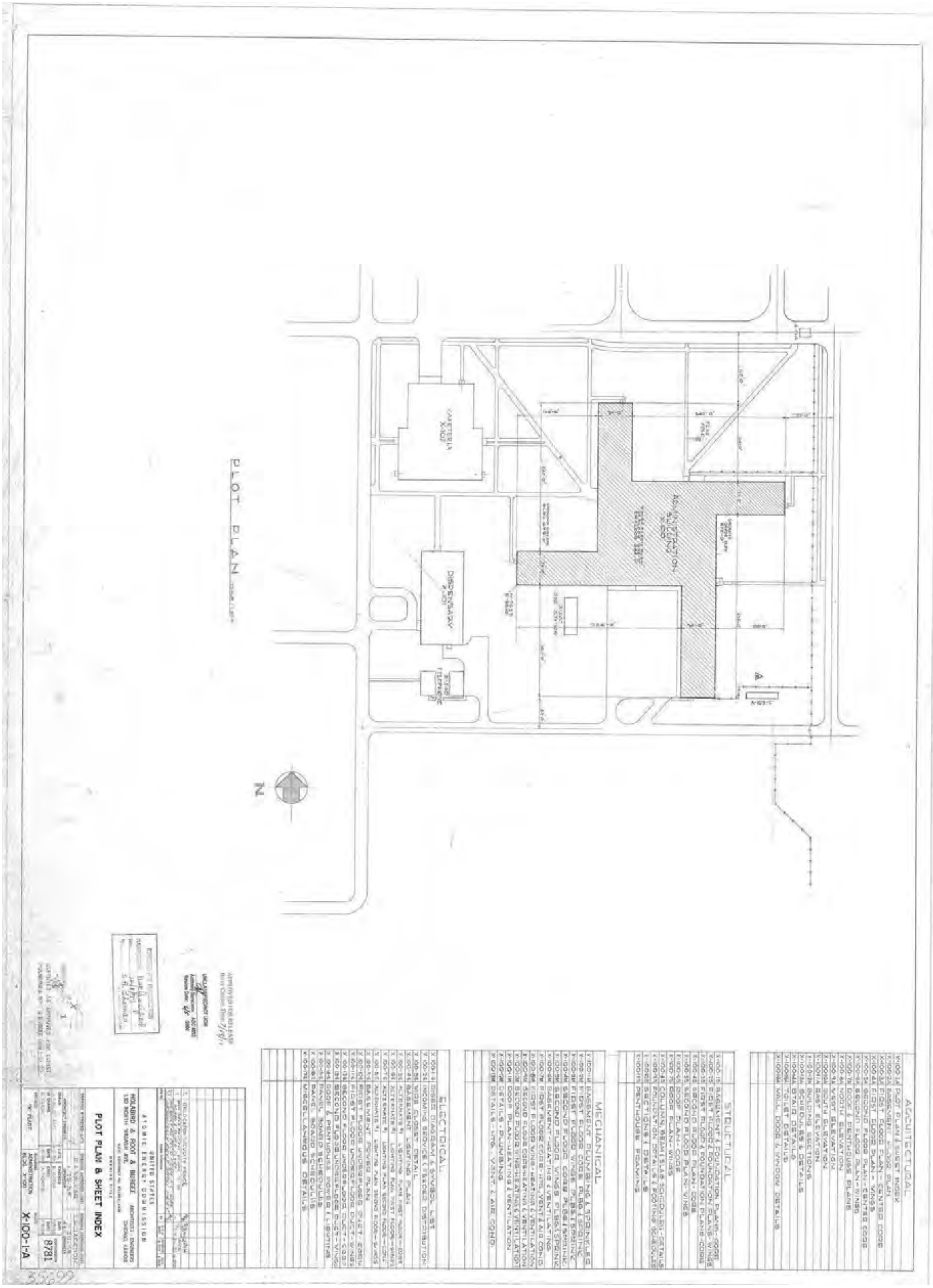

Figure 25: Plot Plan and Sheet Index

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-103 AUXILIARY OFFICE BUILDING
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-I
HAER OH-142-I

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-103 AUXILIARY OFFICE BUILDING

HAER No. OH-142-I

<u>Location:</u>	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-103 Auxiliary Office Building is located at Ohio State Plane South coordinates at easting 1826839.172306 ft, northing 368420.717098755 ft and at Universal Transverse Mercator Zone 17N easting 326961.0439 m, northing 4319838.56 m. The coordinate represents the approximate center of the X-103 Auxiliary Office Building. This coordinate was obtained on June 20, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
<u>Date of Construction:</u>	1954
<u>Designer/Builder:</u>	Peter Kiewit Sons' Construction Company
<u>Previous Owner:</u>	N/A
<u>Present Owner:</u>	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974 when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
<u>Present Use:</u>	Demolished March 09, 2011
<u>Significance:</u>	The former X-103 Auxiliary Office Building was used to irradiate thermoluminescent dosimeters (TLDs) for calibration of onsite TLD readers. The building was also used for cleaning respirators. This building was part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
<u>Project Information:</u>	Los Alamos Technical Associates, Inc./Parallax Portsmouth, LLC photographed the site in June of 2010. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-103 Auxiliary Office HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of X-103 Auxiliary Office Building:
The X-103 Auxiliary Office Building was one of the few prefabricated buildings at PORTS. In the early 1900s, the Butler Manufacturing Company began selling prefabricated steel garages and grain bins in the Kansas City area. By 1940, the company was the first to sell prefabricated rigid frame buildings, something not thought possible to that point due to the stress calculations required for the rigid steel frame. By the Post-WWII era, the prefabricated steel structures had gained widespread acceptance due to their reliability and relatively low cost.

Construction began on the X-103 Auxiliary Office Building in December 1953 when Peter Kiewit Sons' Company and their subcontractors poured the foundations and the concrete slab floors. The prefabricated building was placed on the foundations and the Goodyear Atomic Corporation occupied the building on June 22, 1954 (Appendix B, Figures 6 and 7). Originally intended for temporary use, the X-103 Auxiliary Office Building was modified slightly after its initial construction to serve as the respirator facility and later the Auxiliary Office Building. The X-103 Auxiliary Office Building was demolished in 2011.

Historical drawings of building plans are included in Appendix C (Figures 8 through 28).

Part II. Site Information

Description of the X-103 Auxiliary Office Building:
The former X-103 Auxiliary Office Building was located near the center of the plant, just east of the X-326 Process Building. Built in 1954, the X-103 Auxiliary Office Building was a steel-framed building manufactured by the Butler Manufacturing Company of Kansas City, Missouri (Appendix A, Figures 1 through 5). Erected by the Becket Erection Company, this utilitarian building measured approximately 200' by 50' (10,000 square feet). The X-103 Auxiliary Office Building initially functioned as a temporary garage. However, it was later converted into an administrative office building.

The X-103 Auxiliary Office Building featured a concrete slab foundation, steel-framed walls clad in vertical steel siding, window openings with steel sash, and a front-gabled roof covered with metal roofing material. Four ventilators were equally spaced along the roof ridgeline. The interior of the building consisted of small office spaces, storage spaces, and a vault space for storage of records. Interior partitions consisted of simple wood frame walls with gypsum board in office and storage areas, with a glazed metal partition separating the central corridor. A suspended ceiling ran the length of the interior space, providing an interior room height of 12', 3". The records vault was located in the northwest corner of the building and consisted of 24" thick concrete block walls and smooth-finished poured concrete floors.

The building was significant for being the location where onsite TLD readers were calibrated by irradiating the TLDs with known radiological sources (DOE 2011a). PORTS uses TLDs to measure gamma exposure as part of its human radiation protection program. When exposed to penetrating radiation, thermoluminescent materials in the TLDs absorb and store portions of the radiation energy. Then, when the material is heated during analysis procedures, the radiation energy absorbed is released as light and can be measured to estimate radiation exposure. Two radiological check sources used for instrument calibration were stored in the building's vault.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3, Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *Removal Action Completion Report for the X-103 Auxiliary Office Building at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*. Piketon, OH: U.S. Department of Energy, November 2011.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio*, DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Department of Energy. *Engineering Evaluation/Cost Analysis for Group 1 Buildings X-103, X-334, and X-344B at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio.* DOE/PPPO/03-0145&D2. Piketon, OH: U.S. Department of Energy, 2010.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

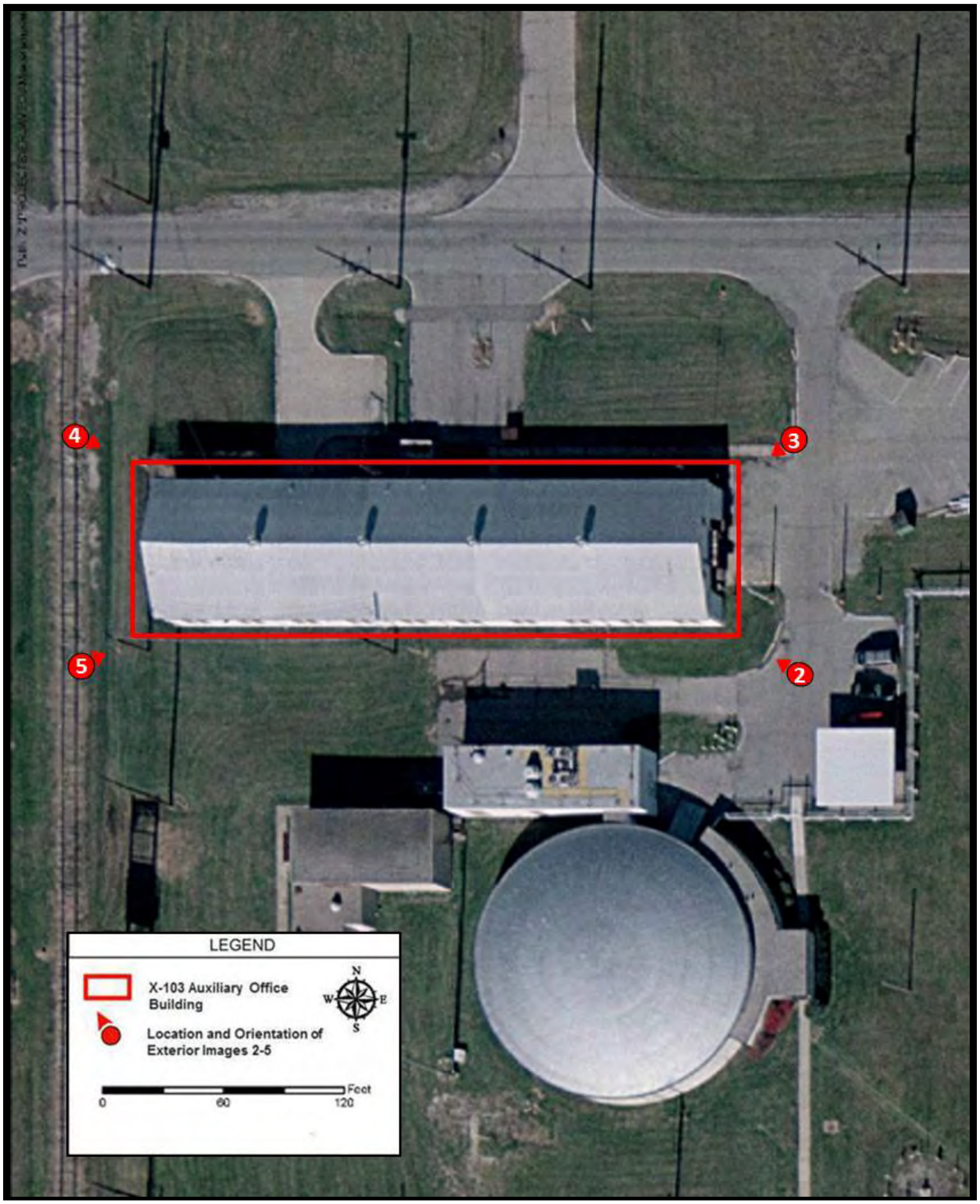

Figure 1: Location and Orientation of Exterior Photographs (2 through 5)

Figure 2: South Side of the X-103 Auxiliary Office Building, June 2010, Facing Northwest

Figure 3: East Side of the X-103 Auxiliary Office Building, June 2010, Facing West

Figure 4: North Side of the X-103 Auxiliary Office Building, June 2010, Facing Southeast

Figure 5: South Side of the X-103 Auxiliary Office Building, June 2010, Facing Northeast

Appendix B: Historical Photographs

Figure 6: Looking Northwest at the X-103 Operations Control Headquarters, August 19, 1954

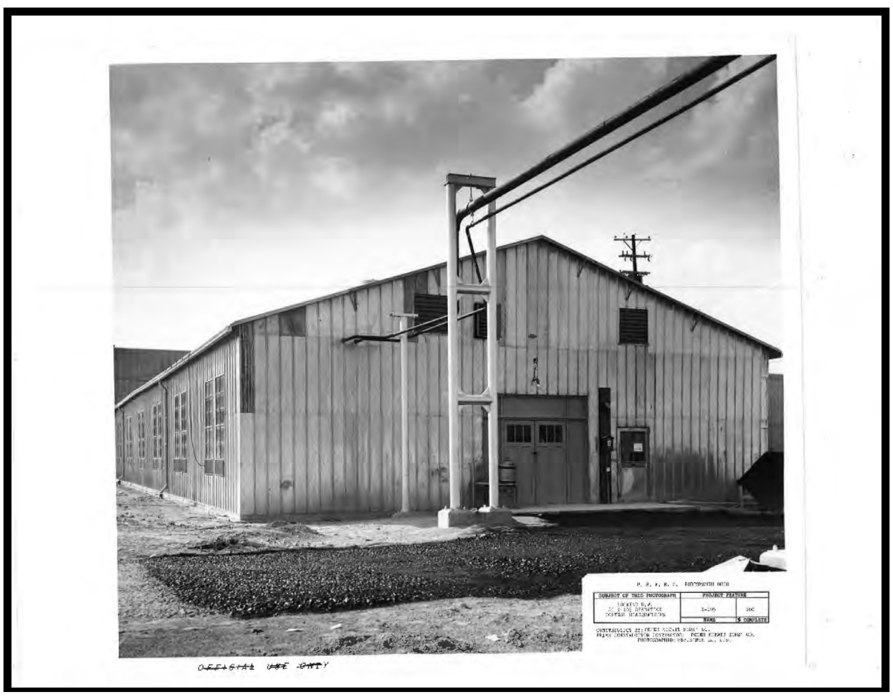

Figure 7: Looking Northwest at the X-103 Operations Control Headquarters, September 14, 1954

Appendix C: Historical Drawings

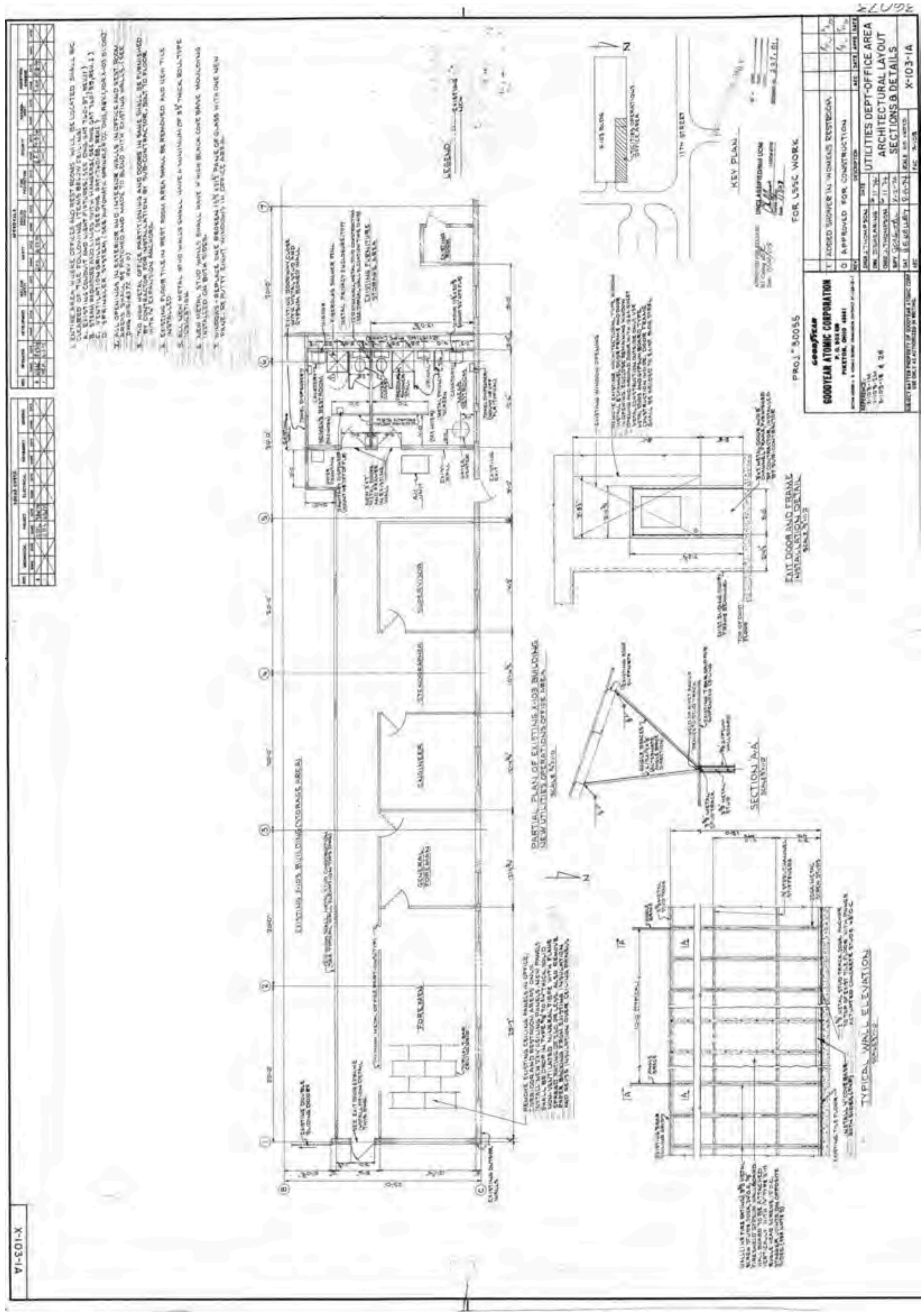

Figure 8: 1A Utilities Department – Office Area, Architectural Layout, Sections and Details

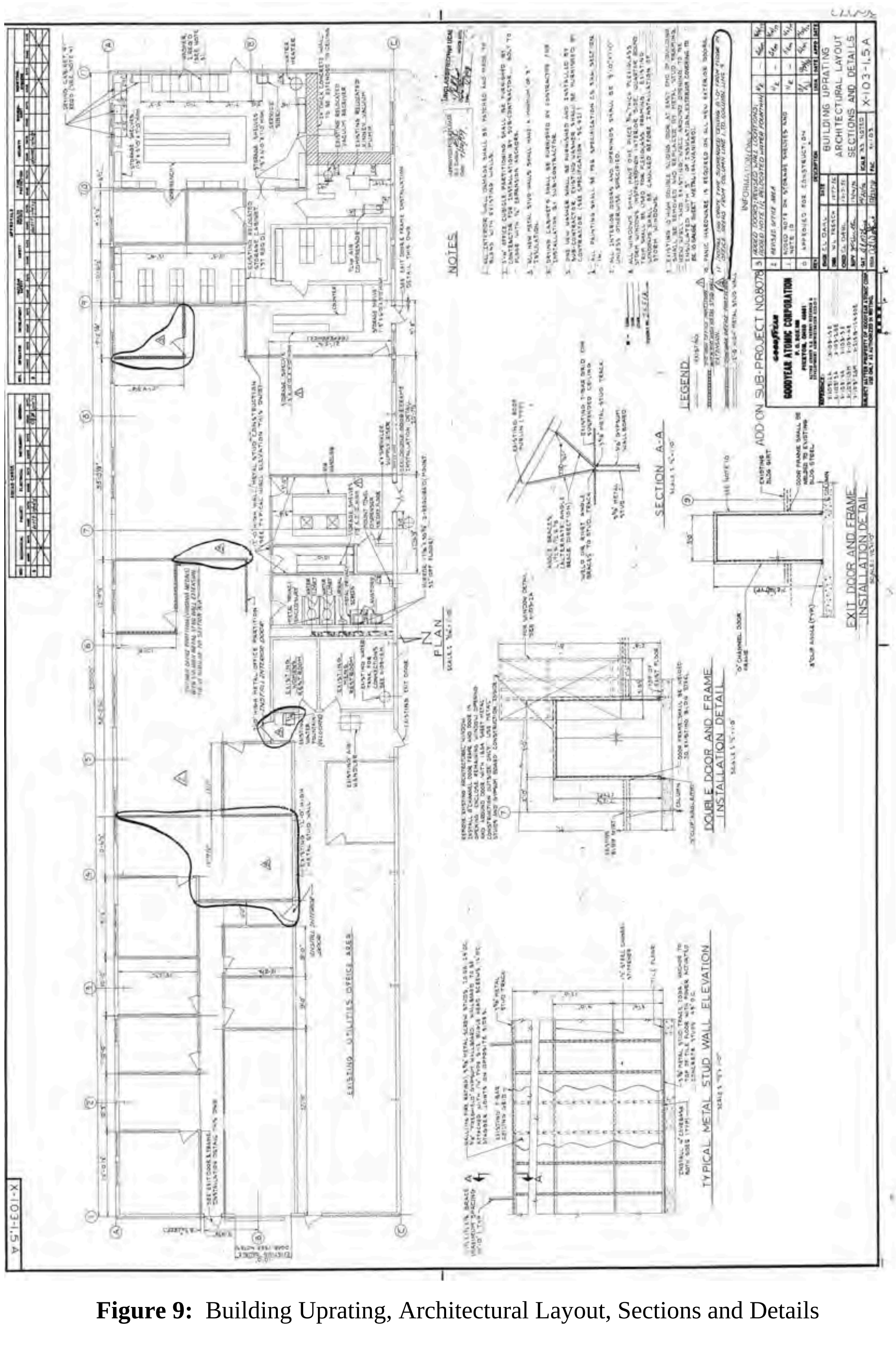

Figure 9: Building Uprating, Architectural Layout, Sections and Details

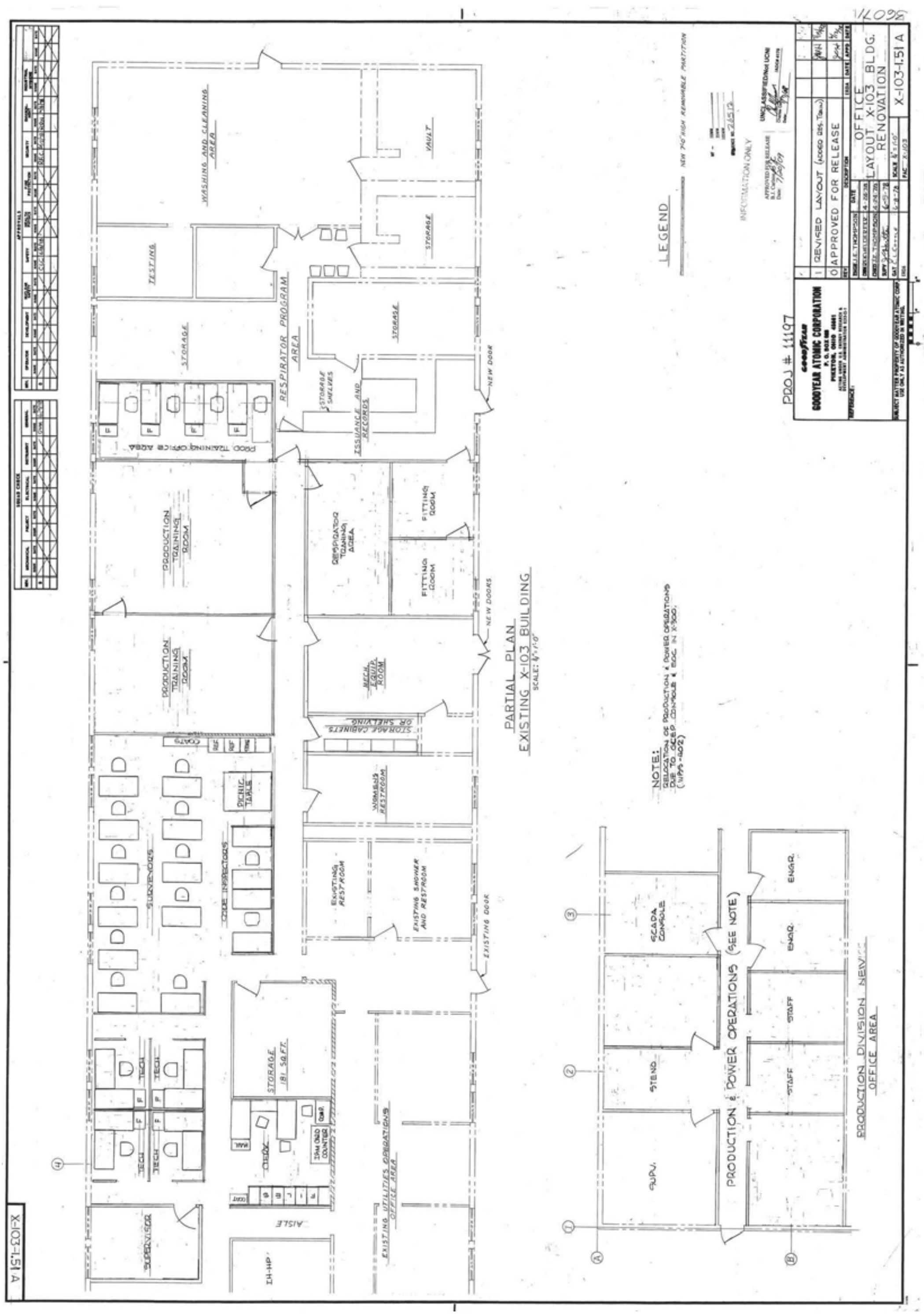

Figure 10: Office Layout, X-103 Building Renovation

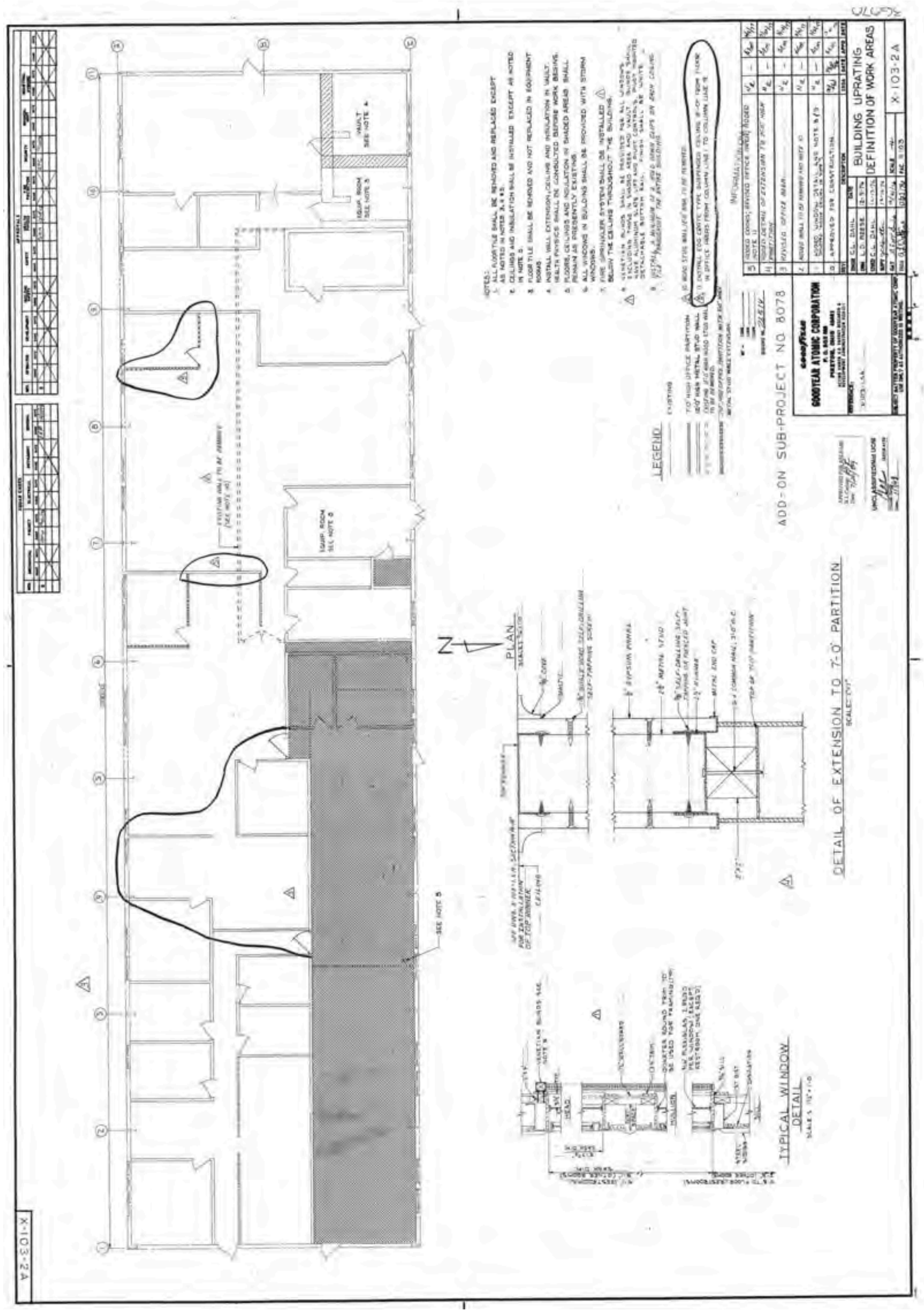

Figure 11: Building Uprating, Definition of Work Areas

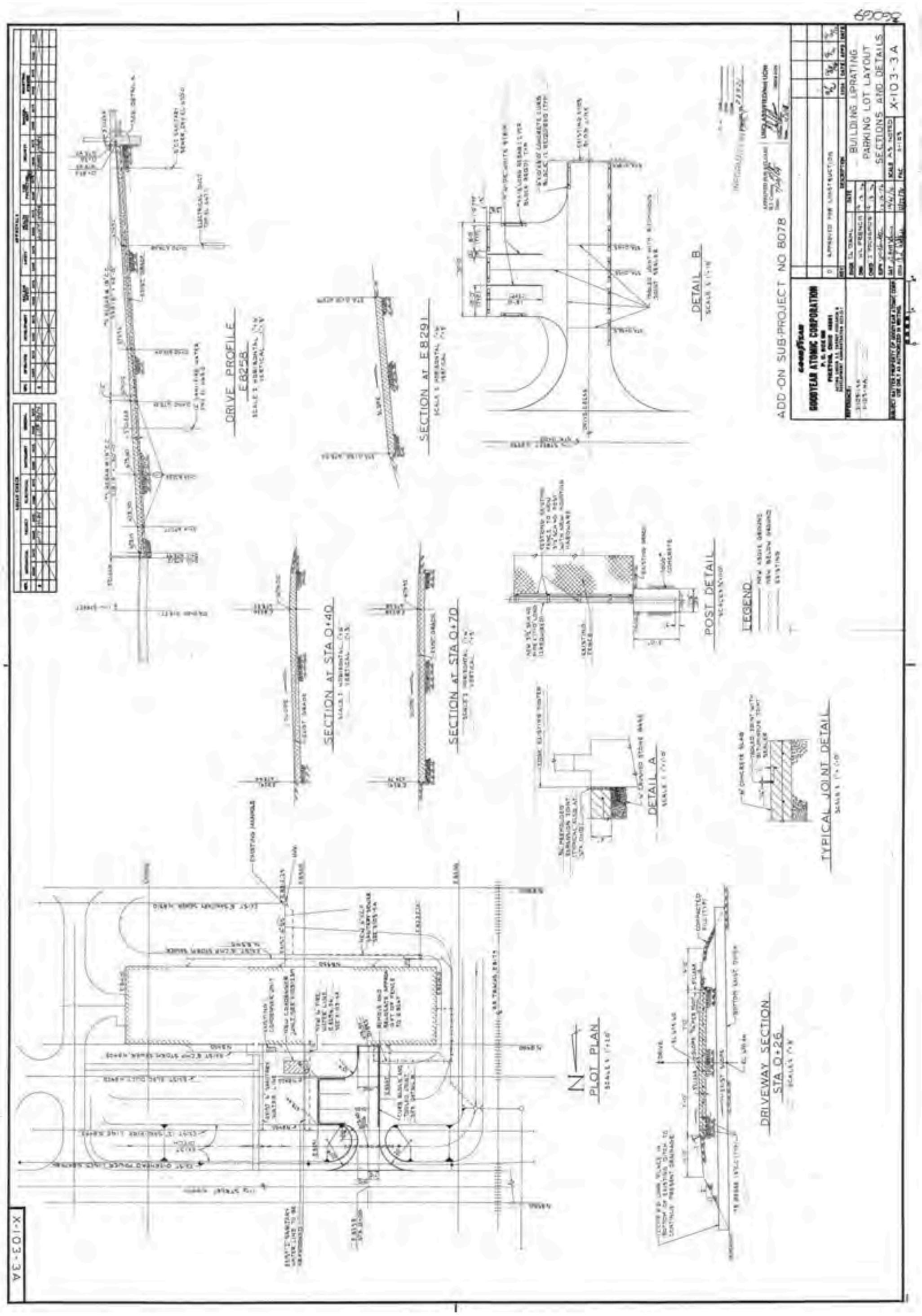

Figure 12: Building Uprating, Parking Lot Layout, Sections and Details

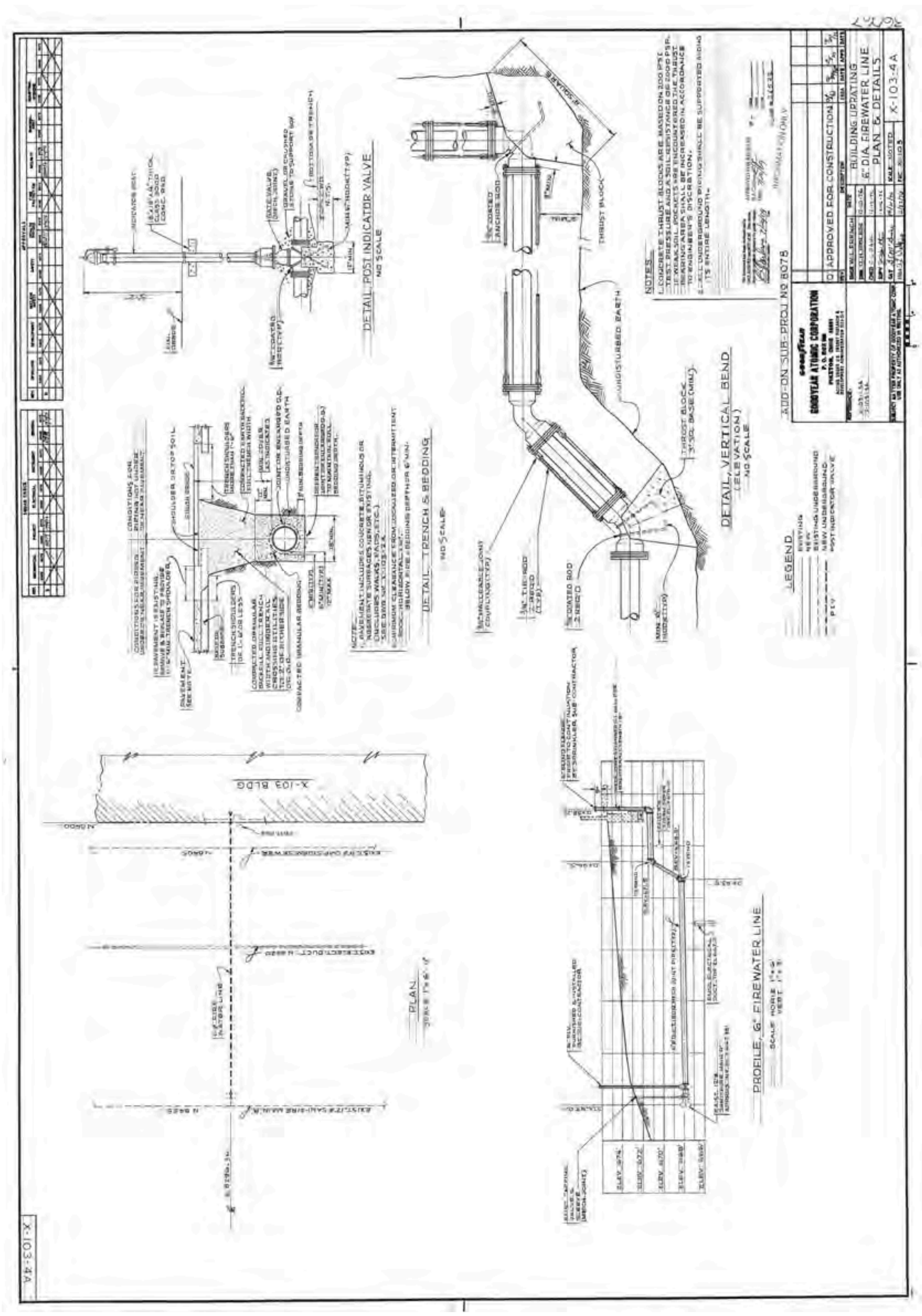

Figure 13: Building Uprating, 6" Diameter Firewater Line, Plan and Details

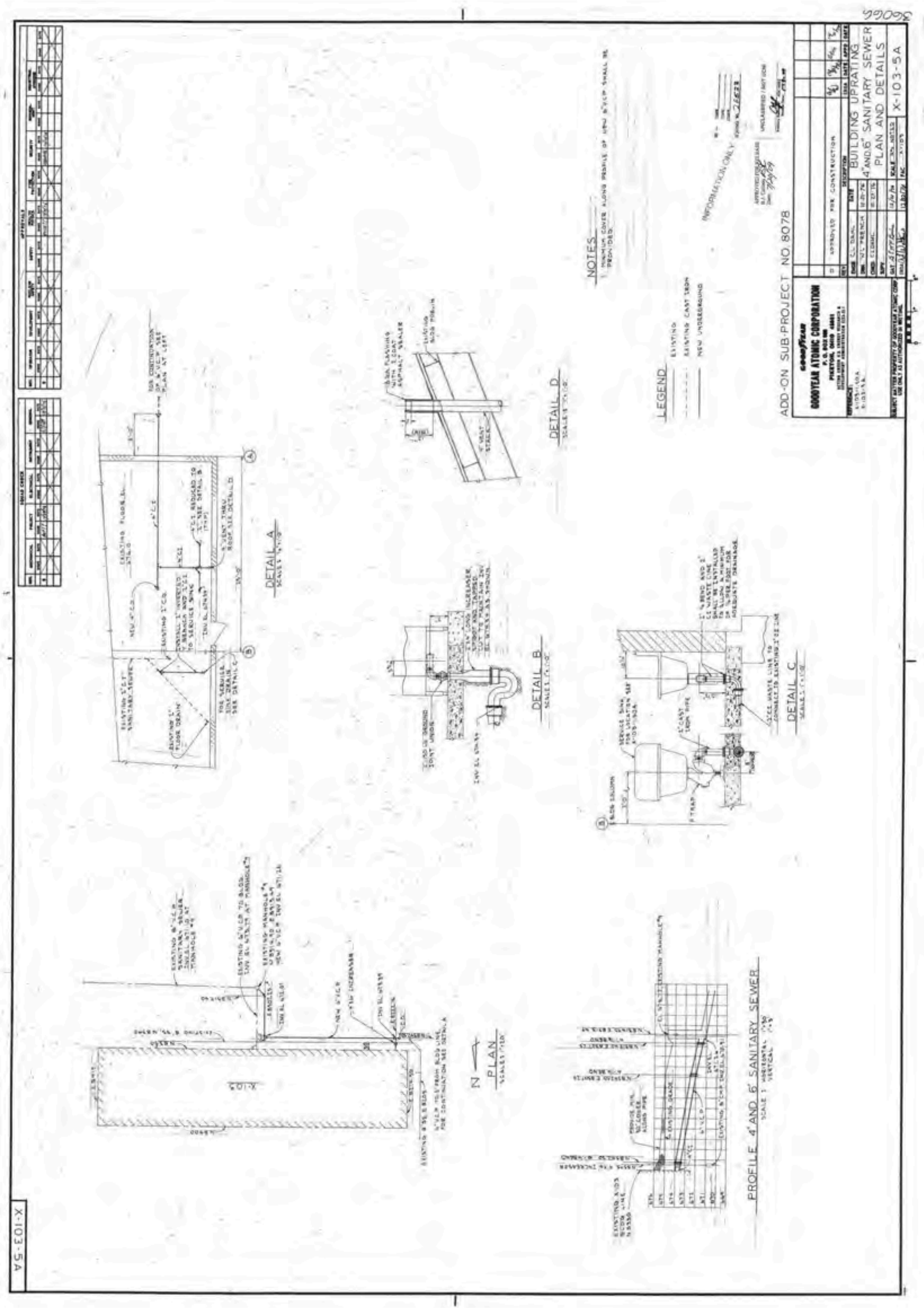

Figure 14: Building Uprating, 4" and 6" Sanitary Sewer, Plan and Details

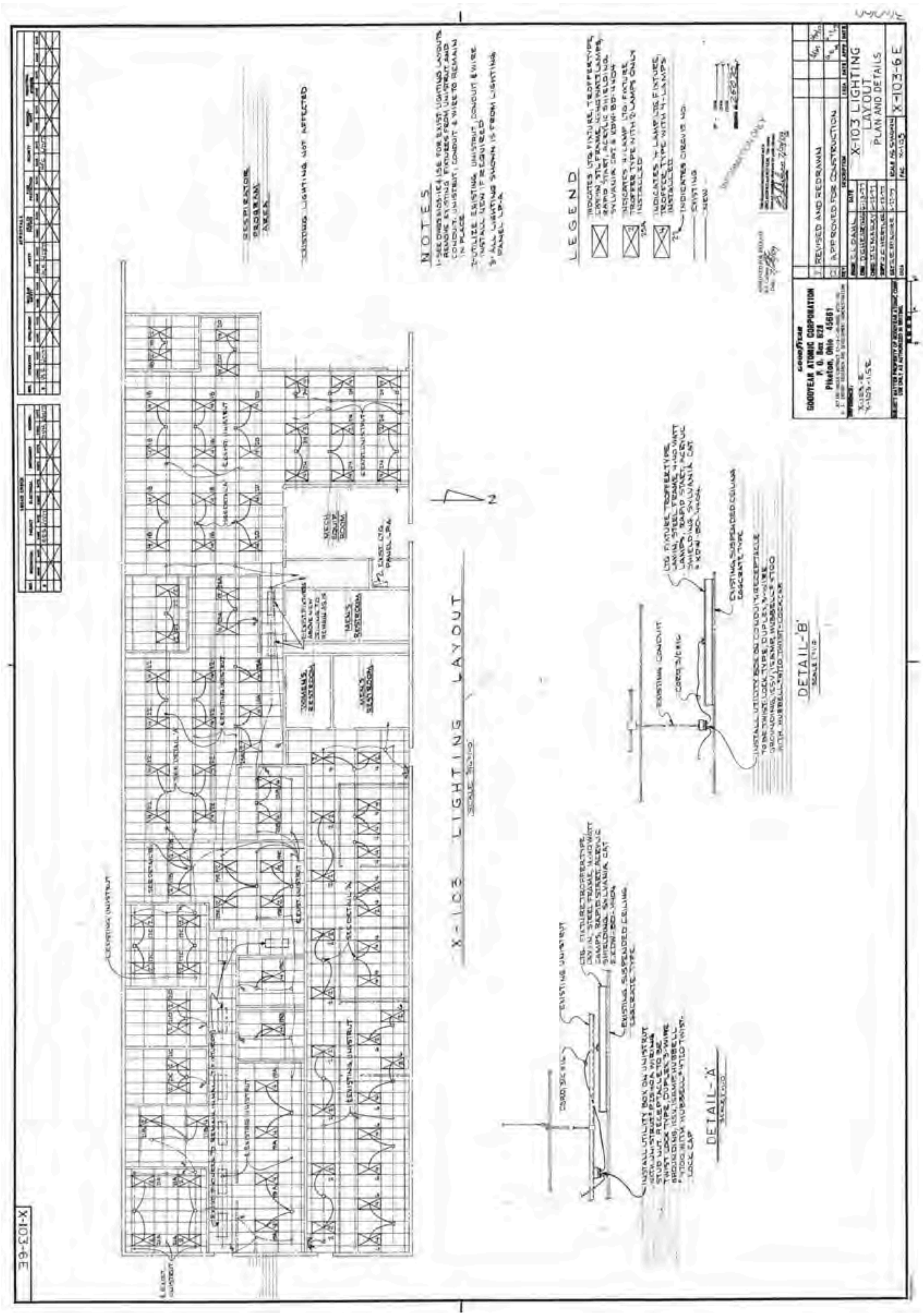

Figure 15: X-103 Lighting Layout, Plan and Details

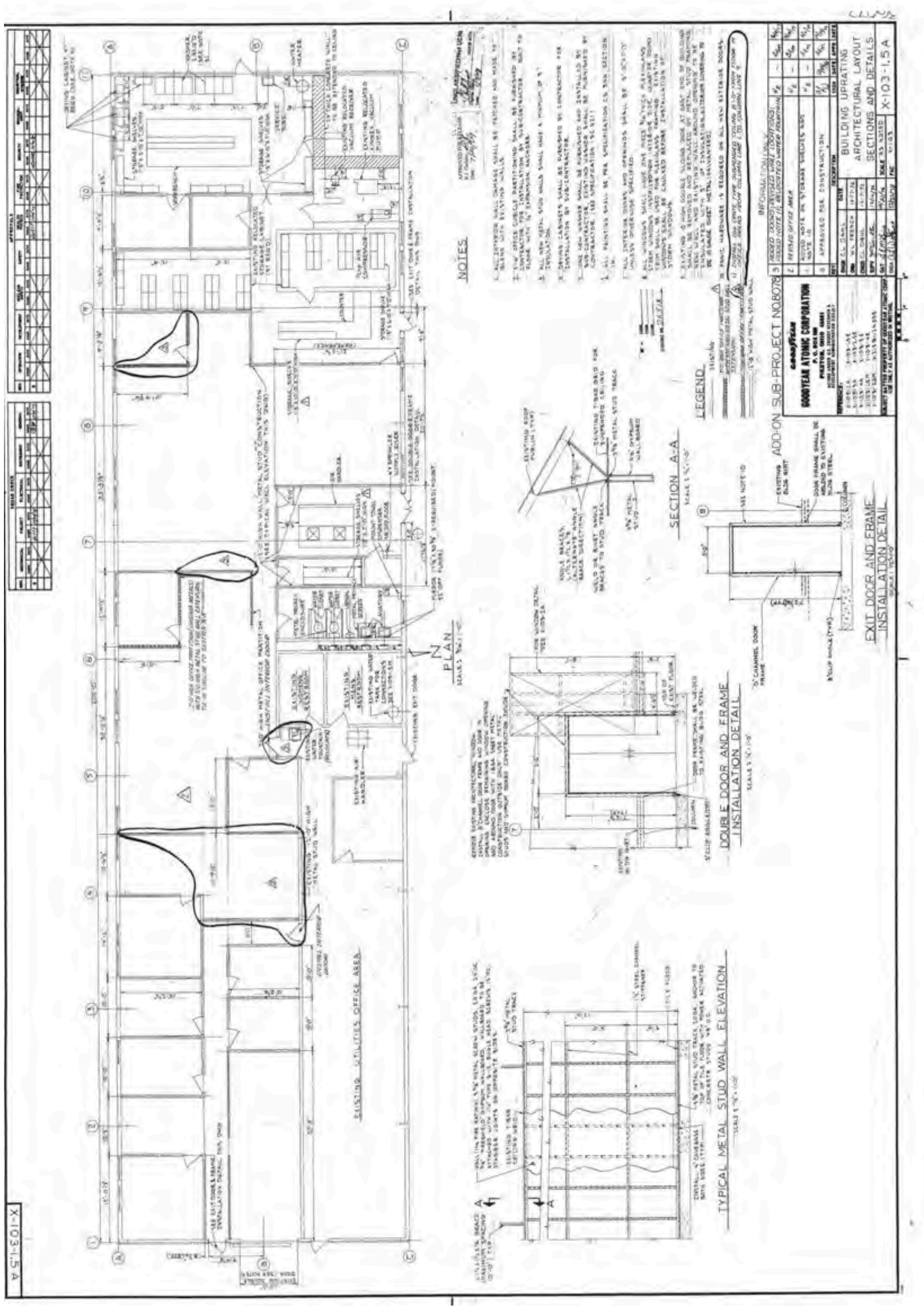

Figure 16: Building Uprating, Architectural Layout, Sections and Details

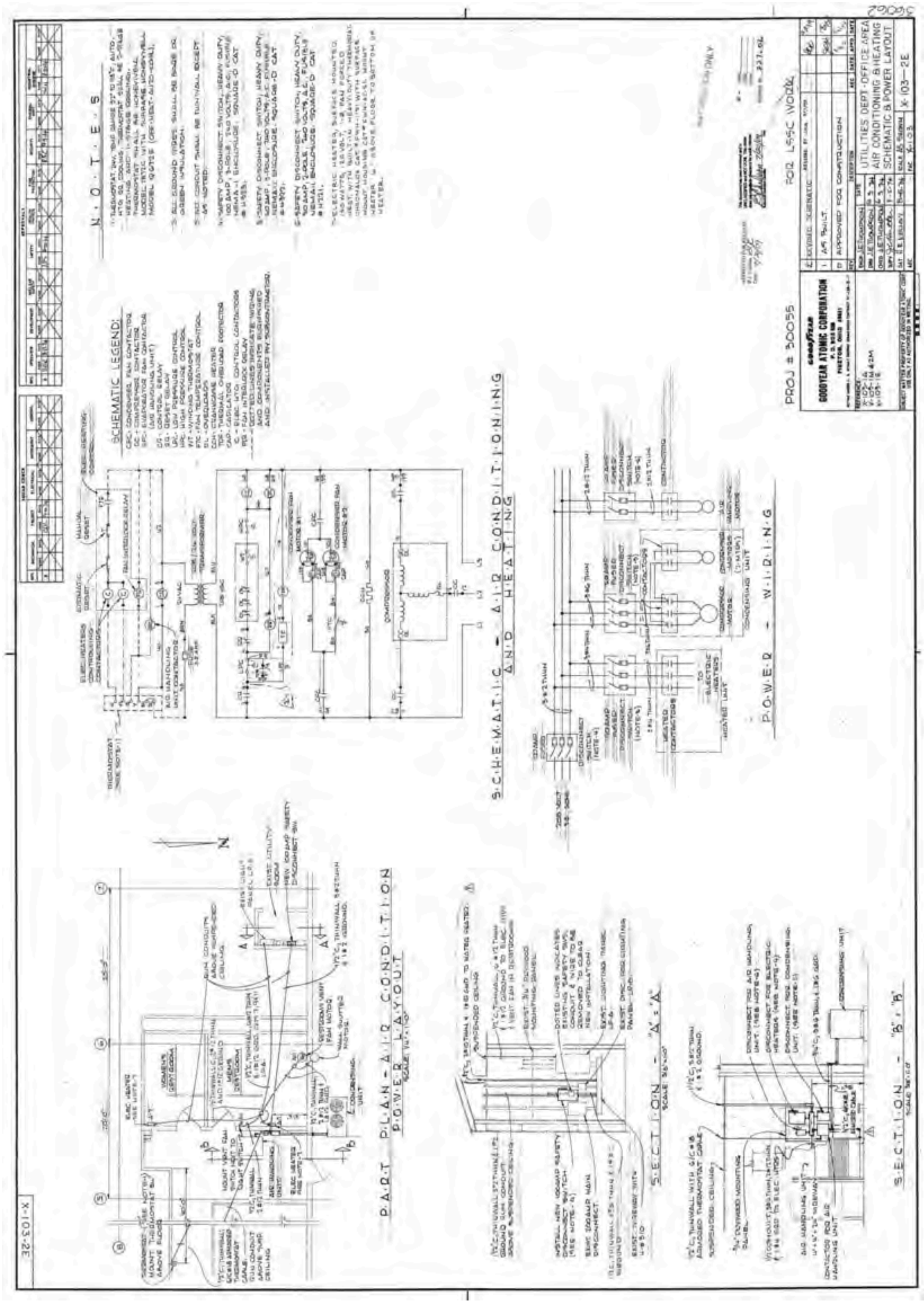

Figure 17: Utilities Department – Office Area, Air Conditioning and Heating Schematic and Power Layout

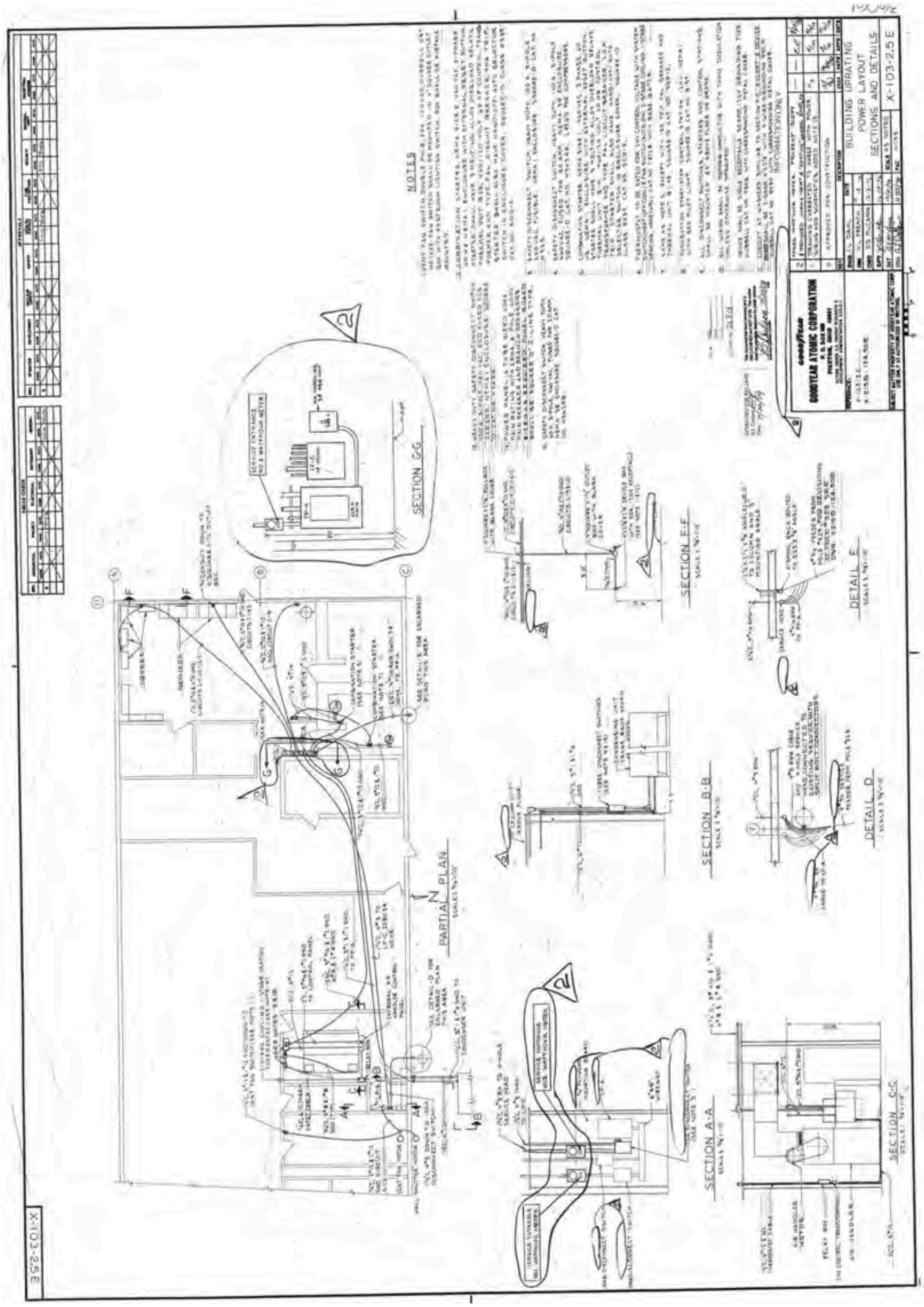

Figure 18: Building Uprating, Power Layout, Sections and Details

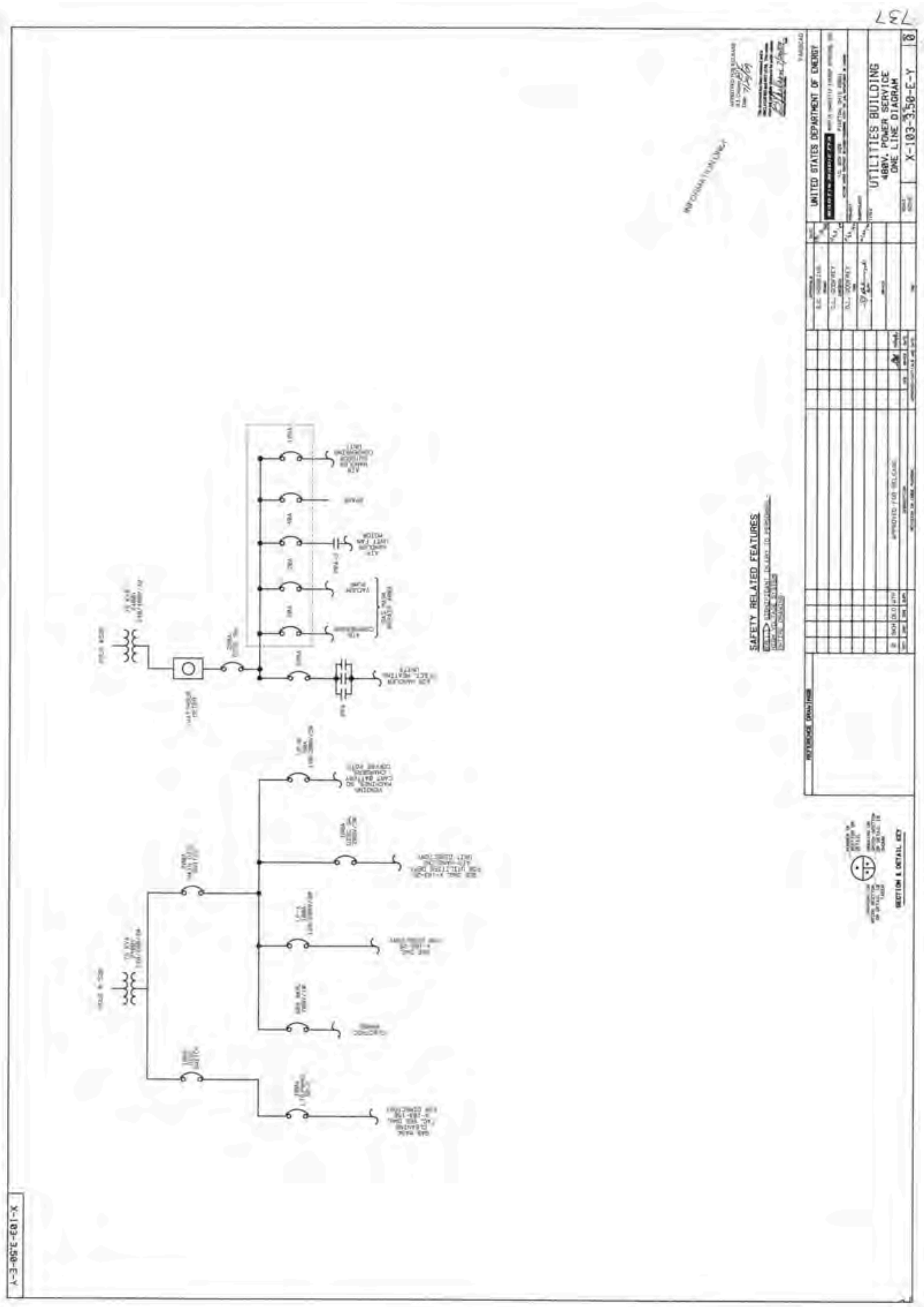

Figure 19: Utilities Building, 480v Power Service, One Line Diagram

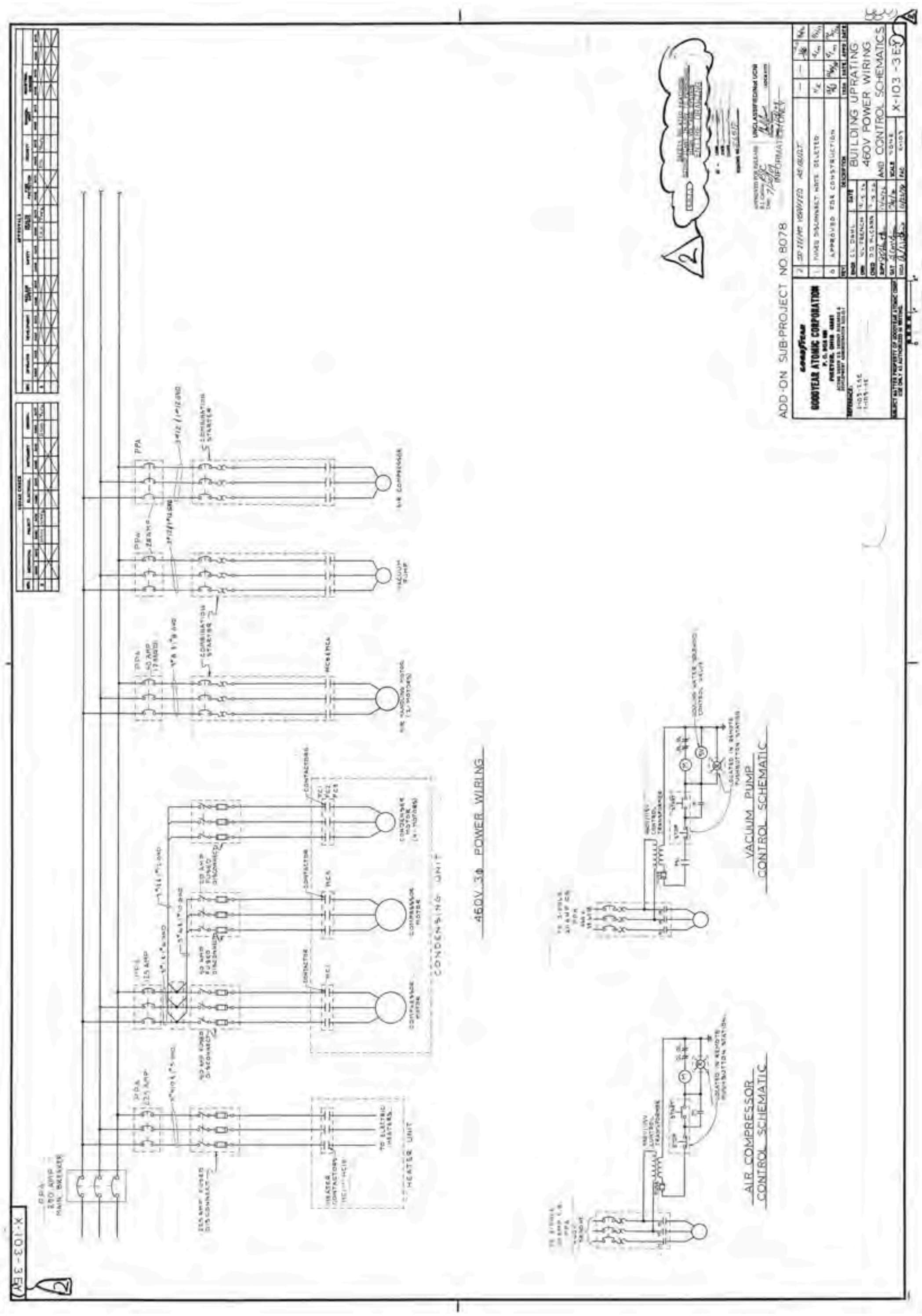

Figure 20: Building Uprating, 460v Power Wiring and Control Schematics

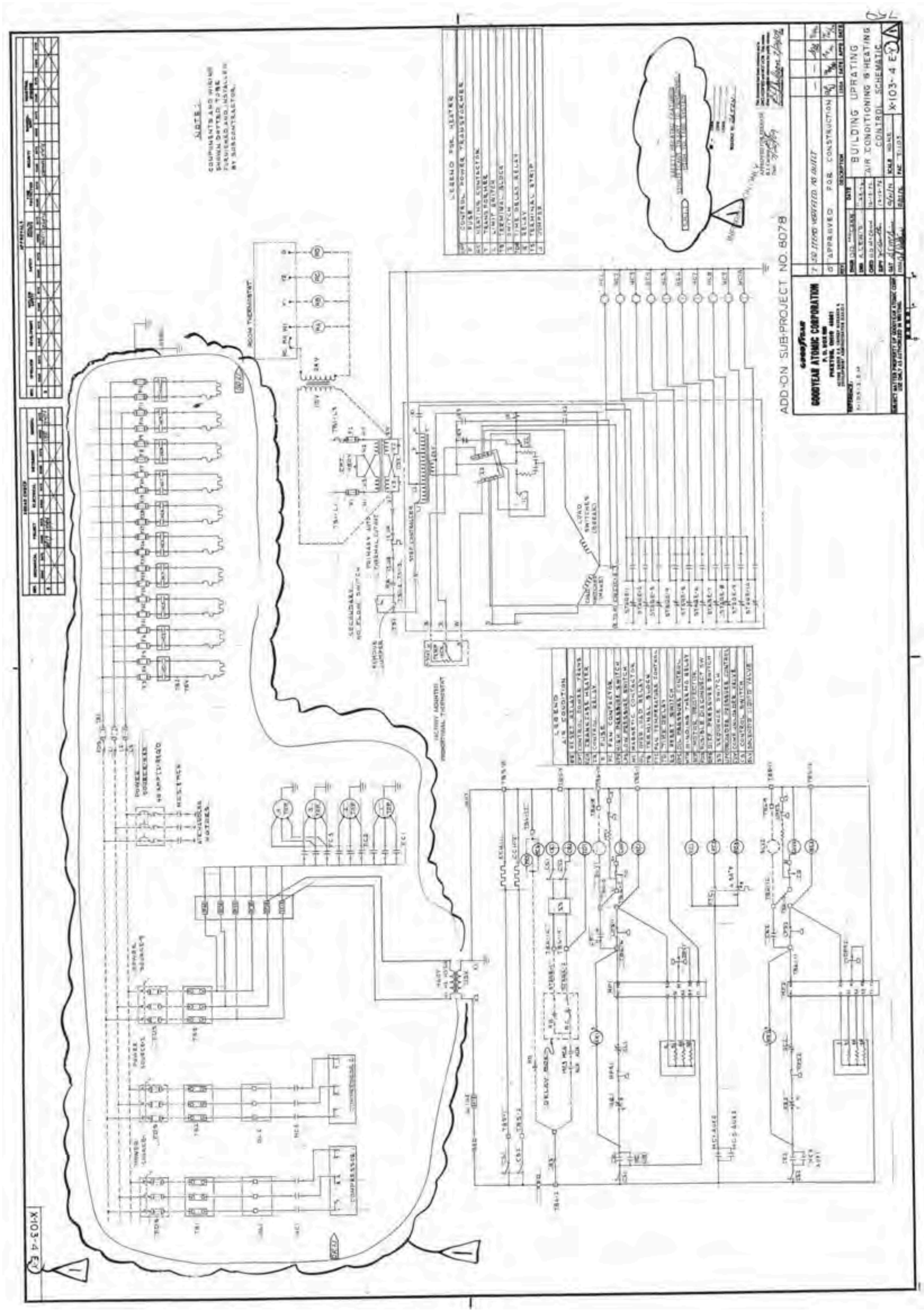

Figure 21: Building Uprating, Air Conditioning and Heating Control Schematic

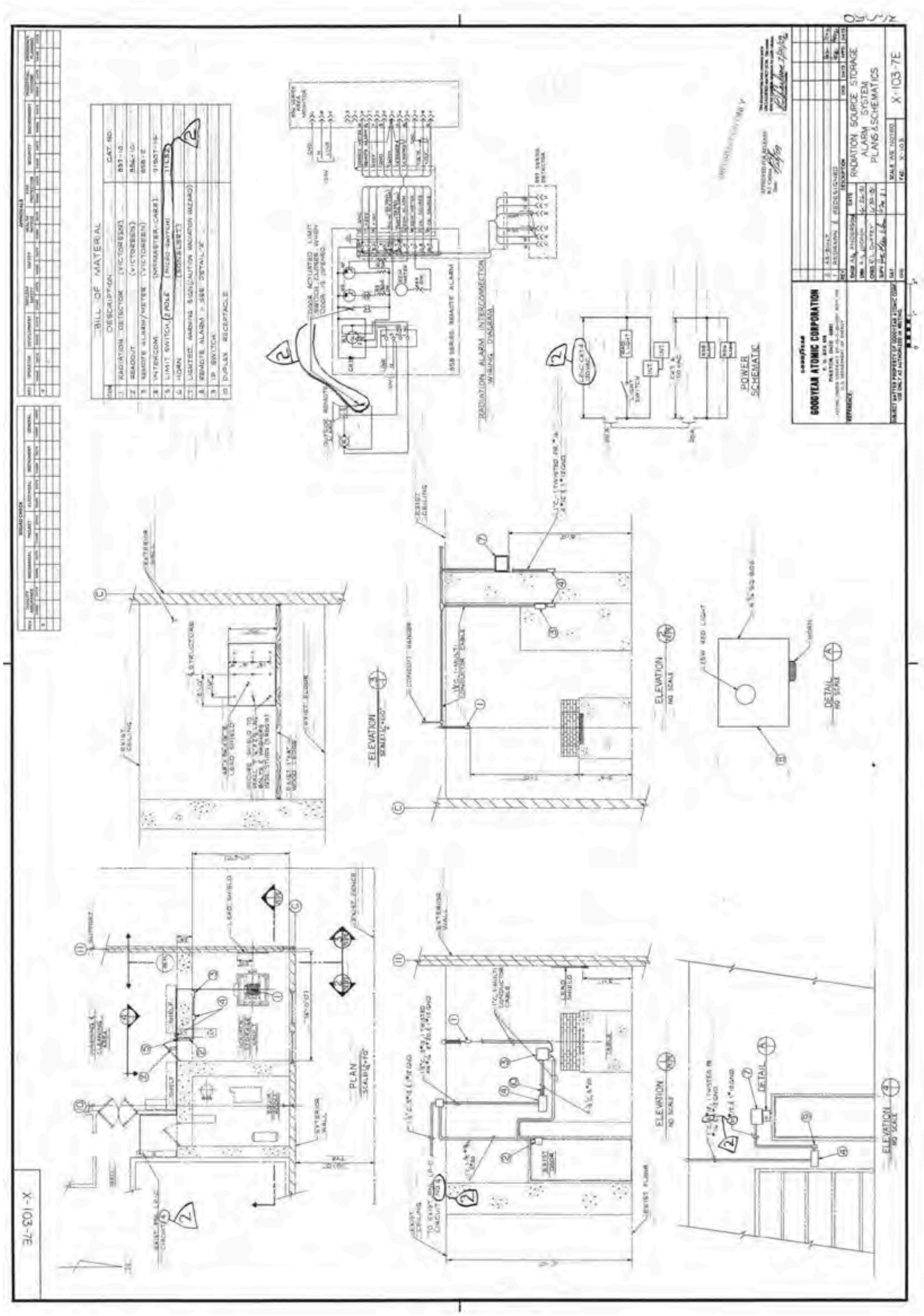

Figure 22: Radiation Source Storage, Alarm System, Plans and Schematics

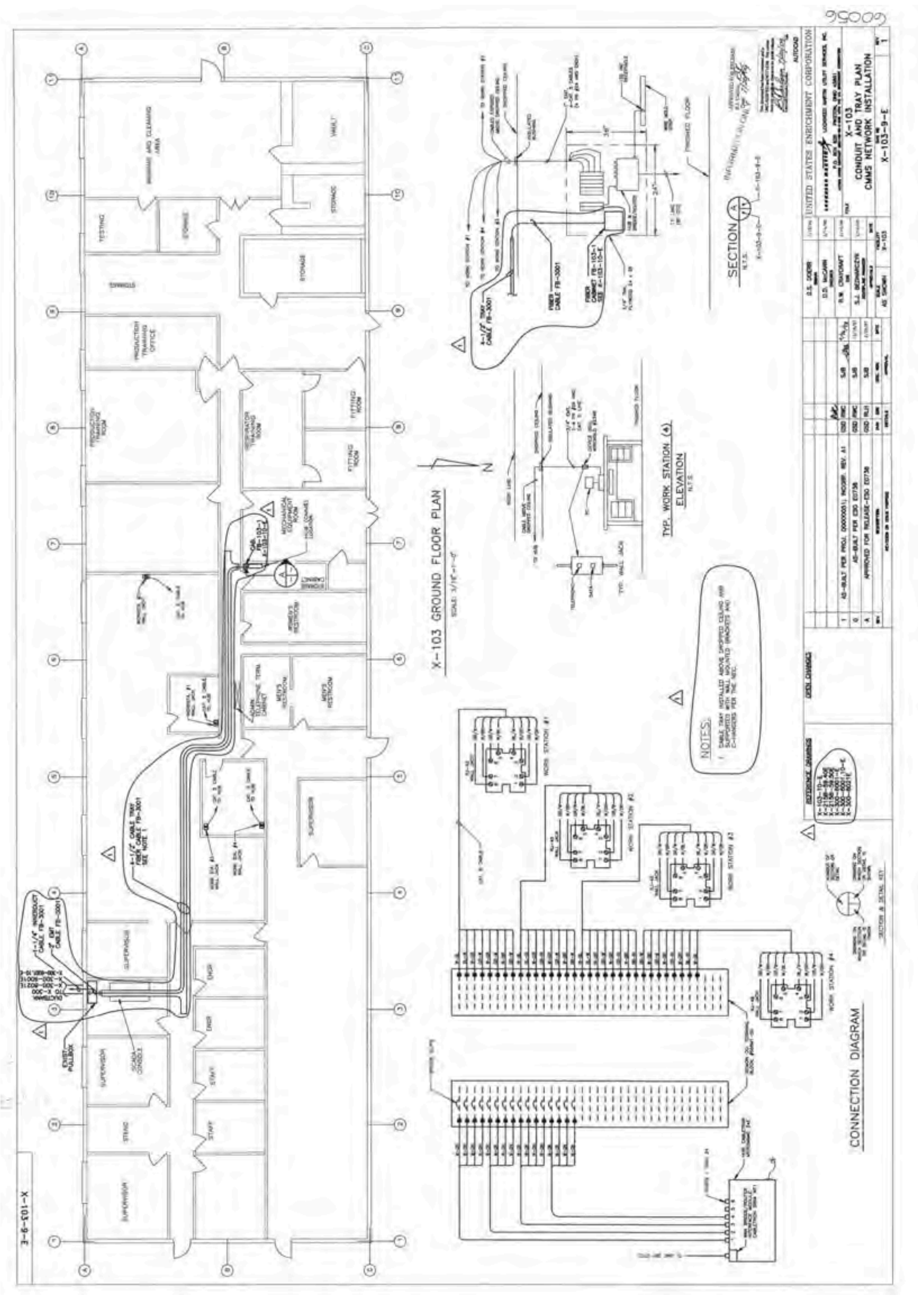

Figure 23: X-103 Conduit and Tray Plan CMMS Network Installation

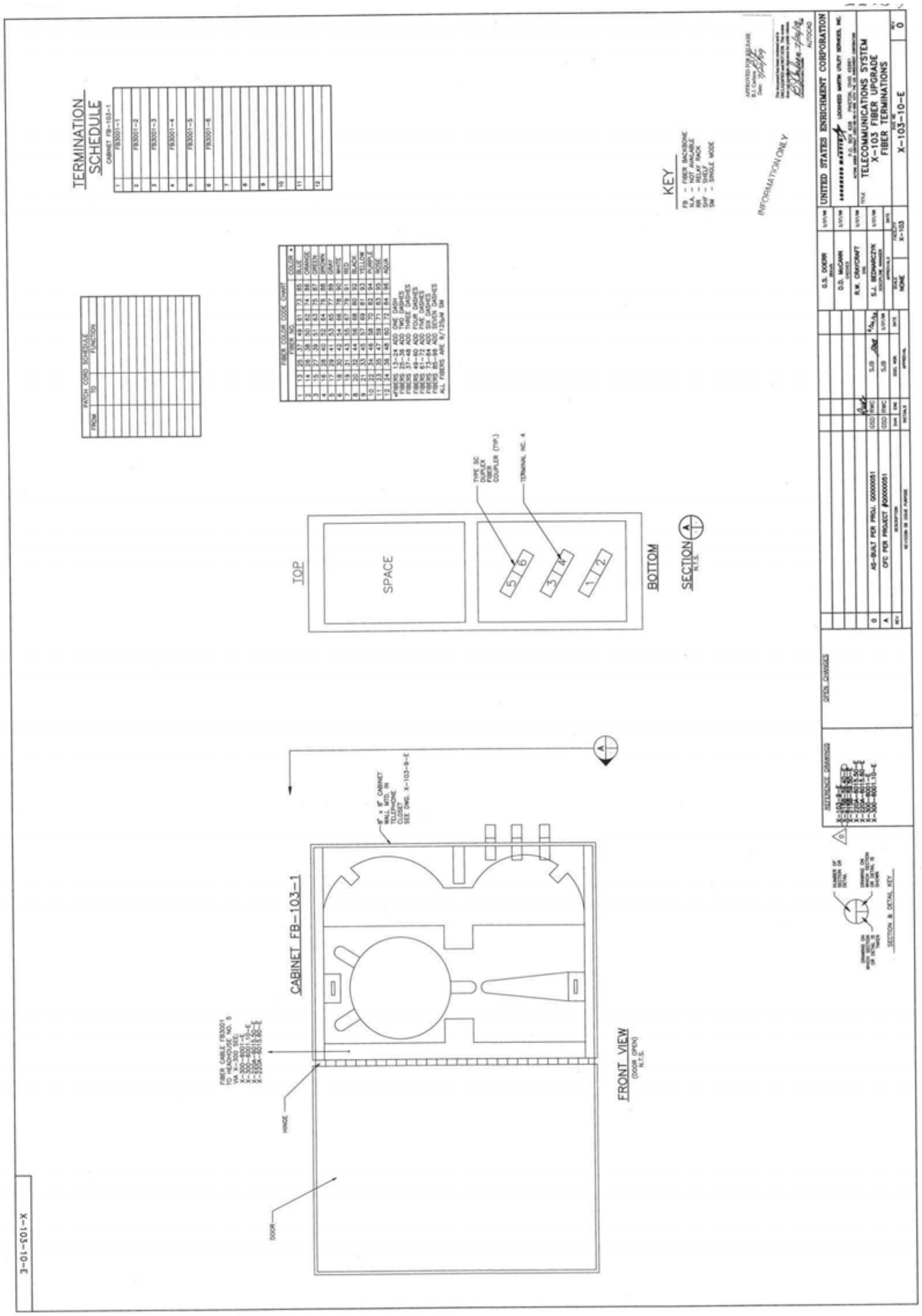

Figure 24: Telecommunications System, X-103 Fiber Upgrade, Fiber Terminations

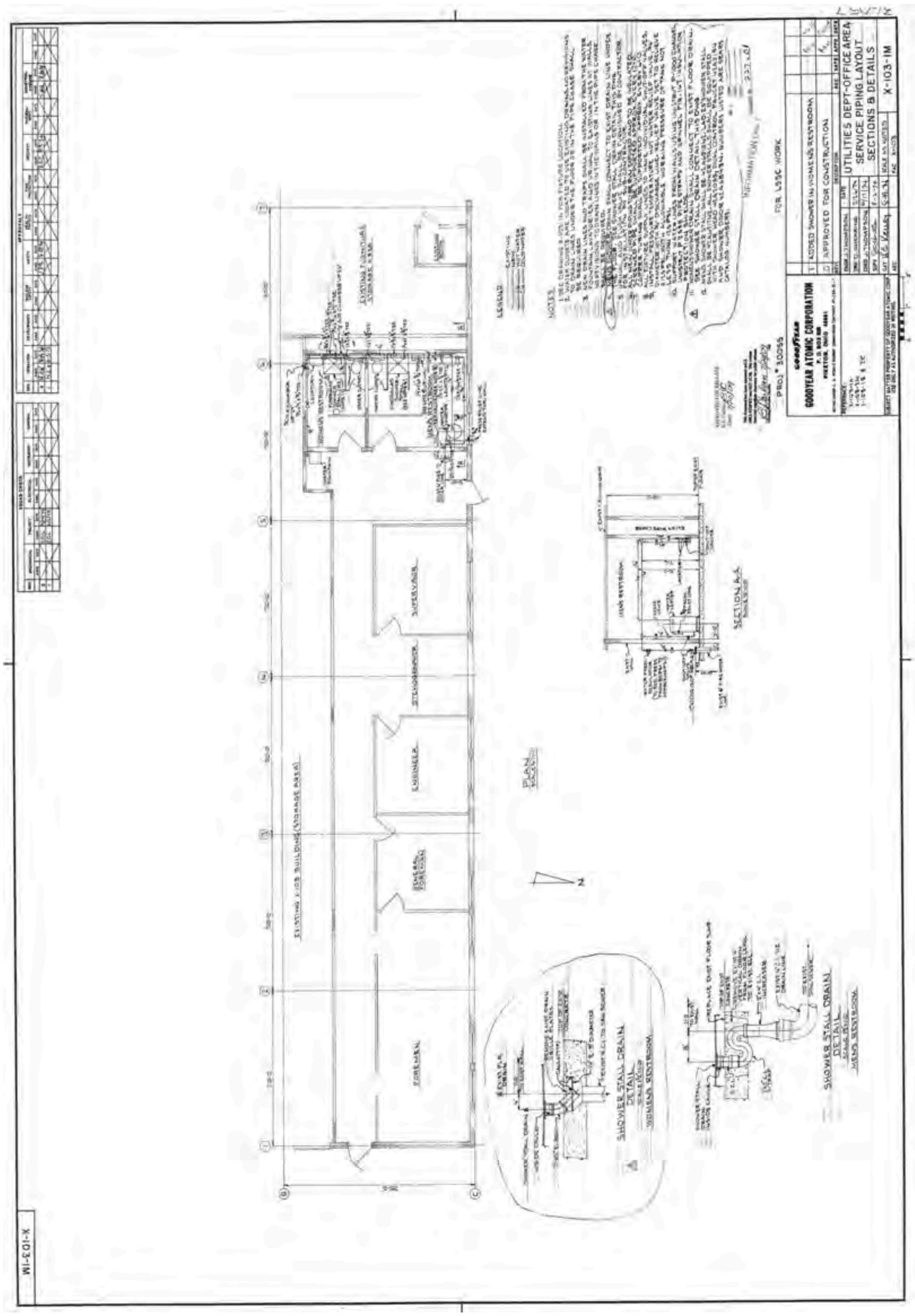

Figure 25: Utilities Department – Office Area, Service Piping Layout, Sections and Details

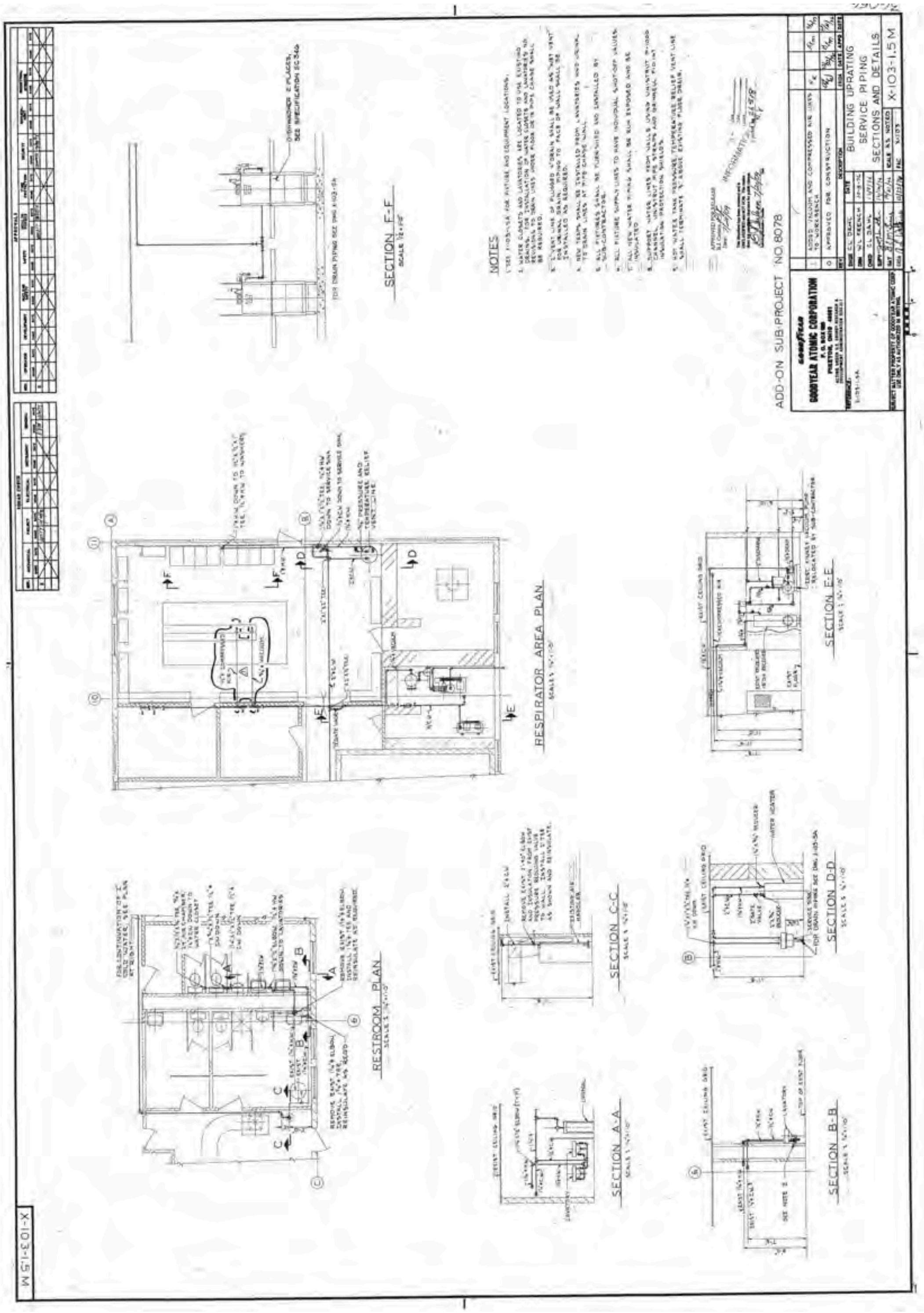

Figure 26: Building Uprating, Service Piping, Sections and Details

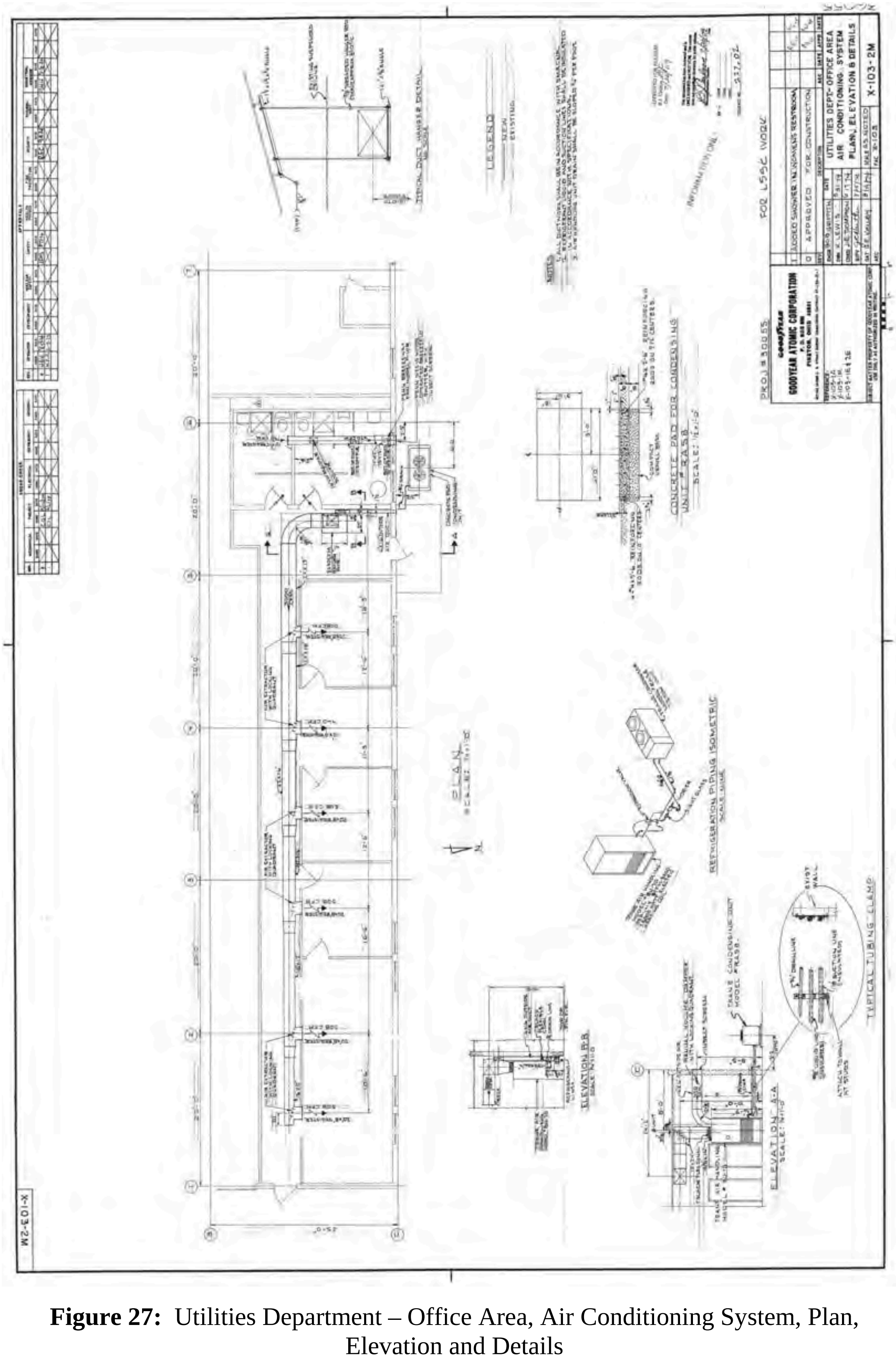

Figure 27: Utilities Department – Office Area, Air Conditioning System, Plan, Elevation and Details

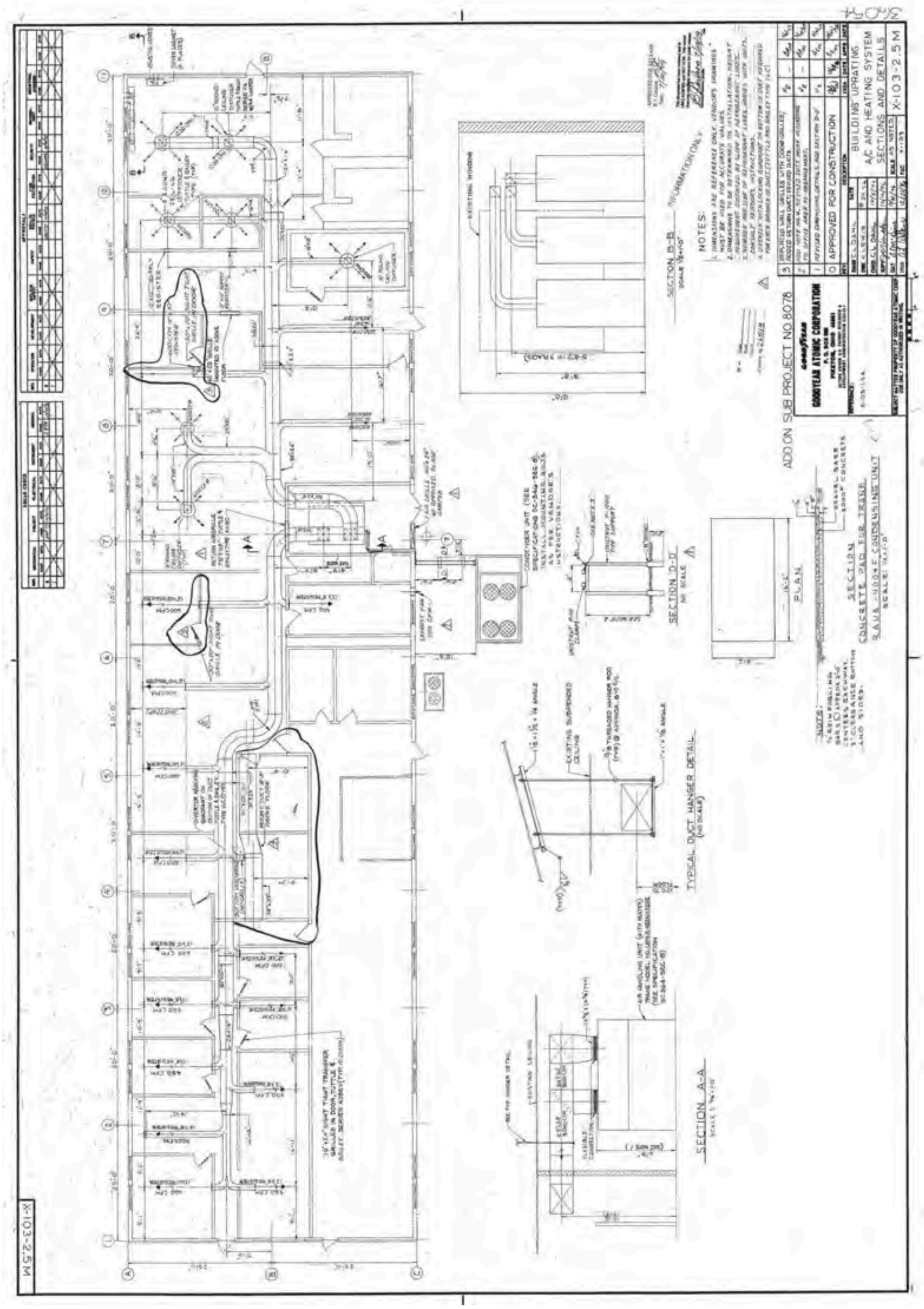

Figure 28: Building Uprating, A/C And Heating System, Sections and Details

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-104 GUARD HEADQUARTERS
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-J

HAER OH-142-J

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-104 GUARD HEADQUARTERS

HAER No. OH-142-J

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-104 Guard Headquarters is located at Ohio State Plane South coordinates at easting 1827675.296066 ft, northing 368266.503376549 ft and at Universal Transverse Mercator Zone 17N easting 327215.0906 m, northing 4319787.372 m. The coordinate represents the approximate center of the X-104 Guard Headquarters building. This coordinate was obtained on June 9, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1954
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission) oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	Guard Headquarters
Significance:	Since its construction, the X-104 Guard Headquarters has served as the central operation point for protection forces assigned to PORTS. PORTS was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor B&W Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-104 Guard Headquarters HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-104 Guard Headquarters:
Peter Kiewit Sons' Construction Company subcontracted the construction of the X-104 Guard Headquarters to the Clark Construction Company, of Owensboro, Kentucky (Appendix B, Figures 4 through 12). Construction on the X-104 Guard Headquarters began in the summer of 1953 and was largely completed by August 1954. The building was renovated in 1978 and the northwest addition was built in 1982.

Historical drawings of building plans are included in Appendix C (Figures 13 through 21).

Part II. Site Information

Description of the X-104 Guard Headquarters:
The X-104 Guard Headquarters is a vernacular, one-story, rectangular shaped building located just inside the main entrance to the limited area of the site. The building shows elements of the International Style (Appendix A, Figures 1 through 3). The building served as the central operation point for protection forces assigned to PORTS. It consists of three independent structures joined by a connecting corridor. The main structure, located in the center and eastern portion of the facility, houses the offices, supply rooms, restrooms, and locker facilities. The smaller building on the southwest corner houses the guard communication facilities. The slightly larger addition on the northwest corner contains training rooms, offices, and storage areas. Also associated with the X-104 Guard Headquarters is a steel-frame, two-bay garage, and the X-104A Indoor Firing Range, adjacent to the north.

The main structure is approximately 96' long and 76' wide (approximately 7,300 square feet), with a small, southern wing protruding approximately 14' beyond the south façade. The X-104 Guard Headquarters has a very low-pitched gabled roof with the ridge extending from north to south. The building has a concrete slab foundation and concrete block bearing walls. Window openings on the main building contain commercial-type, projected steel sash with double-strength B-grade glass and cast concrete sills. A simple wood trim fascia runs the width of the roofline. Exterior doors are wood with metal canopies above, with the exception of the metal security door to the communication building. The main double entry doors on the south façade feature large glass panes with metal door pulls. The roofline is punctuated by a variety of metal vents, exhaust fans, and air intakes. An incinerator was originally located on the north façade and was used to burn classified and business sensitive documents.

The interior of the main building originally featured a central corridor on the western half of the building with a large open locker room to the east and smaller rooms for offices and other uses on the west, as well as a smaller connecting corridor to the communications building. Interior partitions and ceilings are composed primarily of wood studs and gypsum board. Partition walls in the toilet and shower rooms consist of glazed tile walls and plastered ceilings, while the partition walls in the ammunition room are reinforced concrete. The finished flooring throughout the building is composed of the polished concrete slab, with the exception of ceramic tile in the restrooms and asphalt tile in the offices. Ceilings throughout the building are approximately 9', 5" high. The building was renovated in 1978, and the layout was altered to its present configuration.

The communications building is approximately 44' long and 33.5' wide with 9' ceilings and features reinforced concrete construction and a flat roof. The concrete walls have no window openings, and there is one exterior steel door on the west façade. The original connecting corridor is also of reinforced concrete construction and contained steel doors at either end of the corridor for security purposes. Renovations in 1978 extended the west wall to the edge of the main building, encompassing the connecting corridor. The interior features a partition wall separating the main communications room on the south from the emergency generator and restrooms on the north. The concrete slab floor features a large cable trench in the communications room that was covered with vinyl asbestos tile during the 1978 renovations.

The addition on the northern half of the west façade was built in 1982 for additional training space. The addition matches the construction materials and design of the main building with a concrete slab foundation and concrete block bearing walls.

Also associated with the X-104 Guard Headquarters is the X-104A Indoor Firing Range to the north of the main building. The building serves as a practice firing range for PORTS protective forces. The X-104A Indoor Firing Range was built in conjunction with the northwest addition to the main building in 1982. The building is approximately 129' long from east to west and 27' wide from north to south. There is a screen wall to the north of the building hiding the mechanical space. The building features a concrete slab foundation, concrete block bearing walls, no windows, and metal doors with aluminum canopies.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0207&D4. Piketon, OH: U.S. Department of Energy, October 2011.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio,* DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

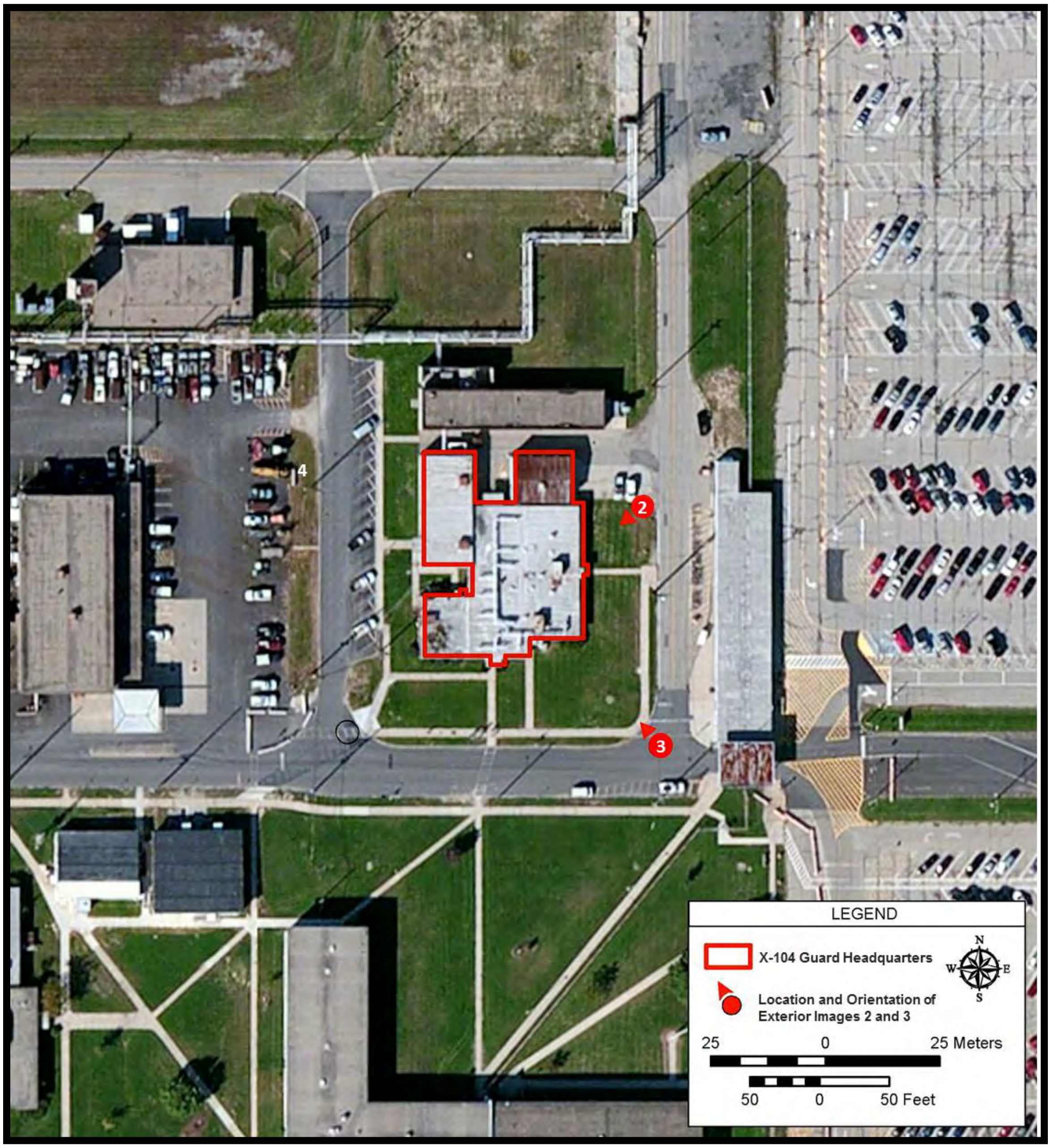

Figure 1: Location and Orientation of Exterior Photographs (A-2 through A-3)

Figure 2: East Side of the X-104 Guard Headquarters, August 2014, Facing Southwest

Figure 3: South Side of the X-104 Guard Headquarters, August 2014, Facing Northwest

Appendix B: Historical Photographs

Figure 4: Looking Northwest at X-104 Guard Headquarters, August 12, 1953

Figure 5: Looking East at X-104 Guard Headquarters, October 14, 1953

Figure 6: Looking East at X-104 Guard Headquarters, September 15, 1953

Figure 7: Looking Southeast at X-104 Guard Headquarters, November 13, 1953

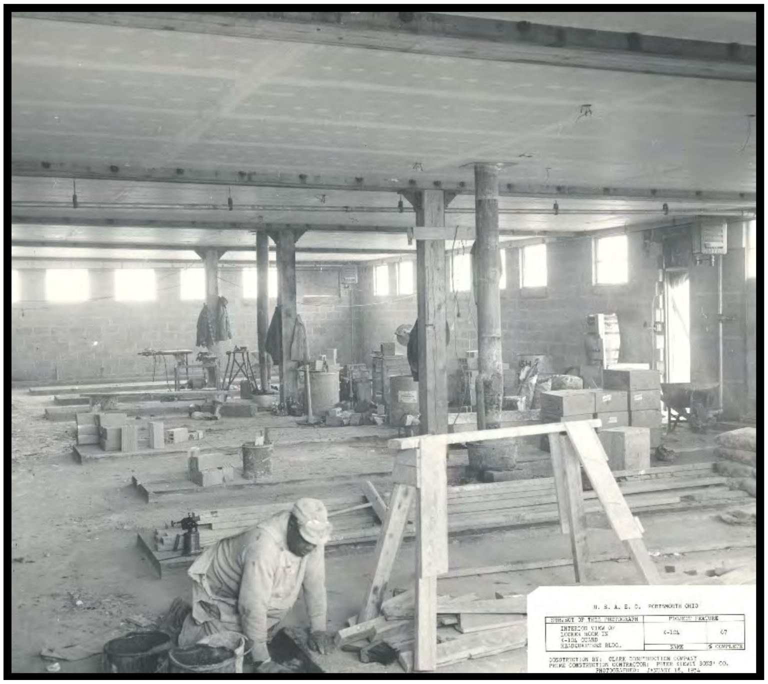

Figure 8: Interior View of Locker Room at X-104 Guard Headquarters, January 18, 1954.

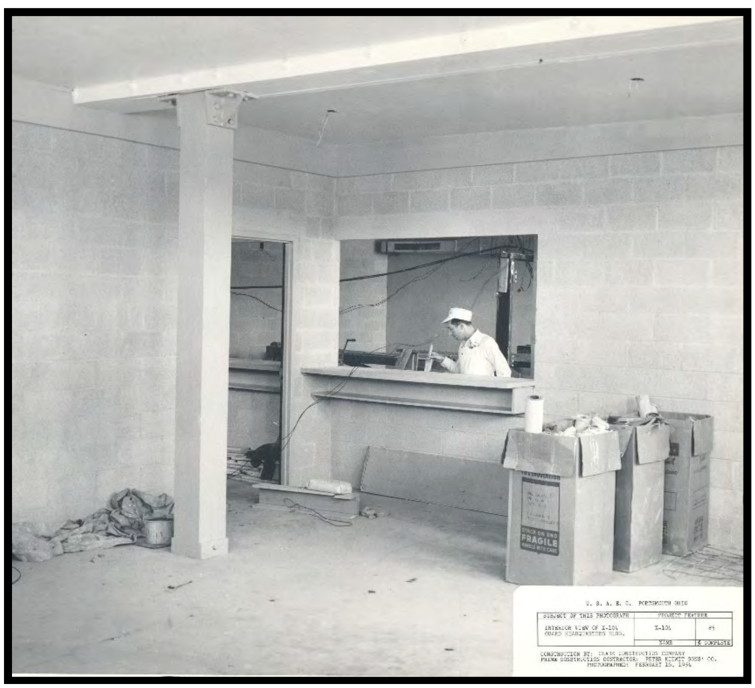

Figure 9: Interior View of X-104 Guard Headquarters, February 15, 1954

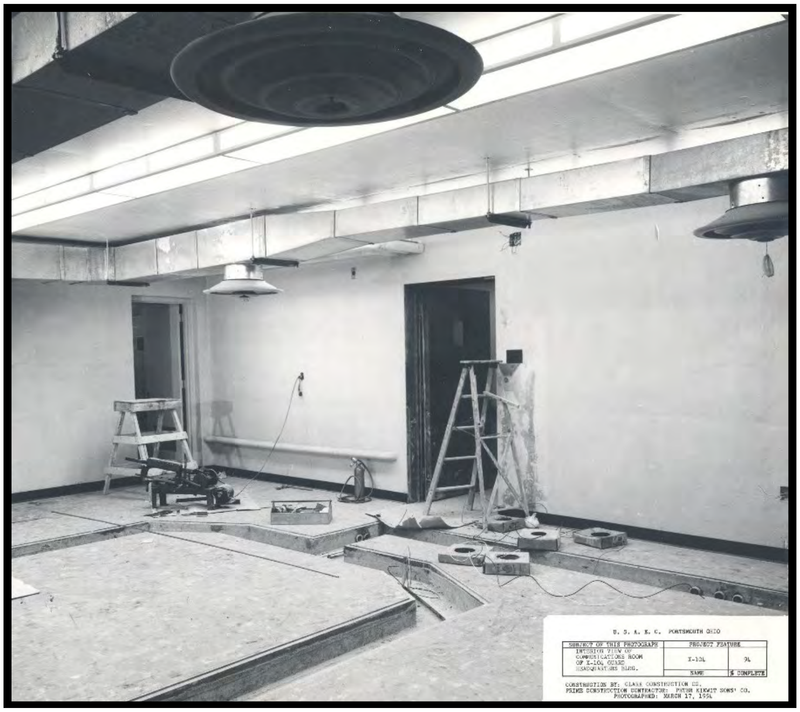

Figure 10: Interior View of Communications Room of X-104 Guard Headquarters, March 17, 1954

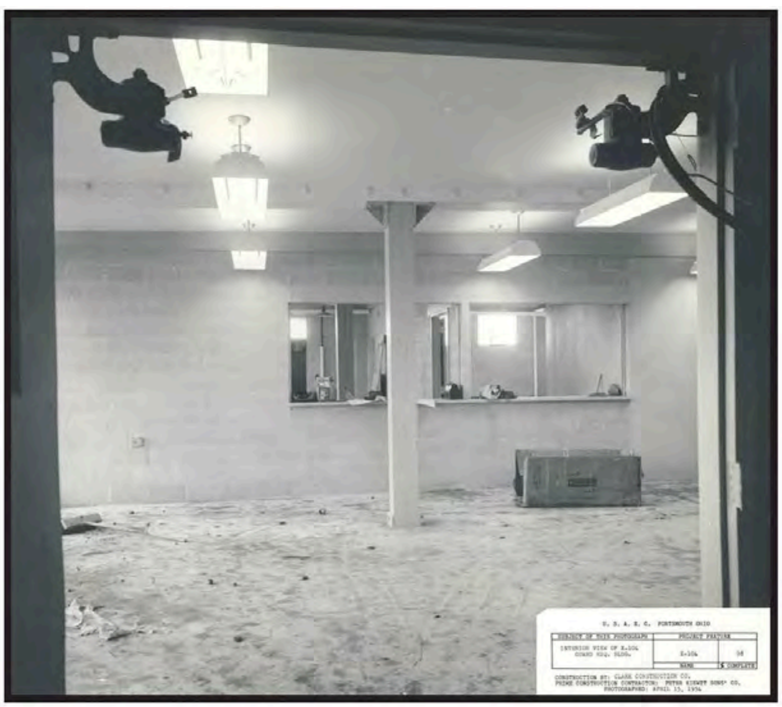

Figure 11: Interior View of X-104 Guard Headquarters, April 15, 1954

Figure 12: Looking Northeast at X-104 Guard Headquarters, August 19, 1954

Appendix C: Historical Drawings

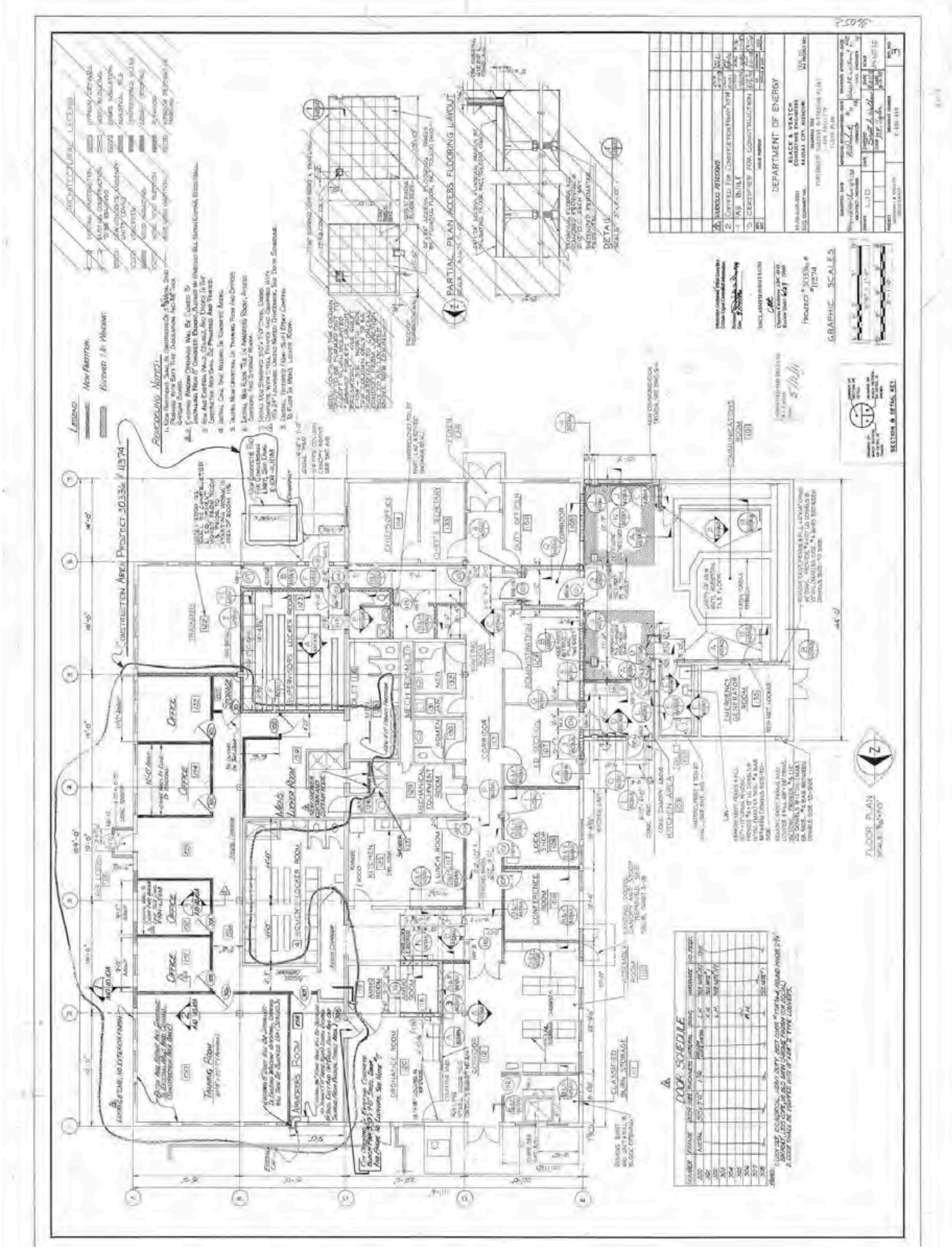

Figure 13: X-104 Guard Headquarters Elevations

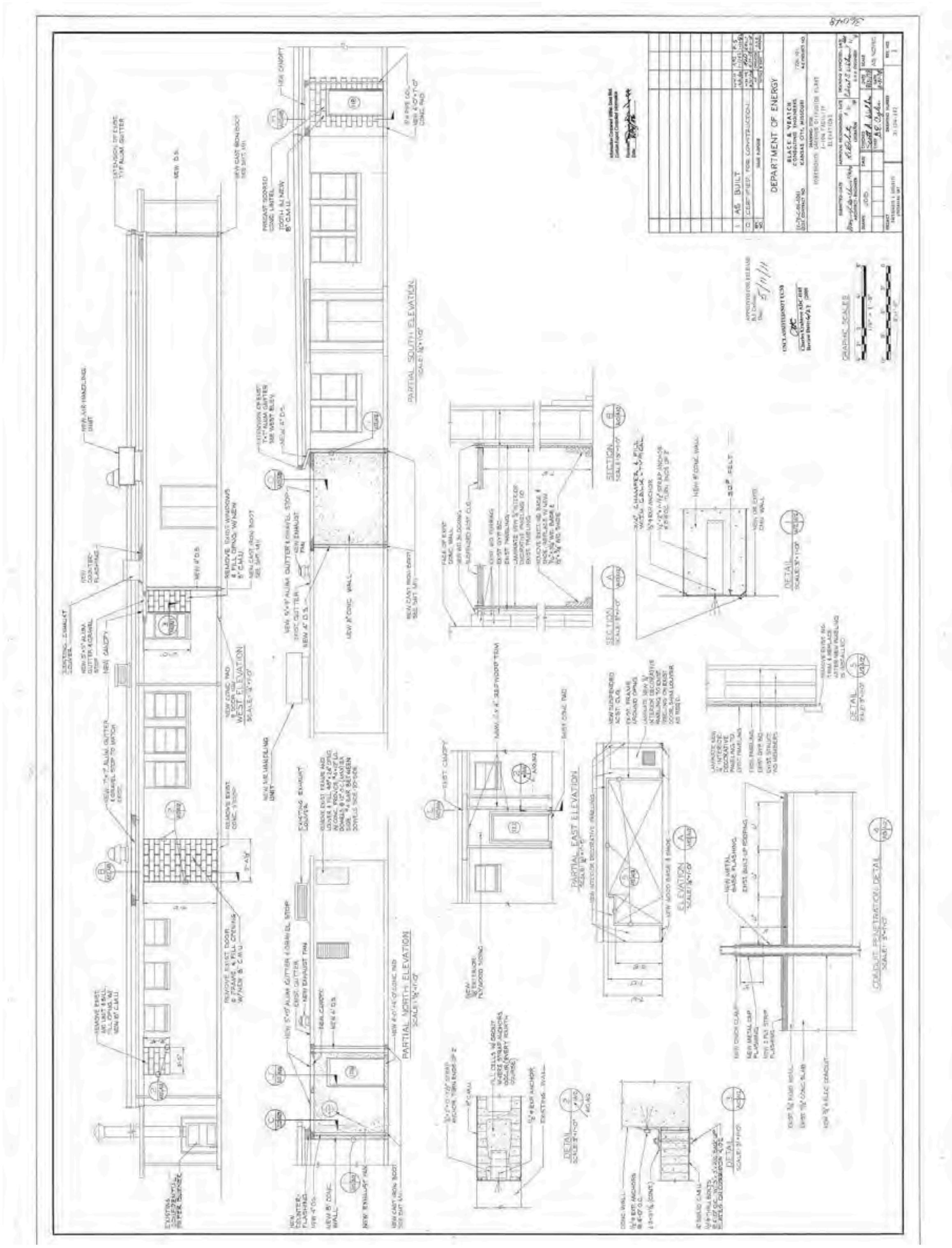

Figure 14: X-104 Guard Headquarters Elevations

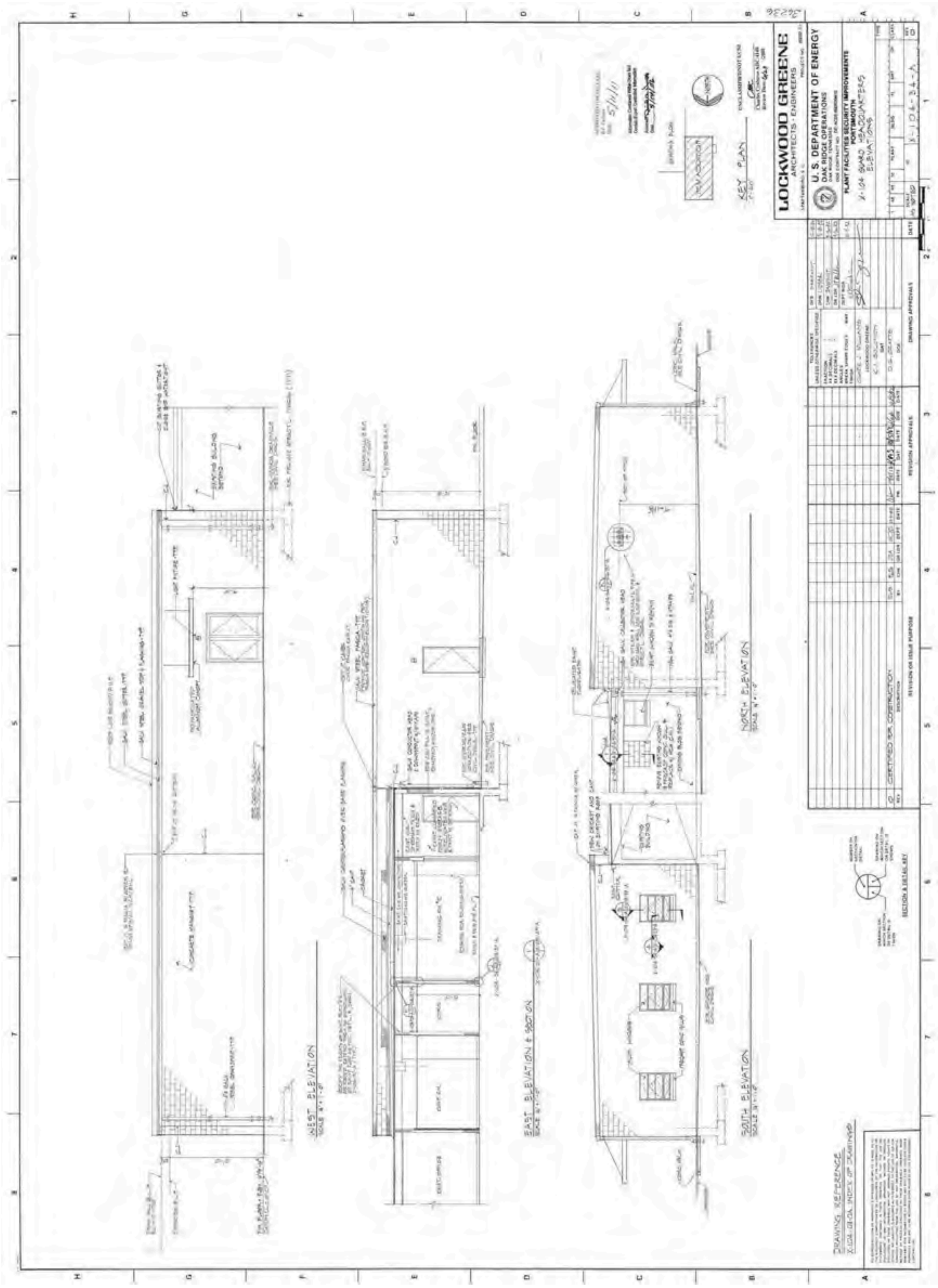

Figure 15: X-104 Guard Headquarters Floor Plan

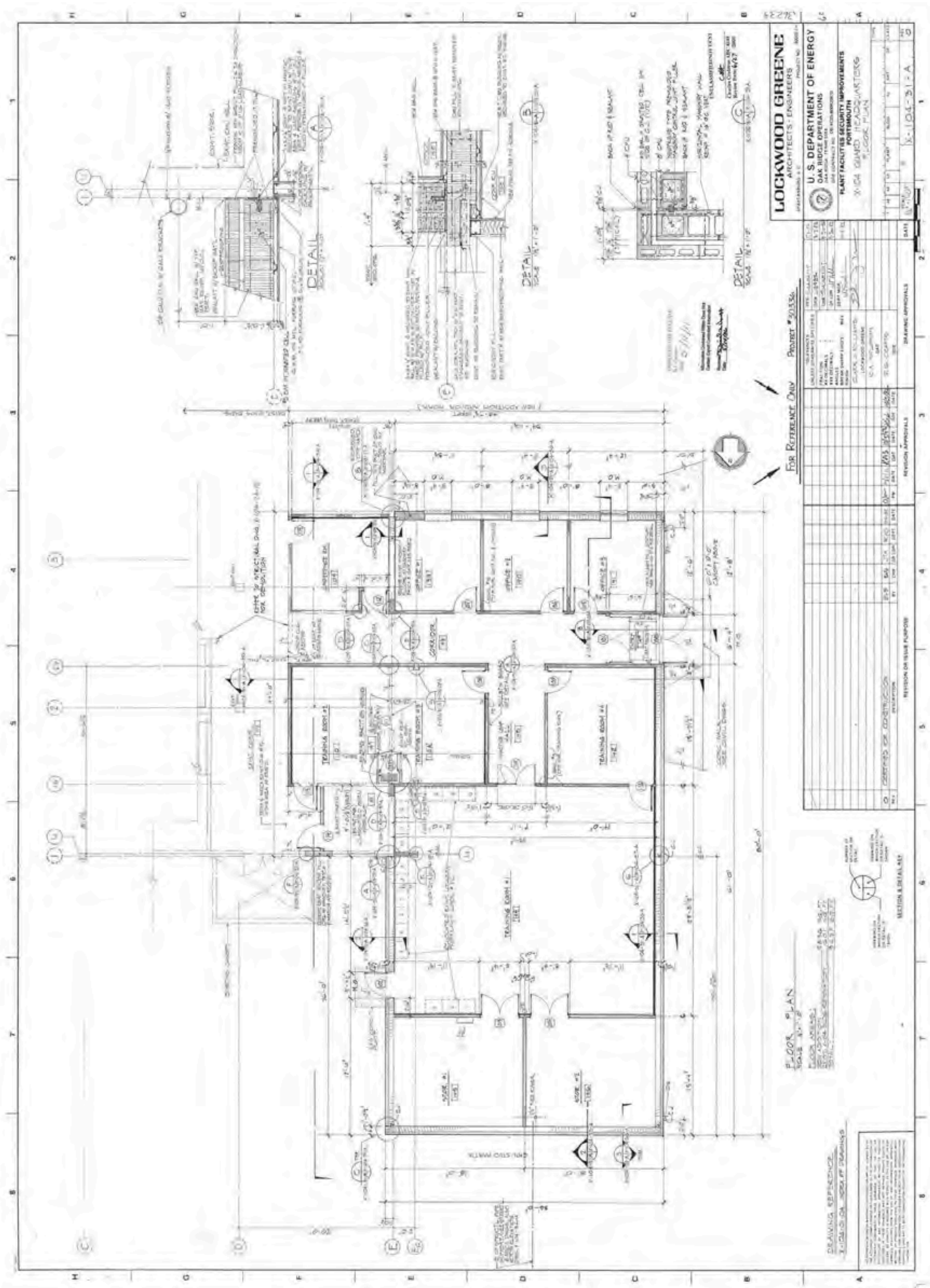

Figure 16: X-104 Guard Headquarters Floor Plan

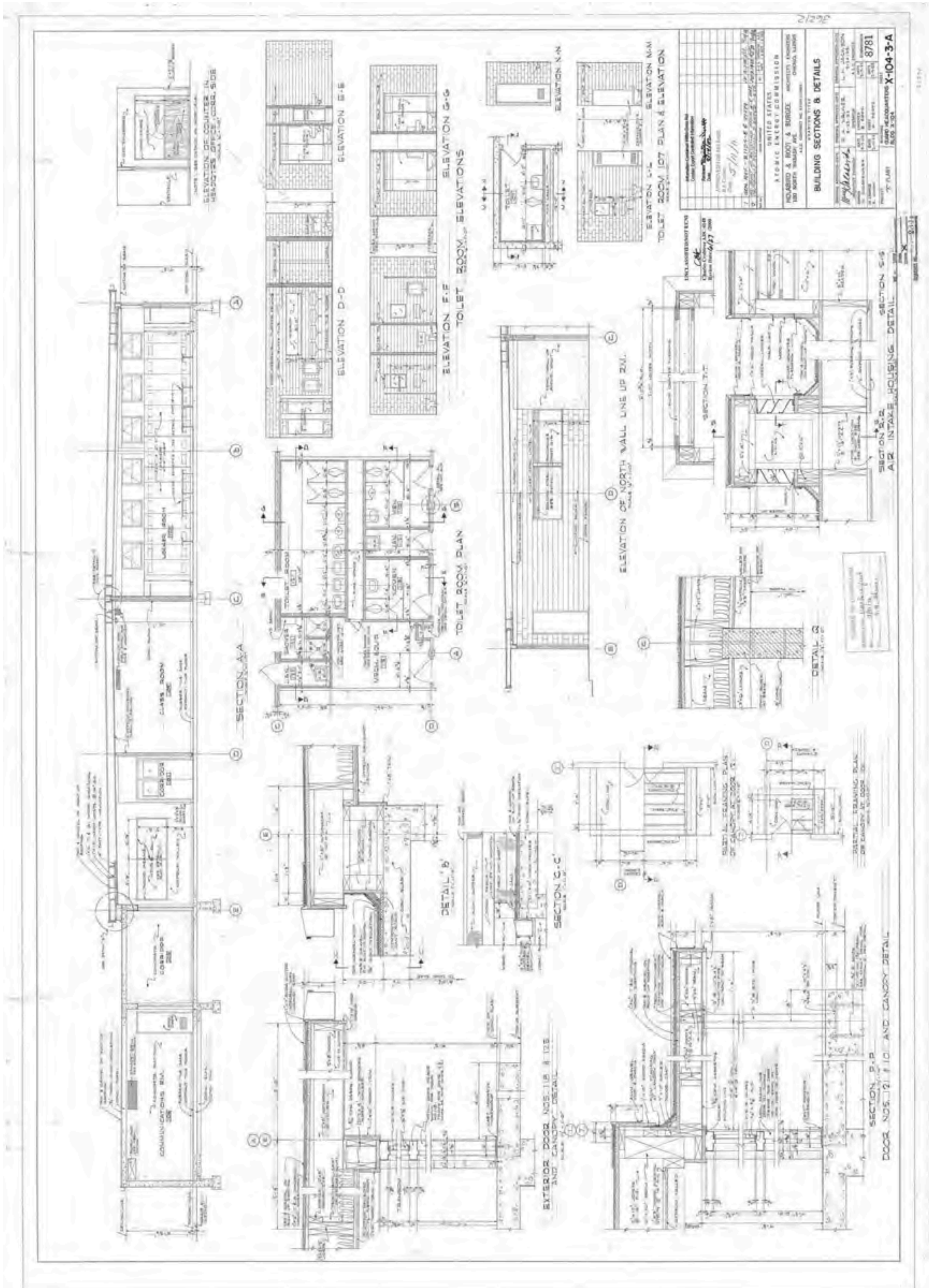

Figure 17: X-104 Guard Headquarters Building Sections and Details

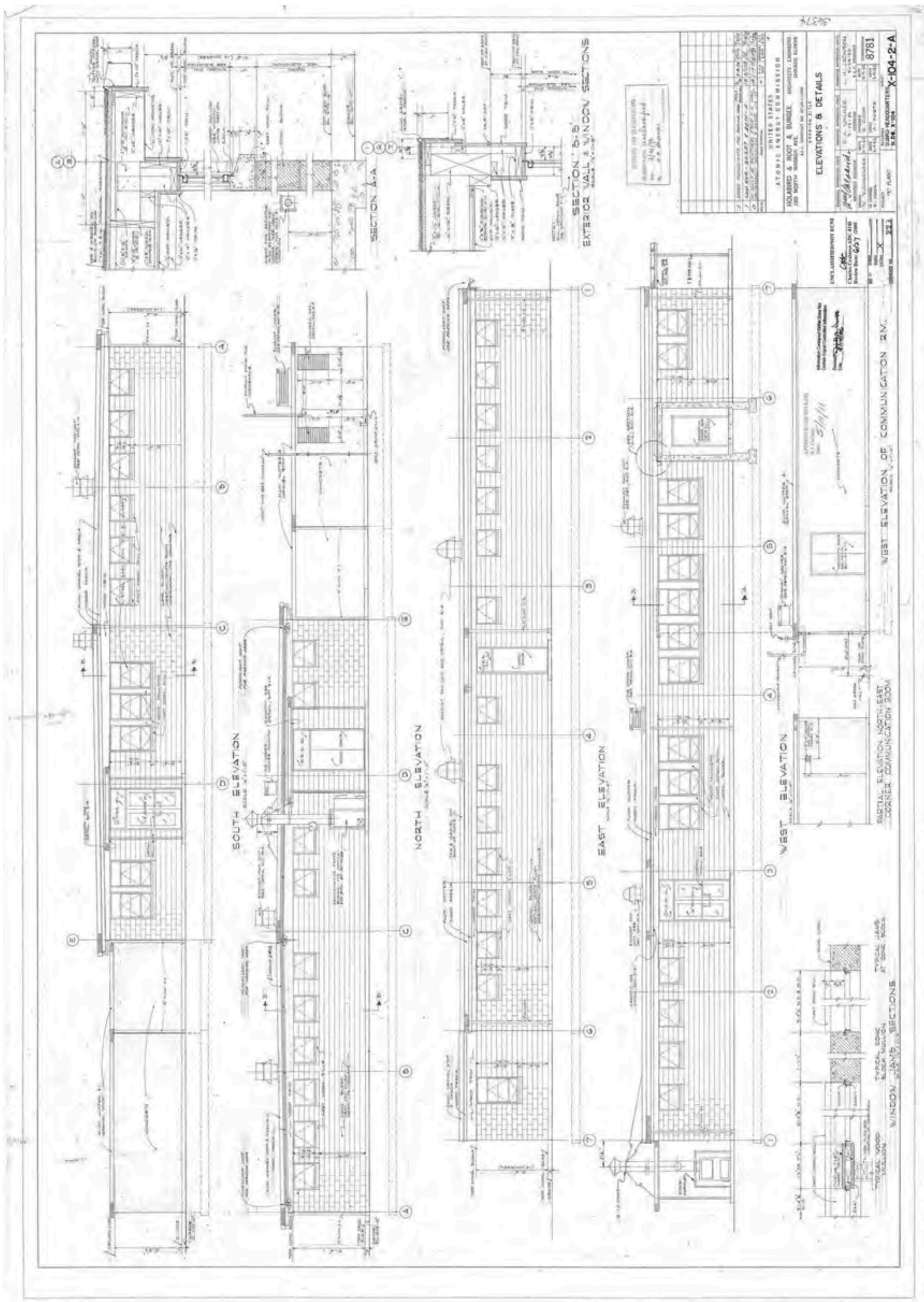

Figure 18: X-104 Guard Headquarters Elevations and Details

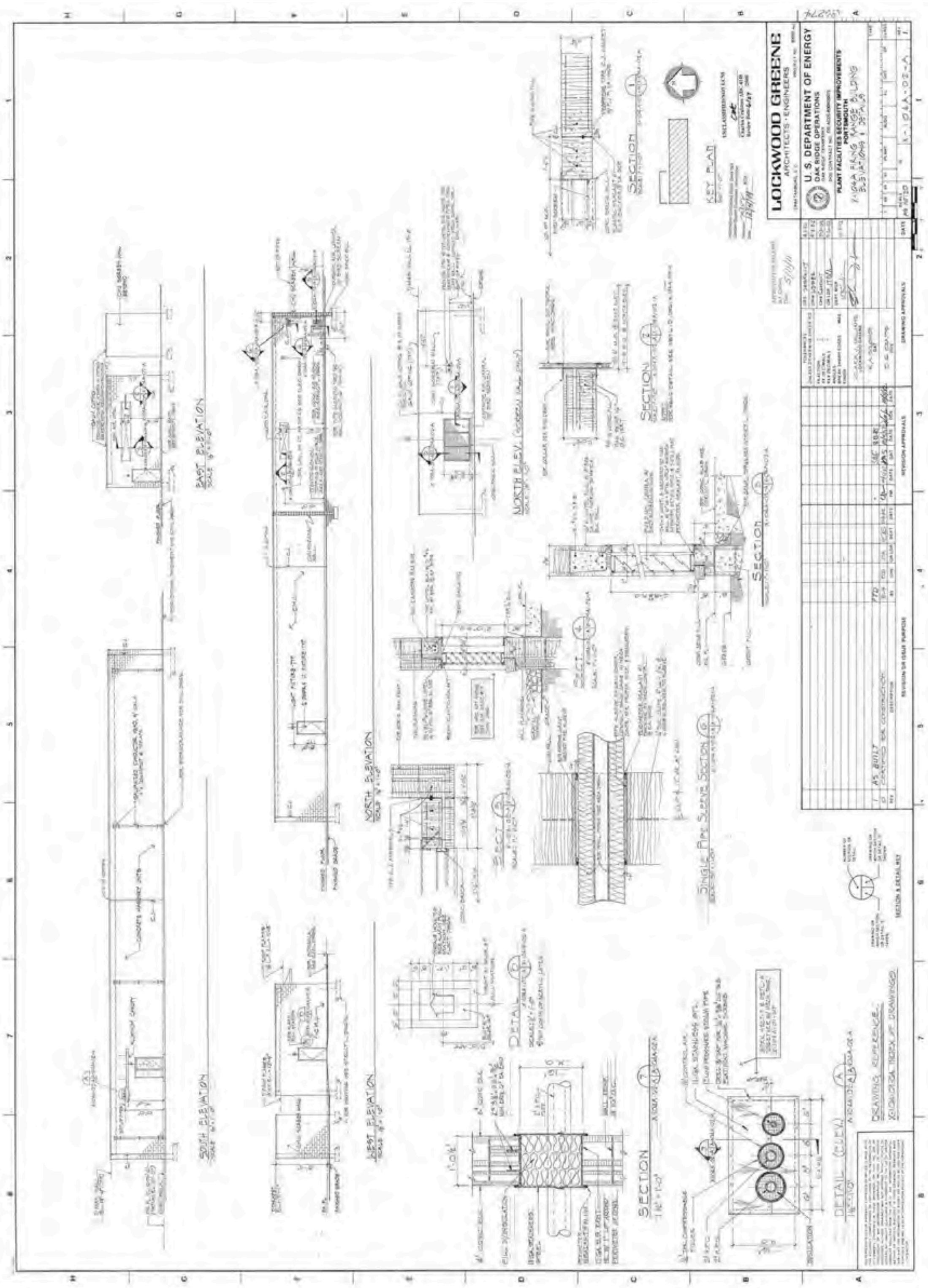

Figure 19: X-104A Firing Range Building Elevations and Details

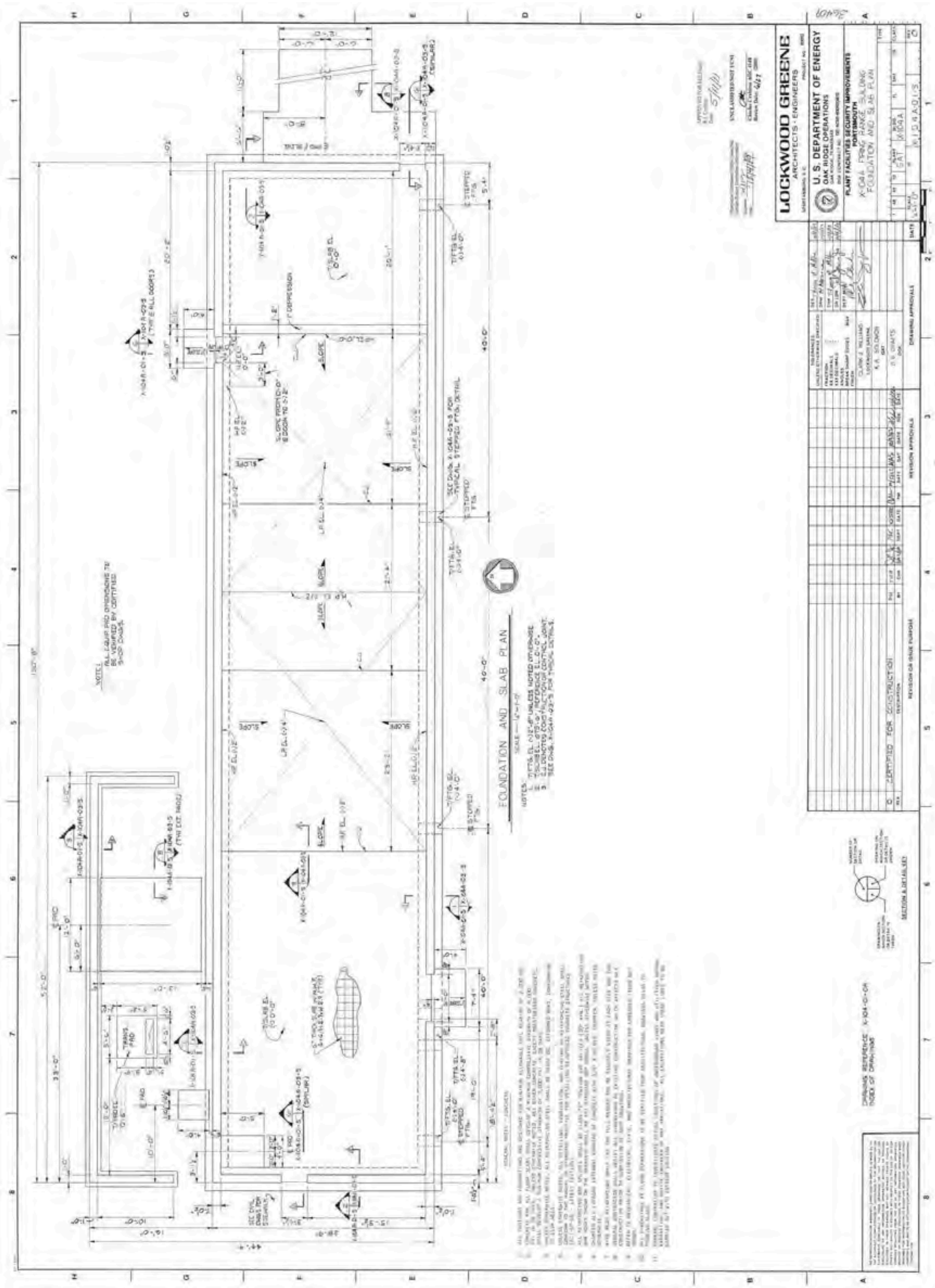

Figure 20: X-104 Firing Range Building Foundation and Slab Plan

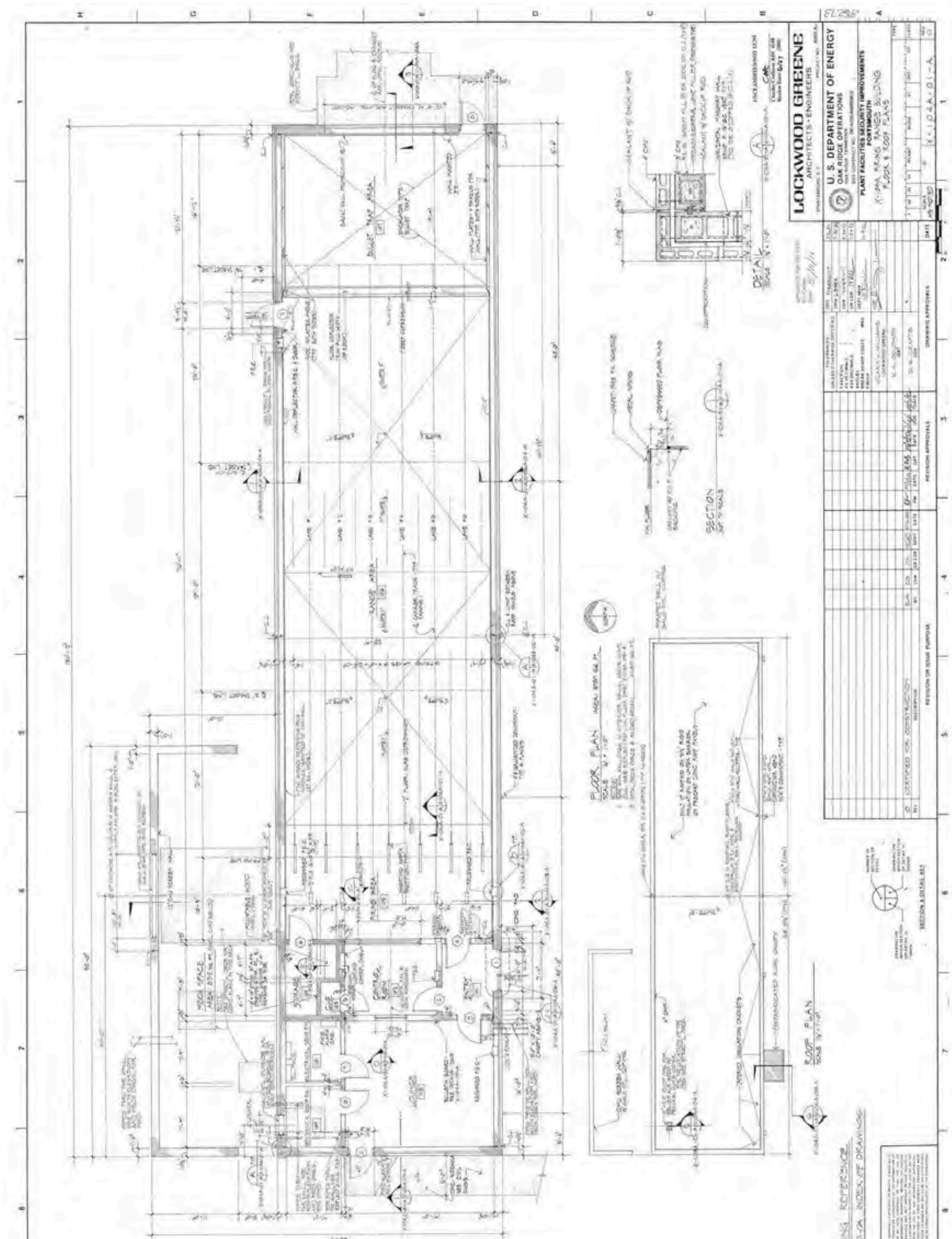

Figure 21: X-104 Firing Range Building Floor and Roof Plans

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-108B SECURITY PORTAL
(North Portal)
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-K
HAER OH-142-K

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-108B SECURITY PORTAL (NORTH PORTAL)

HAER No. OH-142-K

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-108B Security Portal is located at Ohio State Plane South coordinates at easting 1827850.976002 ft, northing 368999.147765966 ft and at Universal Transverse Mercator Zone 17N easting 327272.3027 m, northing 4320009.774 m. The coordinate represents the approximate center of the X-108B Security Portal. This coordinate was obtained on June 20, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1955
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	Security check post
Significance:	The X-108B Security Portal is one of three remaining original portals that facilitate pedestrian access to controlled areas of PORTS. PORTS was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor B&W Portsmouth LLC photographed the site on August 5, 2011. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-108B Security Portal HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-108B Security Portal:

Possibly due to its minimal design, few details exist regarding the construction history of the X-108B Security Portal. Available plans indicate that A.M. Kinney, Inc., of Cincinnati, Ohio, served as consulting engineers for the building. Primary contractor, Peter Kiewit Sons' Construction Company approved the plans for the X-108B Security Portal in May 1954. Peter Kiewit Sons' Construction Company's own forces handled all construction activities for the portal (Appendix B, Figure 4). They initiated excavation on July 20, 1954. One week later, the contractor began pouring the concrete foundation. They completed all concrete work by October 11, 1954. By March 7, 1955, the portal was ready for use.

Historical drawings of building plans are included in Appendix C (Figures 5-8).

Part II. Site Information

Description of the X-108B Security Portal:

The X-108B Security Portal (also known as North Portal) is located just south of the southeast corner of the X-720 Maintenance and Stores Building. It is one of three portals that facilitate pedestrian access to controlled areas of PORTS. The X-108B Security Portal provides access to the north end of the site. In addition to pedestrian access, the X-108B Security Portal also features guard booths, benches for workers awaiting buses, and bicycle storage.

Measuring approximately 37' by 127' (approximately 4,700 square feet), the X-108B Security Portal consists of a nominally, flat roof supported by a series of steel pipe posts, steel beams, and cinderblock walls (Appendix A, Figures 1-3). The roof pitches slightly toward the center of the building. This building is largely wide open with the flat roof functioning as a wide overhang. A cinderblock wall divides the center of the south end of the shelter. Benches line each side of the cinderblock divider. A series of bicycle racks are located on the west side of the south end of the building.

The north half of the X-108B Security Portal features three guard booths. The booths served as badge exchange stations for workers. Workers were required to wear calibrated thermoluminescent dosimeter badges with identification when at PORTS. These badges were used for security purposes and to monitor worker exposure to radiation. As workers exited PORTS at the end of their shift, they dropped their security badges through slots located in the sides of the security guard booths. A guard reissued the badges upon return to work.

Also built of cinderblock, each booth includes a pair of steel sash, double-hung windows. The windows are an unusual, 2/2 design, with the panes of each window located one above the other. Access to the guard booths is facilitated by a single doorway for each, individual booth.

A chain link fence, topped by barbed wire, separates the main parking lot from the facility. Workers entering controlled areas of PORTS were required to pass through one of three rotary gate and turnstiles. These entrance portals are located between the guard shelters in the north end of the X-108B Security Portal.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio*, DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

Figure 1: Location and Orientation of Exterior Photographs (A-2 through A-3)

Figure 2: North Side of the X-108B Security Portal, August 5, 2011, Facing Southwest

Figure 3: South Side of the X-108B Security Portal, August 5, 2011, Facing Northeast

Appendix B: Historical Photographs

Figure 4: Looking Northeast at X-108B Security Portal Construction, 1955

Appendix C: Historical Drawings

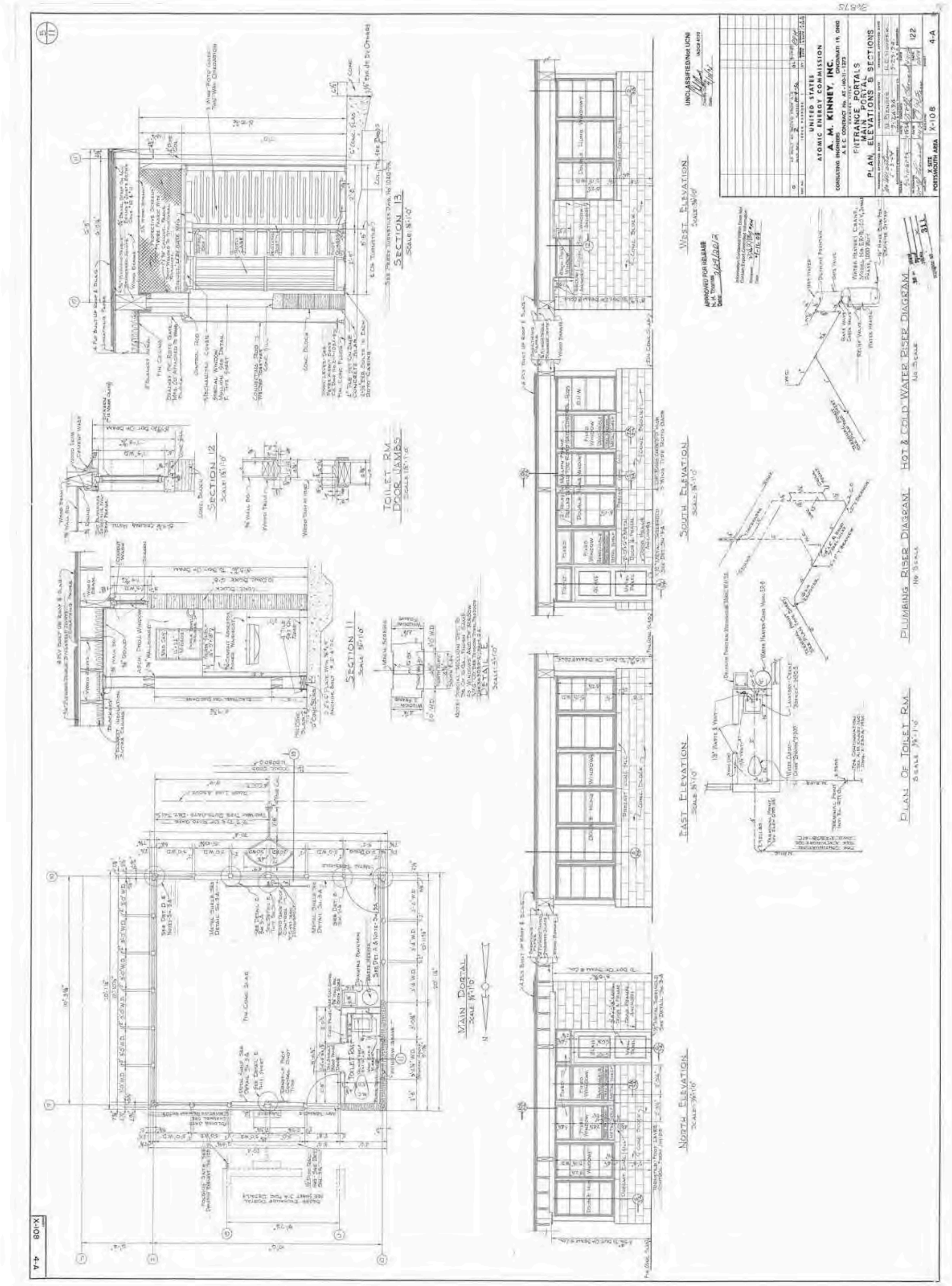

Figure 5: Plan, Elevations, and Sections

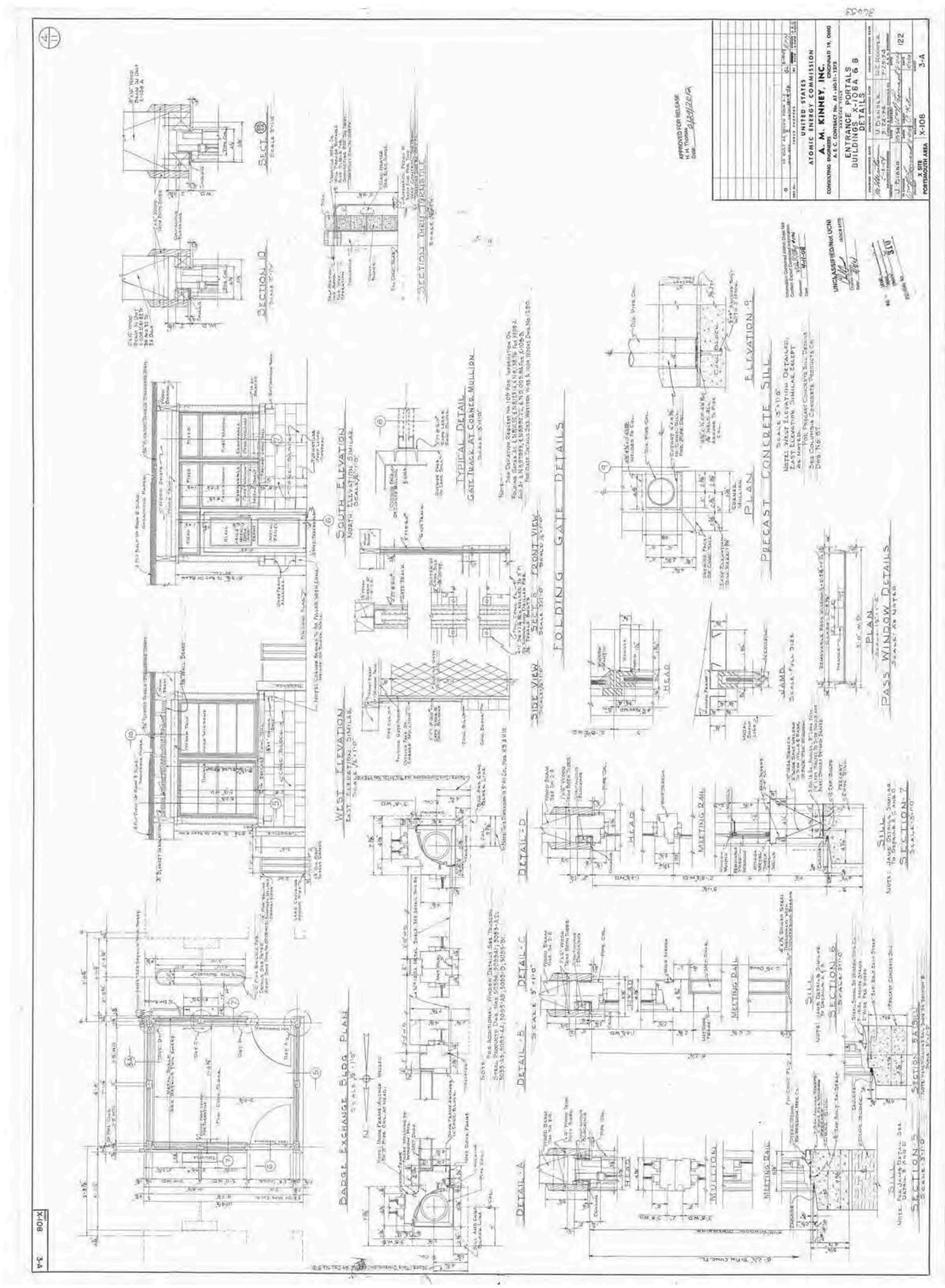

Figure 6: Details

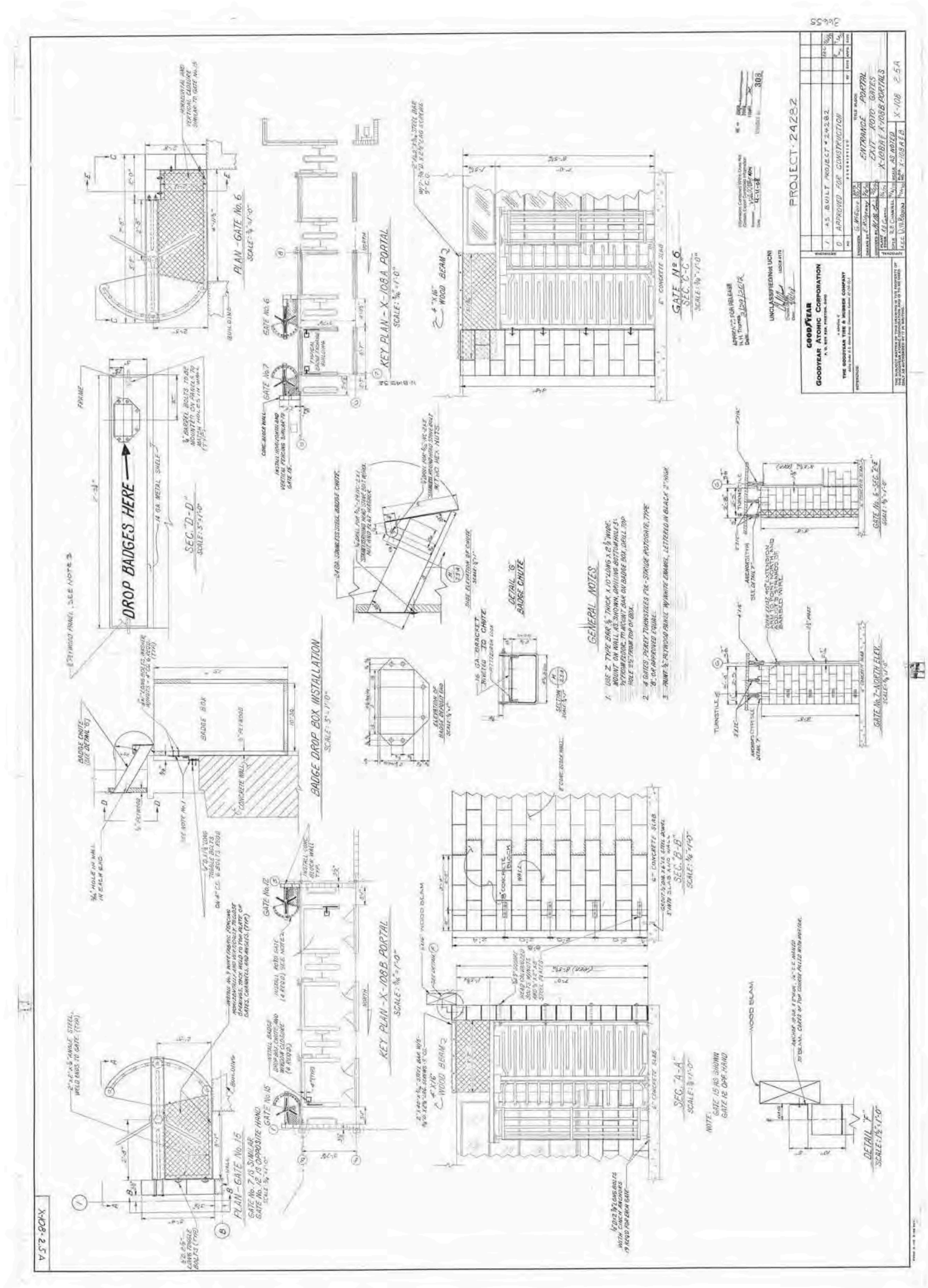

Figure 7: Exit Roto Gates

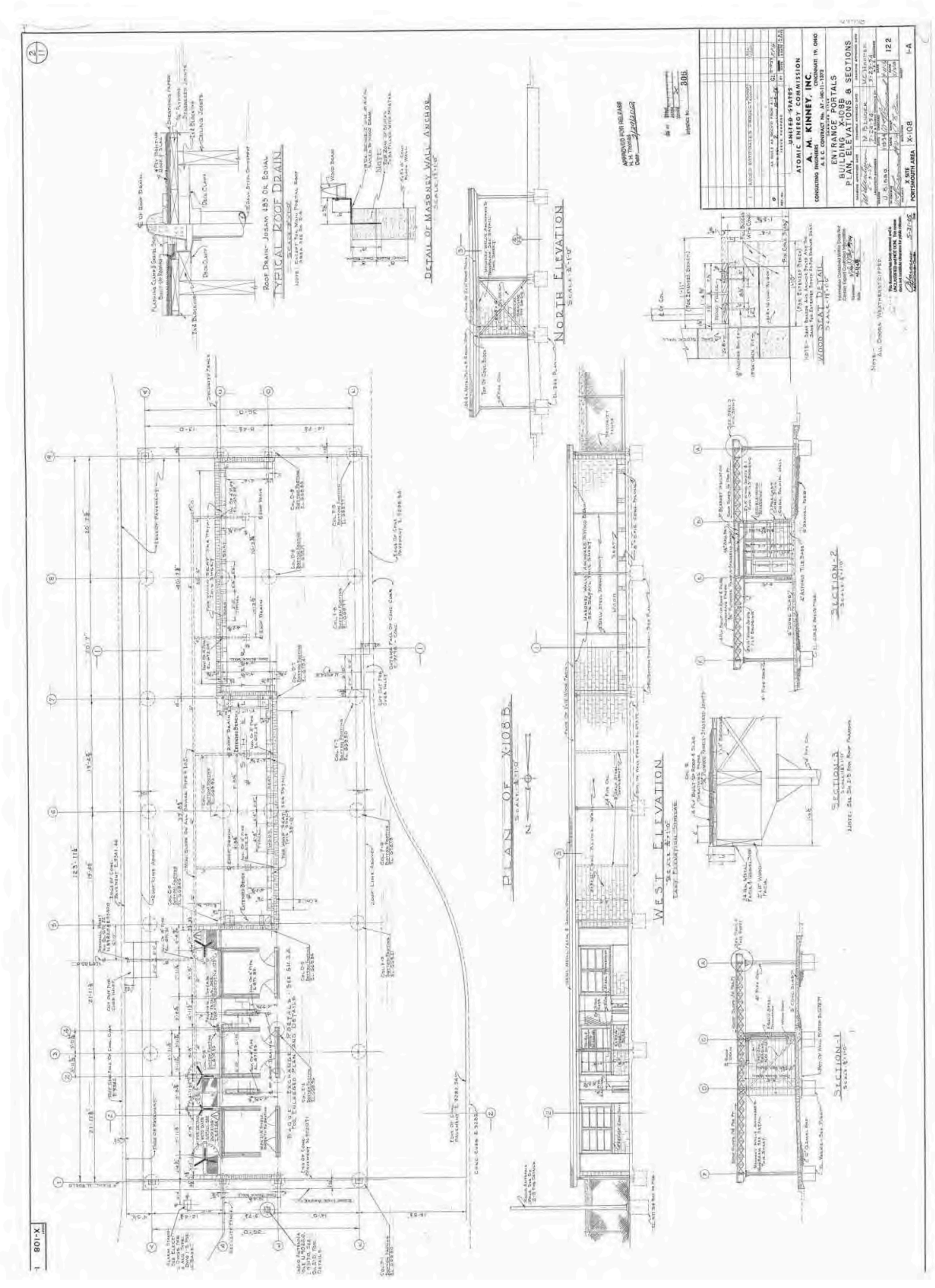

Figure 8: Plan, Elevations, and Sections

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-111A AND X-111B SPECIAL NUCLEAR MATERIALS MONITORING PORTALS
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-L
HAER OH-142-L

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-111A AND X-111B SPECIAL NUCLEAR MATERIALS MONITORING PORTALS

HAER No. OH-142-L

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-111A and X-111B Special Nuclear Materials Monitoring Portals are located at Ohio State Plane South coordinates at easting 1826582.888882 ft, northing 367684.110978017 ft and easting 1826011.557923 ft, northing 369318.851632371 ft, respectively, and at Universal Transverse Mercator Zone 17N, easting 326879.2472 m, northing 4319615.354 m and easting 326713.3182 m, northing 4320116.426 m, respectively. The coordinates represent the approximate center of both the X-111A and X-111B Special Nuclear Materials Monitoring Portal. These coordinates were obtained on June 20, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1981
Designer/Builder:	United States Enrichment Corporation
Previous Owner:	N/A
Present Owner:	Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	The X-111A and X-111B Special Nuclear Materials Monitoring Portals are no longer in use and are awaiting demolition.
Significance:	The X-111A and X-111B Special Nuclear Materials Monitoring Portals served as secure entrances for employees and equipment entering and exiting the X-326 Process Building. These facilities had a critical role in PORTS' Cold War mission. These portals are part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant,

HAER no. OH-142. This X-111A and X-111B Special Nuclear Materials Monitoring Portals HAER was completed in 2021.

Part I. Historical Information

In support of this effort, there are two appendices: Appendix A and Appendix B, consisting of survey photographs and historical drawings, respectively.

Construction History of the X-111A and X-111B Special Nuclear Materials Monitoring Portals:
The X-111A and X-111B Special Nuclear Materials Monitoring Portals were built in 1981 as security portals for employees and equipment entering and leaving the X-326 Process Building. They are built of common construction materials and are utilitarian in form and style. A historical drawing of the building plans is provided in Appendix B (Figure 6).

Part II. Site Information

Description of the X-111A and X-111B Special Nuclear Materials Monitoring Portals:
The X-111A and X-111B Special Nuclear Materials Monitoring Portals are one-story, utilitarian structures adjacent to the X-326 Process Building in the center of PORTS. Special nuclear materials can include plutonium, uranium-233, or uranium enriched with uranium-233 or uranium-235 isotopes. The special nuclear material produced by the gaseous diffusion process at PORTS was enriched uranium-235. The X-111A Portal is located south of the midpoint of the east side of the X-326 Process Building. The X-111B Portal is located at the western end of the north side of the X-326 Process Building. The portals served as secure entrances for employees and equipment entering and exiting the X-326 Process Building. PORTS security forces monitored and provided direct operational control of materials and personnel that entered and exited the X-326 Process Building.

The X-111A Portal consists of three rectangular buildings, conjoined into a Z-shaped plan, encompassing approximately 900 square feet (Figures 2 and 3). The central building has a poured concrete slab foundation, concrete block bearing walls, a central window opening with plate glass, and a flat steel roof. The eastern building provided pedestrian access to the central building and consists of a concrete pier foundation, metal walls, window openings with aluminum sliding sash, and a flat metal roof. This building provided an entry vestibule to the central block. The southern building provided vehicular access to the X-326 Process Building. It has a poured concrete slab foundation, walls clad in corrugated metal, and a large rolling metal garage-type door on the east façade. Access to the central portal building was gained through a typical metal door on the interior of the vehicular access portal. A chain link fence topped with barbed wire surrounds the X-111A Portal. Barbed wire also runs along the roofline of the portal buildings. A small access drive to the rear of the portal leads to an opening on the X-326 Process Building.

The X-111B Portal is located on the north façade of the X-326 Process Building and is nearly identical to the X-111A Portal, with the exception of the vehicular access portal (Figures 4 and 5). The portal consists of two rectangular buildings in an L-shaped plan, comprising approximately 300 square feet. The main building is similar to the central building of the X-111A Portal with a poured concrete slab foundation, concrete block bearing walls, a window opening with plate glass, and a flat steel roof. The northern building provided a pedestrian access and vestibule for the X-111B Portal, and features concrete pier foundations, metal walls, window openings with sliding sash, and a flat metal roof. There was no vehicular access portal for the X-111B Portal; the portal is physically attached to the X-326 Process Building.

The interior of the portals are nearly identical, with the vestibules containing a simple keypad and intercom for access to the central building. The portals' central buildings contained a variety of equipment used for security and safety screening on any persons or equipment entering or leaving the X-326 Process Building.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio*, DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Appendix A: Survey Photographs

Figure 1: Location and Orientation of Exterior Photographs (A-2 through A-5)

Figure 2: North Side of the X-111A Special Nuclear Materials Monitoring Portal, August 2014, Facing Southwest

Figure 3: South Side of the X-111A Special Nuclear Materials Monitoring Portal,; August 2014, Facing Northeast

Figure 4: North Side of the X-111B Special Nuclear Materials Monitoring Portal, August 2014, Facing Southwest

Figure 5: North Side of the X-111B Special Nuclear Materials Monitoring Portal, August 2014, Facing Southeast

Appendix B: Historical Drawings

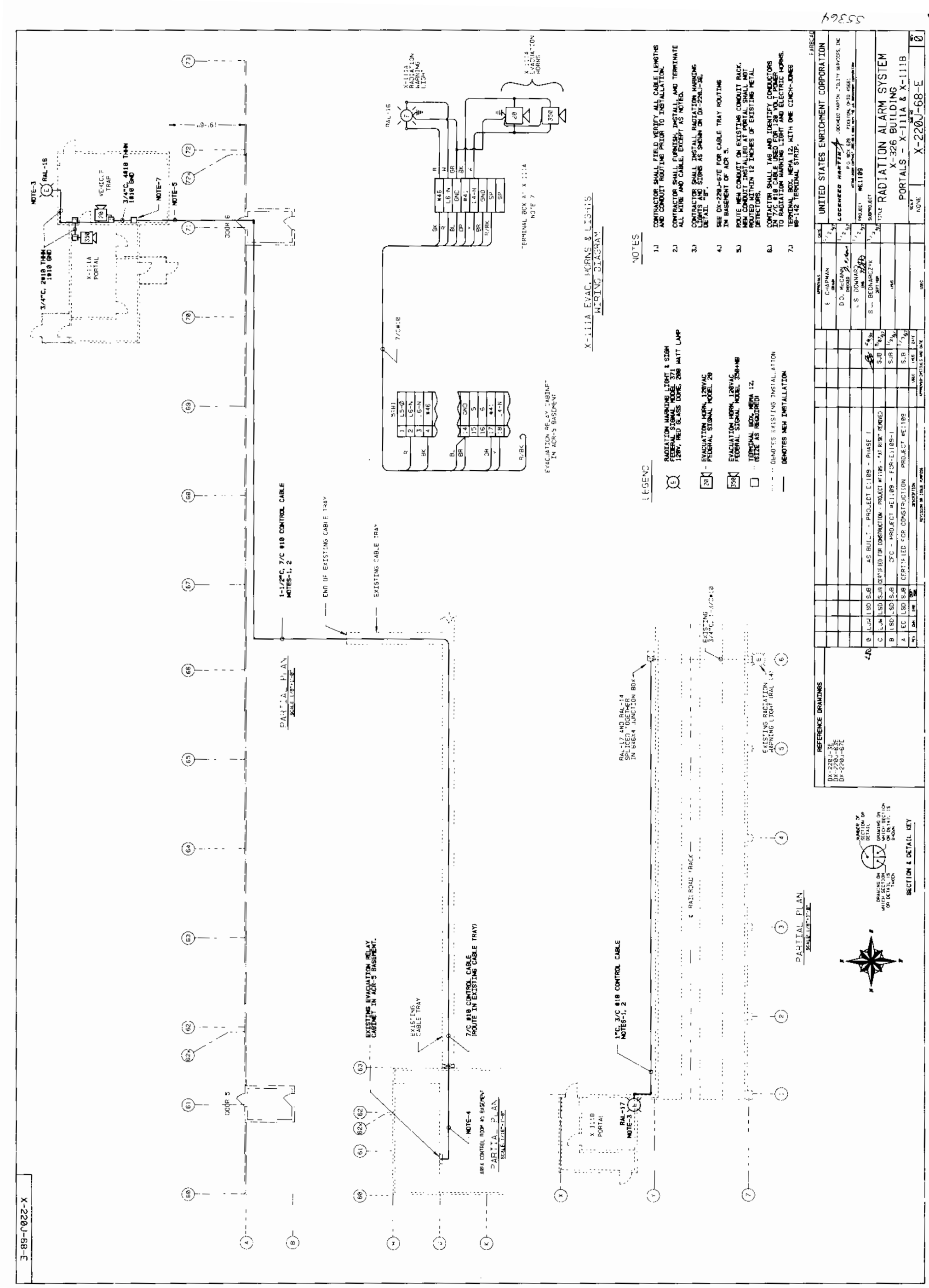

Figure 6: Radiation Alarm System

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-230J2 SOUTH ENVIRONMENTAL SAMPLE STATION
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-M
HAER OH-142-M

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-230J2 SOUTH ENVIRONMENTAL SAMPLE STATION

HAER No. OH-142-M

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-230J2 South Environmental Sample Station is located at Ohio State Plane South coordinates at easting 1826764.312376 ft, northing 364845.952173479 ft and at Universal Transverse Mercator Zone 17N easting 326920.3189 m, northing 4318749.48 m. The coordinate represents the approximate center of the X-230J2 South Environmental Sample Station. This coordinate was obtained on June 20, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1968
Designer/Builder:	Goodyear Atomic Corporation
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy (DOE) was established, overseeing operations at PORTS.
Present Use:	Environmental sampling
Significance:	The X-230J2 South Environmental Sample Station houses instrumentation for use in the monitoring of the X-230K South Holding Pond effluent for environmental compliance, which requires regular monitoring and sampling of water and air at PORTS. DOE installed the station in 1968 to monitor for compliance with air and water quality standards set forth in new environmental regulations, such as the 1963 Clean Air Act, the 1965 National Emissions Standards Act, and the 1965 Water Quality Act. PORTS was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant,

HAER no. OH-142. This X-230J2 South Environmental Sample Station HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are two appendices: Appendix A and Appendix B, consisting of survey photographs and historical drawings, respectively.

Construction History of the X-230J2 South Environmental Sample Station:
The X-230J2 South Environmental Sample Station was built in 1968, after the initial phase of construction at PORTS. DOE installed the station in order to monitor for compliance with air and water quality standards set forth in new environmental regulations, such as the 1963 Clean Air Act, the 1965 National Emissions Standards Act, and the 1965 Water Quality Act.

The interior of the small building features equipment and instrumentation used to monitor the X-230K South Holding Pond effluent for environmental compliance. The air monitoring and water composite sampling equipment were originally installed in the X-230J2 Environmental Sample Station but were removed in the early 1980s. The station remained empty until the current pH meter and flow monitoring equipment were installed in the early 1990s. Historical drawings of building plans are included in Appendix B (Figures 4 and 5).

Part II. Site Information

Description of the X-230J2 South Environmental Sample Station:
The X-230J2 South Environmental Sample Station is located in the southeast section of PORTS, just south of the X-230K South Holding Pond and east of the X-617 South Holding Pond pH Control Facility. The X-230J2 Station features a poured concrete slab foundation, concrete block bearing walls, no window openings, and a front-gabled wood-frame roof covered with asphalt shingles (Figures 2 and 3). The building's gable ends are clad in vertical wood siding and feature central louvered vents. The main entry consists of a solid door offset on the east façade. The building has a total of approximately 100 square feet of floor space.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio*, DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Appendix A: Survey Photographs

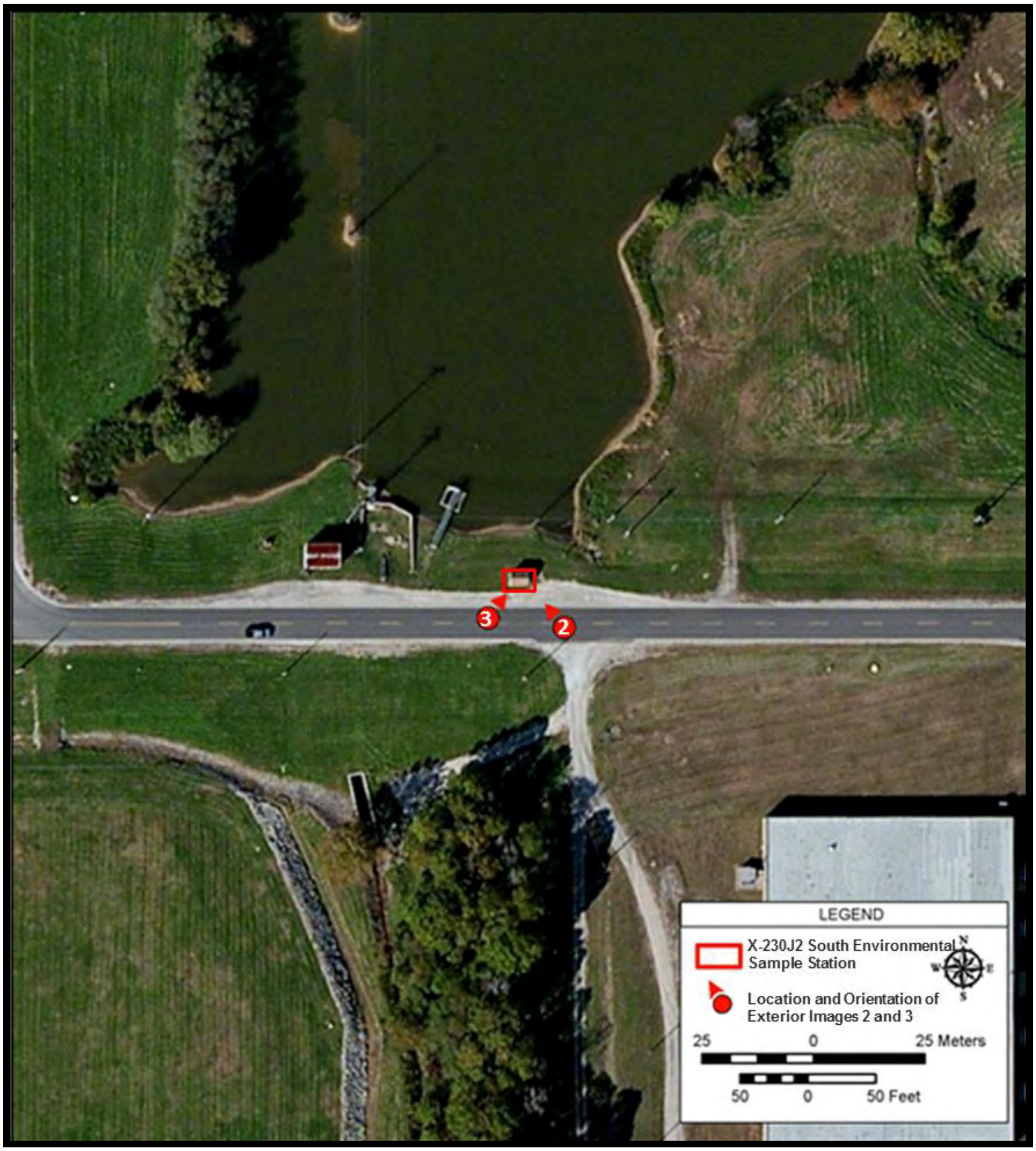

Figure 1: Location and Orientation of Exterior Photographs (A-2 and A-3)

Figure 2: South Side of the X-230J2 South Environmental Sample Station, August 2014, Facing Northwest

Figure 3: South Side of the X-230J2 South Environmental Sample Station, August 2014, Facing Northeast

Appendix B: Historical Drawings

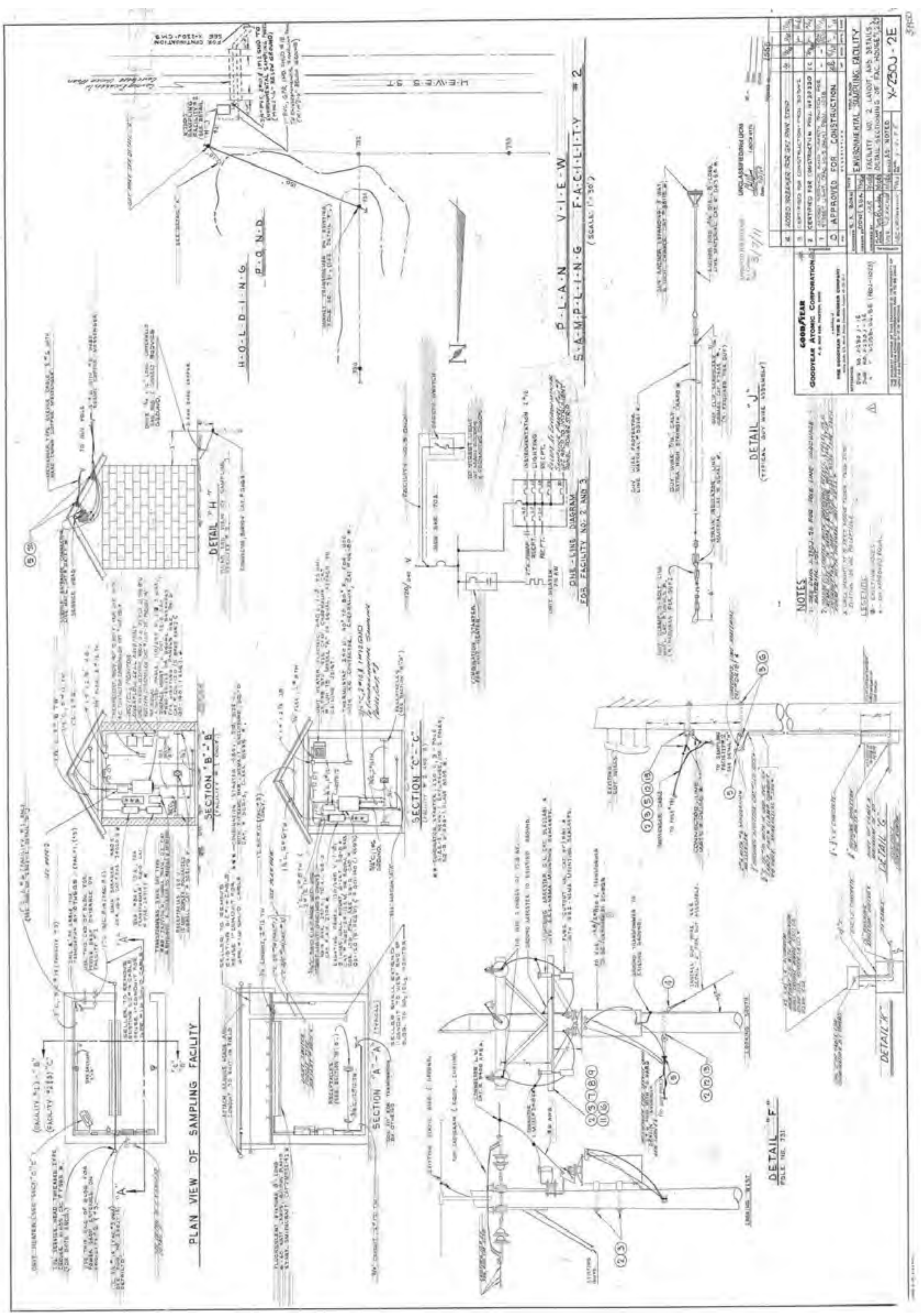

Figure 4: Facility No. 2 Layout and Details

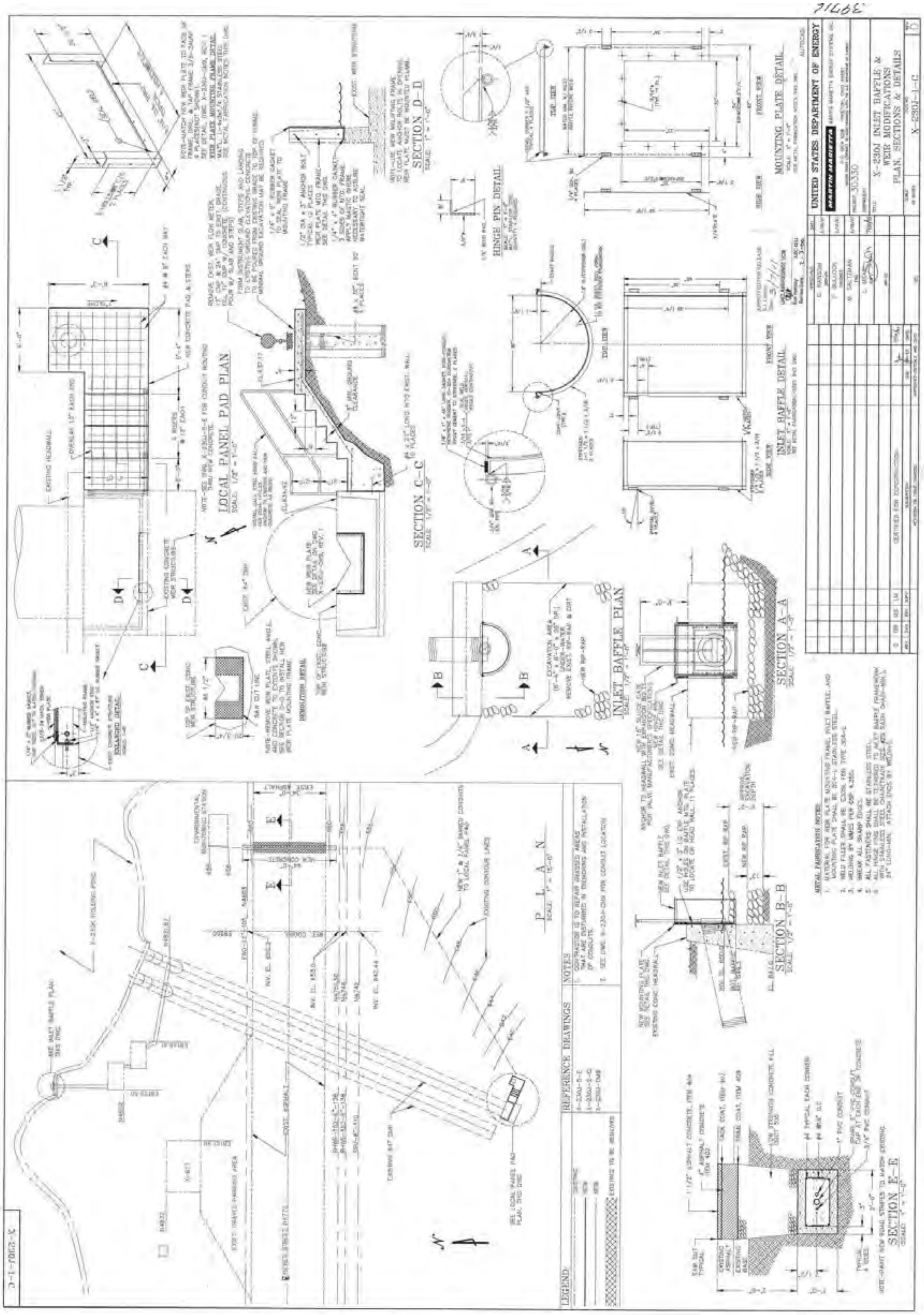

Figure 5: Inlet Baffle and Weir Modifications: Plan, Sections, and Details

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-300A PROCESS MONITORING BUILDING
(Computer Building)
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-N

HAER OH-142-N

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-300A PROCESS MONITORING BUILDING (COMPUTER BUILDING)

HAER No. OH-142-N

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-300A Process Monitoring Building is located at Ohio State Plane South coordinates at easting 1826839.172 ft, northing 368420.7171 ft and at Universal Transverse Mercator Zone 17N easting 326961.0439 m, northing 4319838.56 m. The coordinate represents the approximate center of the X-300A Process Monitoring Building. This coordinate was obtained on November 3, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1954
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	The X-300A Process Monitoring Building is currently not in use and is awaiting demolition.
Significance:	The X-300A houses the electronic monitoring equipment to track plant processing, including the computer-processing unit for the cascade automatic data processing system. This building is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-300A Process Monitoring Building HAER was completed in 2021.

Part I. Historical Infomation

In support of this report, there are three appendices:Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-300A Process Monitoring Building:
The X-300A Process Monitoring Building was built in 1954, during the initial stage of construction at PORTS (Appendix B, Figures 5 and 6). Also known as the "Computer Building," the X-300A Process Monitoring Building houses the electronic monitoring equipment that tracks plant processing, including the computer processing unit for the cascade automatic data processing system.

Historical drawings of building plans are included in Appendix C (Figures 7 and 8).

Part II. Site Information

Description of the X-300A Process Monitoring Building:
The X-300A Process Monitoring Building is associated with the X-300 Plant Control Facility, and is located just west of the circular domed X-300 building. The X-300A Building is a one-story utilitarian building in a rectangular plan (Appendix A, Figures 2 through 4). The building has a poured concrete slab foundation, reinforced concrete walls, no window openings, and a relatively flat roof. There is an L-shaped concrete block addition on the west half of the southern façade. The main building has one entry located on the north façade with a heavy solid metal blast door. The addition has two metal entry doors on the west façade and one inset in the south façade. The main building has 1,400 square feet of floor space.

The interior of the building houses a variety of computers and equipment used in the monitoring of plant processing systems. Floors in the building are covered with linoleum, with certain panels perforated to allow for increased air flow to keep the computer equipment cool. The walls are clad in a fibrous wallboard material, and the building has a drop ceiling with acoustic tiles and inset troffer-type fluorescent lighting.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio*, DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Department of Energy. *Highly Enriched Uranium: Striking a Balance, A Historical Report on the United States Highly Enriched Uranium Production, Acquisition, and Utilization Activities from 1945 to September 30, 1996*, Revision 1, National Nuclear Security Administration, Washington, D.C.: U.S. Department of Energy, 2001.

Appendix A: Survey Photographs

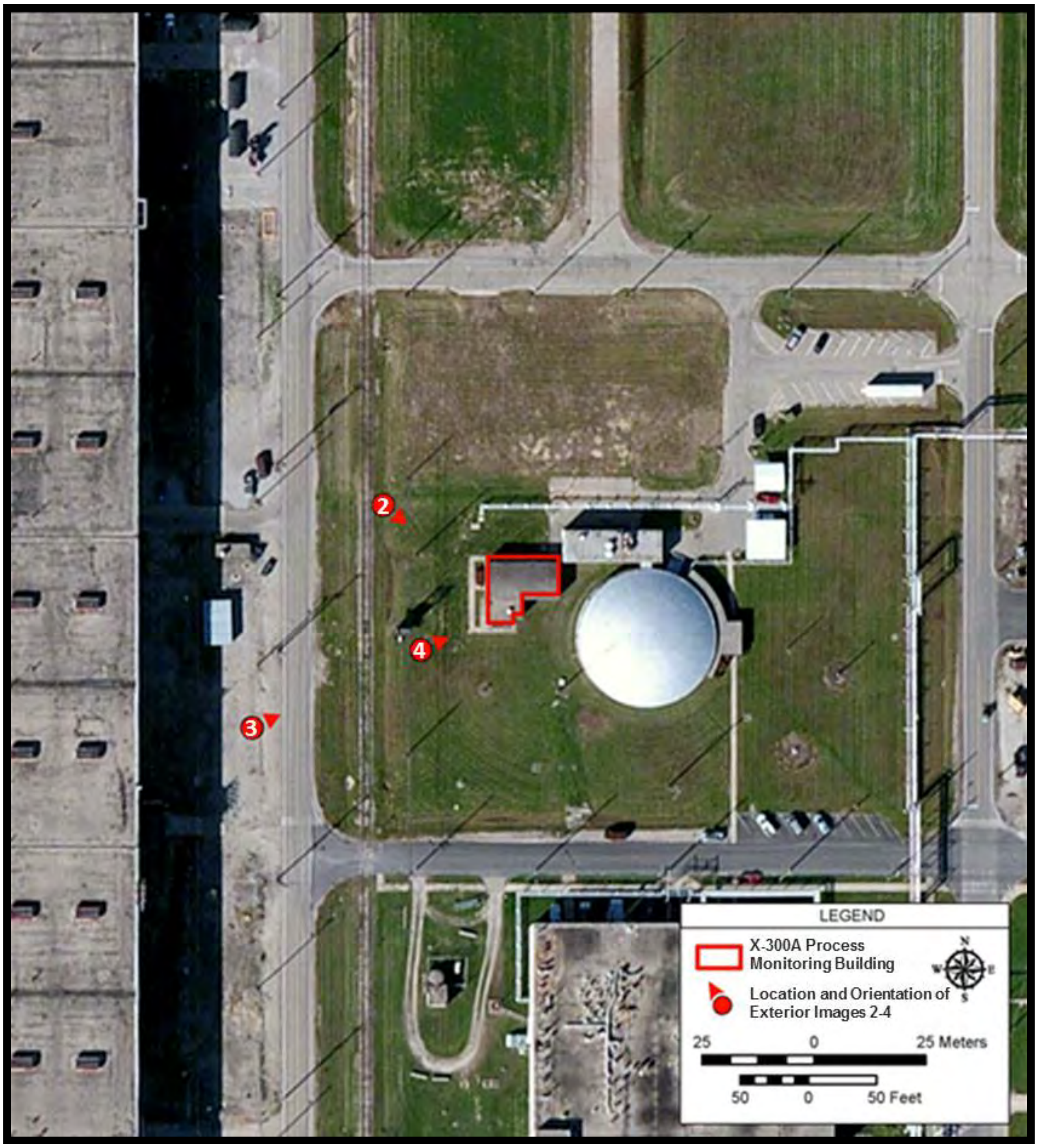

Figure 1: Location and Orientation of Exterior Photographs (2 through 4)

Figure 2: North Side of the X-300A Process Monitoring Building, August 2014, Facing Southeast

Figure 3: South Side of the X-300A Process Monitoring Building, August 2014, Facing Northeast

Figure 4: South Side of the X-300A Process Monitoring Building, August 2014, Facing Northeast

Appendix B: Historical Photographs

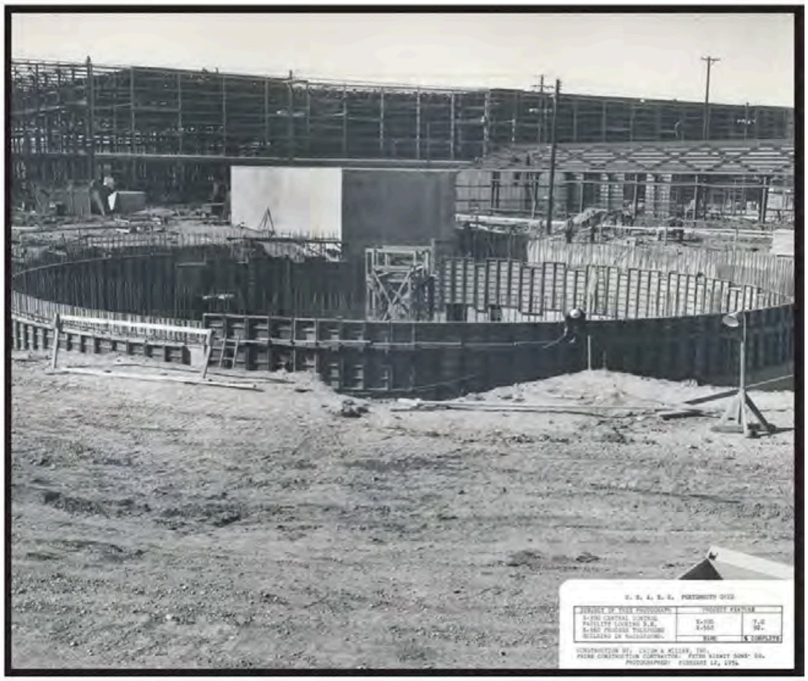

Figure 5: X-300A Process Monitoring Building, X-300 Plant Control Facility Under Construction in Foreground February 1954

Figure 6: X-300A Process Monitoring Building, X-300 Plant Control Facility Under Construction to Right of X-300A, May 1954

Appendix C: Historical Drawings

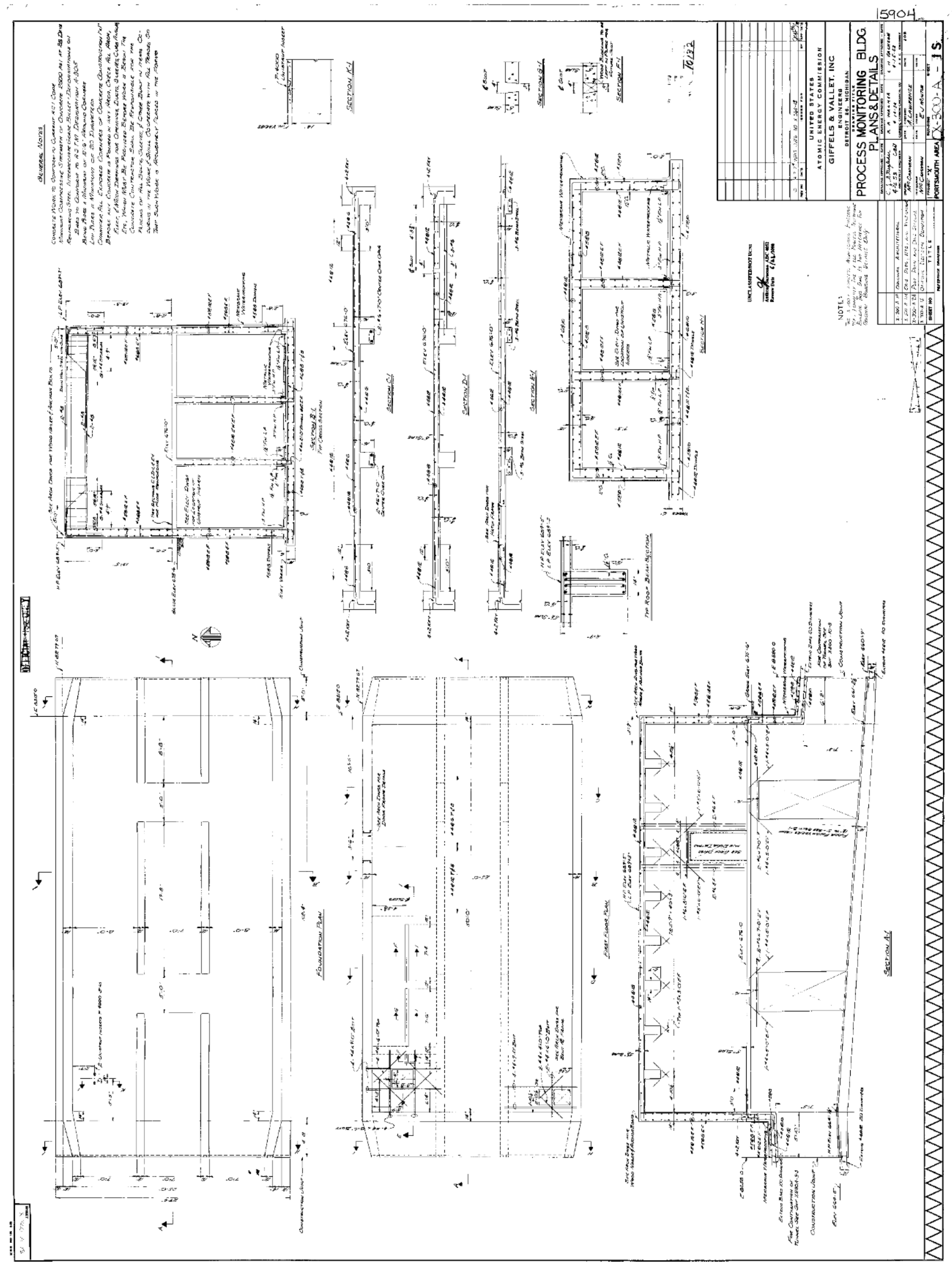

Figure 7: Plans and Details

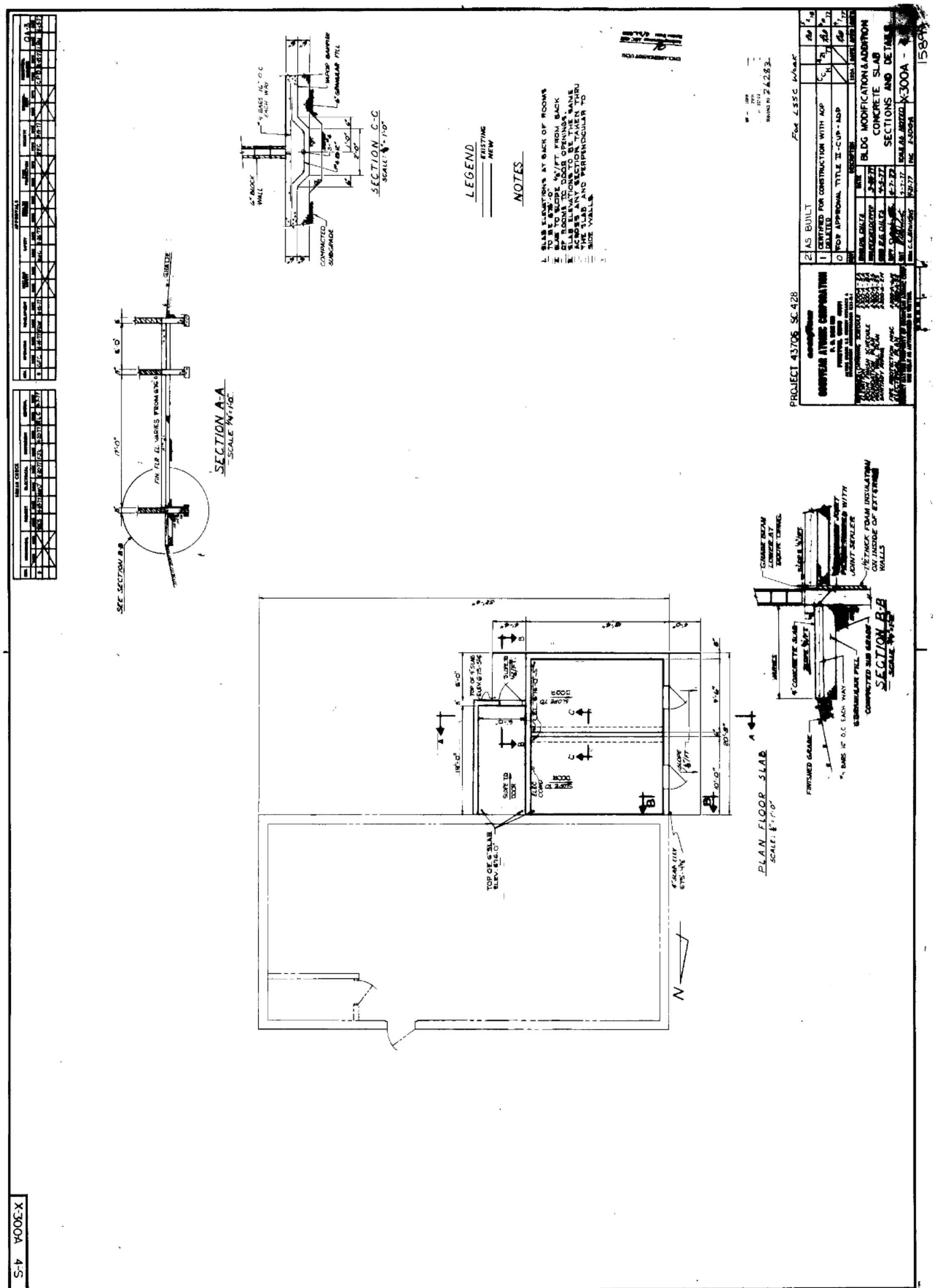

Figure 8: Concrete Slab Section and Details

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-344B MAINTENANCE STORAGE BUILDING
(Ash Storage Facility)
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-O
HAER OH-142-O

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-344B MAINTENANCE STORAGE BUILDING (ASH STORAGE FACILITY)

HAER No. OH-142-O

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-344B Maintenance Storage Building is located at Ohio State Plane South coordinates at easting 1826447.494224 ft, northing 372456.690383045 ft and at Universal Transverse Mercator Zone 17N easting 326861.9021 m, northing 4321070.539 m. The coordinate represents the approximate center of the X-344B Maintenance Storage Building. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1958
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	Demolished 2011
Significance:	The former X-344B Maintenance Storage Building was used for cooling tower equipment modification and repair, and roads and grounds equipment storage. This facility is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor B&W Portsmouth LLC photographed and documented the site in June of 2010. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-344B Maintenance Storage Building HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are two appendices that are provided: Appendix A and Appendix B, which consist of survey photographs and historical drawings, respectively.

Construction History of the X-344B Maintenance Storage Building:
Construction of the X-344B Maintenance Storage Building began with excavation activities in July 1953. Concrete placement began shortly after completion of excavation activities. A total of 346 cubic yards of concrete were used during construction. Subcontracted through Peter Kiewit Sons' Construction Company, The Eichleay Corporation of Pittsburgh, Pennsylvania erected 57 tons of structural steel shortly after the completion of the concrete footings and grade beams. Mechanical and electrical work proceeded concurrently with structural work. The X-344B Maintenance Storage Building was completed in April 1958. The completion date was delayed by approximately 196 days due to labor disputes, scheduling conflicts, and inclement weather. The X-344B Maintenance Storage Building was demolished in 2011.

Historical drawings of building plans are provided in Appendix B (Figures 4 through 17).

Part II. Site Information

Description of the X-344B Maintenance Storage Building:
The X-344B Maintenance Storage Building was located just north of the X-342B Fluorine Storage Building at the north end of PORTS. Measuring 50' wide by 120' long, the X-344B Maintenance and Storage Building was a utilitarian, prefabricated "Butler Building" (Appendix A, Figures 1 through 3). Resting atop a concrete slab foundation, this front-gabled building consisted of a steel frame structure clad with metal siding. There were no window openings within the X-344B Maintenance and Storage Building. The ridgeline of the steel-covered roof featured a pair of exhaust vents. Vehicular access to the interior of the building was provided by large, roll-away doors, located in each of the gabled ends of the building. With a floor space of 6,000 square feet, the interior of the building was largely open and unobstructed. One corner of the room featured a restroom facility, which was enclosed with concrete blocks.

The X-344B Maintenance Storage Building was originally known as the Ash Storage Facility. When built, it served as temporary storage space for canisters of uranium oxides and containers of ash, which came from the fluorination process in the X-344A UF_6 Sampling Facility. Throughout its history, the building served a variety of storage and maintenance needs. In 1993, maintenance operations moved to another facility on site. Currently this facility provides for sample and transfer of uranium hexafluoride (UF_6) from production cylinders to shipping cylinders.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio,* DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *Historical Narrative for the X-344B Maintenance Storage Building*, Portsmouth Gaseous Diffusion Plant Piketon, Ohio, Washington, D.C.: U.S. Department of Energy, 2011.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio,* DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

Figure 1: Location and Orientation of Exterior Photographs (2 and 3)

Figure 2: South Side of the X-344B Maintenance Storage Building, June 2010, Facing Northeast

Figure 3: South Side of the X-344B Maintenance Storage Building, June 2010, Facing North

Appendix B: Historical Drawings

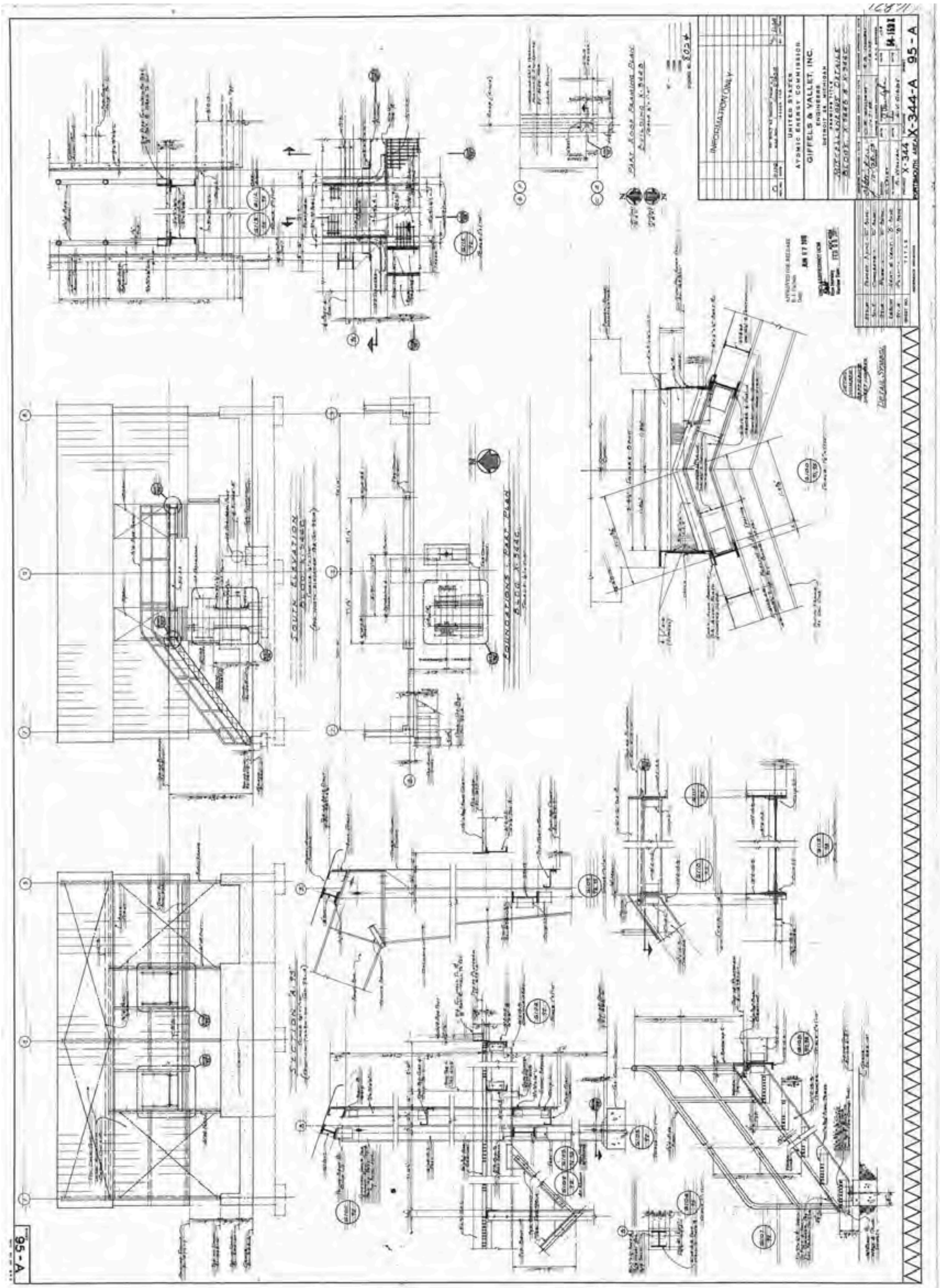

Figure 4: Miscellaneous Details

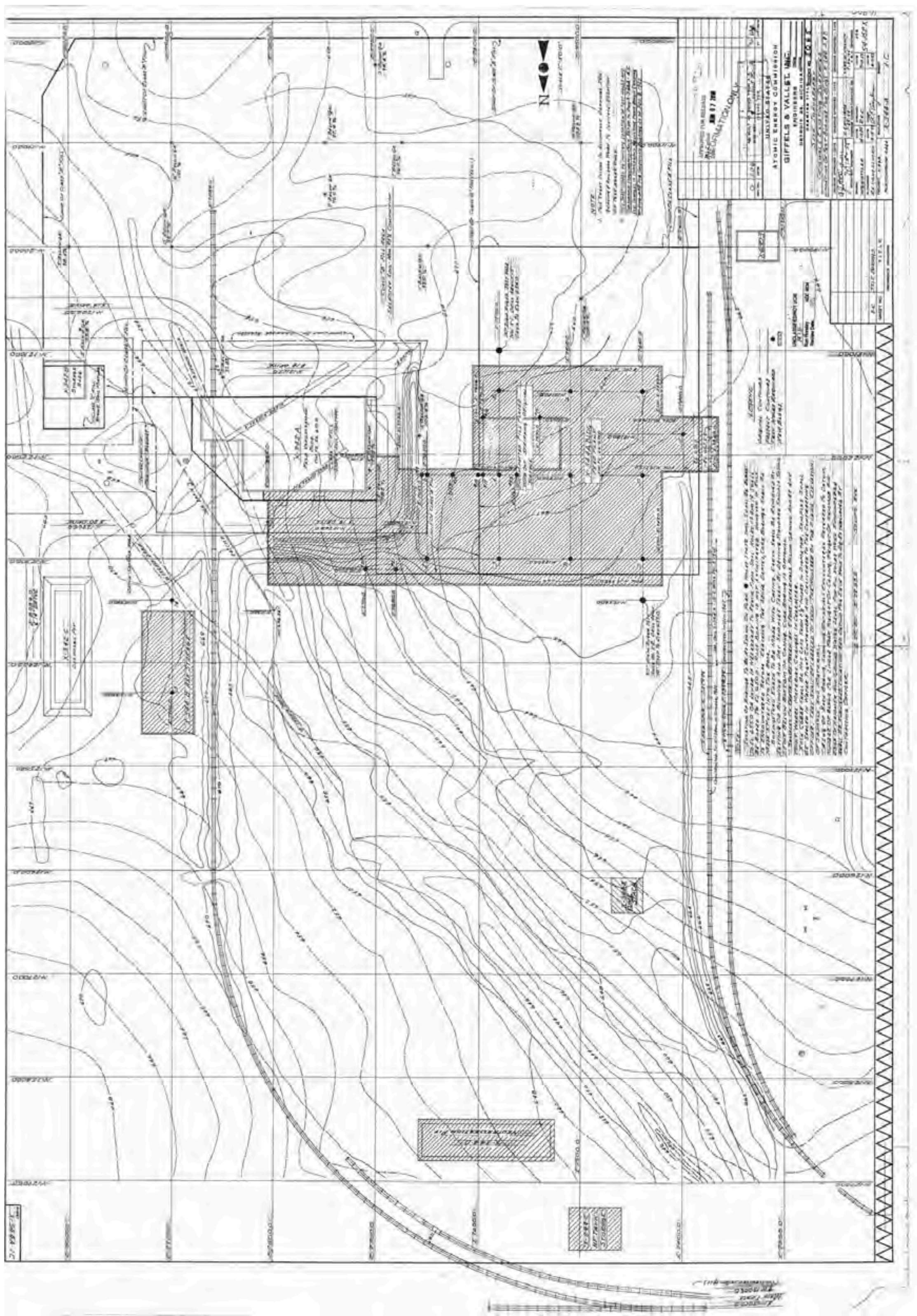

Figure 5: Site Topography

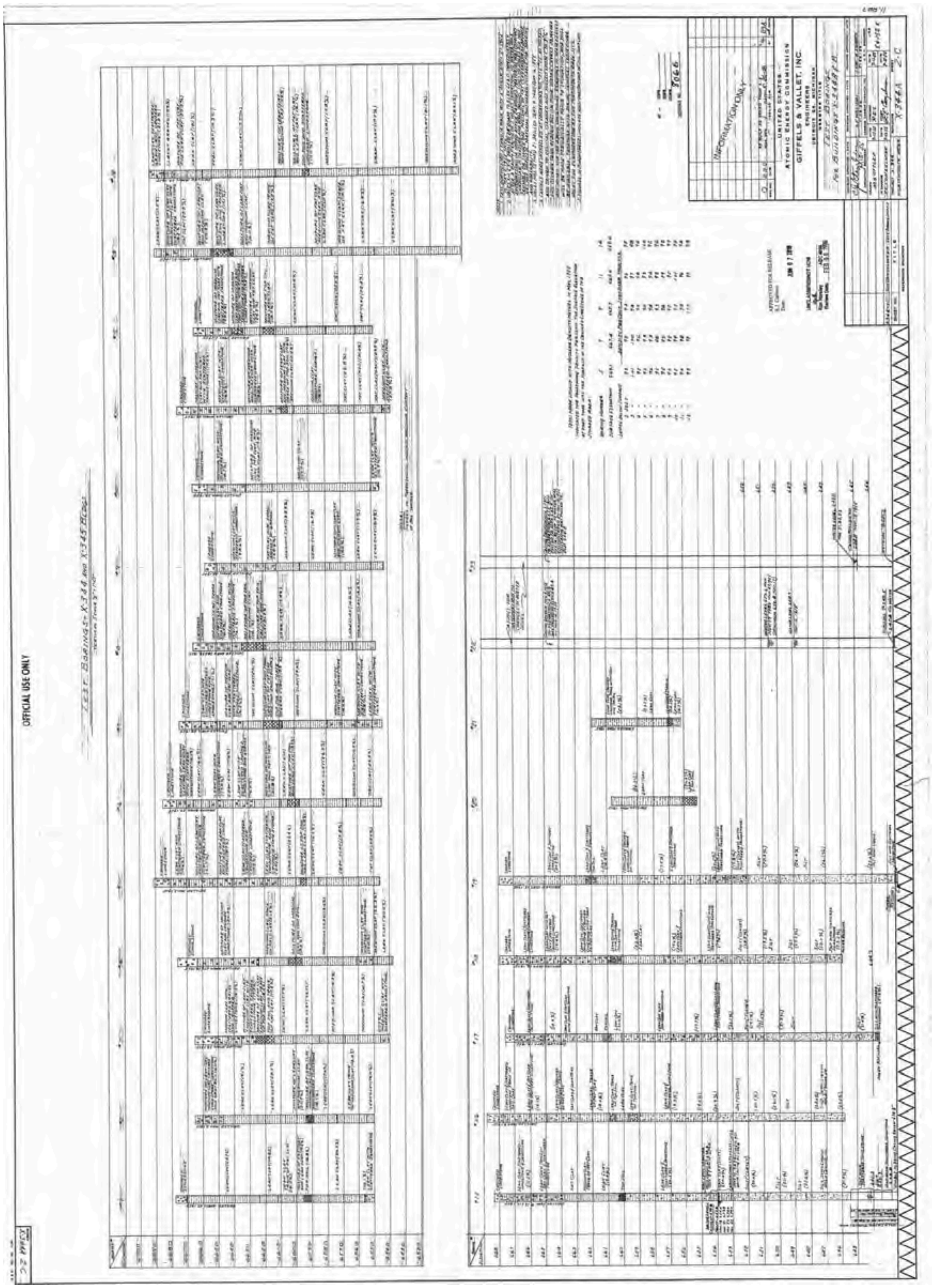

Figure 6: East Borings

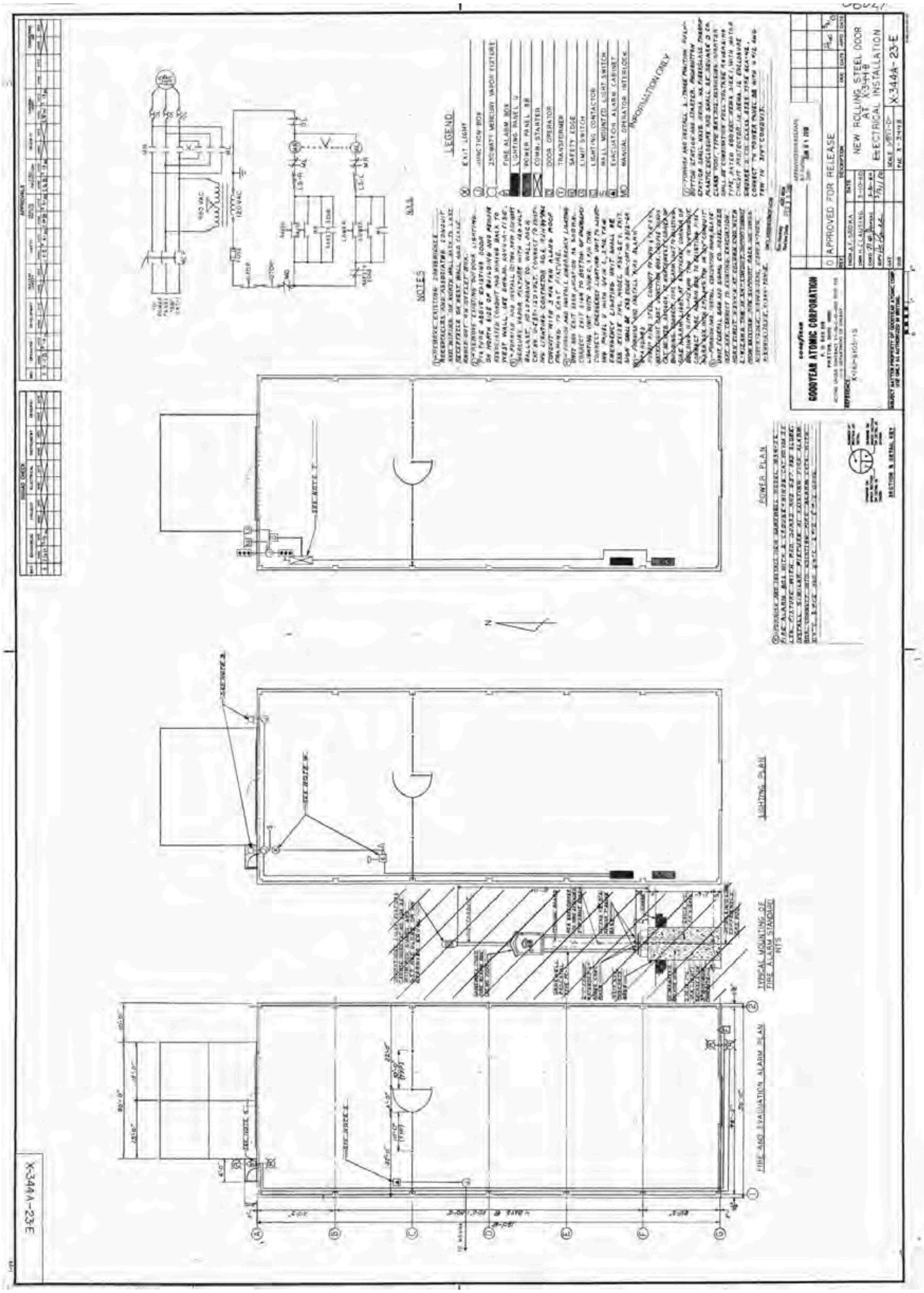

Figure 7: Rolling Steel Door Electrical Installation

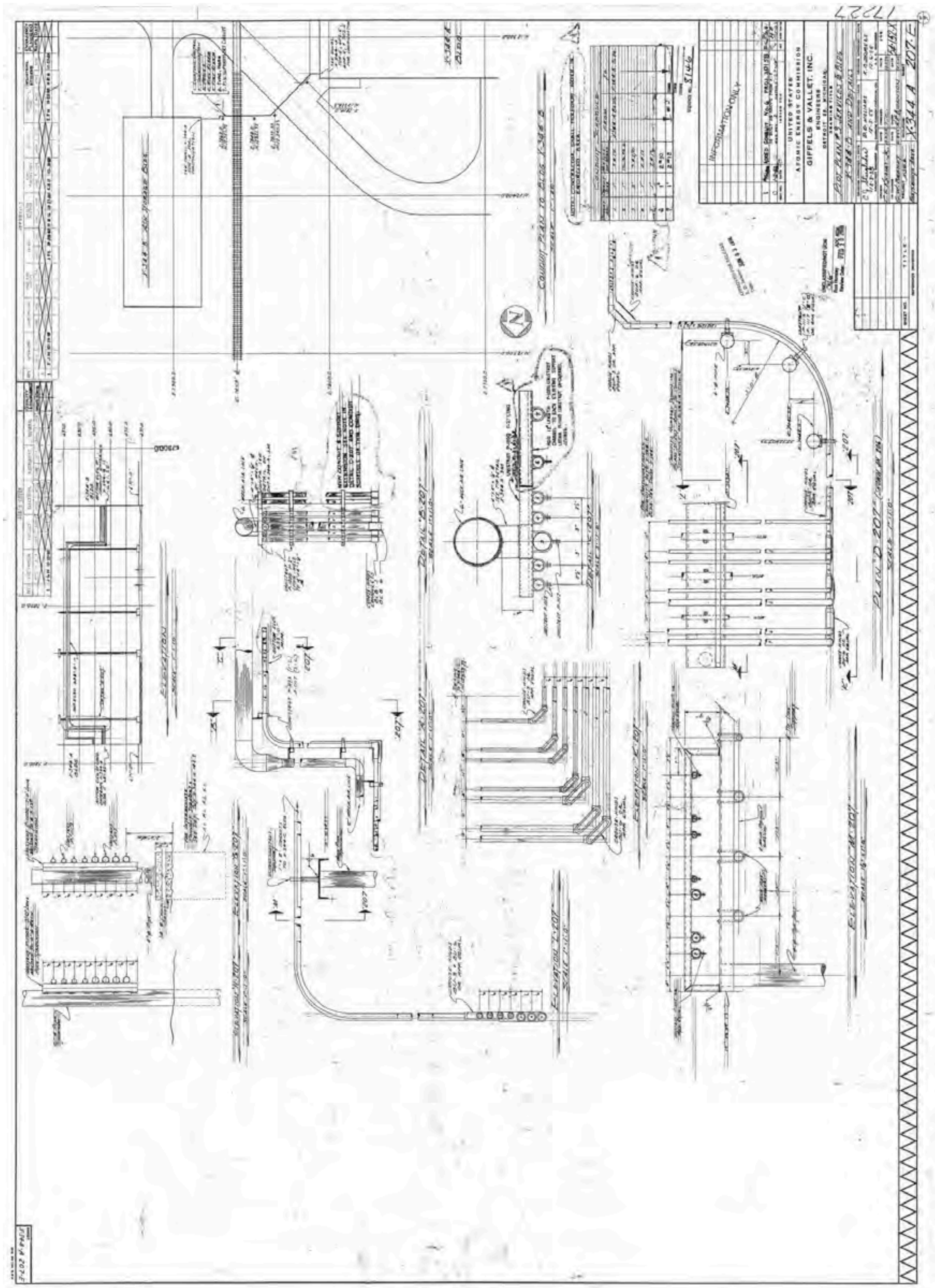

Figure 8: Plot Plan

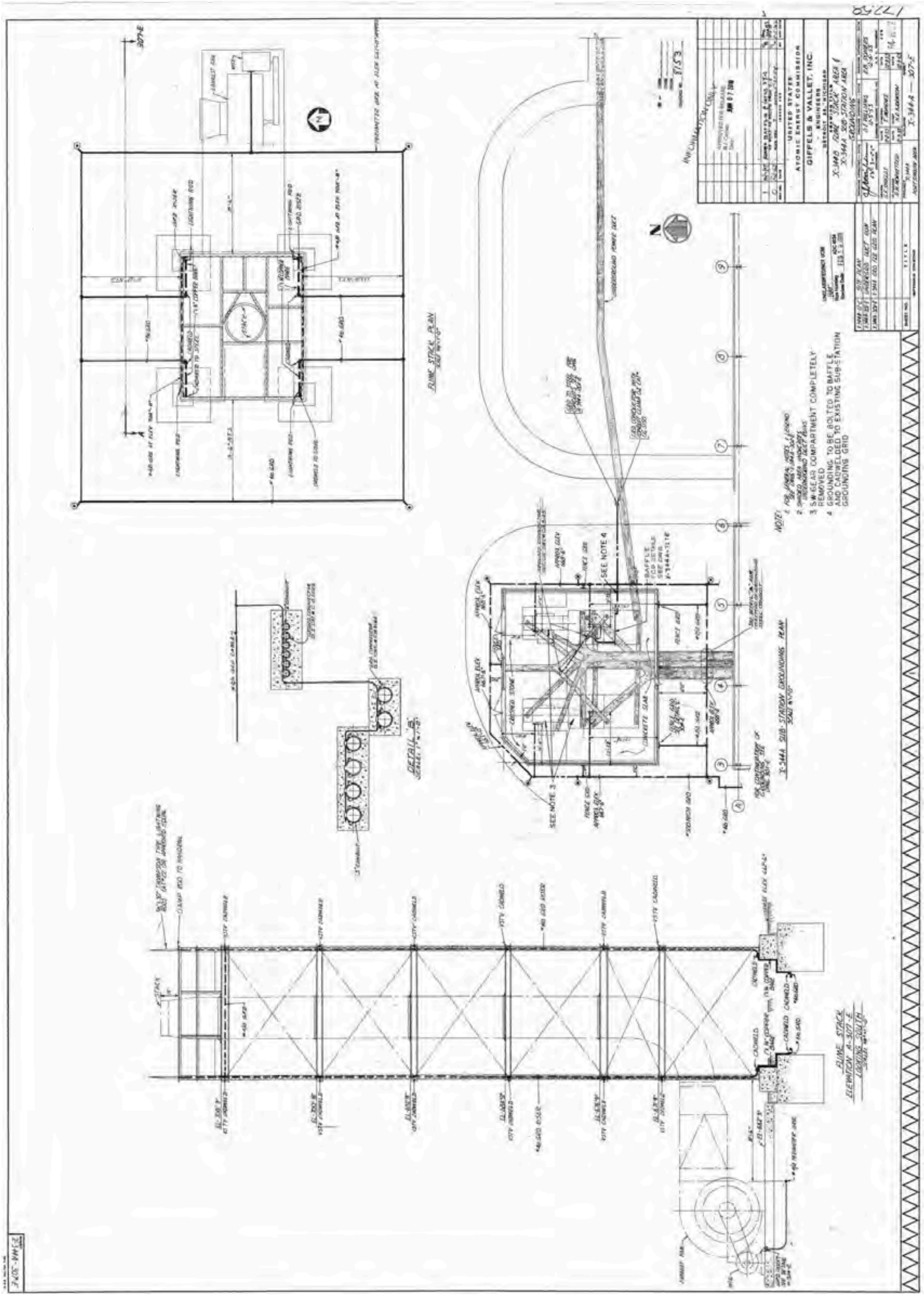

Figure 9: Fume Stack Area and Sub-Station Area

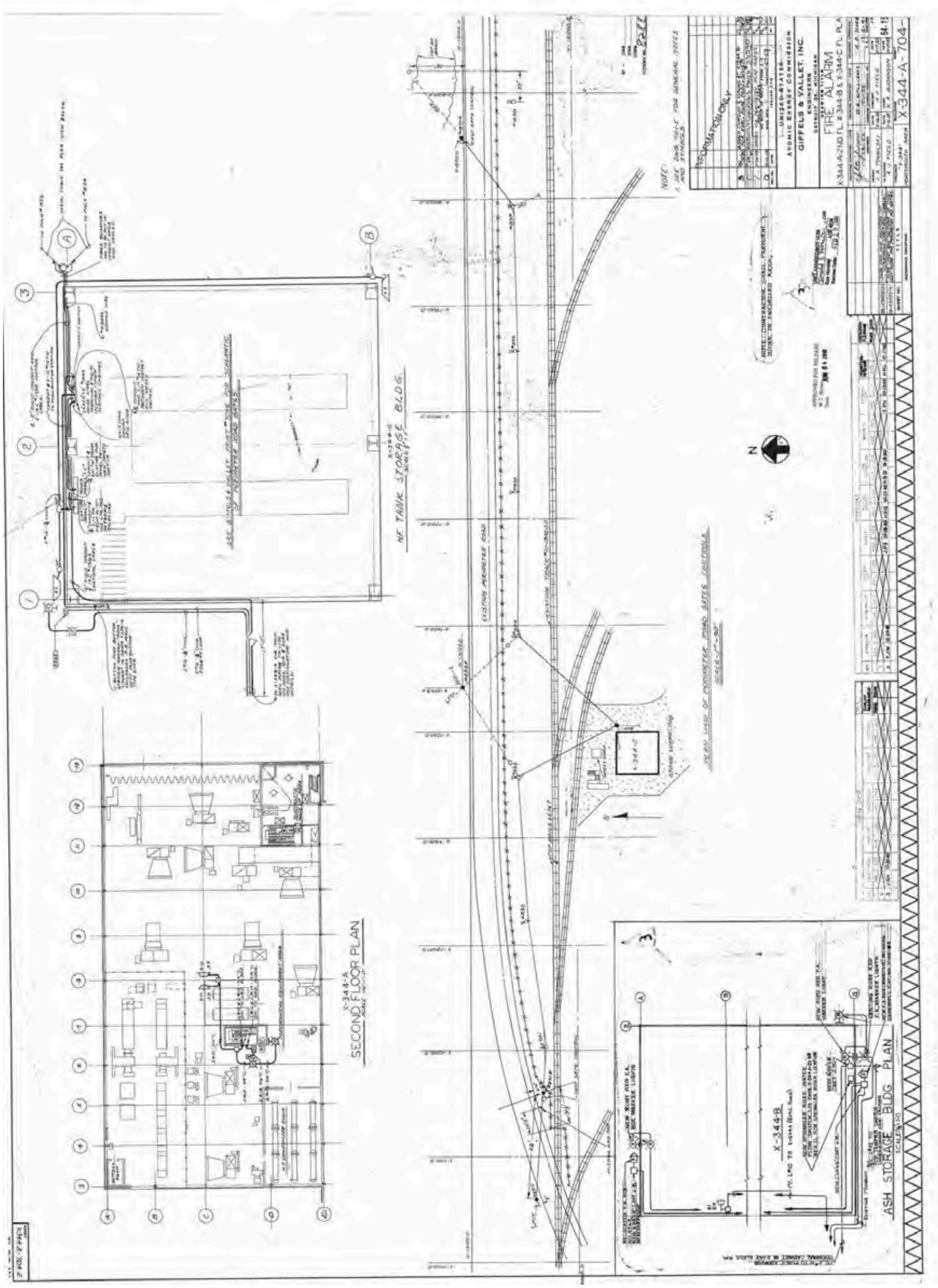

Figure 10: Fire Alarm

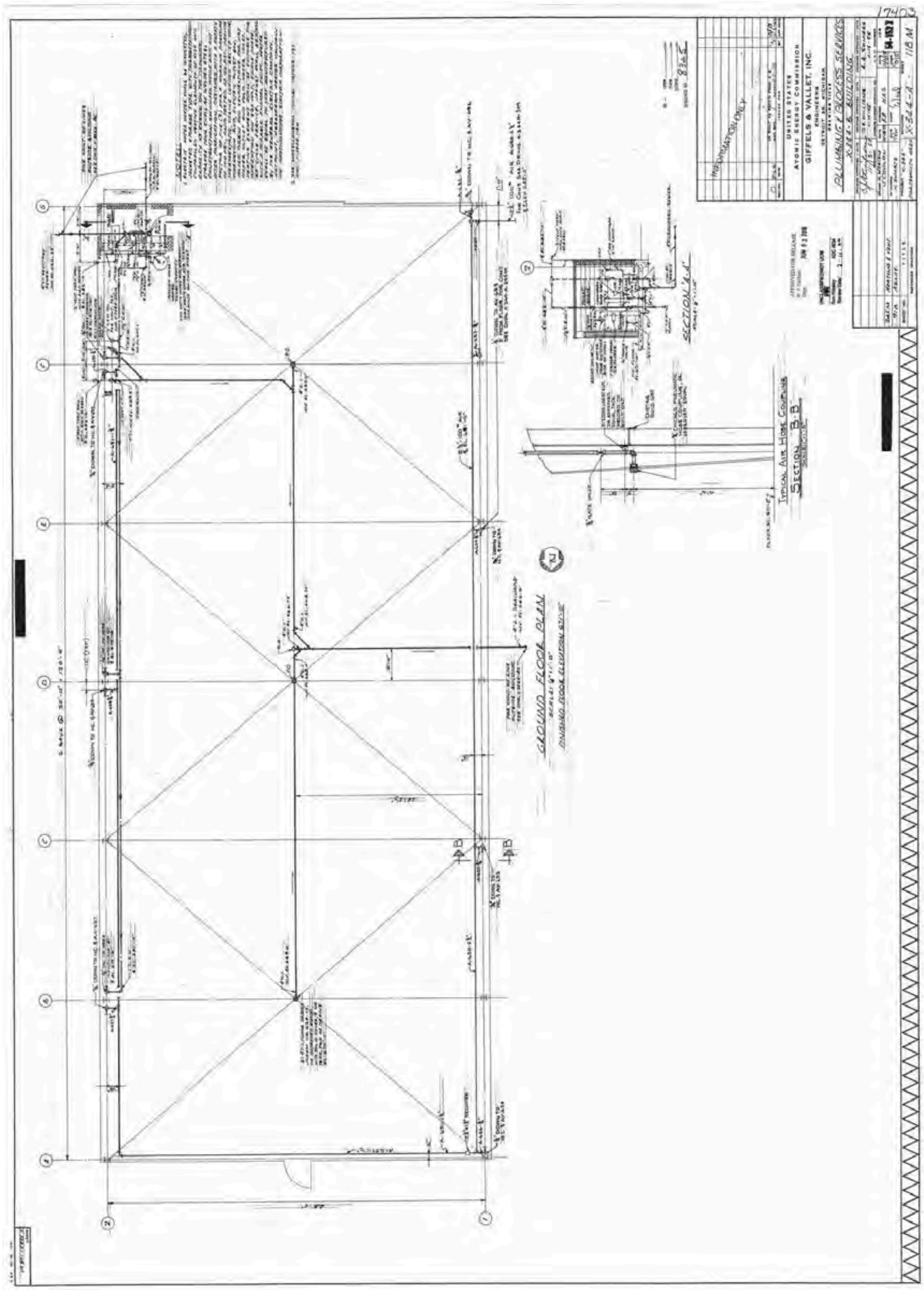

Figure 11: Plumbing and Process Services

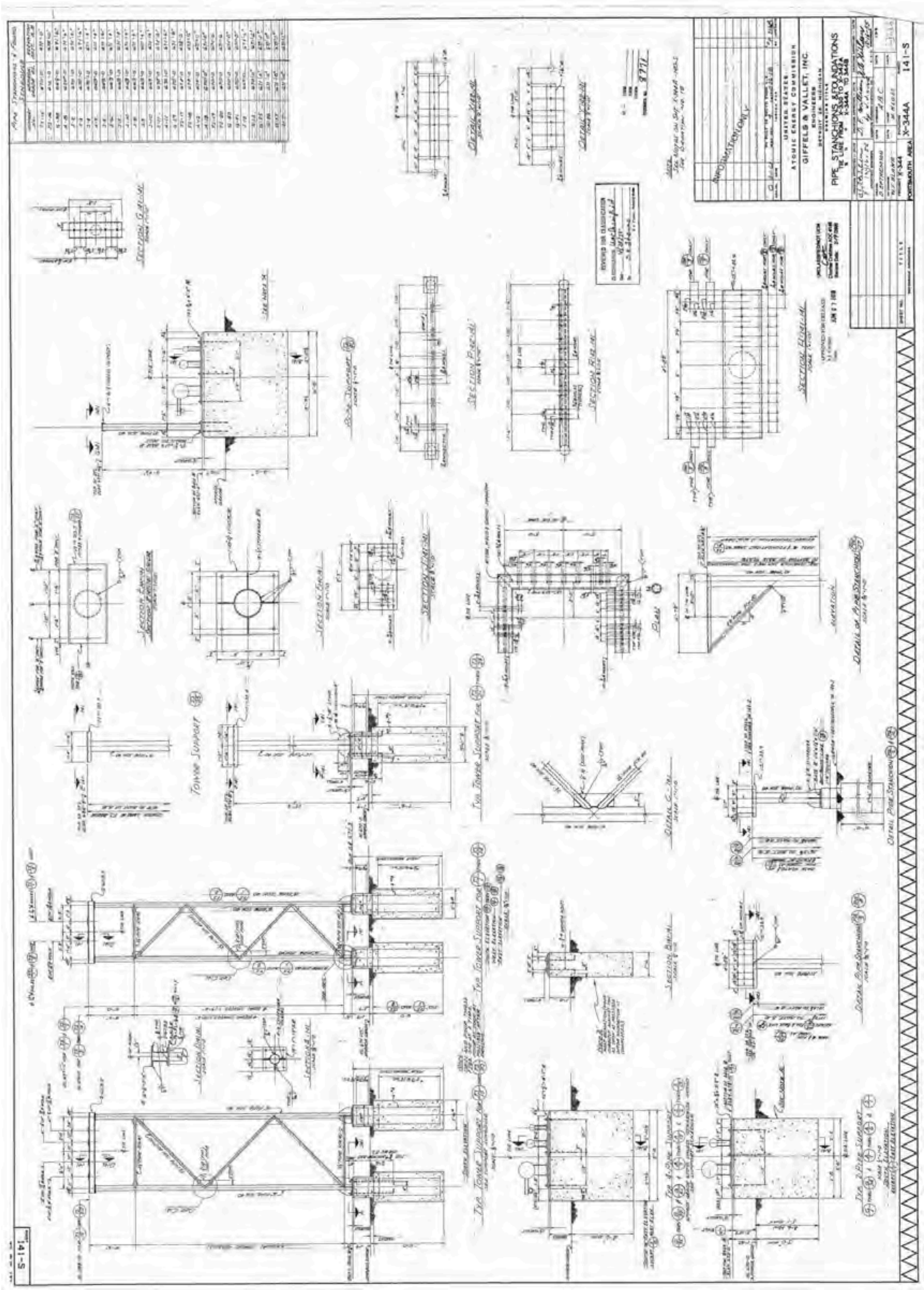

Figure 12: Pipe Stanchions and Foundations

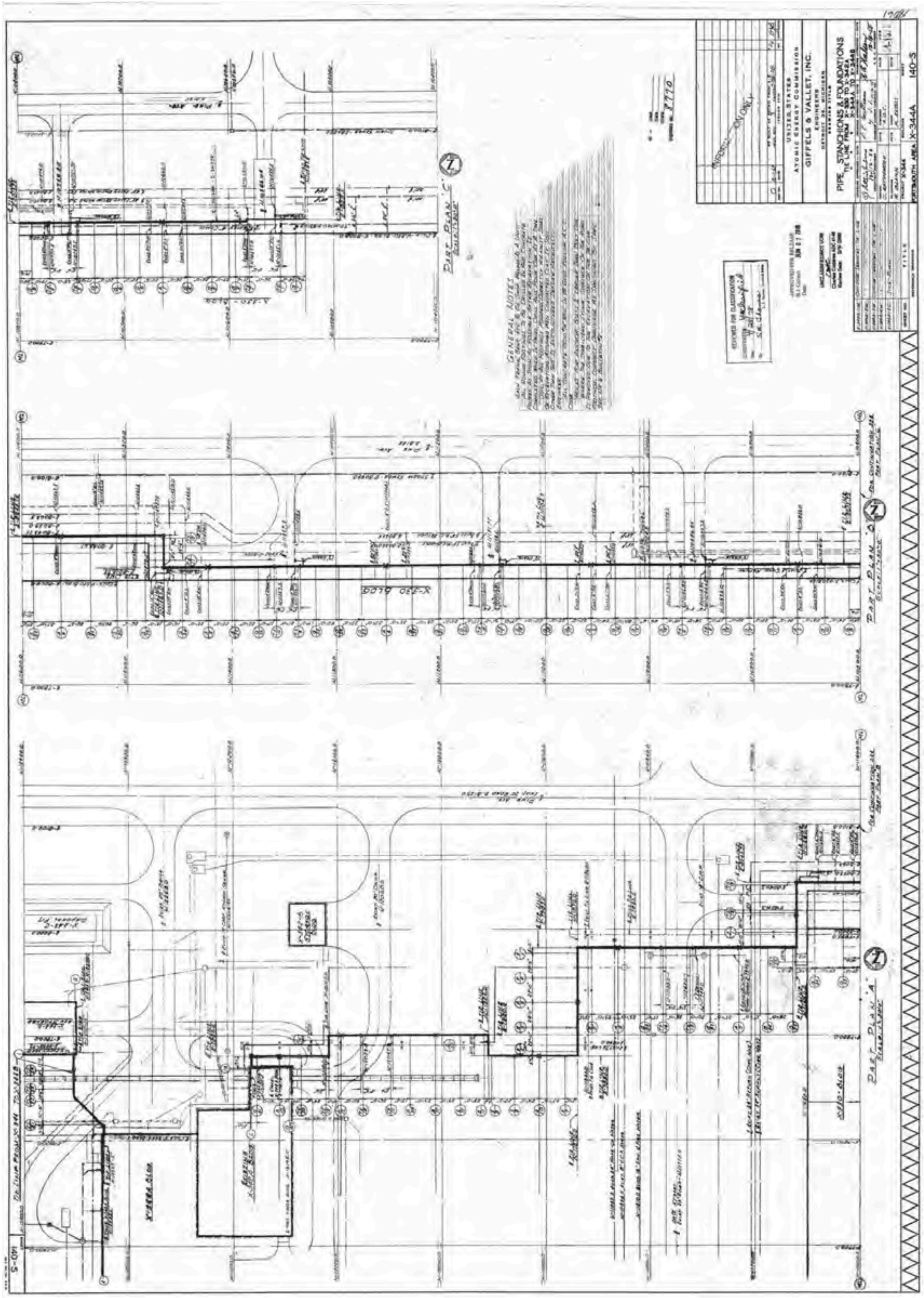

Figure 13: Pipe Stanchions and Foundations

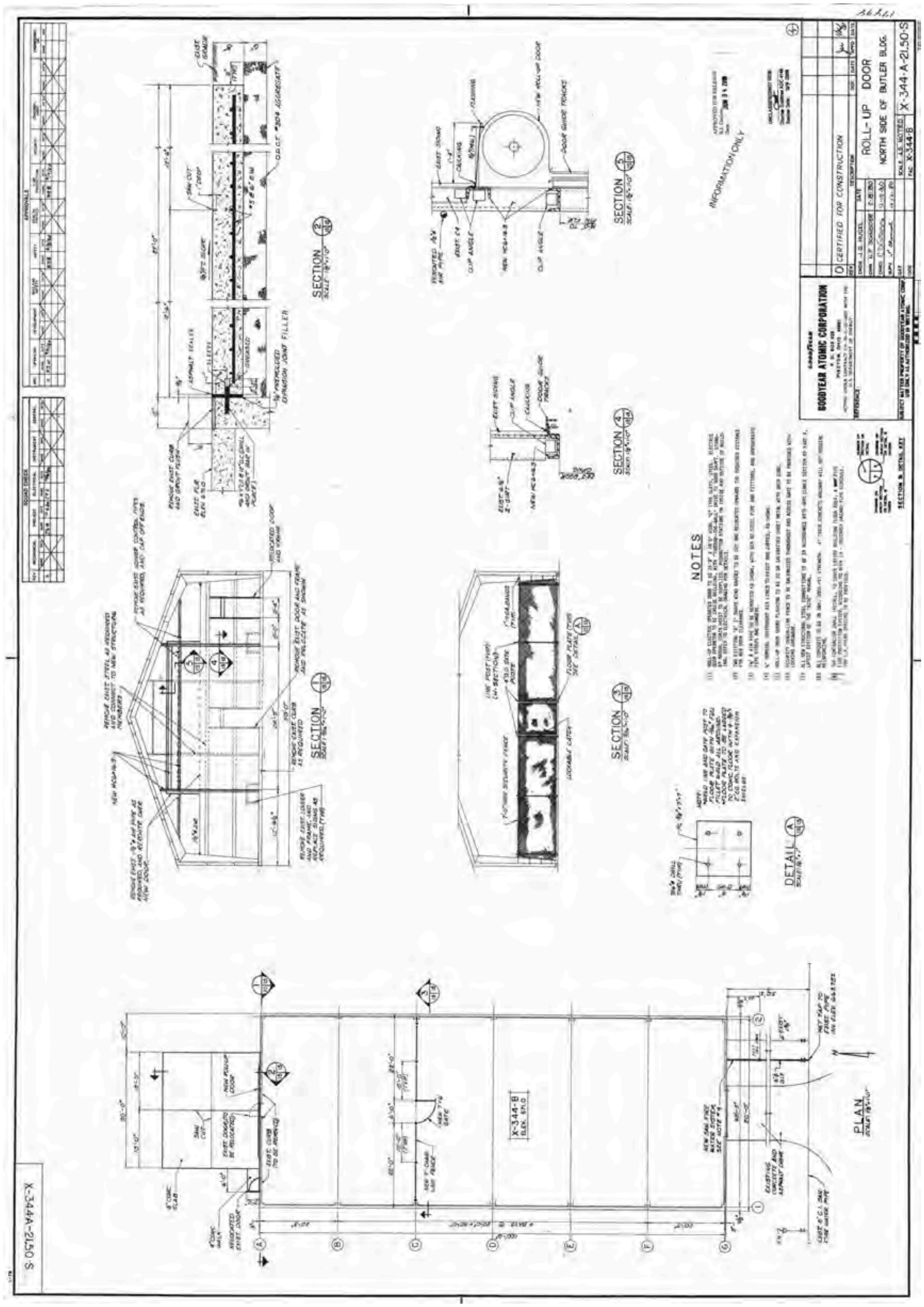

Figure 14: Roll-Up Door

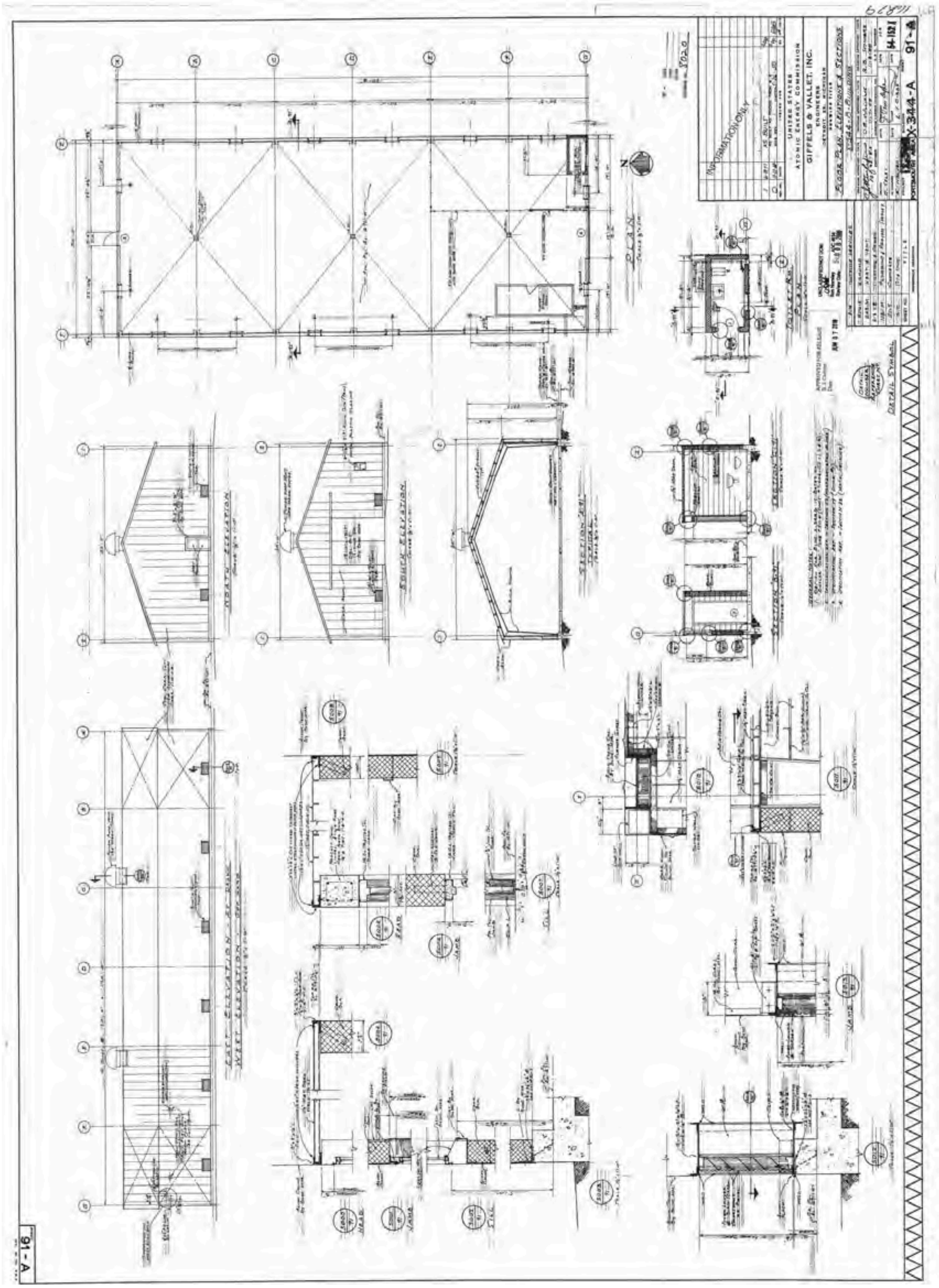

Figure 15: Floor Plans, Elevations, and Sections

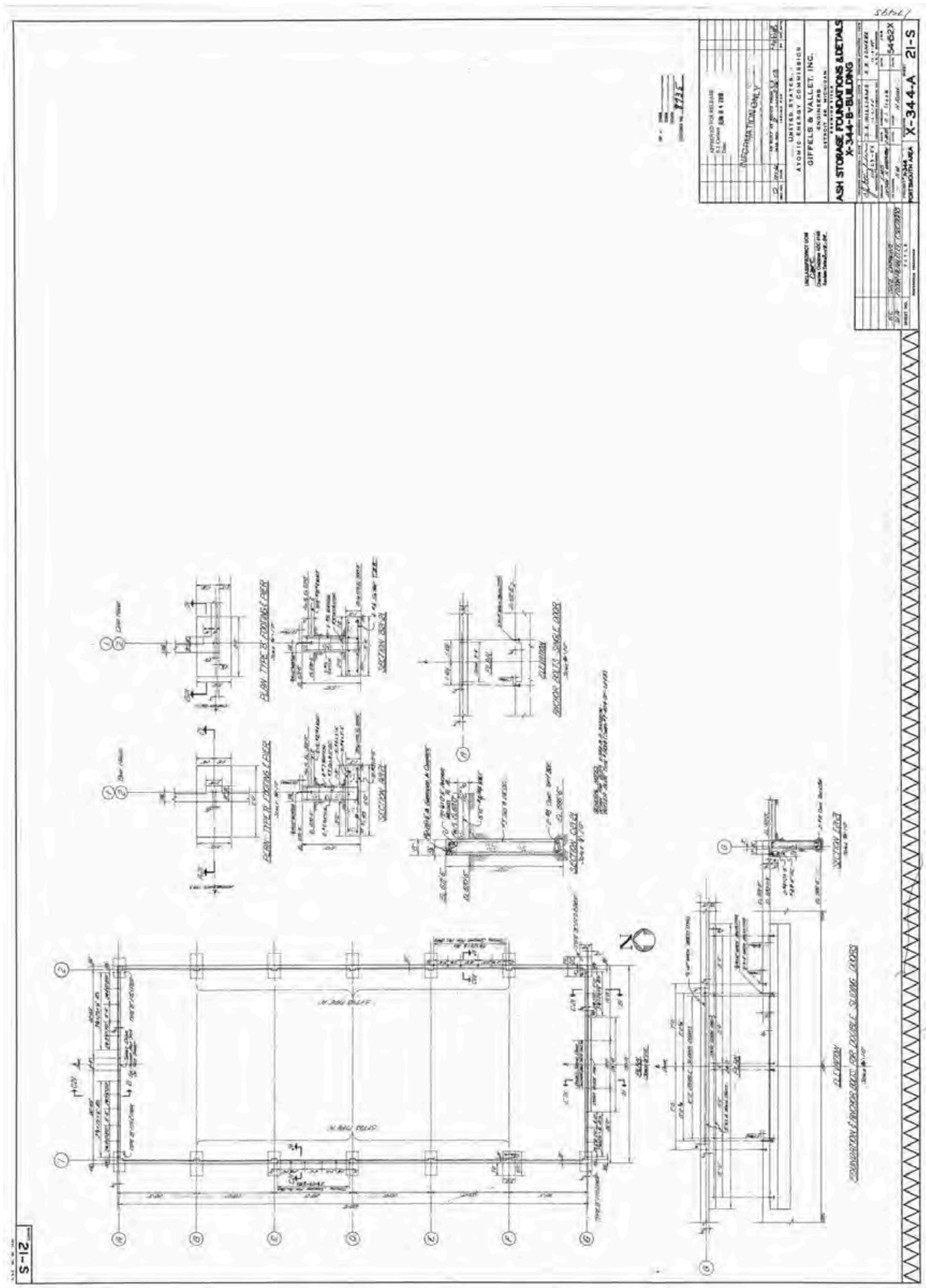

Figure 16: Foundation Details

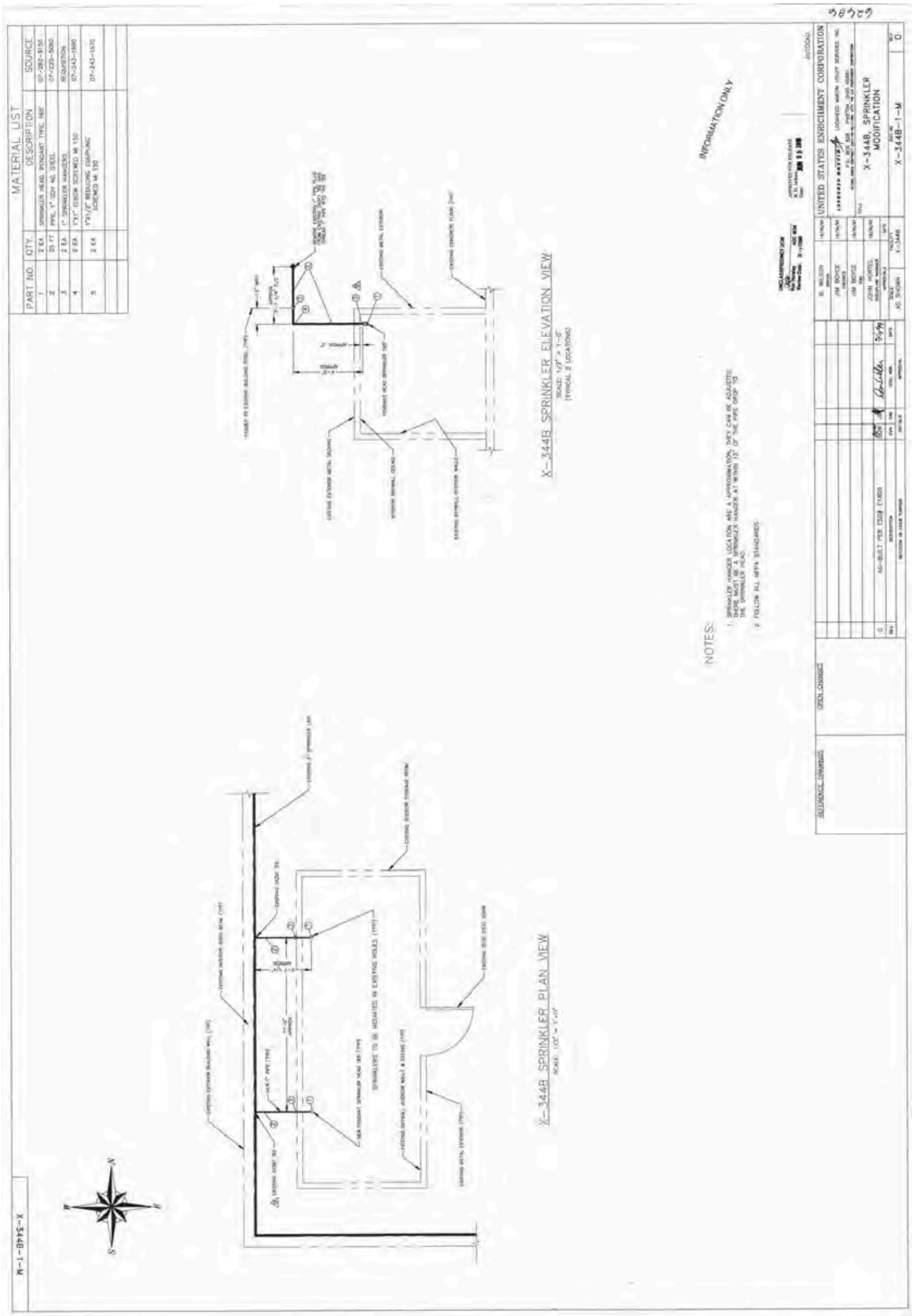

Figure 17: Sprinkler Modification

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-530 ELECTRICAL SWITCHYARD COMPLEX
(X-530A, X-530-B, X-530-C, X-530-D, X-530-E)
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-P
HAER OH-142-P

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-530 ELECTRICAL SWITCHYARD COMPLEX (X-530A, X-530-B, X-530-C, X-530-D, X-530-E, X-530-F, X-530-G)

HAER No. OH-142-P

Location: Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio

The X-530 Electrical Switchyard Complex is located at Ohio State Plane South coordinates at easting 1825294.092376 ft, northing 370468.415645847 ft and at Universal Transverse Mercator Zone 17N easting 326500.4219 m, northing 4320470.366 m. The coordinate represents the approximate center of the X-530 Electrical Switchyard Complex. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.

Date of Construction: 1954

Designer/Builder: Peter Kiewit Sons’ Construction Company

Previous Owner: N/A

Present Owner: The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.

Present Use: Power delivery to PORTS

Significance: The X-530 Electrical Switchyard Complex facilitates the delivery of power to the PORTS process buildings and area auxiliaries. The X-530 Electrical Switchyard Complex consists of several structures which cover an area of approximately 18 acres. Electric power was generated by the facilities of the Ohio Valley Electric Corporation and delivered to the switchyard at 330,000 volts (V) by four transmission lines and reduced in voltage by the switchyard equipment and supplied at 13,000 V to the switch houses for distribution to the plant facilities. This facility is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS’ primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.

Project Information: Fluor-BWXT Portsmouth LLC photographed the site in August 2014.
Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans.
For additional contextual information, see Portsmouth Gaseous Diffusion Plant,

HAER no. OH-142. This X-530 Electrical Switchyard Complex HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-530 Electrical Switchyard Complex:
Special attention was paid to construction of the X-530 Electrical Switchyard Complex, as it was necessary for completing Phase I of PORTS construction, which followed a tight deadline for getting the first cascades on line. Mount Vernon Bridge Company, of Mt. Vernon, Ohio, received the contract to erect the structural steel and miscellaneous iron for the X-530 Electrical Switchyard Complex. Mount Vernon Bridge Company subcontracted the construction labor to Carl Vestal Steel Erector Company of Indianapolis, Indiana. Construction work began in early 1953 and was completed ahead of schedule in November 1954.

Brown and Kerr, of Chicago, Illinois, won the contract to install metal roof decking for the X-530B Control House and Switch Houses. Elwin G. Smith Company, of Pittsburgh, Pennsylvania, received the contract to fabricate and install aluminum siding panels for the X-530B Control House, as well as the corrugated asbestos siding for the X-530B Switch Houses. Charles Wood & Company, of Newark, New Jersey, won the contract to install standard and special perforated-metal acoustical tile ceilings and accessories in the X-530B Control House. Johns-Manville Sales Corporation, of Cincinnati, Ohio, received a contract to install thermal insulation for air conditioning ductwork and various piping. Thomas Moulding Floor Company, of Chicago, Illinois, received a contract to install asphalt tile flooring in the X-530B Control House and Switch Houses, and Cyclone Fence Department, of Cincinnati, Ohio, won the contract to install all fencing in and around the X-530 Electrical Switchyard.

Taylor-Wheless Company, of Jackson, Mississippi, performed site grading and backfill activities for the X-530 Electrical Switchyard Complex (Appendix B, Figures 12 and 13). Workers began pouring footers in August 1953 (Figures 14 through 16). Installation of structural steel commenced in September and continued through early December 1954 (Figure 17 through 32). By late February 1954, contractors had completed installation of the main control boards (Figure 33). By early September 1954, all work on the X-530 Electrical Switchyard Complex had been largely completed (Figure 34).

Historical drawings of building plans are provided in Appendix C (Figures 35 through 43).

Part II. Site Information

Description of the X-530 Electrical Switchyard Complex:
The X-530 Electrical Switchyard Complex is located in the northwestern portion of PORTS, immediately west of the X-330 Process Building. The X-530 Electrical Switchyard Complex provides power for the operation of electrical equipment, electrical systems, and other components of the X-326 and X-330 Process Buildings, and now provides all electrical power to the gaseous diffusion plant and the Depleted Uranium Hexafluoride Conversion Facility following the removal of the X-533 switchyard in 2011. Power is also supplied to the area system for general use.

The X-530 Electrical Switchyard Complex consists of the switchyard itself (X-530A) on the west of the site, a control house and two switch houses (X-530B), a test and repair facility (X-530C), an oil house (X-530D), two valve houses (X-530E and X-530F), and an oil pumping station (X-530G). The buildings are mainly located on the eastern end of the switchyard, facing the X-330 Process Building. The X-530G Gas Centrifuge Enrichment Plant (GCEP) Oil Pumping Station is located in the northwest corner of the switchyard. The X-530A, B, C, D, and E structures have been identified as historic processing support facilities at PORTS. Although only these five structures are the focus of this HAER documentation, all parts of the X-530 Electrical Switchyard are discussed herein, including X-530F and G.

The X-530A Switchyard is approximately 740' wide and 1,200' long (888,000 square feet) and sits on a limestone gravel bed atop clay soil (Appendix A, Figures 1 through 4). The switchyard contained at one time 12 power transformers, now 10, to reduce the incoming power supply voltage from 330 kilovolts (kV) to 13.8 kV for distribution to plant facilities. Four transmission lines enter the switchyard from the west, carrying power from the Kyger Creek steam plant at Cheshire, Ohio and the Pierce switching station at Pierce, Ohio. Additionally, two smaller transmission lines enter the facility from a Columbus & Southern Ohio Electric Company line and an Ohio Power Company line. These two lines are available as an auxiliary source of power. Equipment in the switchyard, including 10 transformers, 2 of which are in service and 2 in cold standby, actively reduces the voltage for use at PORTS. One transformer is held in reserve.

The X-530B Control House and Switch Houses are oriented from north to south along the eastern edge of the X-530A Switchyard. The X-530B Control House is located in the center of the X-530B Switch Houses. The X-530B Control House is a utilitarian, two-story, steel frame building that measures approximately 120' long by 70’ wide (8,400 square feet) (Figure 5). The building rests atop concrete footings and grade beams under a poured concrete floor slab. Exterior walls are clad in fluted, insulated, metal paneling. Window openings are located only on the second floor in the control room, and consist of industrial metal sash. The roof is relatively flat, consisting of metal deck panels covered with insulation and built-up material. The central bay of the X-530B Control House protrudes from the east façade. The first-floor interior of the X-530B Control House contains switchgear, electrical equipment, buses, and conduit installations, while the second floor contains the control room, offices, restrooms, and other work areas. The interior is functional in nature with few finishes or stylistic detailing.

The X-530B Switch Houses consist of utilitarian, one-story, steel-frame structures with flat roofs of concrete slabs (Figures 6 through 7). Each building is approximately 395' long and 67' wide (approximately 26,500 square feet). The concrete slab roofing supports three separate outdoor enclosures on each X-530B Switch House for 11 switchgear units and six synchronous hydrogen-cooled condensers. Exterior walls are clad in corrugated cement-asbestos siding. Walkways at roof level connect the X-530B Switch Houses to the second floor of the central X-530B Control House. Pedestrian and vehicular access doors are located on the north, south, and west façades of each X-530B Switch House. The first-floor interiors of the switch houses contain three groups of air compressors, two switchgear installations, electrical buses and other mechanical equipment, as well as large fan rooms. Stairways reaching from the ground floor to rooftop penthouses are located at each end of the buildings and in the fan rooms. Like the Control House, the interiors of the X-530B Switch Houses are largely functional in nature with few finishes or detailing. Underground, box-type, concrete, power tunnels run outside the eastern wall of the X-530B Control House and Switch Houses.

The X-530C Test and Repair Facility is a one-story, rectangular plan, steel frame building located in the northeast corner of the switchyard area (Figure 8). The building measures approximately 25' by 50' (1,250 square feet) and features a concrete slab foundation, walls clad in cement-asbestos siding, window openings with industrial steel sash, and a flat roof. An overhead metal door is located on the north façade and is flanked by two metal storage lockers labelled “Tools” and “Materials.”

The X-530D Oil House is a small, one-story, rectangular plan, steel frame building (Figure 9). It is located in the southern section of the switchyard area and measures approximately 17' by 30' (510 square feet). The building has a poured concrete foundation, walls clad in corrugated cement-asbestos siding, window openings with nine lights, and a lightly-pitched roof covered with corrugated metal. Hollow metal double entry doors are located on the west façade. The building houses the equipment necessary to provide oil exchanges in switchyard electrical equipment. The X-530D Oil House is connected to large storage tanks on the east and west by surface piping.

The X-530E Valve House is located on the northeast corner of the switchyard area (Figure 10). The X-530E Valve House consists of an underground, reinforced concrete room. The valve house consists of an enclosed stairway that sits atop a concrete pad. The pad measures approximately 20' by 25' (500 square feet). Built of reinforced concrete, the enclosure features a single, hollow metal door with a small wire-glass window.

The X-530F Valve House is a 500 square foot reinforced-concrete structure located on the south side of the switchyard (Figure 11). It houses an emergency sprinkler main with distribution lines leading to transformers on the southern half of the switchyard.

Unlike the other X-530 Complex buildings that were built during the initial phase of construction at PORTS, the X-530G GCEP Oil Pumping Station was built in 1980. It is a 500 square foot metal building that contains pumps to maintain positive pressure on oil-filled underground pipes containing power cables. It contains two pumps, a diked aboveground storage tank, fluorescent lights, and a sprinkler system. The building sits on a concrete vault structure. There is a below-grade structure where the oil system is connected to the tie line from the X-530A Electrical Switchyard.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0207&D4. Piketon, OH: U.S. Department of Energy, October 2011.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio,* DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

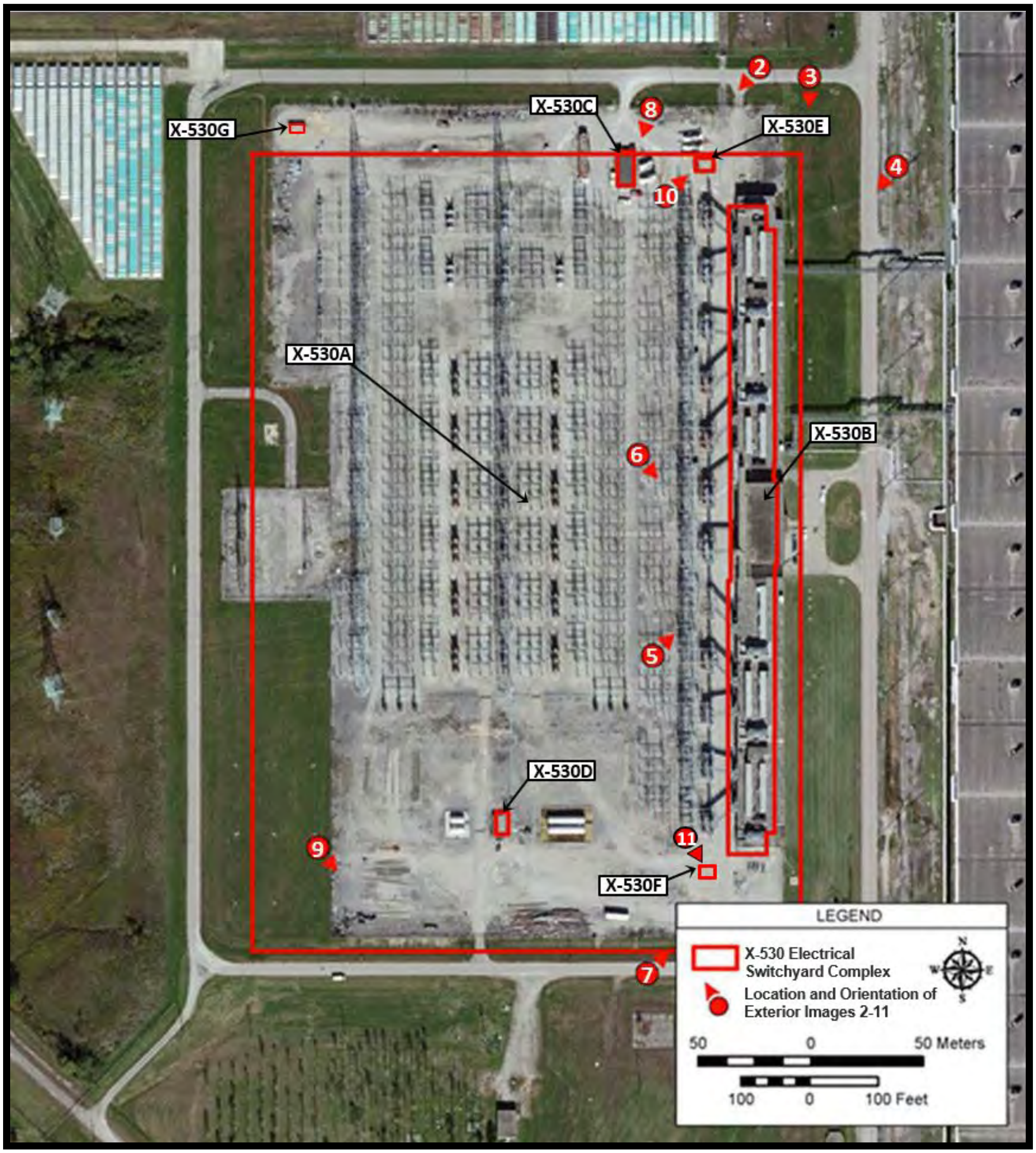

Figure 1: Location and Orientation of Exterior Photographs (Figures 2 through 11)

Figure 2: North Side of the X-530 Electrical Switchyard Complex with the X-530A Switchyard Shown to the Right, August 2014, Facing Southwest

Figure 3: Northeast Corner of X-530B Switch House, August 2014, Facing South

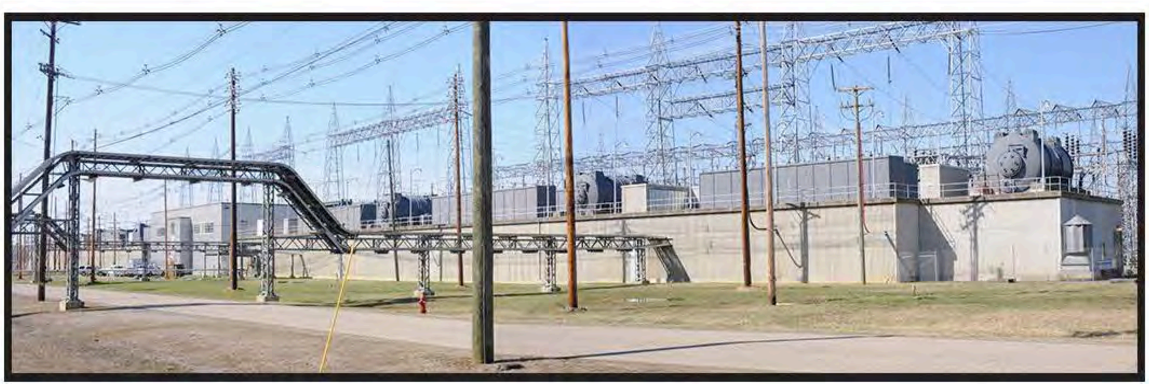

Figure 4: East Side of X-530B Switch House, August 2014, Facing Southwest

Figure 5: The X-530B Control House, August 2014, Facing Northeast

Figure 6: The X-530B Control House, August 2014, Facing Southeast

Figure 7: Southwest Corner of X-530B Switch House, August 2014, Facing Northwest

Figure 8: North Side of X-530C Test and Repair Facility, August 2014, Facing Southwest

Figure 9: Northwest Corner of the X-530D Oil House, August 2014, Facing Southeast

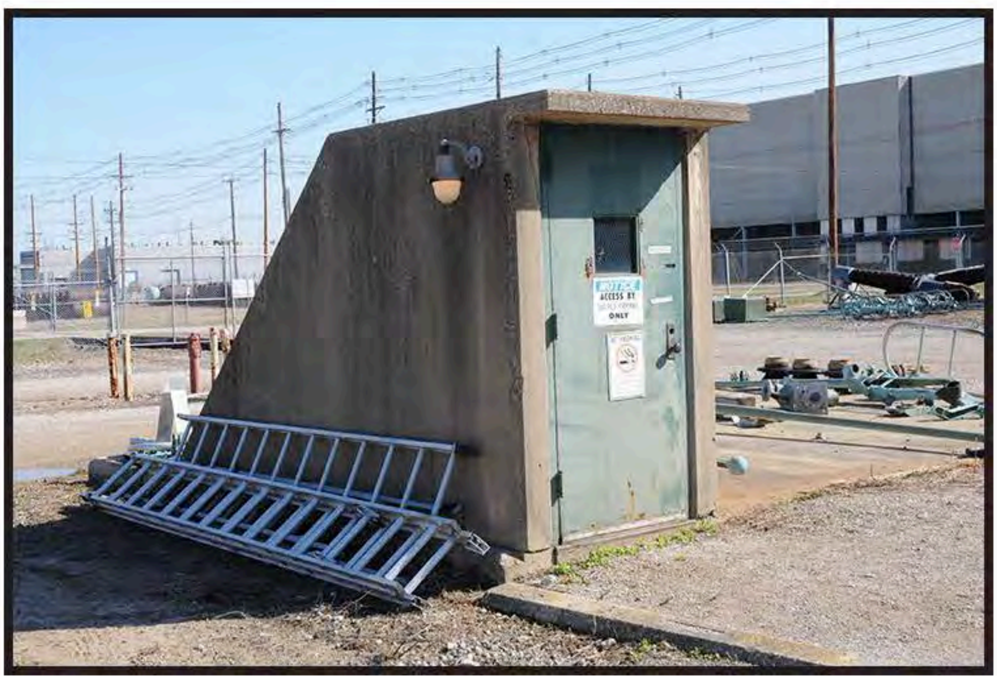

Figure 10: Entrance to the X-530E Valve House, August 2014, Facing Northeast

Figure 11: Entrance to the X-530F Valve House, August 2014, Facing Southeast

Appendix B: Historical Photographs

Figure 12: The X-530 Electrical Switchyard Complex Construction Site, May 1953

Figure 13: The X-530B Control House and Switch House, Looking North, June 1953

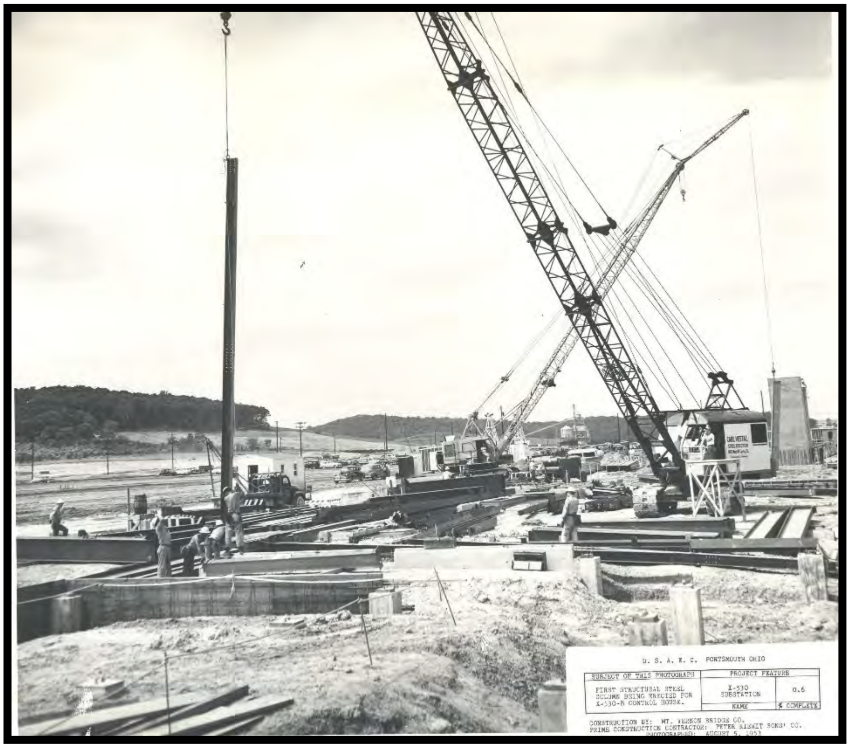

Figure 14: First Structural Steel Column Being Erected for the X-530B Switch House, August 1953

Figure 15: Grading and Foundation Work for the X-530 Electrical Switchyard Complex, August 1953

Figure 16: Foundation Work for the X-530 Electrical Switchyard Complex, September 1953

Figure 17: Foundation Work for the X-530 Electrical Switchyard Complex, September 1953

Figure 18: Foundation Work for the X-530 Electrical Switchyard Complex, September 1953

Figure 19: Foundation Work for the X-530 Electrical Switchyard Complex, September 1953

Figure 20: Steel Framework for the X-530 Electrical Switchyard Complex, October 1953

Figure 21: Steel Framework for the X-530 Electrical Switchyard Complex, October 1953

Figure 22: Steel Framework for the X-530 Electrical Switchyard Complex, November 1953

Figure 23: Steel Framework for the X-530 Electrical Switchyard Complex, December 1953

Figure 24: Steel Framework for the X-530 Electrical Switchyard Complex, December 1953

Figure 25: Looking Northwest at the X-530 Electrical Switchyard Complex, February 1954

Figure 26: Overall View of the X-530 Electrical Switchyard Complex, March 1954

Figure 27: Looking North at Ohio Valley Electric Company (OVEC)
13.8 Kv Switchyard, West of the X-530 Electrical Switchyard Complex,
June 1954

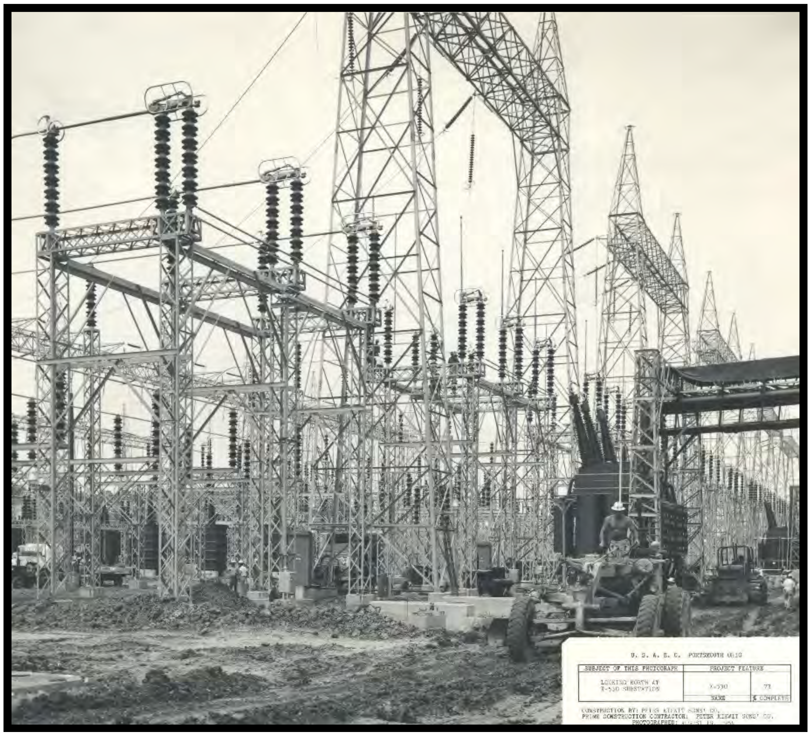

Figure 28: Looking North at the X-530 Electrical Switchyard Complex, August 1954

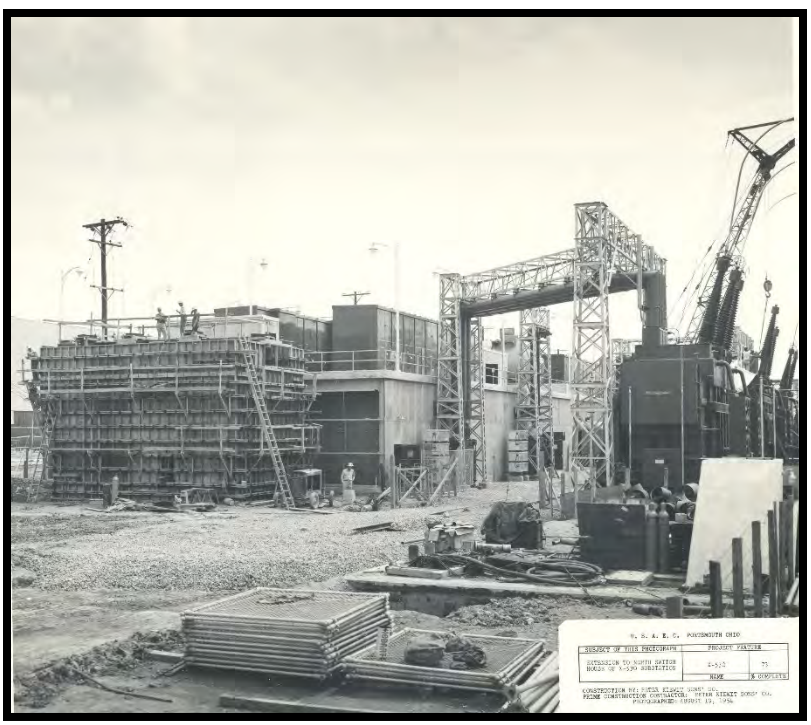

Figure 29: Extension to North Switch House of X-530 Electrical Switchyard Complex, August 1954

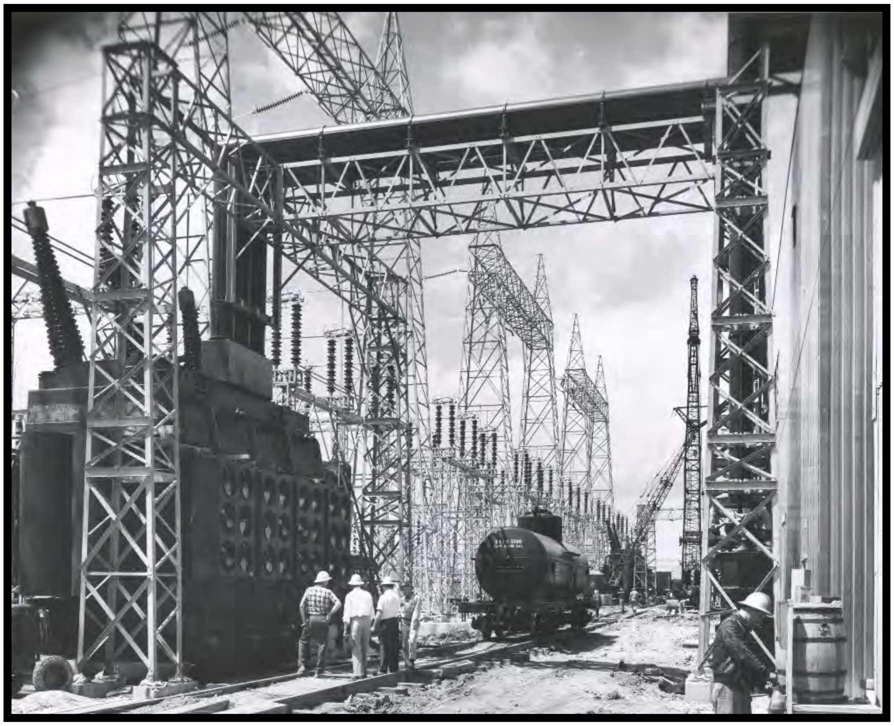

Figure 30: The X-530 Electrical Switchyard Complex, September 1954

Figure 31: The X-530 Electrical Switchyard Complex, September 1954

Figure 32: The X-530 Electrical Switchyard Complex, September 1954

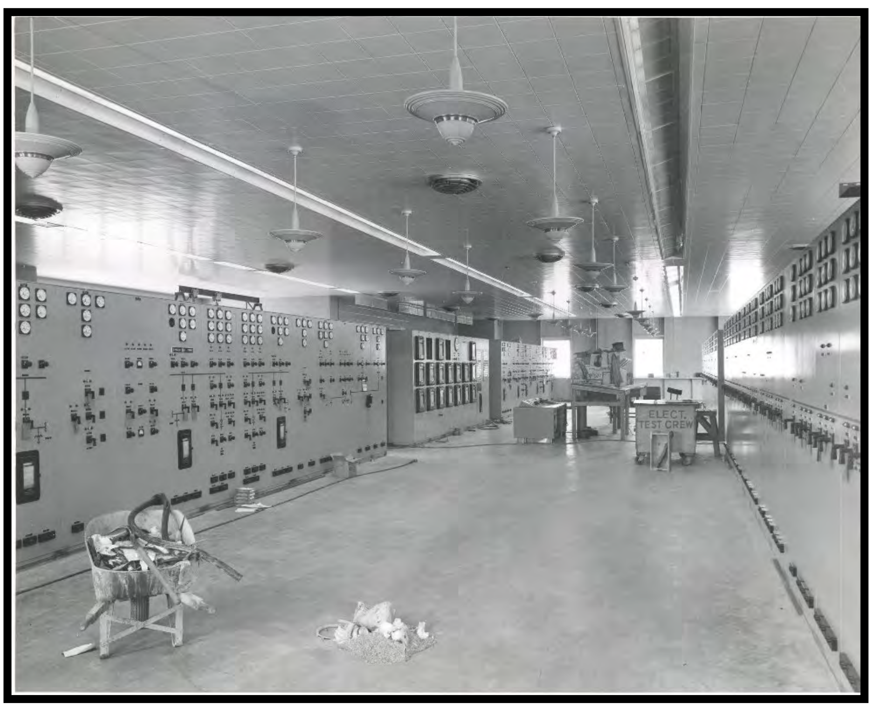

Figure 33: Main Control Board, the X-530 Electrical Switchyard Complex, September 1954

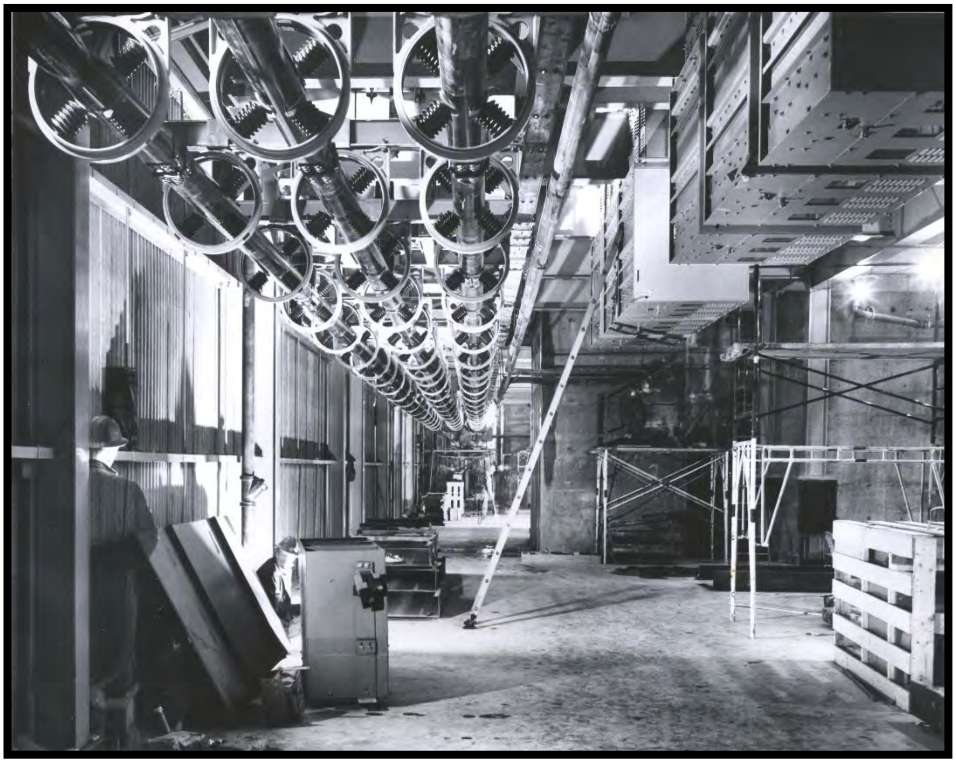

Figure 34: The X-530 Electrical Switchyard Complex, September 1954

Appendix C: Historical Drawings

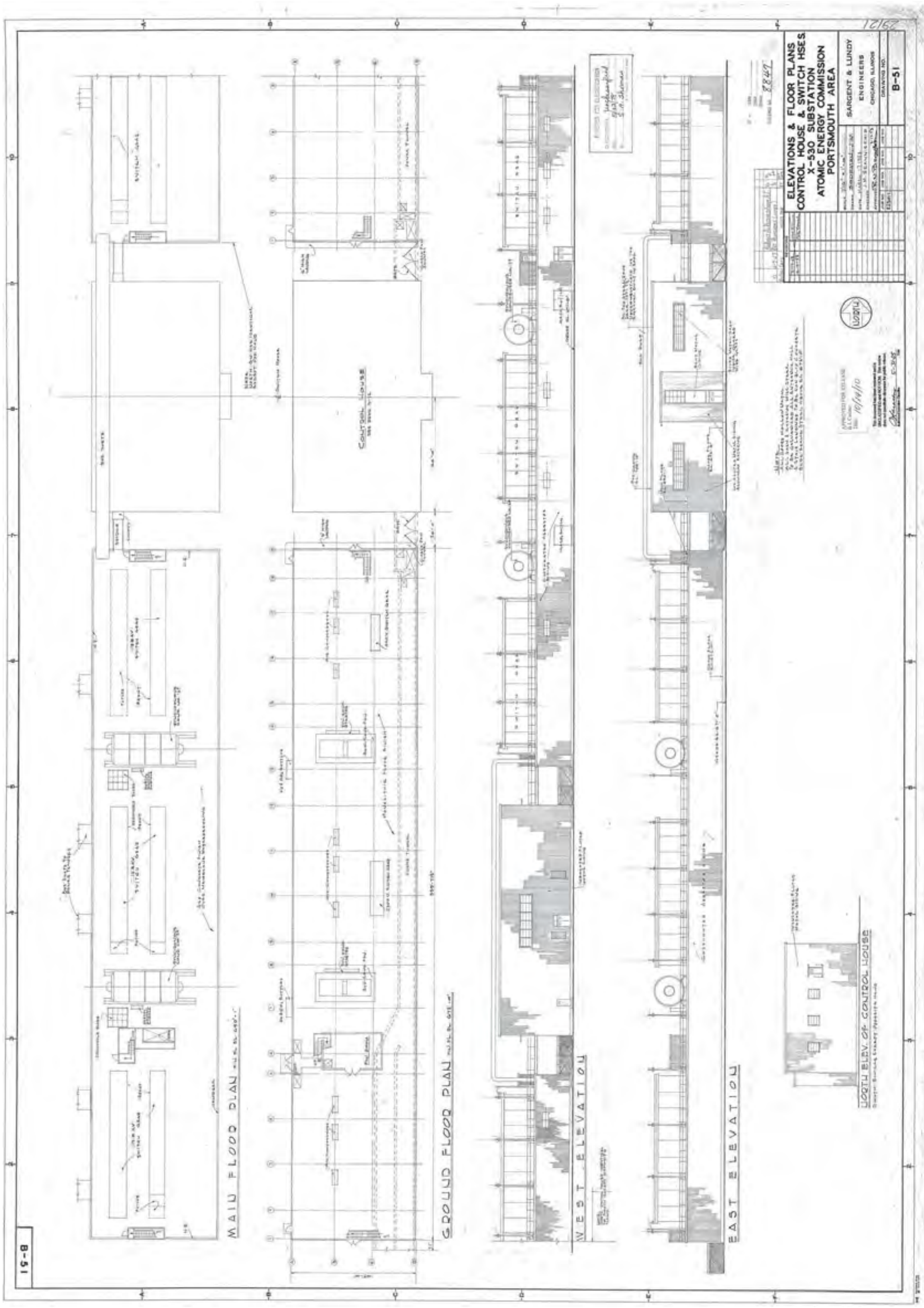

Figure 35: Elevations and Floor Plans

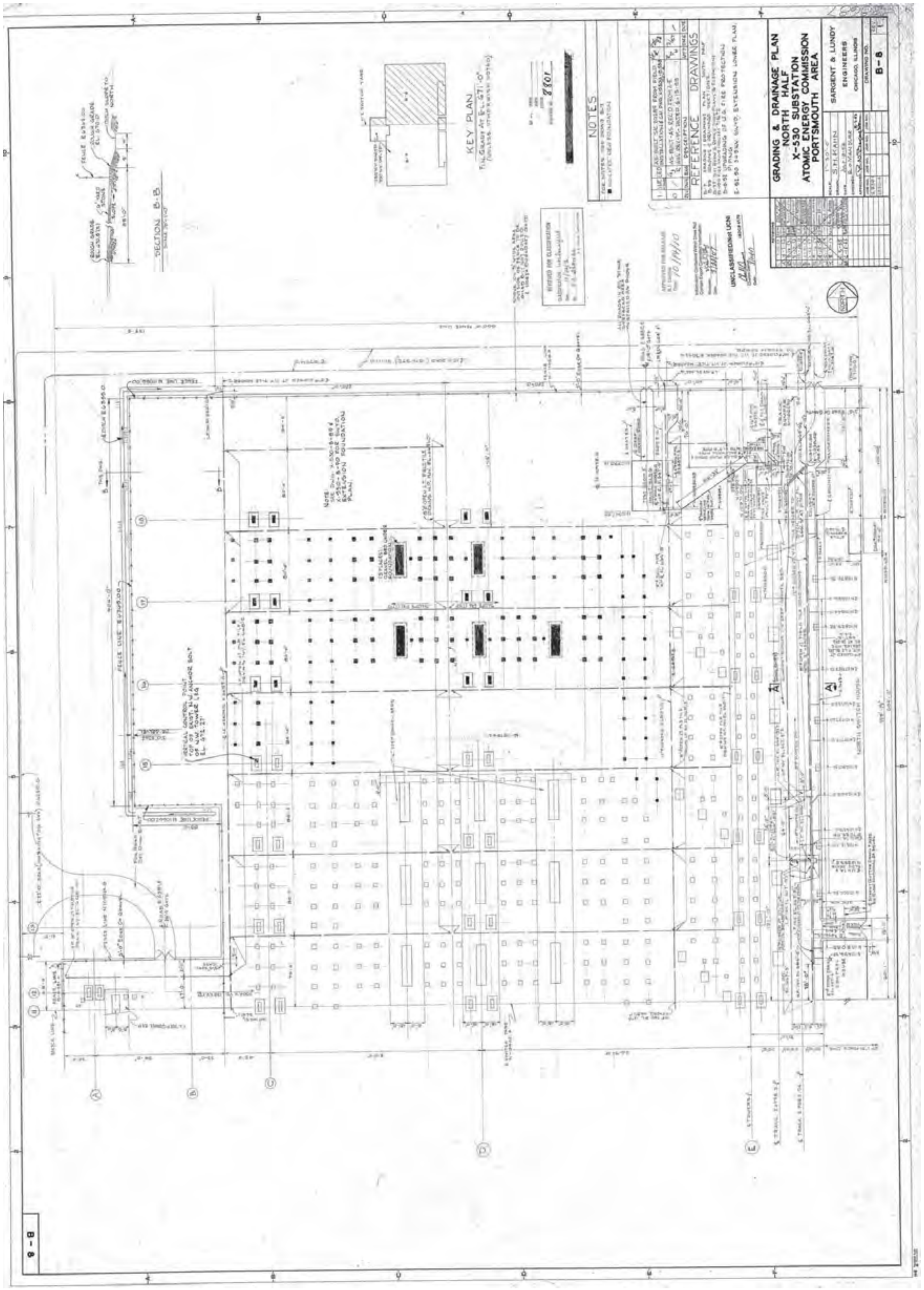

Figure 36: North Grading and Drainage Plan

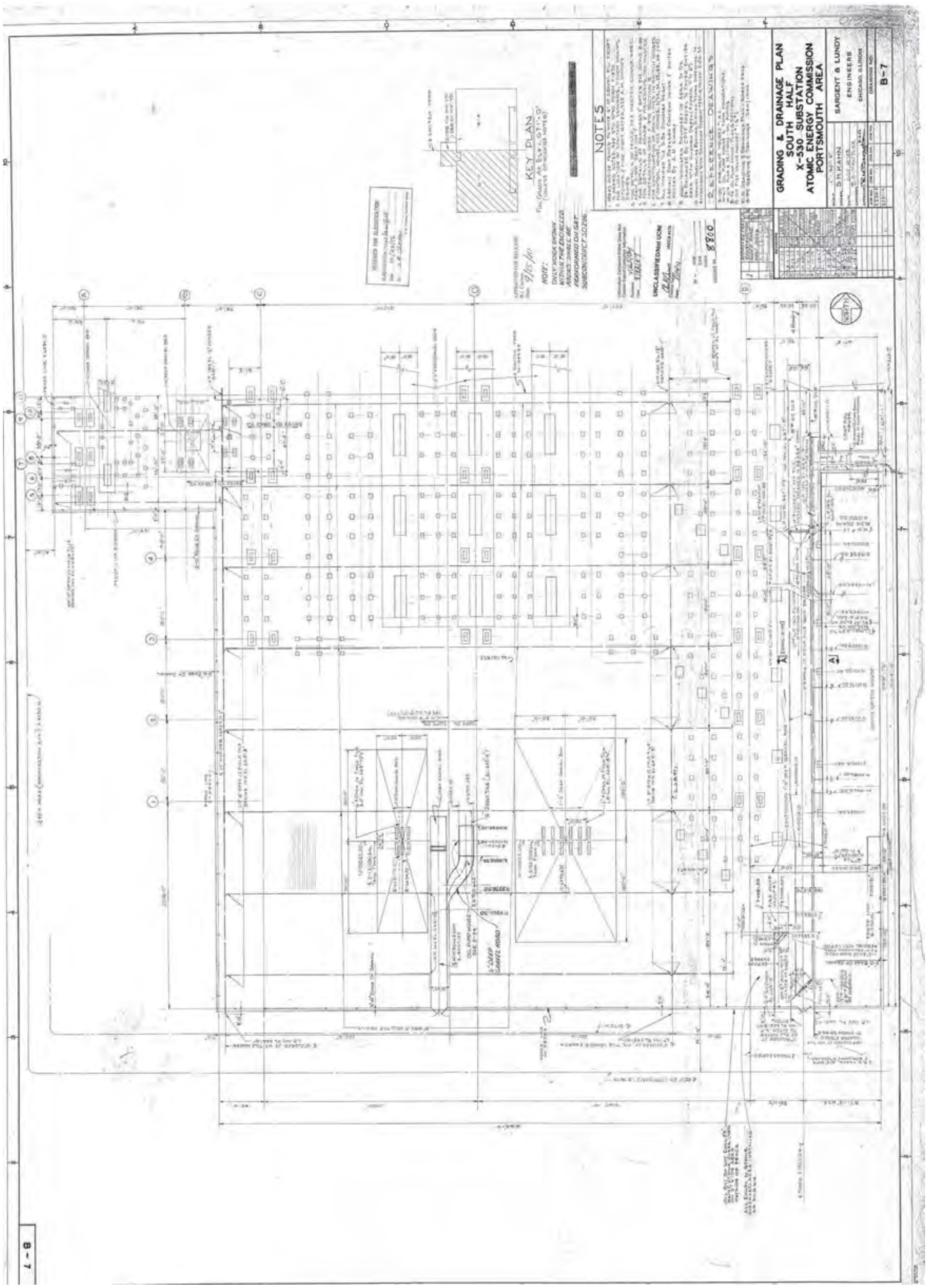

Figure 37: South Grading and Drainage Plan

Figure 38: Log of Test Borings

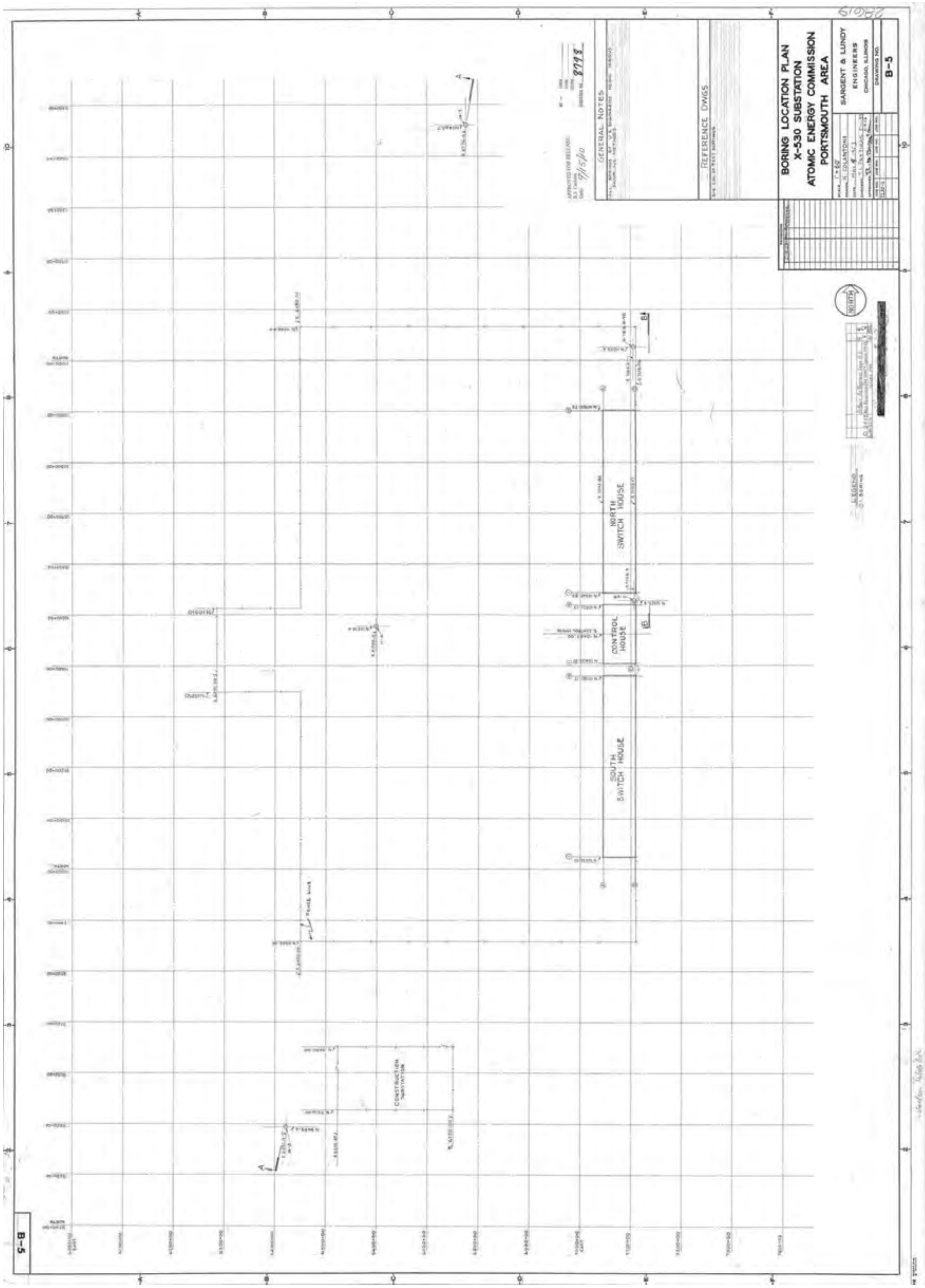

Figure 39: Boring Location Plan

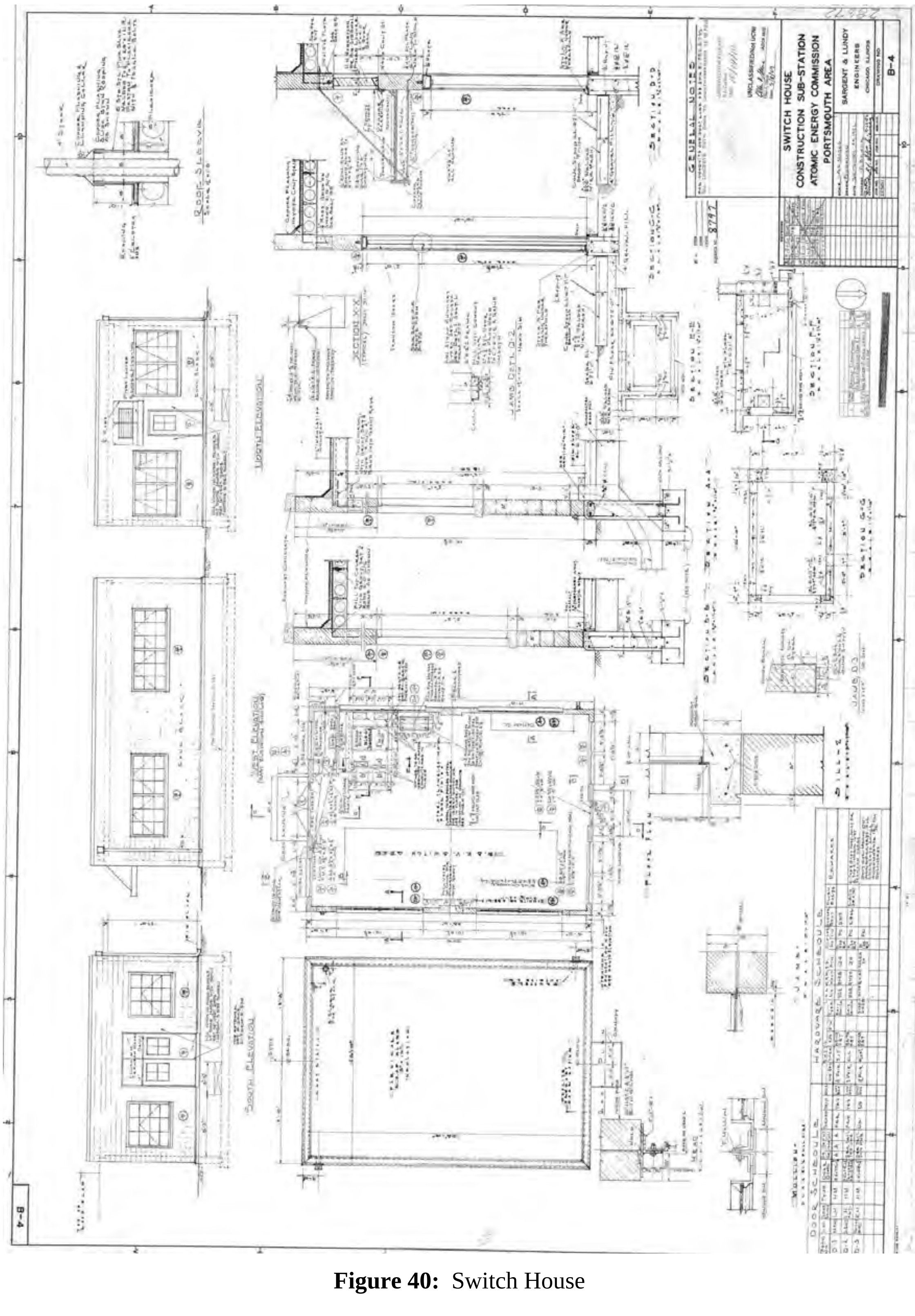

Figure 40: Switch House

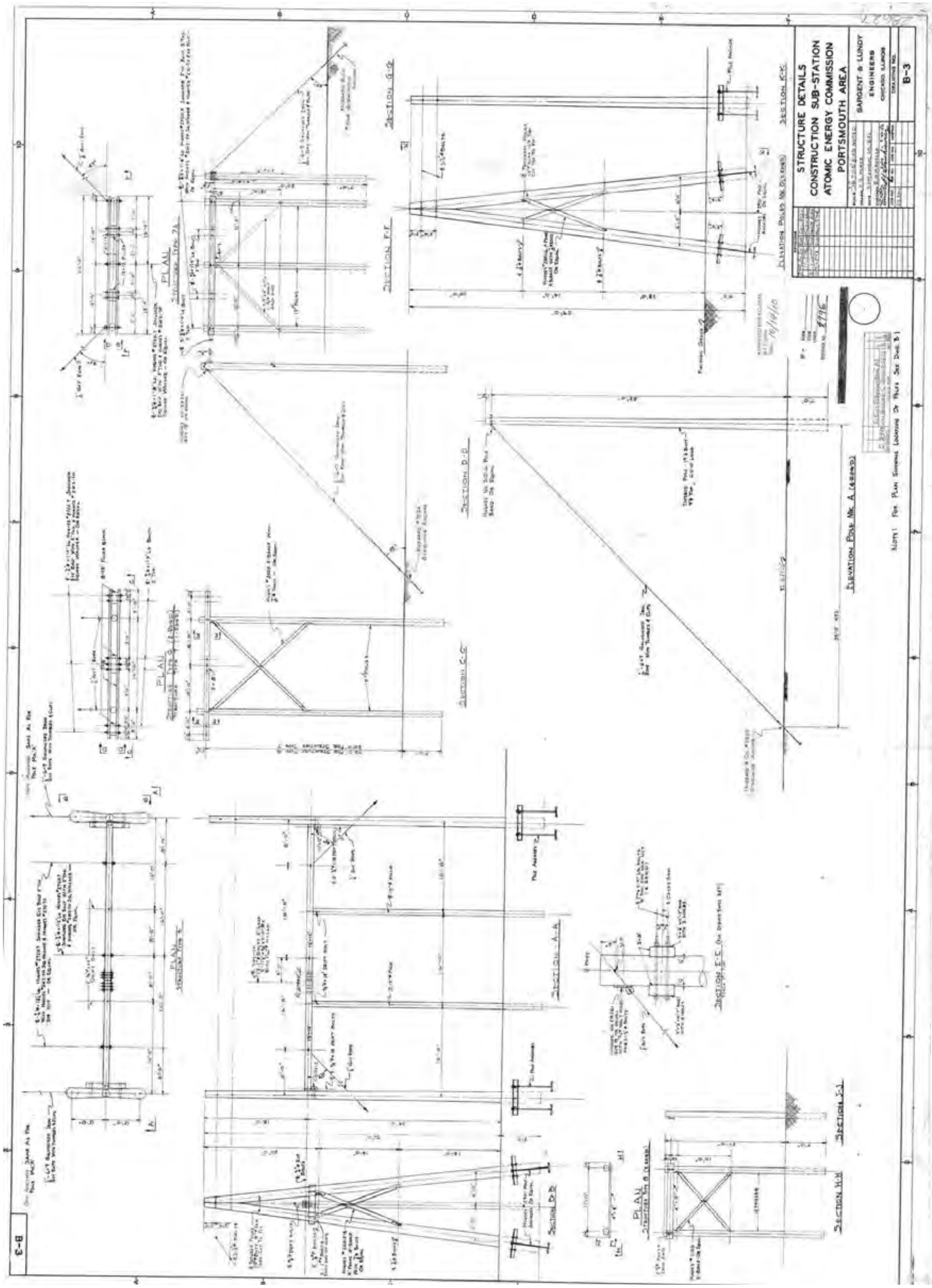

Figure 41: Structure Details

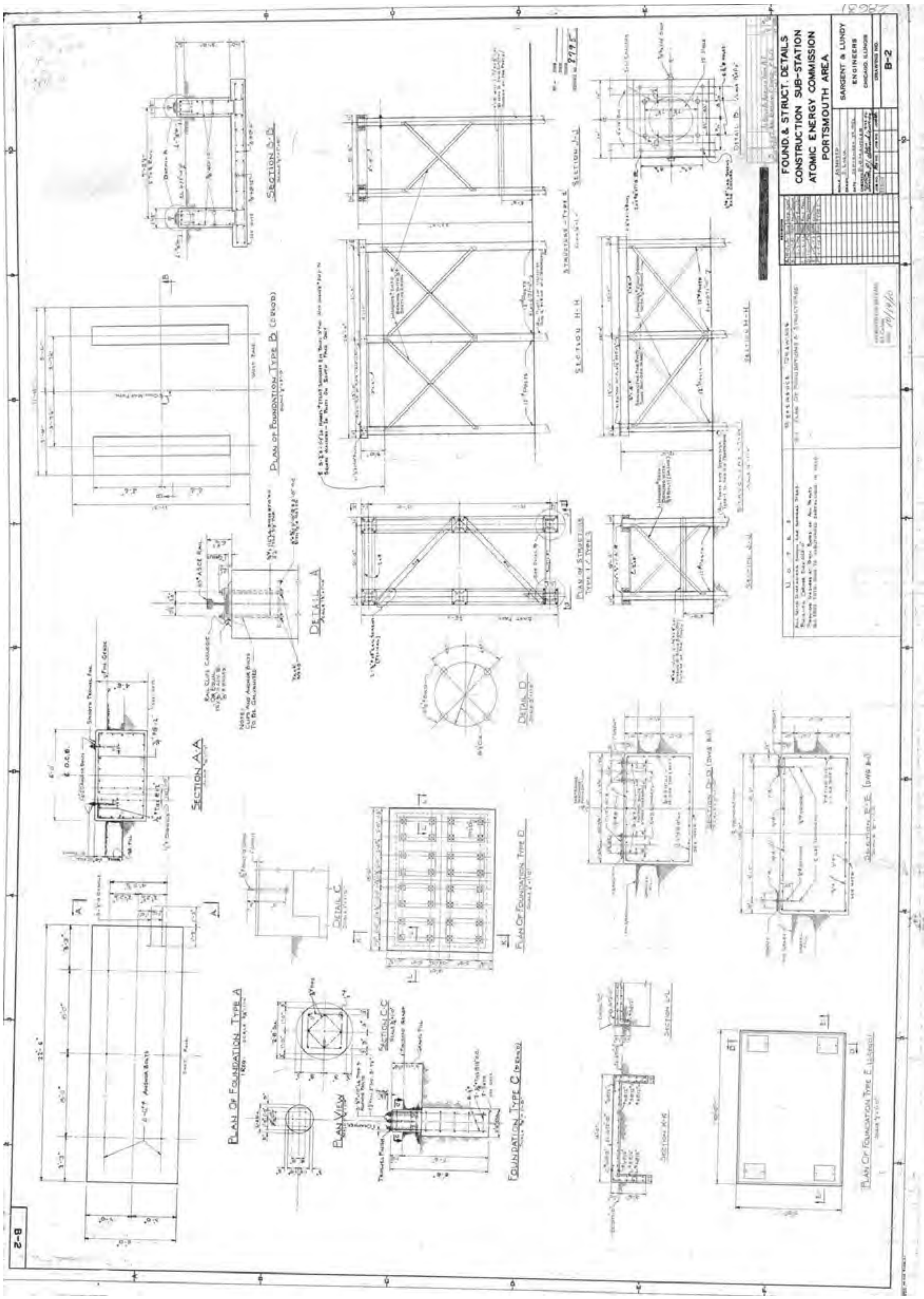

Figure 42: Foundation and Structure Details

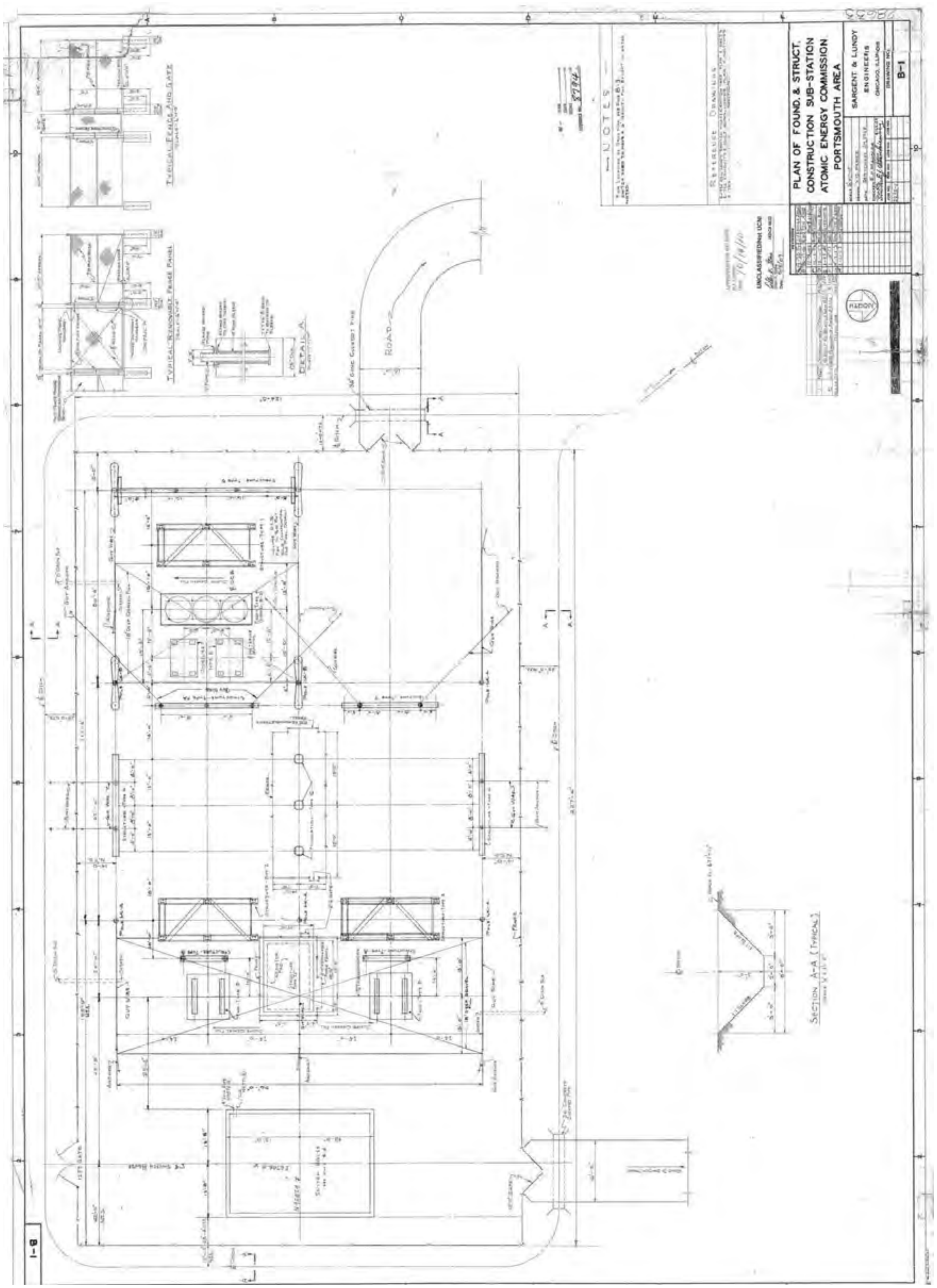

Figure 43: Plan of Foundation and Structure

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-600 STEAM PLANT
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-Q
HAER OH-142-Q

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-600 STEAM PLANT

HAER No. OH-142-Q

<u>Location:</u>	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-600 Steam Plant is located at Ohio State Plane South coordinates at easting 1826782.024267 ft, northing 366978.704281456 ft and at Universal Transverse Mercator Zone 17N easting 326936.4018 m, northing 4319399.374 m. The coordinate represents the approximate center of the X-600 Steam Plant. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
<u>Date of Construction:</u>	1954
<u>Designer/Builder:</u>	Peter Kiewit Sons' Construction Company
<u>Previous Owner:</u>	N/A
<u>Present Owner:</u>	The Atomic Energy Commission (AEC) oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
<u>Present Use:</u>	Demolished in 2013
<u>Significance:</u>	The former X-600 Steam Plant provided steam to heat buildings, vaporize uranium, maintain process temperatures, and clean equipment. The former X-600 Steam Plant produced 125-pounds per square inch (psi) saturated steam and consisted of three boilers, each rated for continuous operation at 125,000 pounds of steam per hour at 125 psi. The boilers were fired with coal fed through stokers. This facility was part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
<u>Project Information:</u>	Fluor-BWXT Portsmouth LLC photographed the site on July 31, 2012 and August 13, 2012. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-600 Steam Plant HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-600 Steam Plant:
Peter Kiewit Sons' Company and the AEC awarded the subcontract for the X-600 Steam Plant to the James Leck Company of Minneapolis, Minnesota, with Peter Kiewit Sons' Company expediting and coordinating the work. Excavation proceeded from January to October 1953 with a total of 5,093 cubic yards excavated (Appendix B, Figures 4 and 5). Eight hundred and thirty-four cubic yards of concrete were laid between July 1953 and January 1954 (Figures 6 through 9). Towne Construction Company erected 214 tons of structural steel, using both bolted and riveted connections, between August and November 1953 (Figures 10 through 12). All work was completed on the initial phase of the X-600 Steam Plant by early October 1954 (Figures 13 through 19). A view of the X-600 Steam Plant in 1990 is shown in Figure 20. The X-600 Steam Plant was demolished in 2013.

Historical drawings of building plans are provided in Appendix C (Figures 21 through 32).

Part II. Site Information

Description of the X-600 Steam Plant:
The former X-600 Steam Plant was a large facility located in the south-central portion of PORTS, approximately 300' southeast of the X-326 Process Building. The X-600 Steam Plant provided the steam for the gaseous diffusion process and building heating, uranium vaporization, and equipment cleaning. The building had a floor space of approximately 19,506 square feet. The building had a rectangular plan with two connected areas, a 72' high east wing, and a 37' high west wing (Appendix A, Figures 1 through 3). Both wings were approximately 99½' long with two main floor levels and operating platforms. A control room addition was built on the west facade sometime after the plant's initial construction.

The building featured a reinforced, poured concrete, raised foundation that covered the first floor of the plant. The upper story of the building was composed of a reinforced steel frame with corrugated cement-asbestos siding. Each wing of the building had a flat steel-decked roof covered with built-up material and slag. A row of air-intake louvers lined the top of the west wall of the east wing, with additional venting in the first story concrete wall. The west wall of the west wing featured steel industrial windows running the length of the facade.

The eastern portion of the plant was occupied by three large coal-fired boilers and stacks. To the east of the stacks were three steel hopper-like chambers, built ca. 1990. Additionally, two silos were located on the southwest corner to store ash. One silo dated to the plant's original construction and was made of tile block, and the other silo was added later and was built of concrete. A coal conveyor was attached to the south façade of the taller west wing of the plant to transport coal from the yard to the southeast.

The interior of the building consisted of a concrete slab floor resting on compacted fill on the first story and another concrete slab floor on the second story, which was supported by the steel frame and concrete perimeter walls. Mezzanines, platforms, and stairs were steel. The building housed boilers and their auxiliary units, coal-feed equipment, condensate storage tanks and piping, electrical equipment and controls, and other mechanical equipment. Personnel facilities in the building included lockers, restrooms, and showers.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0207&D4. Piketon, OH: U.S. Department of Energy, October 2011.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio,* DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Portsmouth Gaseous Diffusion Plant Virtual Museum – accessed at http://www.portsvirtualmuseum.org/ operated and managed by Fluor-BWXT Portsmouth for DOE.

Appendix A: Survey Photographs

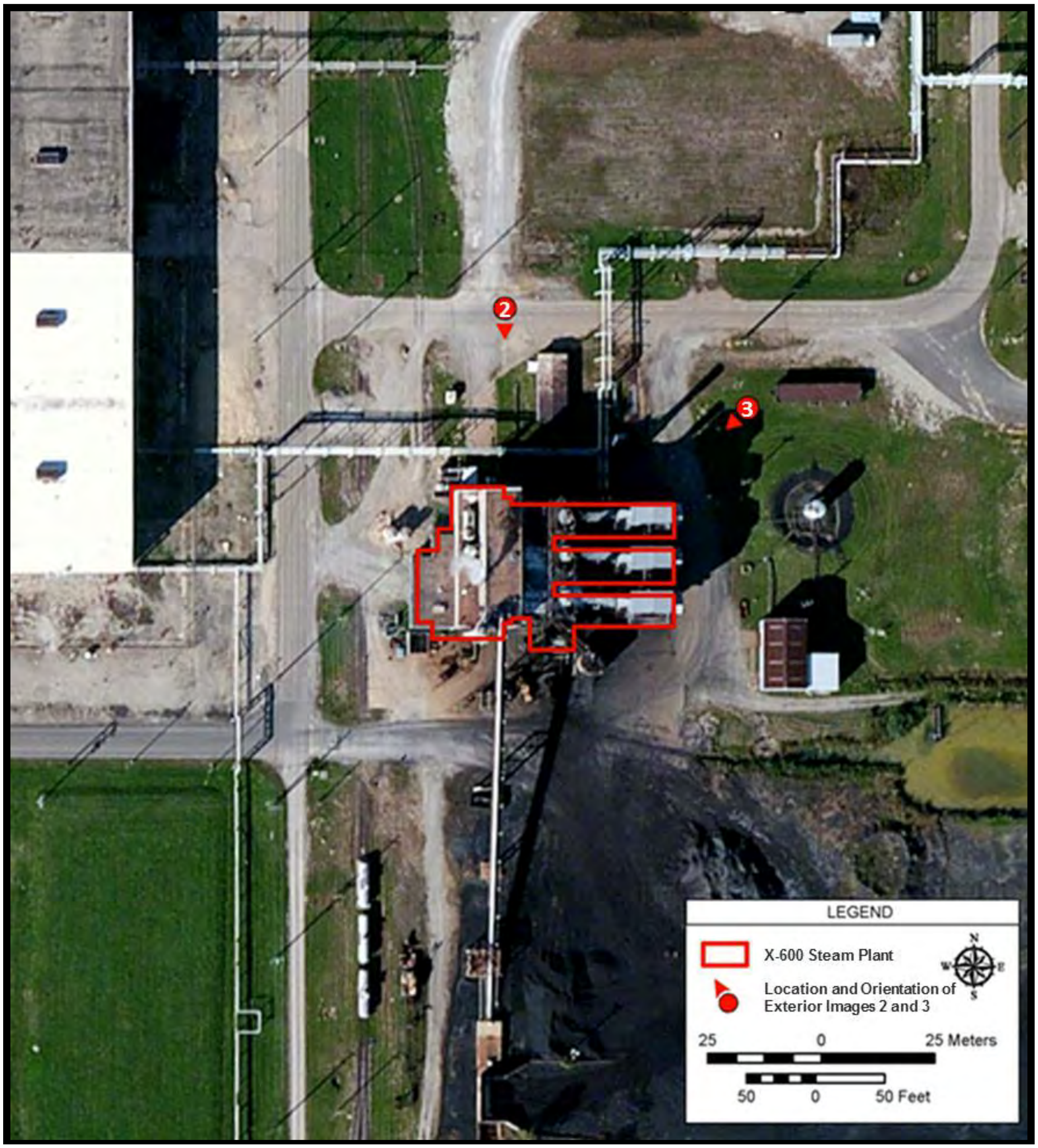

Figure 1: Location and Orientation of Exterior Photographs (2 and 3)

Figure 2: North Side of the X-600 Steam Plant, August 2012, Facing South

Figure 3: North Side of the X-600 Steam Plant, August 2012, Facing South

Appendix B: Historical Photographs

Figure 4: Grading Work for the X-600 Steam Plant, June 1953

Figure 5: Grading and Foundation Work for the X-600 Steam Plant, June 1953

Figure 6: Excavation Work for the X-600 Steam Plant, June 1953

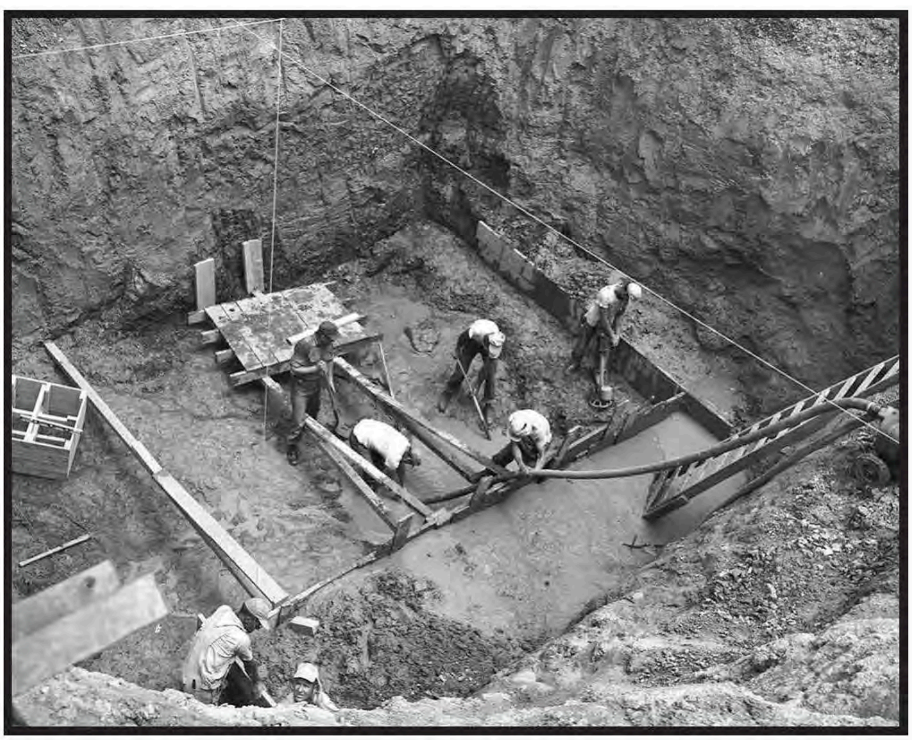

Figure 7: Excavation Work for the X-600 Steam Plant, June 1953

Figure 8: Grading and Foundation Work for the X-600 Steam Plant, July 1953

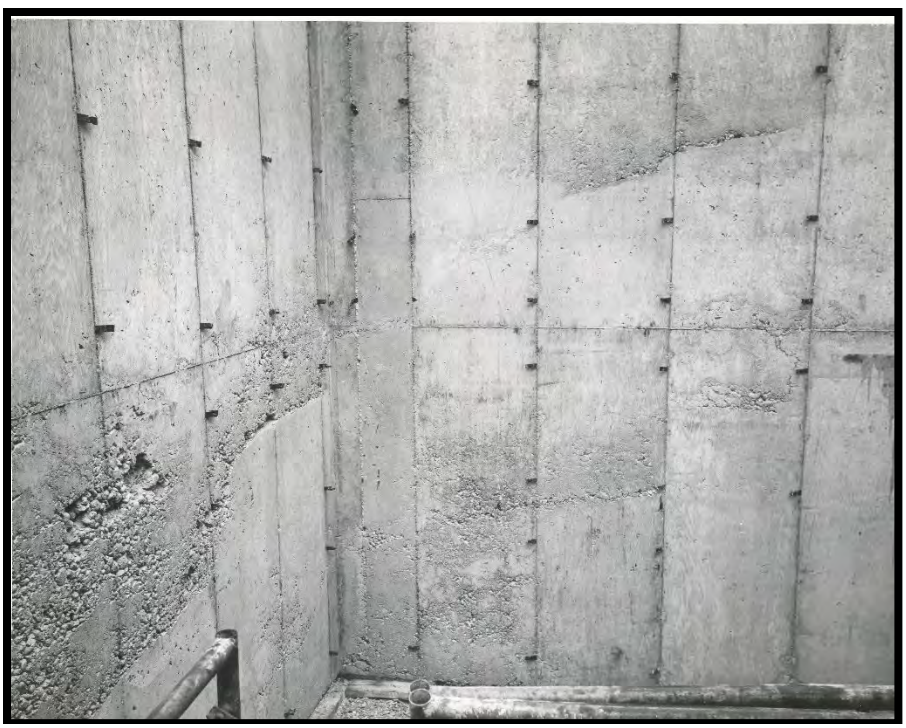

Figure 9: Foundation Work for the X-600 Steam Plant, July 1953

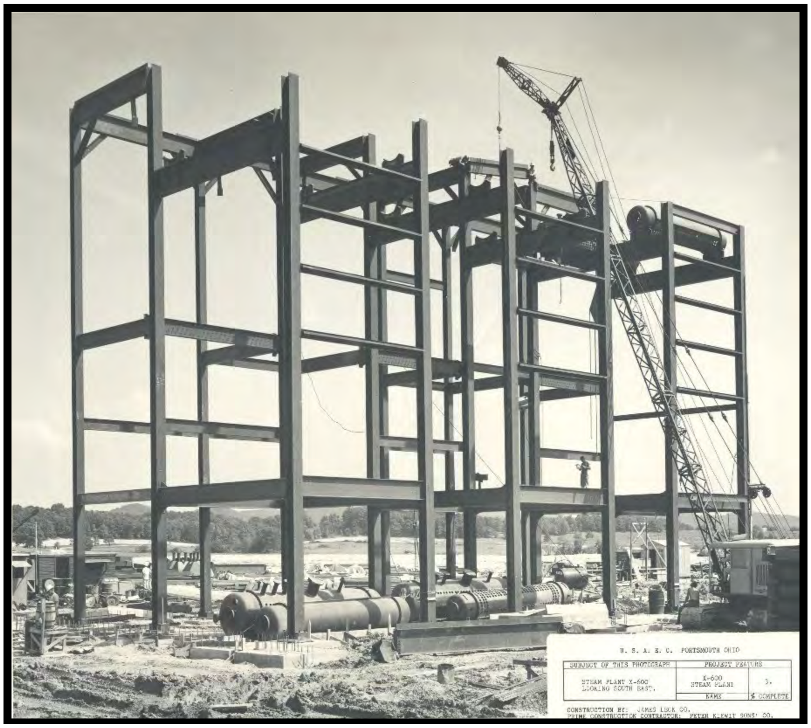

Figure 10: Steel Framework for the X-600 Steam Plant, Looking South, August 1953

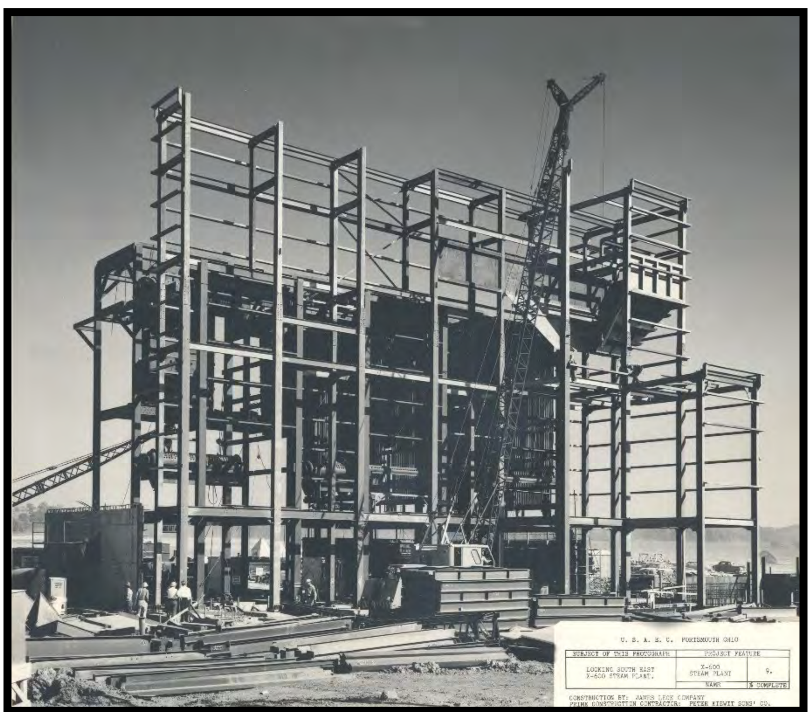

Figure 11: Steel Framework for the X-600 Steam Plant, Looking Southeast, September 1954

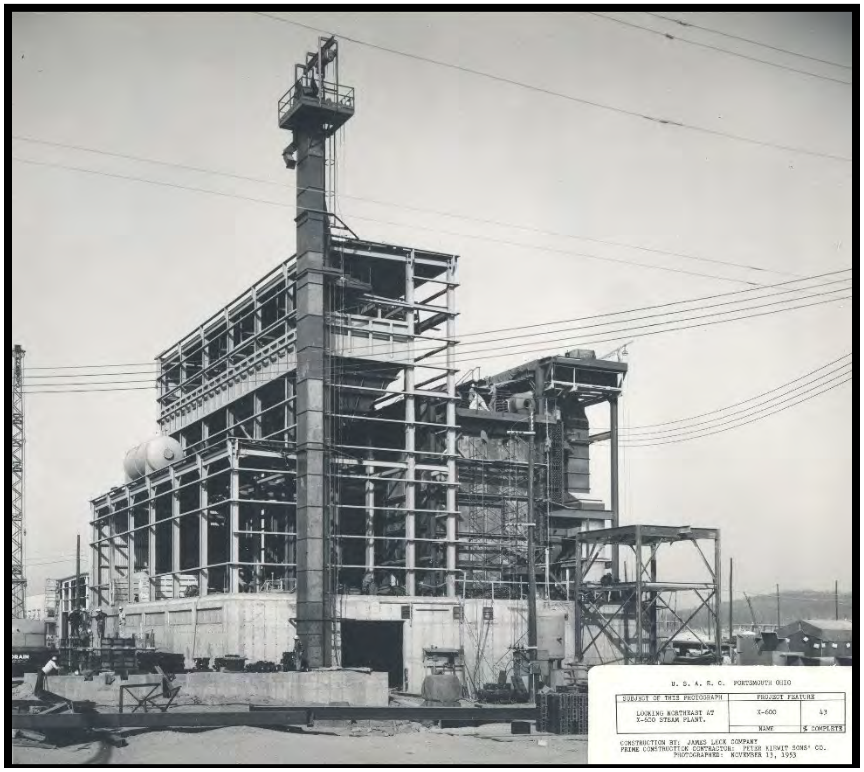

Figure 12: The X-600 Steam Plant, Looking Northeast, November 1953

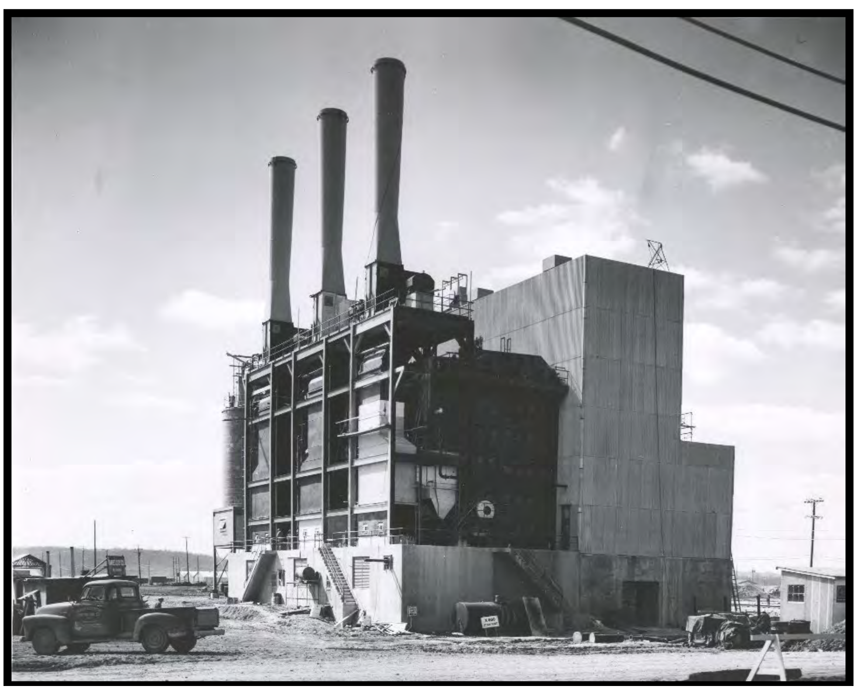

Figure 13: The X-600 Steam Plant, December 1953

Figure 14: The X-600 Steam Plant, December 1953

Figure 15: The X-600 Steam Plant, December 1953

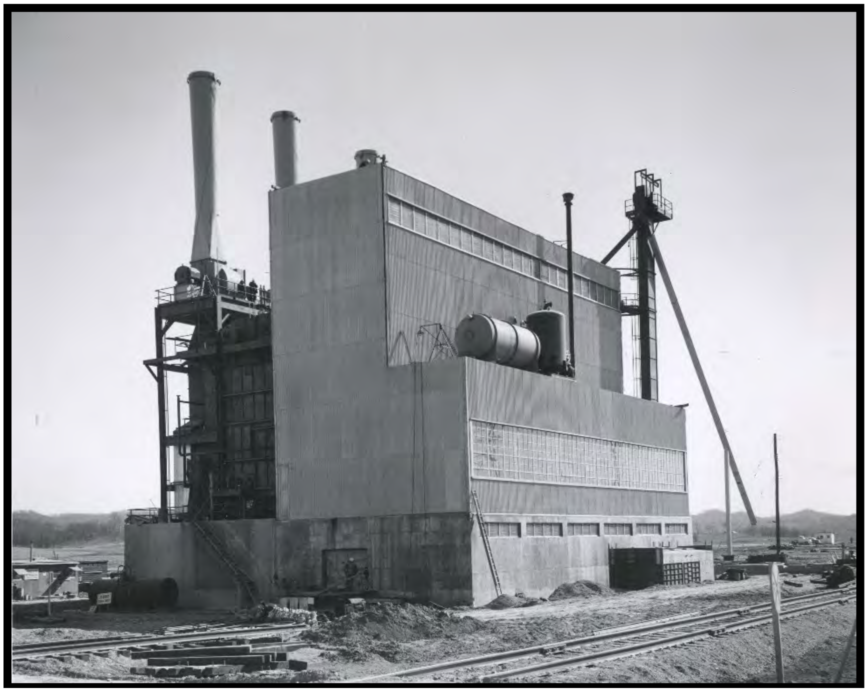

Figure 16: The X-600 Steam Plant, January 1954

Figure 17: Interior View of the X-600 Steam Plant, March 1954

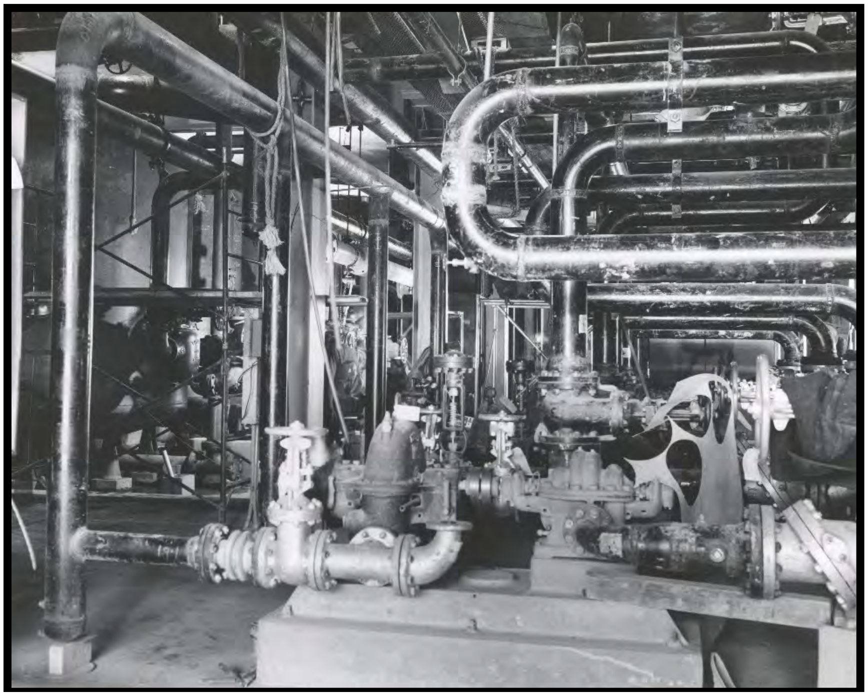

Figure 18: Interior View of the X-600 Steam Plant, March 1954

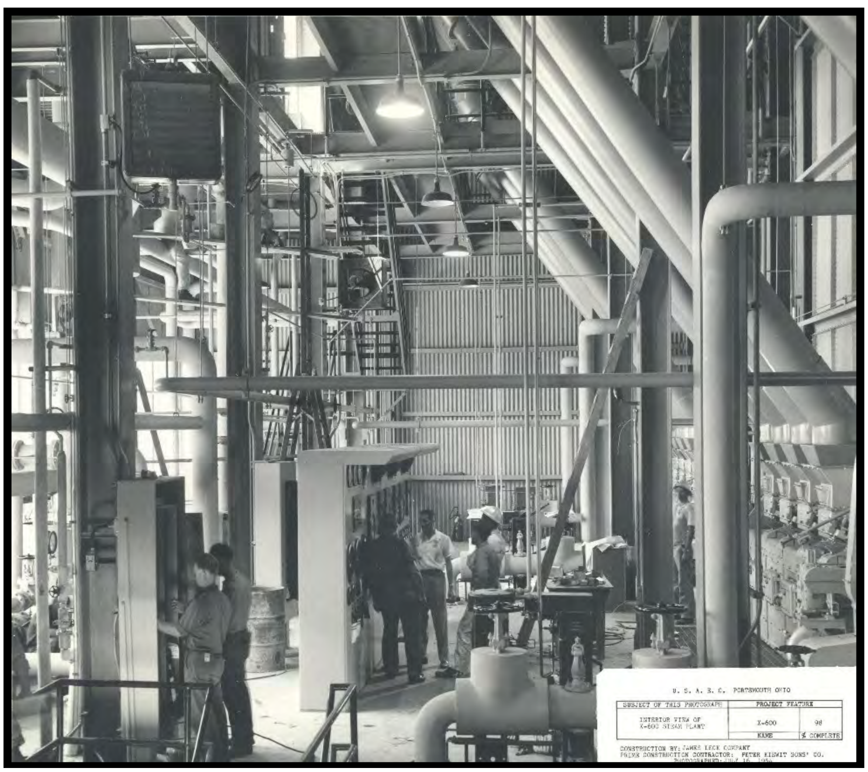

Figure 19: Interior View of the X-600 Steam Plant, July 1954

Figure 20: The X-600 Steam Plant, 1990

Appendix C: Historical Drawings

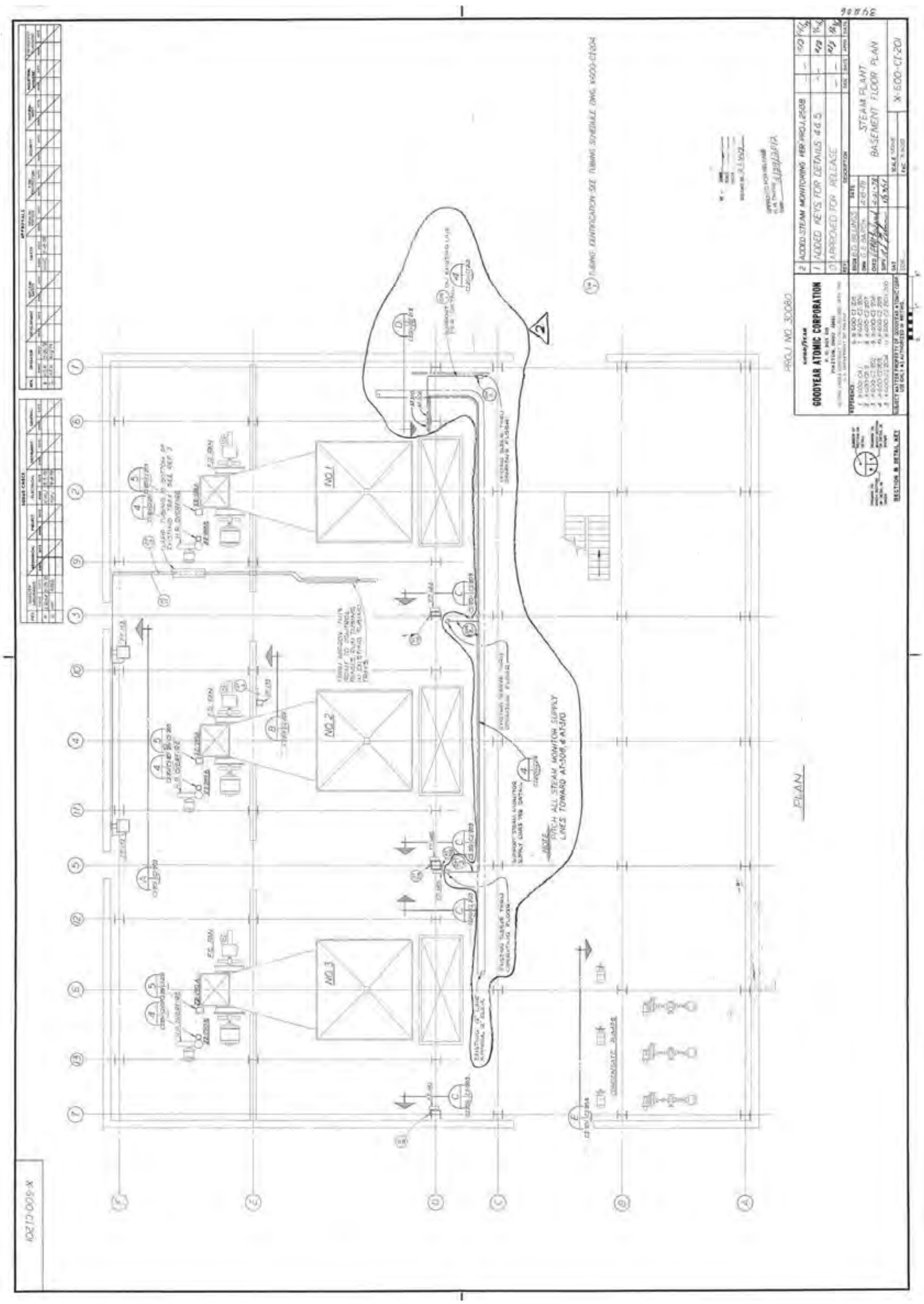

Figure 21: Basement Floor Plan

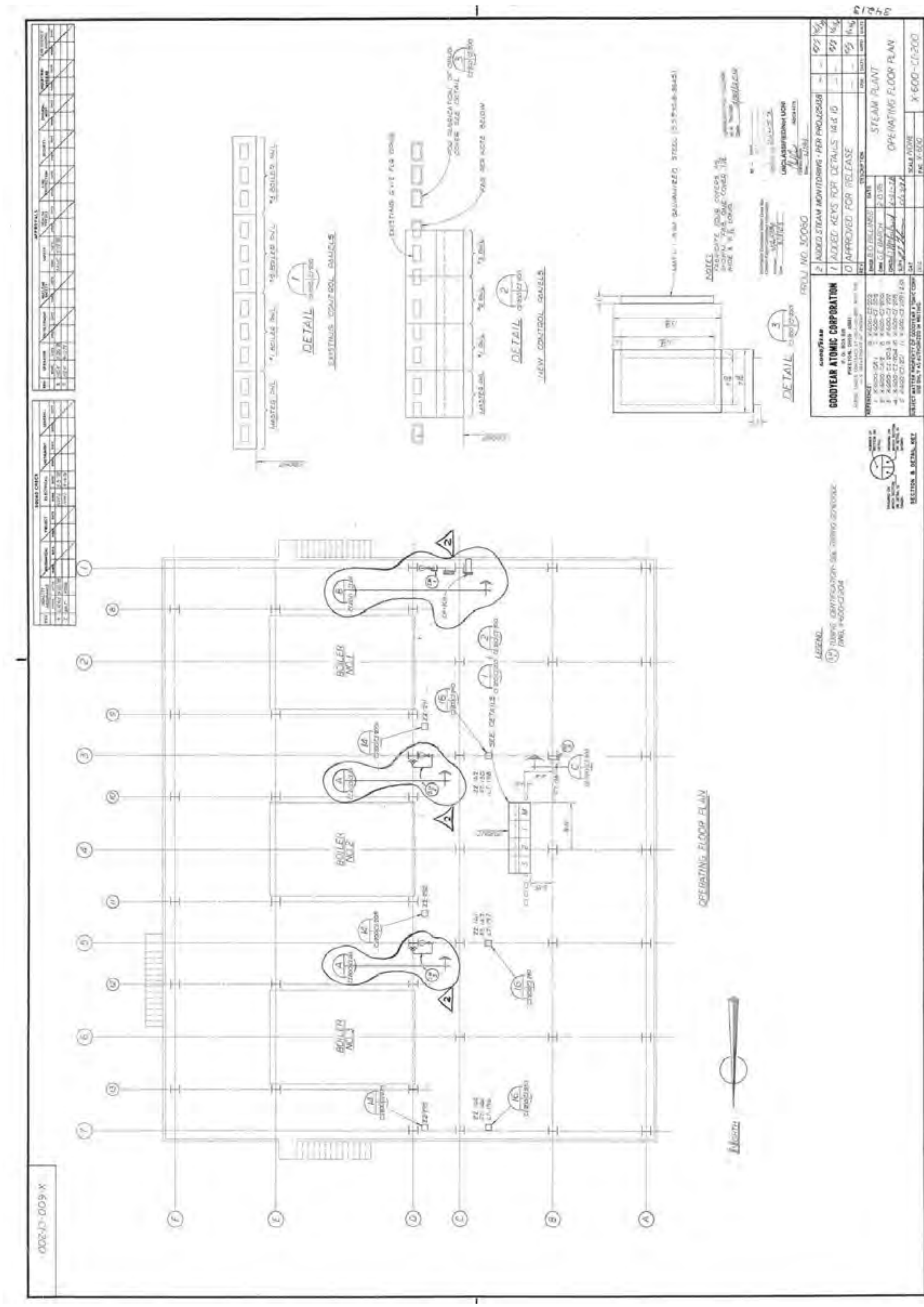

Figure 22: Operating Floor Plan

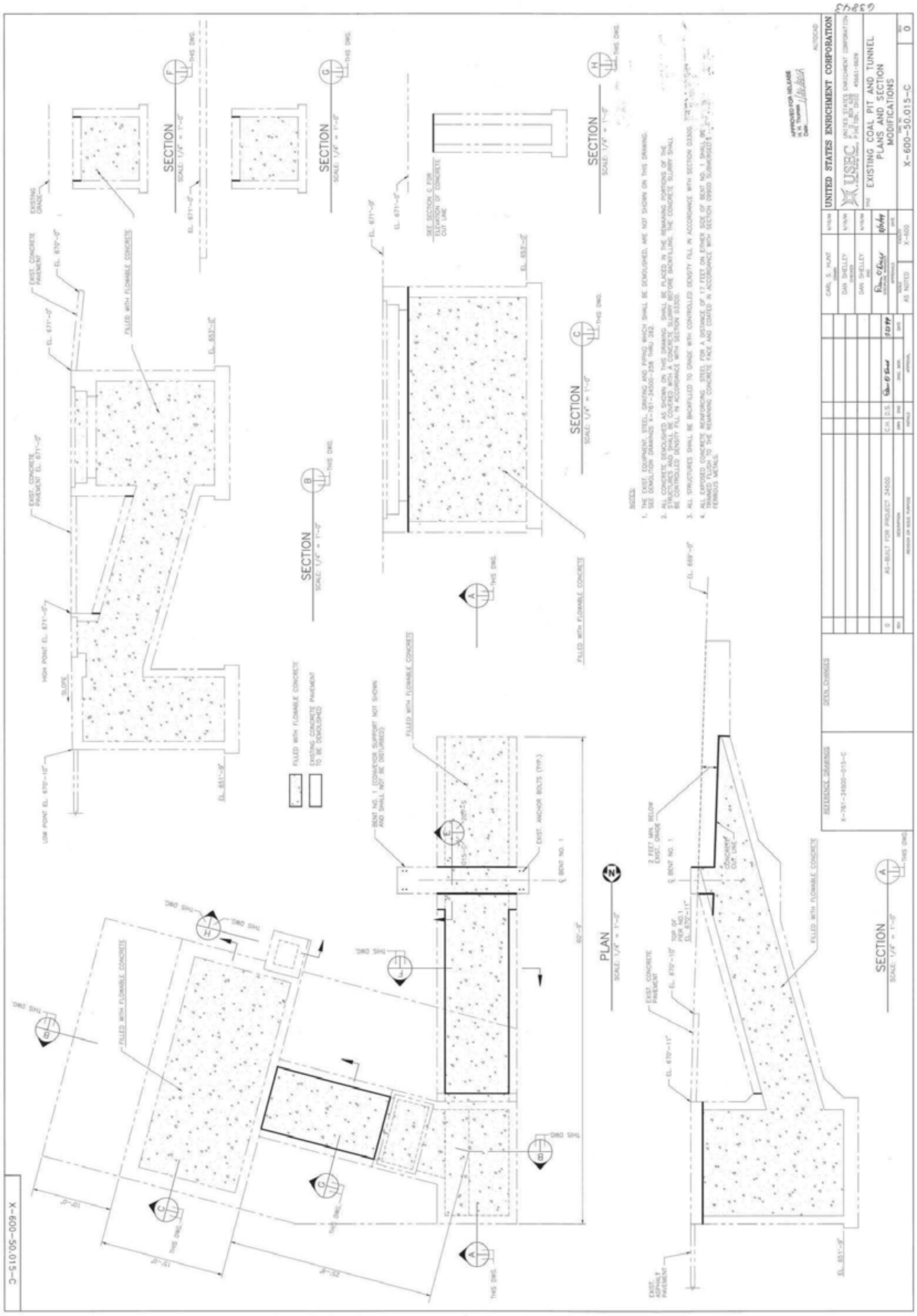

Figure 23: Existing Coal Pit and Tunnel Plans

Figure 24: Site Location Plan

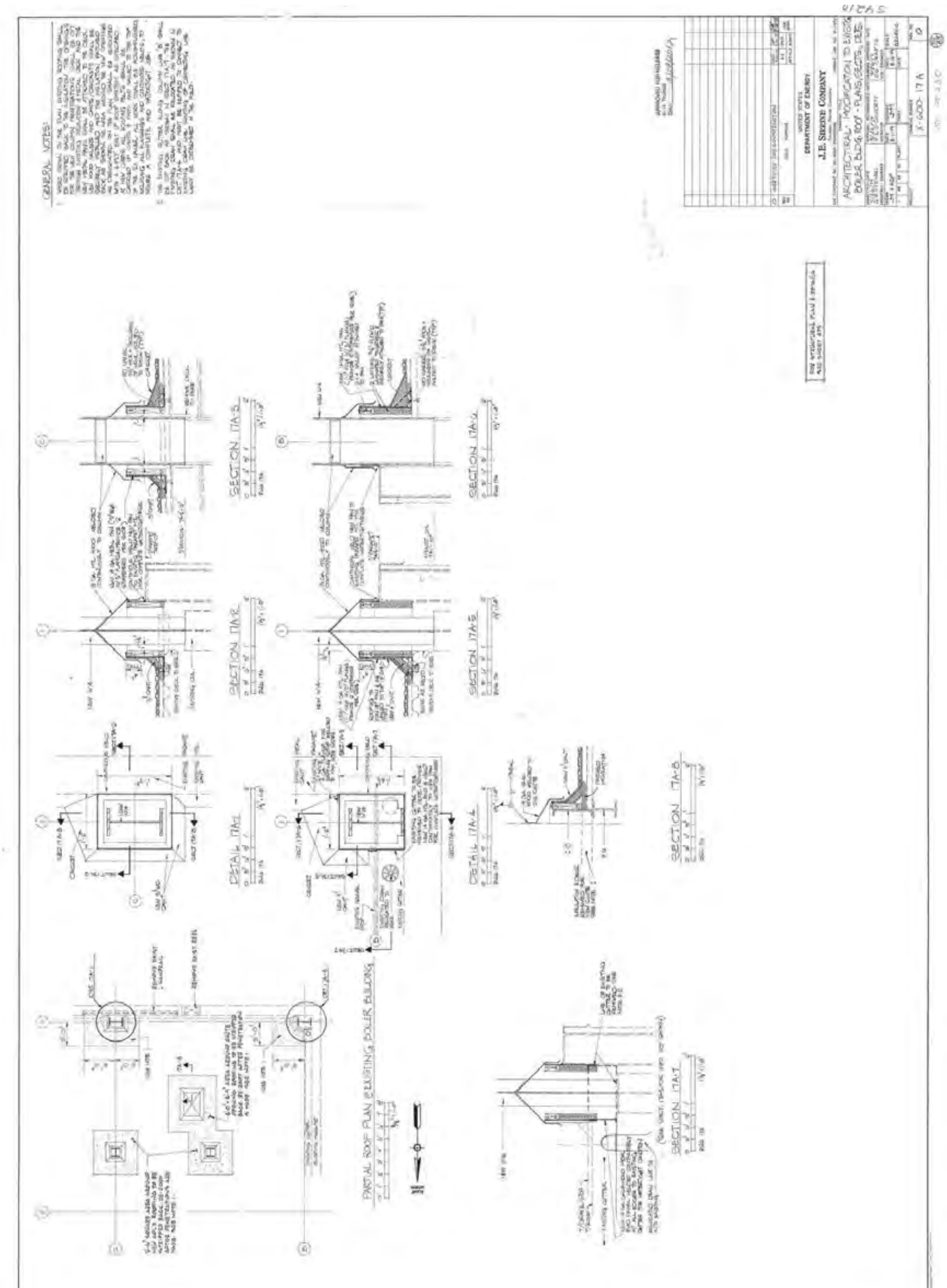

Figure 25: Modification to Existing Boiler Building Room

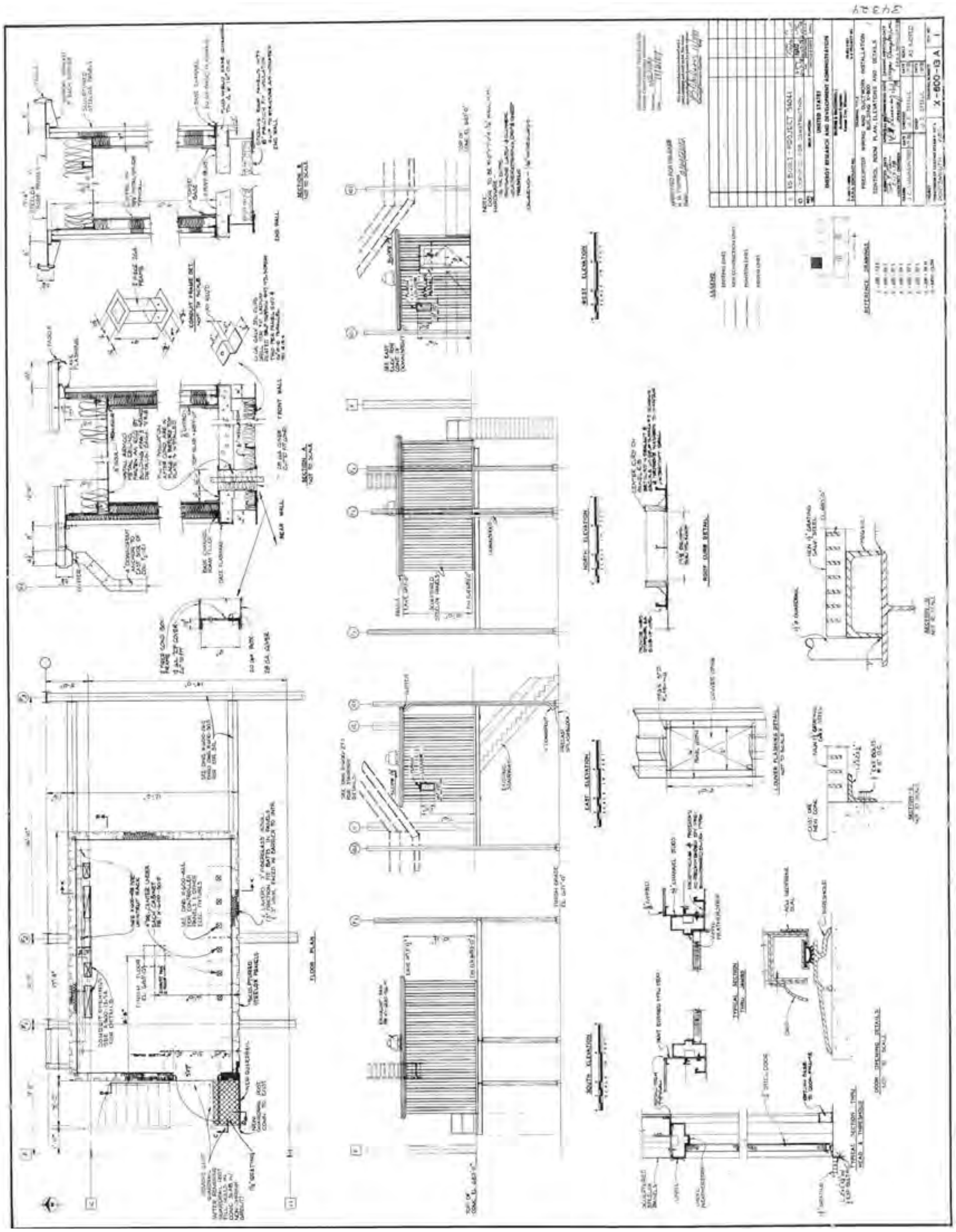

Figure 26: Wiring and Ductwork

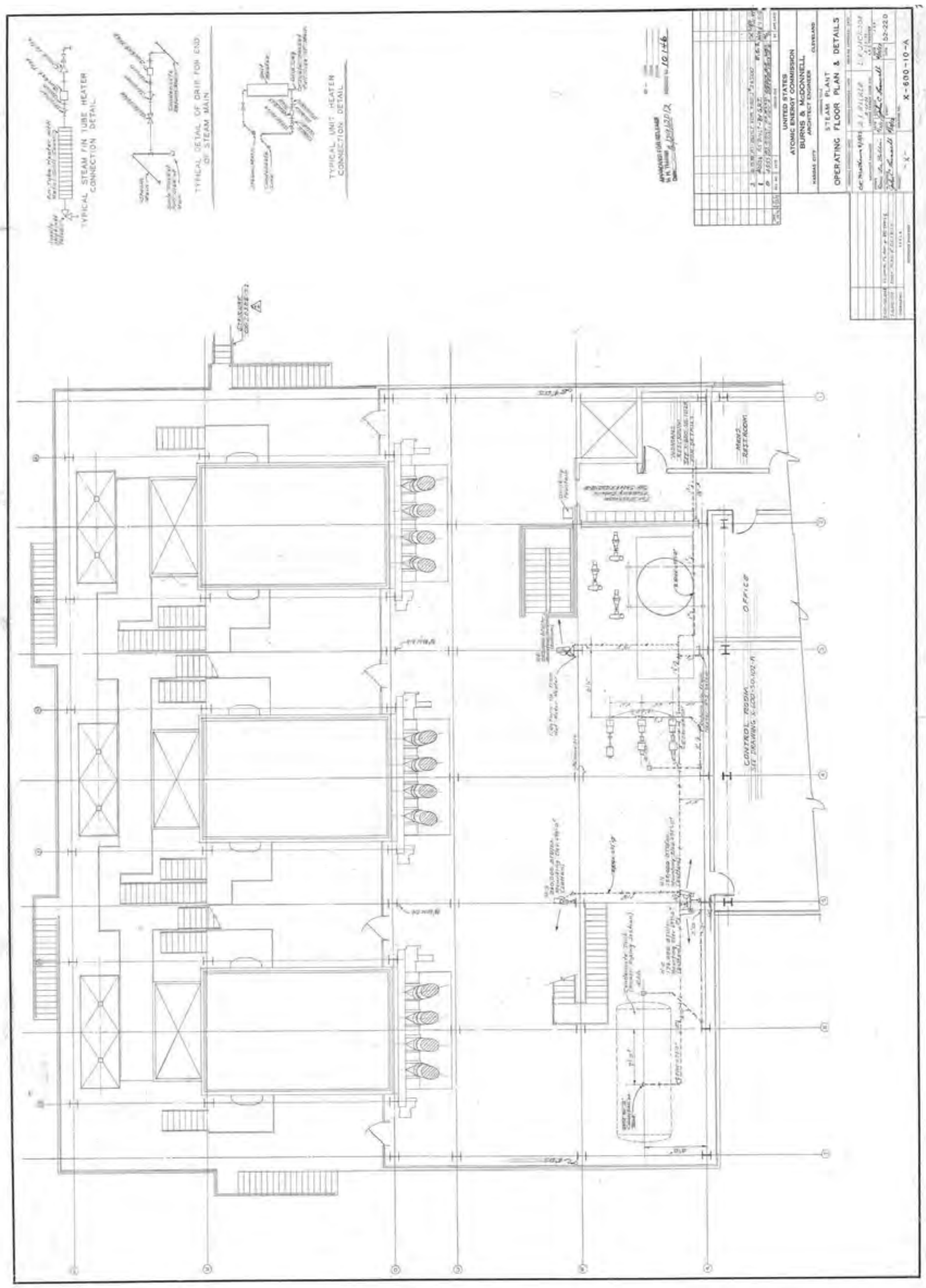

Figure 27: Operating Floor Plan and Details

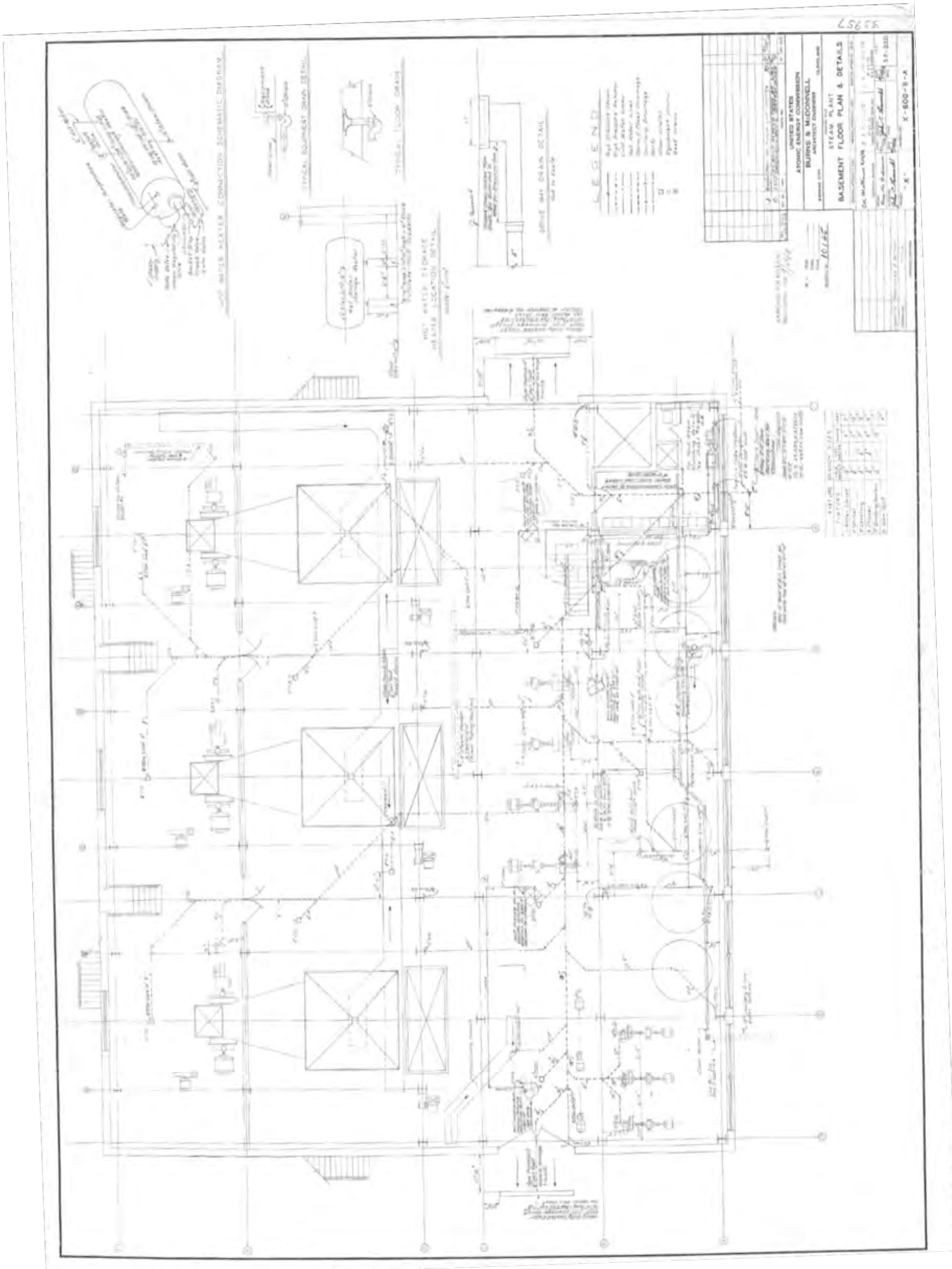

Figure 28: Basement Floor Plan and Details

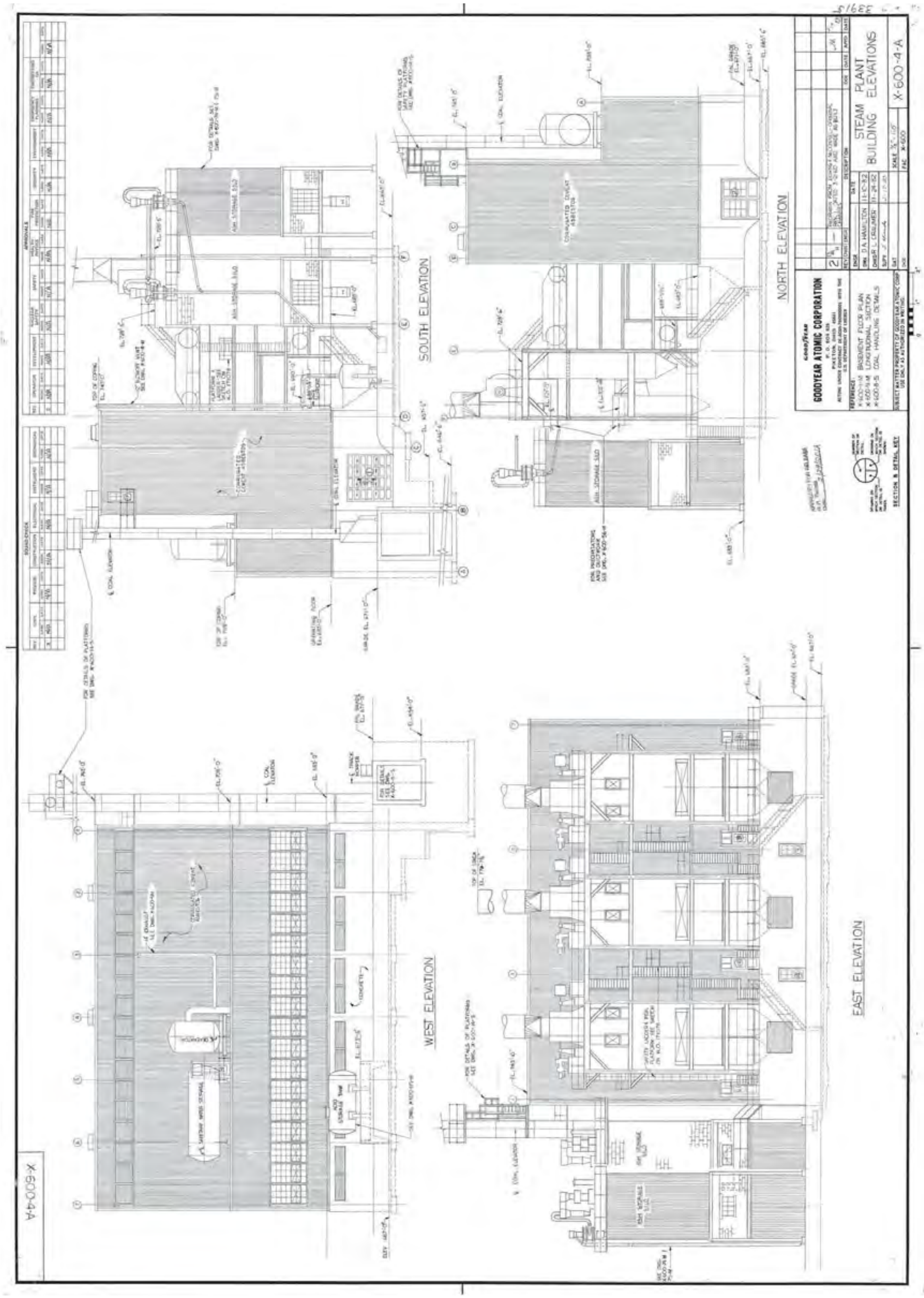

Figure 29: Elevations

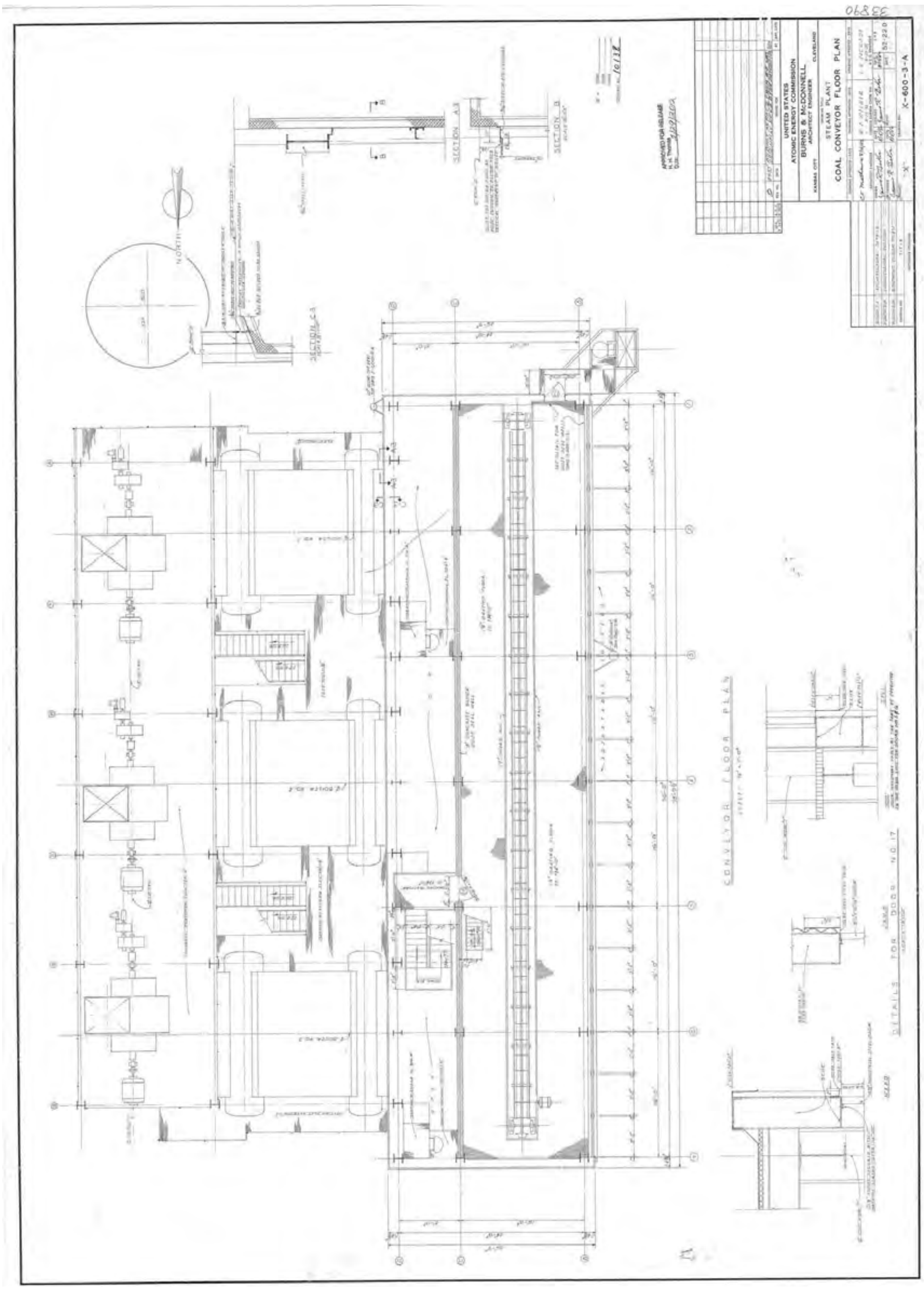

Figure 30: Coal Conveyor Floor Plan

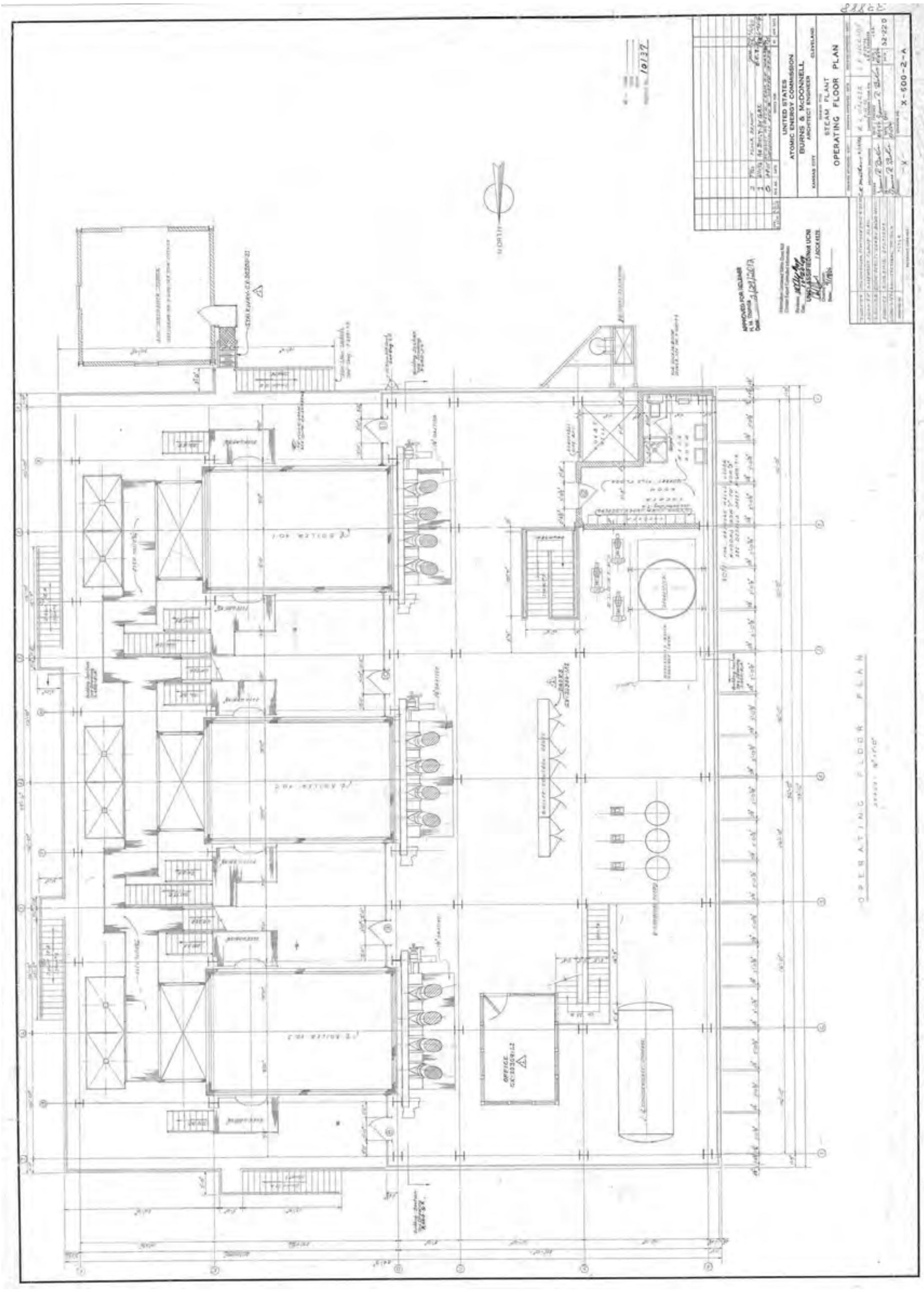

Figure 31: Operating Floor Plan

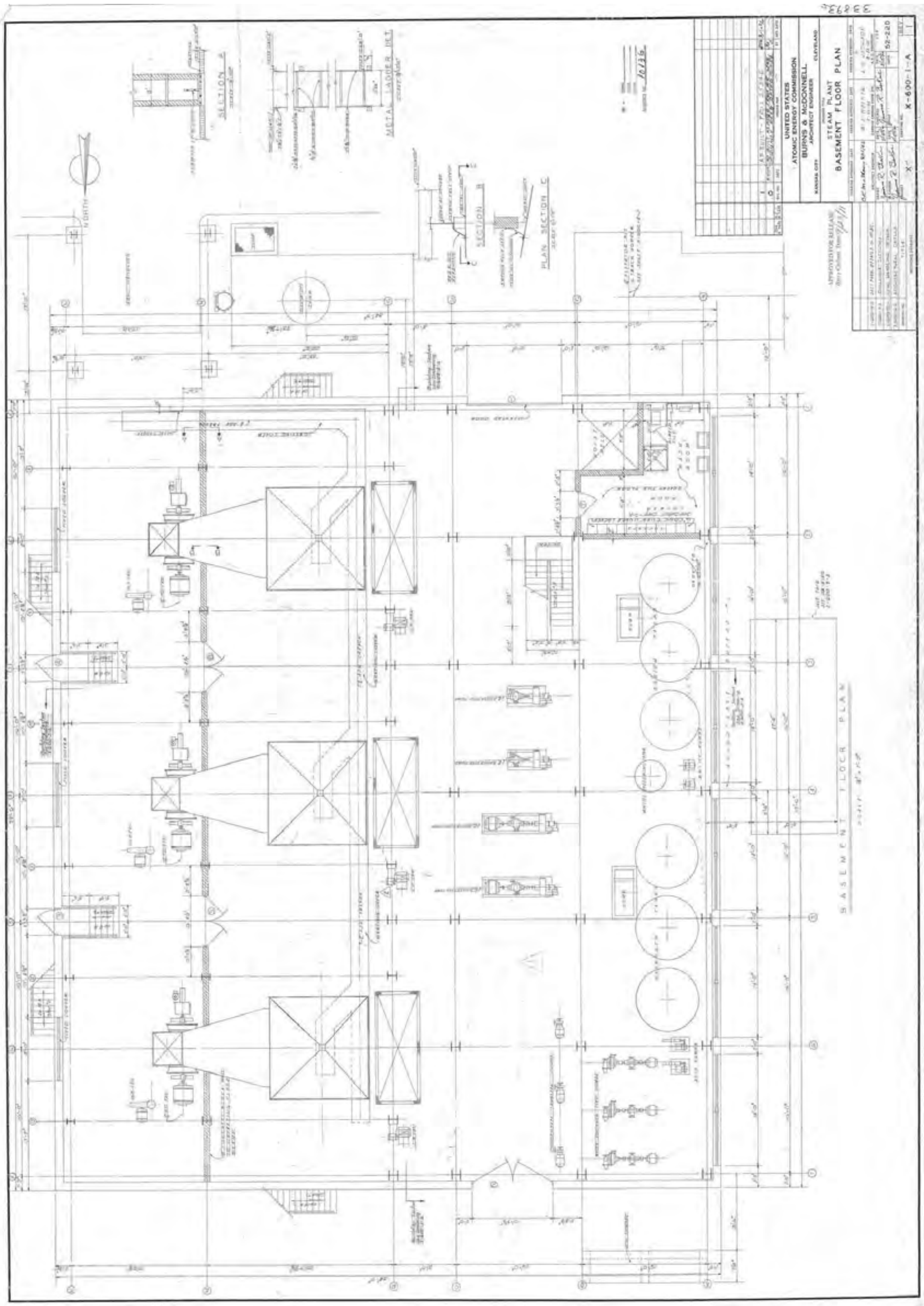

Figure 32: Basement Floor Plan

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-611 WATER TREATMENT PLANT
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-R
HAER OH-142-R

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-611 WATER TREATMENT PLANT

HAER No. OH-142-R

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-611 Water Treatment Plant is located at Ohio State Plane South coordinates at easting 1828699.981569 ft, northing 373454.492076116 ft and at Universal Transverse Mercator Zone 17N easting 327553.3789 m, northing 4321363.341 m. The coordinate represents the approximate center of the X-611 Water Treatment Plant building. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1954
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	Water Treatment
Significance:	The X-611 Water Treatment Plant provides water treatment for all water entering PORTS. This facility is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes. The plant has the design capacity to process 40 million gallon/day (gal/d). Assuming the average person uses 80-100 gallons of water per day (U.S. Dept. of the Interior U.S. Geological Survey), the typical operational level of 10 million gal/d at the X-611 is enough water to regularly service a city of 40,000 people. The total capacity (40 million gal/d) is about four times that much, emphasizing the need for PORTS to be able to support critical Cold War mission.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant,

HAER no.OH-142. This X-611 Water Treatment Plant HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-611 Water Treatment Plant:
Peter Kiewit Sons' Construction Company subcontracted the construction of the X-611 Water Treatment Plant to the Central Contracting Company of Oshkosh, Wisconsin. Excavation activities and foundation work for the X-611 Water Treatment Plant began in September 1953 and continued through the winter of 1954 (Appendix B, Figures 4 through 8).

The schedule of construction began with the sanitary water facilities, followed by the secondary settling basins, primary settling basins, chemical storage building, and the slow-mix basins. In February 1954, workers began erecting structural steel for the chemical storage building (Figure 9). By mid-June 1954, workers had completed much of the concrete work for the settling basins (Figures 10 and 11). The following month, workers began excavation of the sludge ponds (Figures 12). Electrical and mechanical work transpired from late October 1953 through early November 1954, at which time Central Contracting Company and its subcontractors had largely completed the X-611 Water Treatment Plant (Figure 13).

Historical drawings of building plans are provided in Appendix C (Figures 14 through 22).

Part II. Site Information

Description of the X-611 Water Treatment Plant:
The X-611 Water Treatment Plant is located in the northeast section of PORTS, just outside Perimeter Road. The plant includes a chemical storage building; sanitary water filtering and pumping plant (X-611C); a recarbonation instrumentation building (X-611D); settling basins; and a storage basin. The X-608 Raw Water Pump House, located near the east bank of the Scioto River, pumped raw river water to the X-611 Water Treatment Plant for treatment. For many years, the plant's water has been pumped from the X-608A and B well fields which currently bypasses the X-608 pumphouse. In addition, a second well field, X-6609, was added with the Gas Centrifuge Enrichment Plant. Water for plant operations is treated to reduce solids to no more than five parts per million. The X-611 Water Treatment Plant has a capacity of 40,000,000 gallons of water per day for plant operations; 36 million gallons per day for recirculating water make-up and 4,000,000 gallons per day for sanitary water. Water for sanitary use receives further treatment at the X-611C Sanitary Water Filtering and Pumping Plant. Once treated with chemicals, concrete tanks, located east of the X-611 Plant, store the sanitary water prior to use. The X-611C Sanitary Water Filtering and Pumping Plant can treat 4,000,000 gallons per day.

Built with steel framing and concrete blocks, the X-611 Water Treatment Plant Chemical Storage Building stands two stories tall and encloses 4,000 square feet of floor space. Utilitarian in its design, the building follows a simple, rectangular plan (Appendix A, Figures 1 through 3). The roof consists of a flat, concrete slab that slopes from east to west. Fenestration at the first story is comprised largely of 15-light steel, industrial sash awning windows. Fenestration at the second story consists predominantly of 12-light steel, industrial sash awning windows. Pedestrian entrances are secured by hollow, steel doors.

The interior of the first floor includes a heater room, chemical feed room, storage for 1 ton chlorine containers, chlorine scales, chlorine feed room, laboratory, control room, and a restroom. The second floor includes a battery room and a bag storage room for chemicals. Also located on the second floor are the dry-feed machine extension hoppers and conveyor equipment. This equipment feeds lime and ferric sulphate to the feed machine hoppers.

A set of three chemical storage silos are located immediately to the east of the X-611 Plant. Built of concrete, the tanks stand 47' tall and have a diameter of 22'. The tanks store ferric sulfate and lime. Chlorine feed from the main building was discontinued, along with the use of ferric sulphate. The ground floor includes three lime slakers. A polymer is added to the raw water to aid in flocculation and settling of the solids.

Large, semi-circular and square-shaped mixing and settling basins are located to the west and south of the X-611 Water Treatment Plant Chemical Storage Building. Built as a single, monolithic concrete structure, the basins cover an area of 113,050 square feet. The basins are arranged in two groups, with one serving as the primary group, and the second serving as the secondary group. The primary group of basins includes an influent line and meter vault, rapid-mix and slow-mix basins, and settling basins. The secondary group of basins consists of two slow-mix basins and four secondary settling basins, which serve as the final stage of water treatment.

When water was originally sourced from the river, a butterfly valve at the X-608 Raw Water Pump House controlled the flow rate to the X-611 Water Treatment Plant. The flow is now controlled by starting and stopping wells in the two well fields. Water entering the X-611 Water Treatment Plant passes through one of three Venturi meters. Two of the three lines empty into the primary rapid-mix basins, with the third line dividing its flow to the secondary rapid-mix basin and the rapid-mix bypass channel. As water flows into the primary rapid-mix basins, vertical shaft mixers maintain a steady mixture of chemicals and raw water. The secondary basins feature similar equipment as that found in the primary basins. These basins provided the additional treatment necessary for sanitary water when the plant operated on water pumped from the Scioto River and have not been used for active treatment since the 1960s.

The semi-circular shaped basin, located toward the southeast corner of the X-611 Water Treatment Plant, functions as an equalizing basin. This basin stores about 1 million gallons of process water. Water depth in the equalizing basin varies from 7 to 14', with surface area totaling about 29,500 square feet.
A 42"-diameter pipe connects the equalizing basin to the X-611 Water Treatment Plant effluent.
The equalizing basin includes a 15' long overflow weir, which empties into a 30" vitrified tile pipe.

Influent and effluent from the basins is facilitated with manually-operated sluice gates. Sludge, generated by the settling process, exits the basins with the assistance of sludge return boxes and sludge pumps. Waste sludge is pumped into sludge lagoons located east of the basins.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0207&D4. Piketon, OH:U.S. Department of Energy, October 2011.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio,* DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

Figure 1: Location and Orientation of Exterior Photographs (2 and 3)

Figure 2: South Side of the X-611 Water Treatment Plant, August 2014, Facing Northeast

Figure 3: North Side of the X-611 Water Treatment Plant, August 2014, Facing South

Appendix B: Historical Photographs

Figure 4: Excavation Work for the X-611 Water Treatment Plant, Looking East, October 1953

Figure 5: Excavation Work for the X-611 Water Treatment Plant, Looking Southwest, January 1954

Figure 6: The X-611 Water Treatment Plant Construction Site, October 1954

Figure 7: The X-611 Water Treatment Plant Construction Site, October 1954

Figure 8: Foundation Work for the X-611 Water Treatment Plant, October 1954

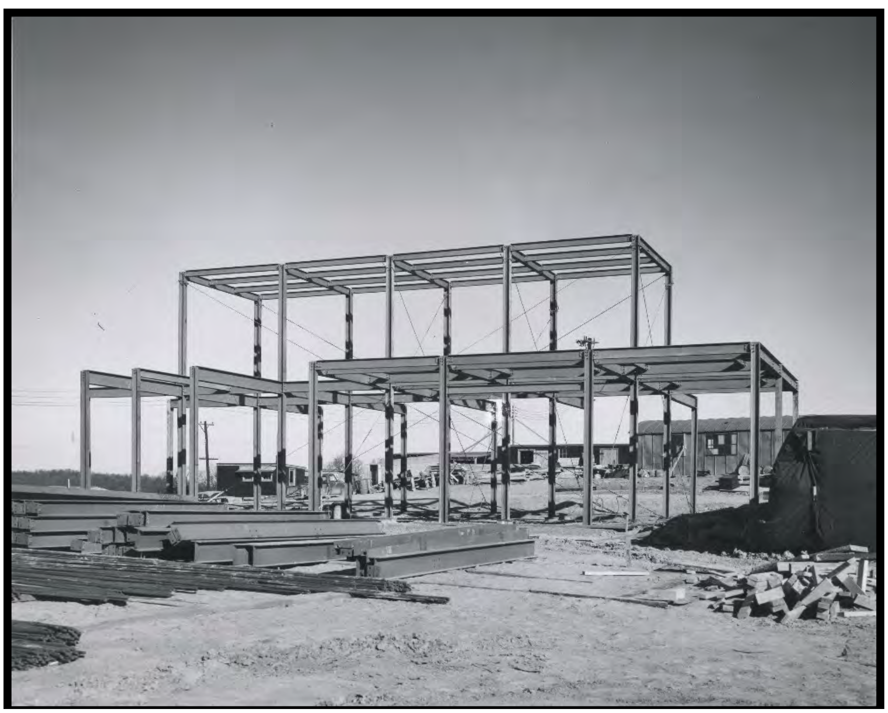

Figure 9: Steel Framework for the X-611 Water Treatment Plant Chemical Building, July 1954

Figure 10: Construction of the X-611 Water Treatment Plant Settling Basins, June 1954

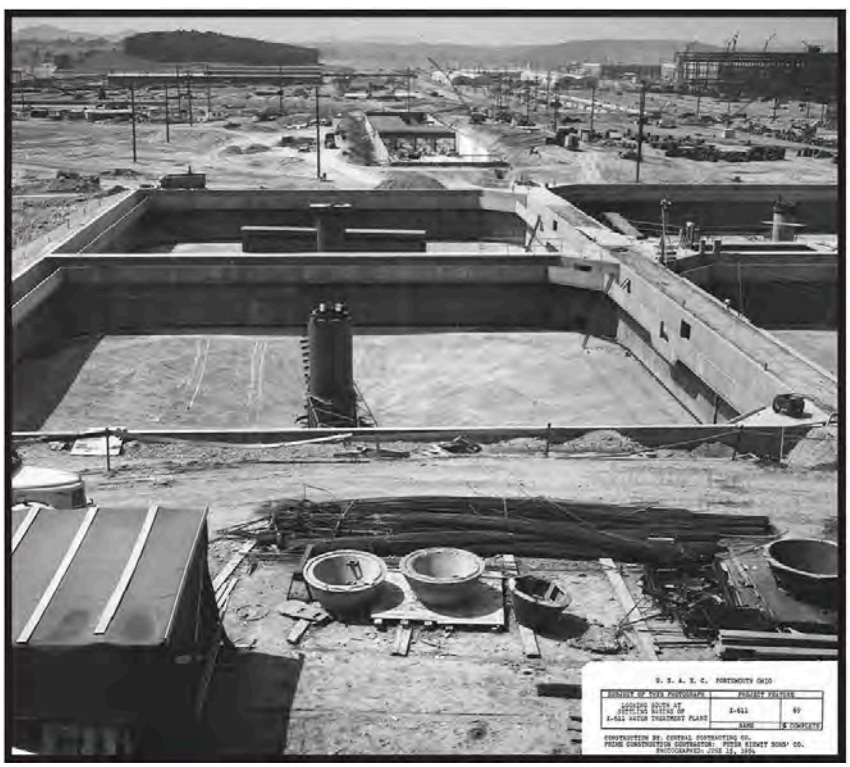

Figure 11: Construction of the X-611 Water Treatment Plant Settling Basins, June 1954

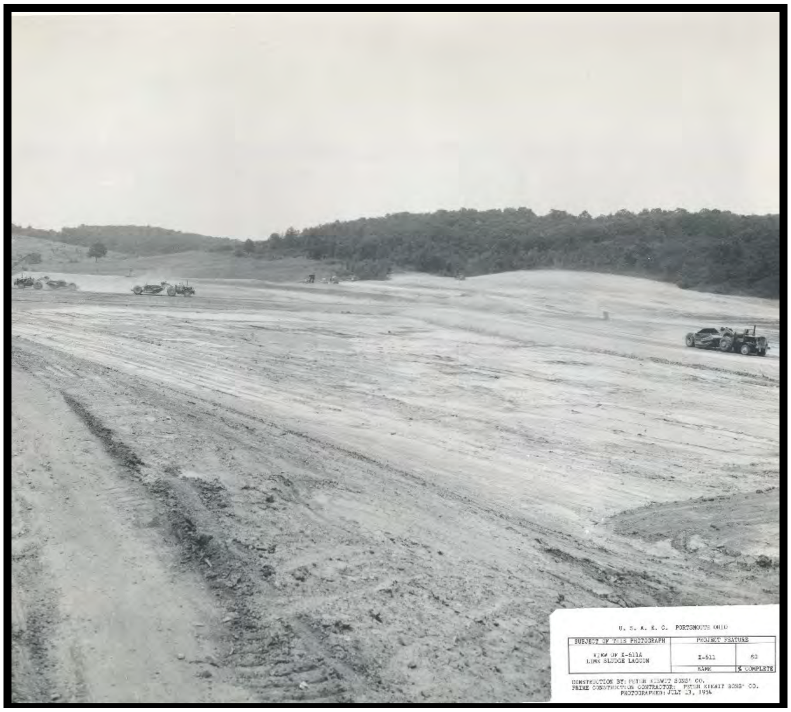

Figure 12: Excavation Work for the X-611A Lime Sludge Lagoon, July 1954

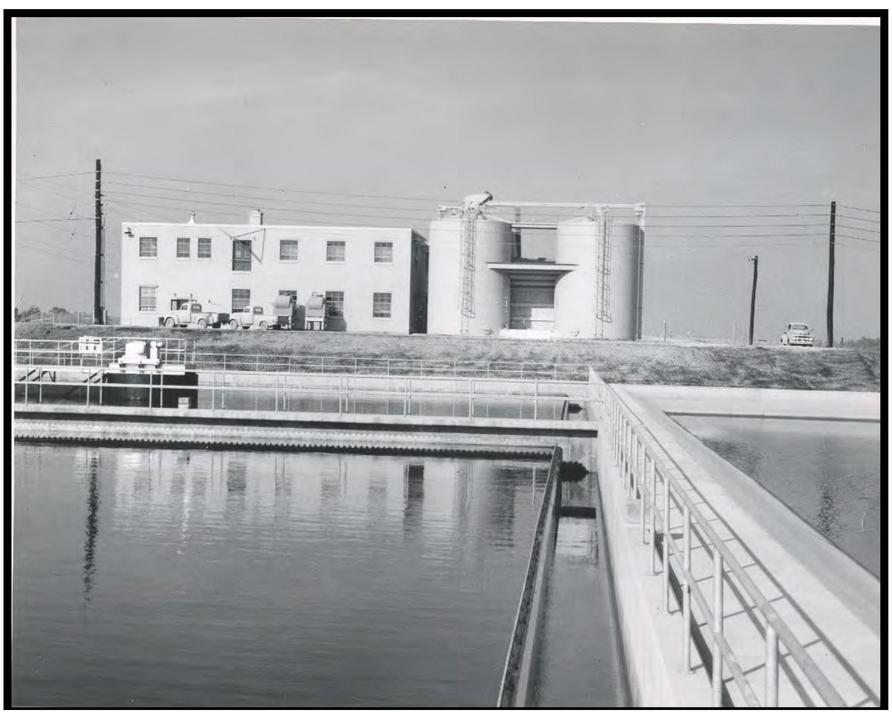

Figure 13: The X-611 Water Treatment Plant, 1955

Appendix C: Historical Drawings

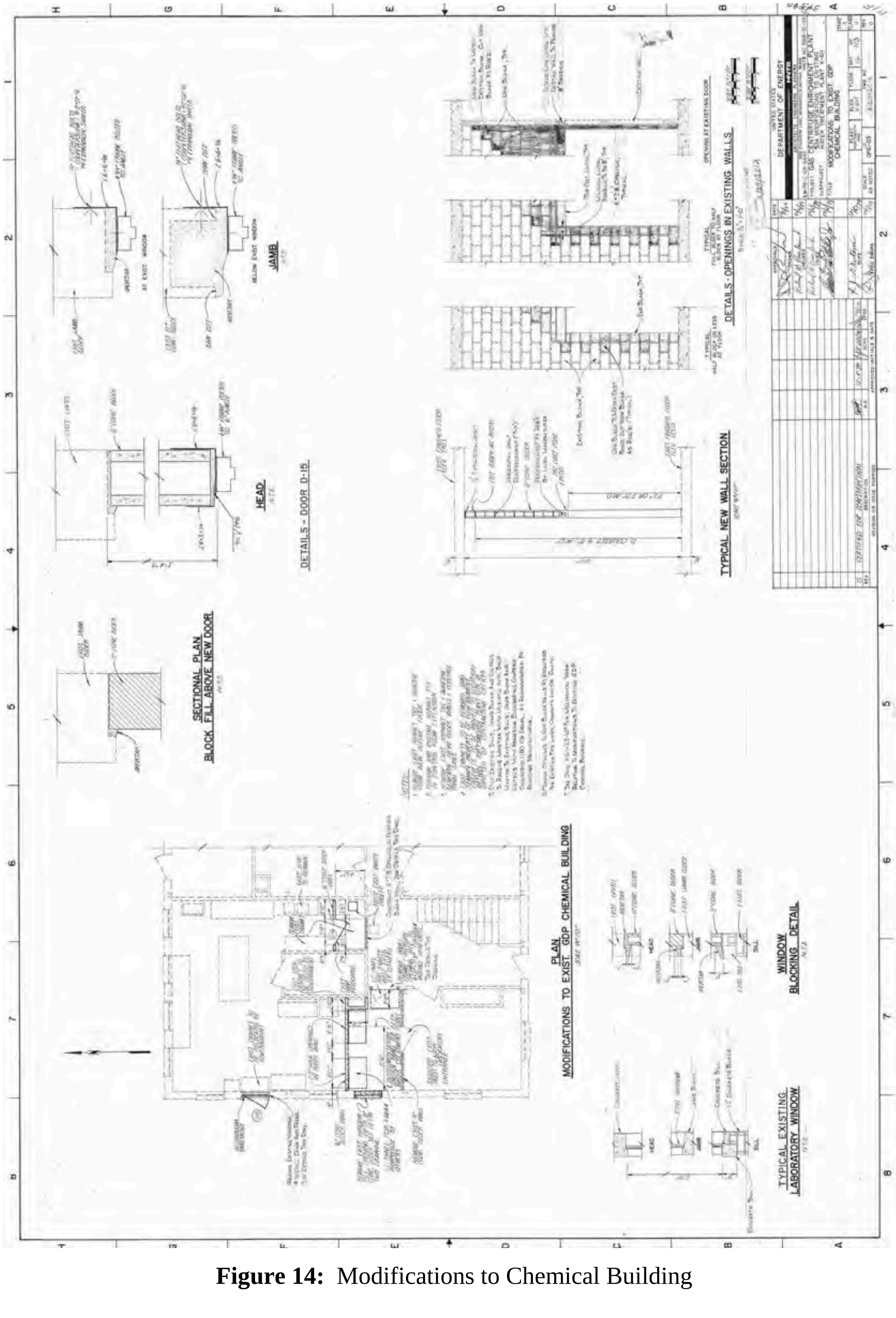

Figure 14: Modifications to Chemical Building

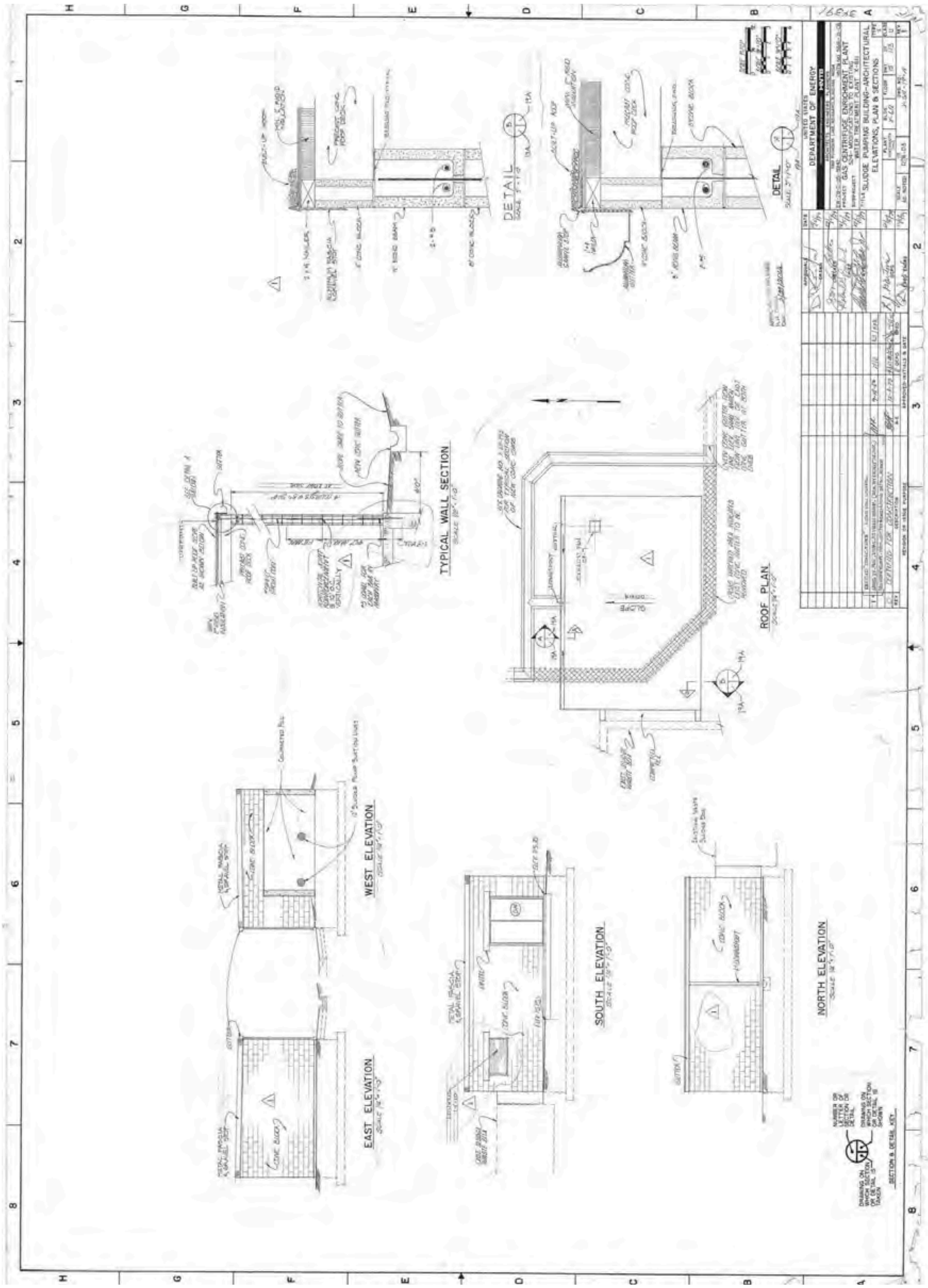

Figure 15: Sludge Building Elevations and Plan

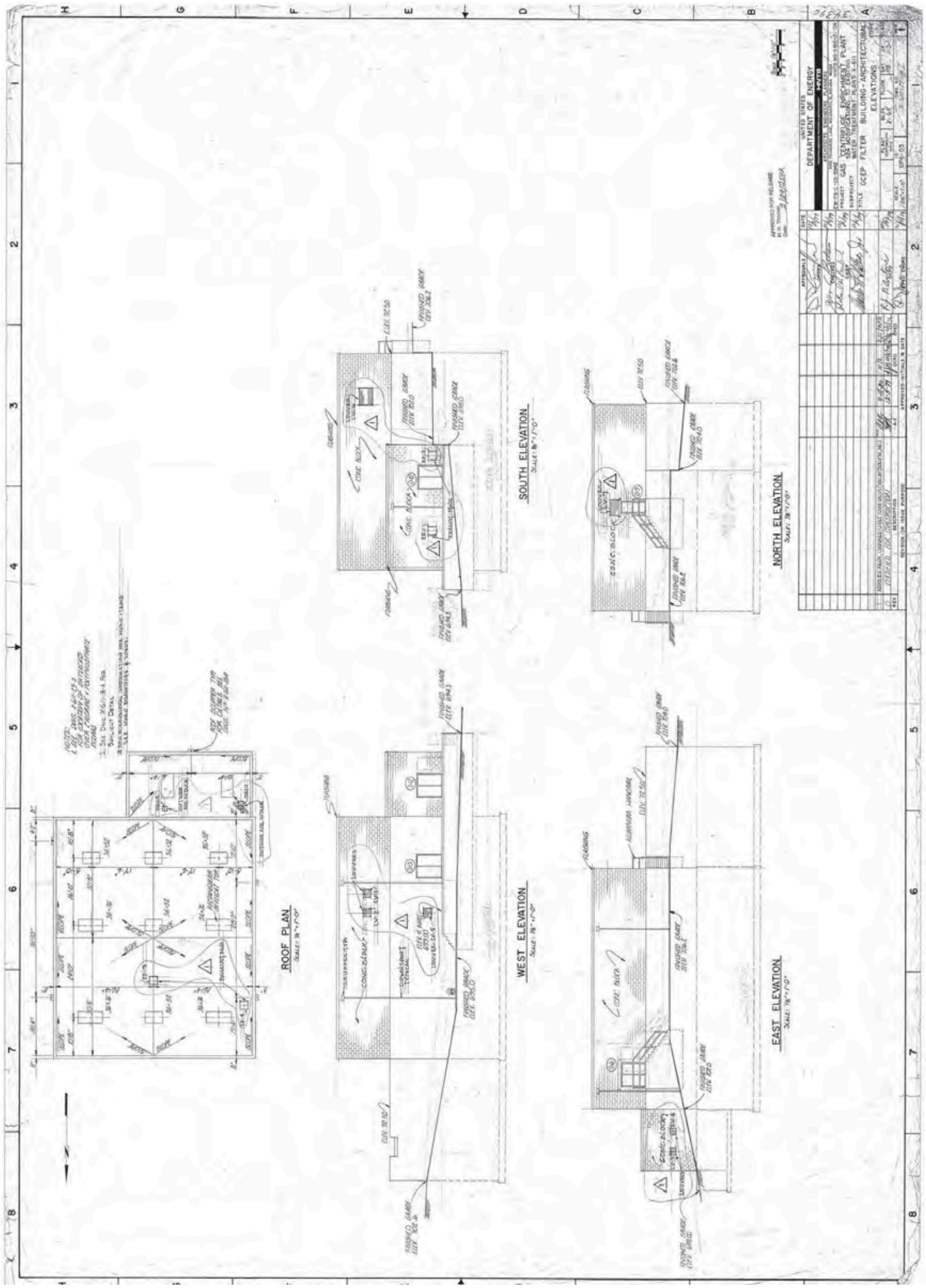

Figure 16: Filter Building Elevations

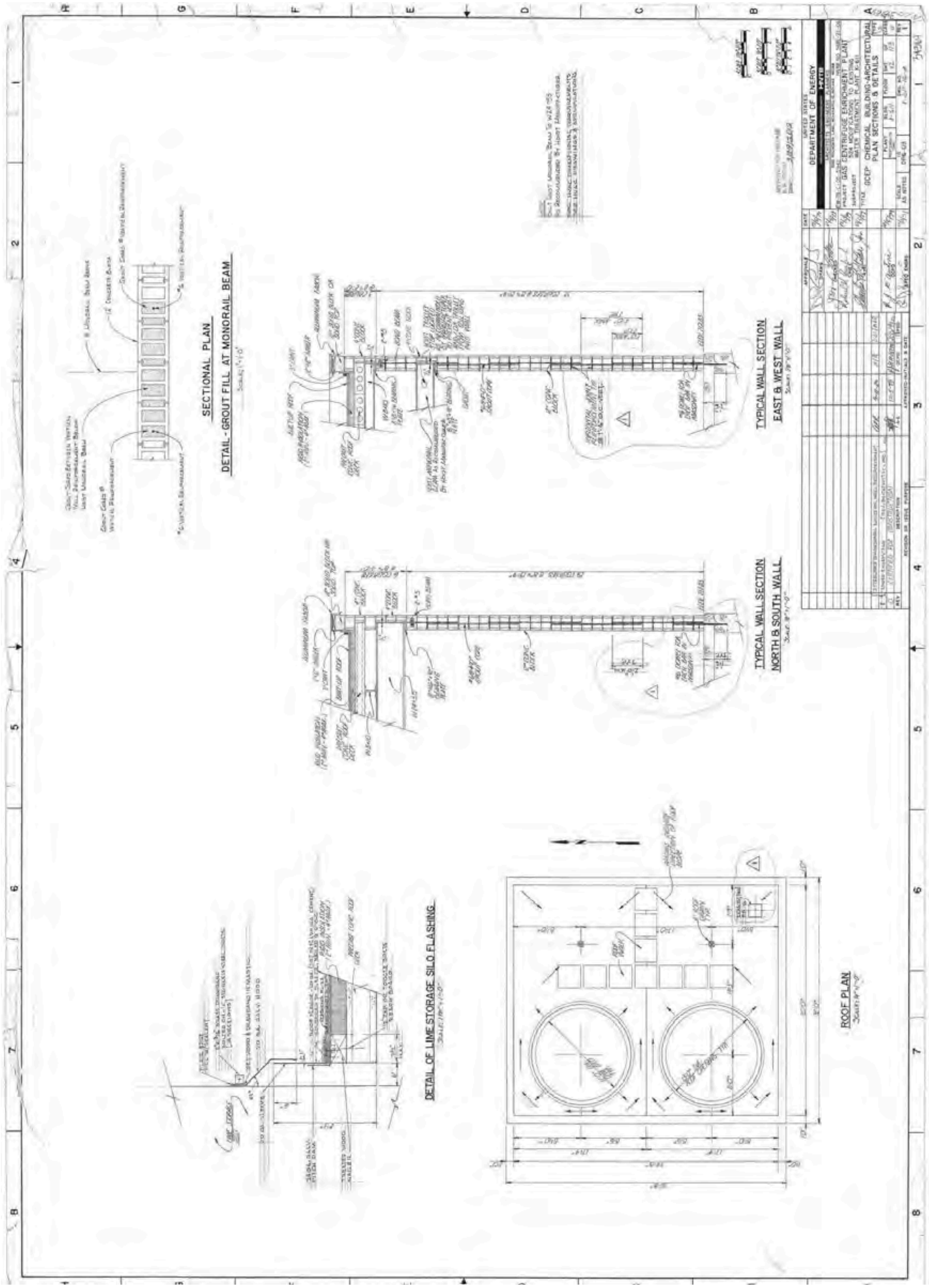

Figure 17: Chemical Building Plan and Details

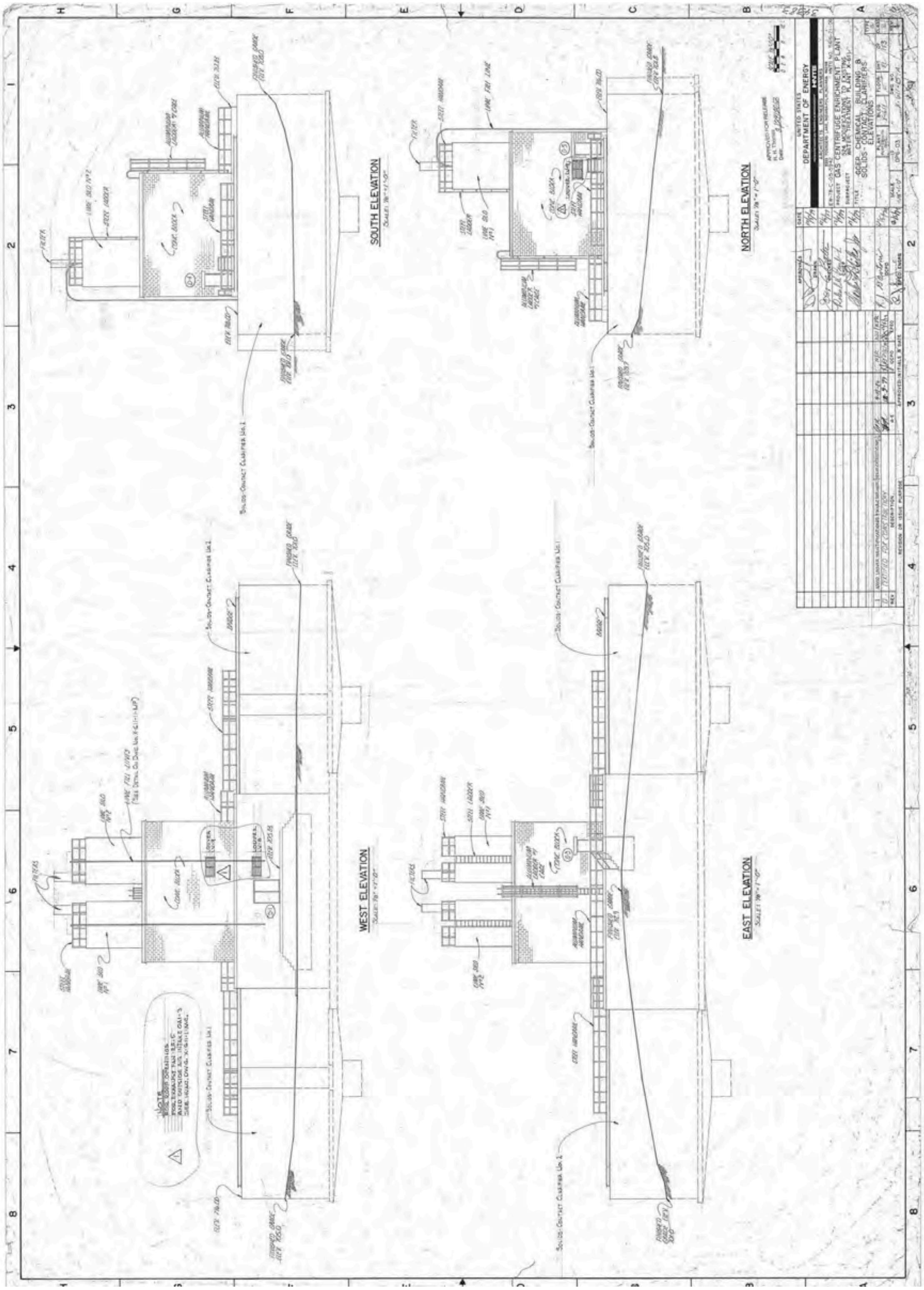

Figure 18: Chemical Building Elevations

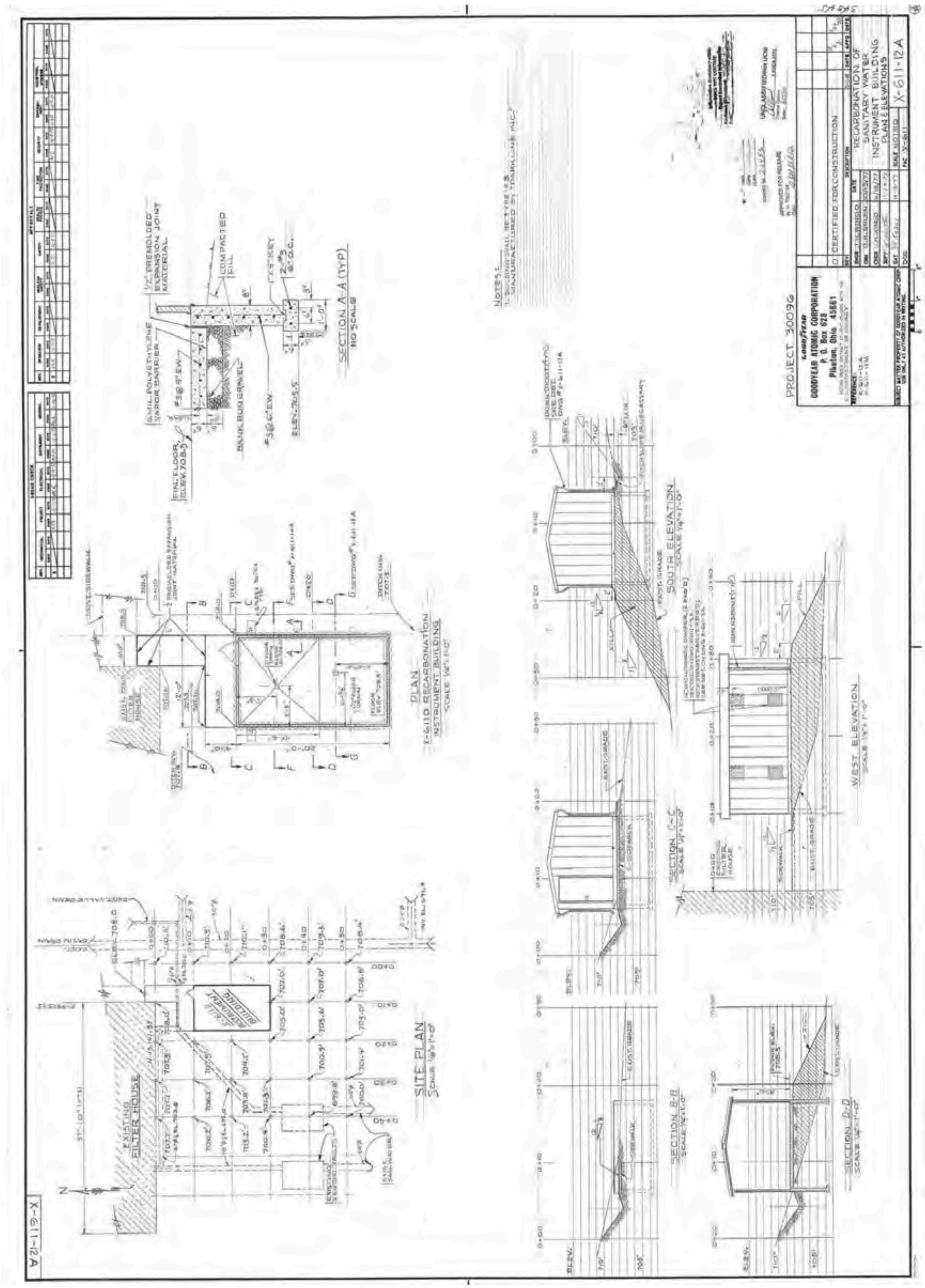

Figure 19: Sanitary Water Instrument Building Plan and Elevations

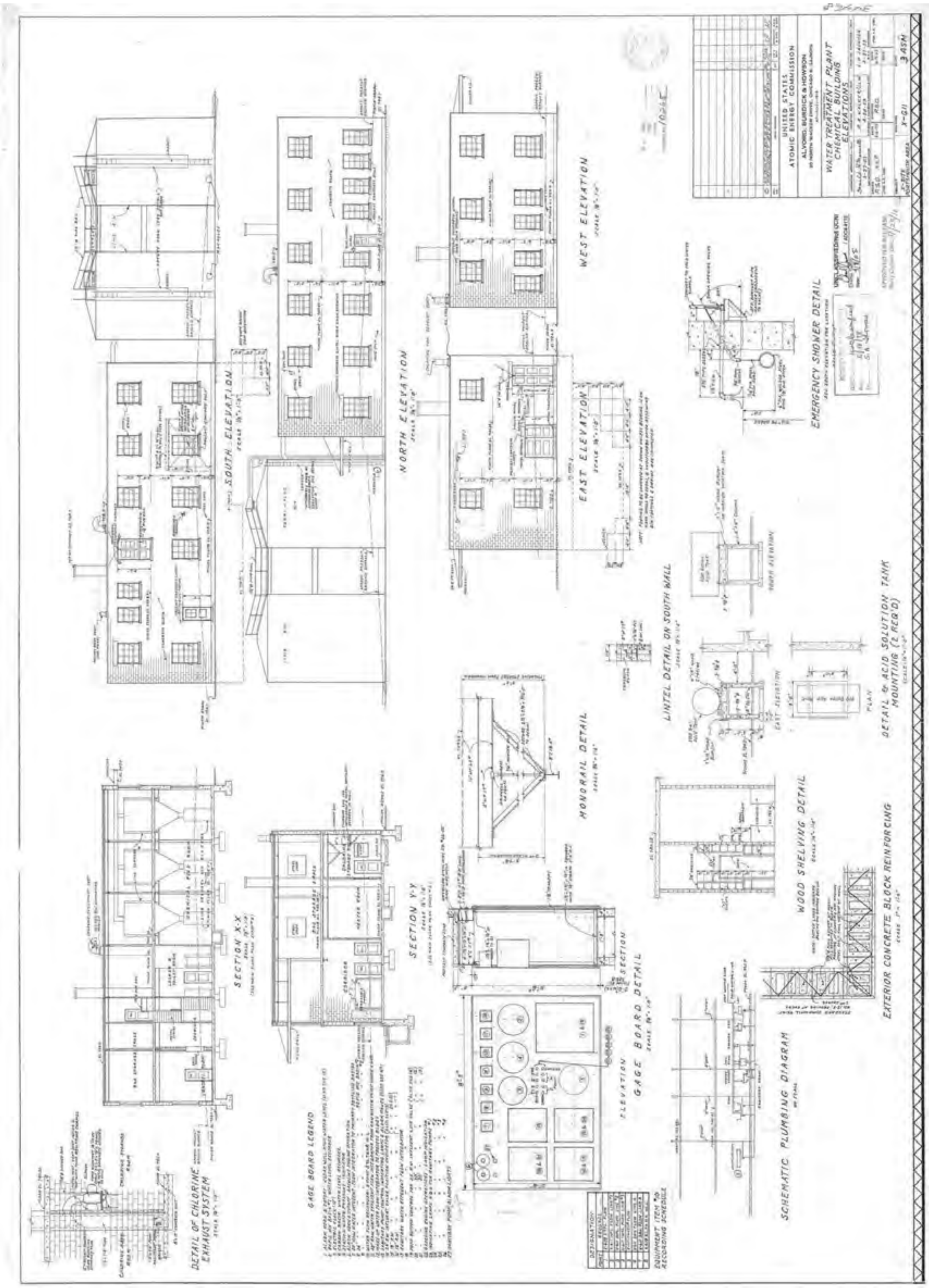

Figure 20: Chemical Building Elevations

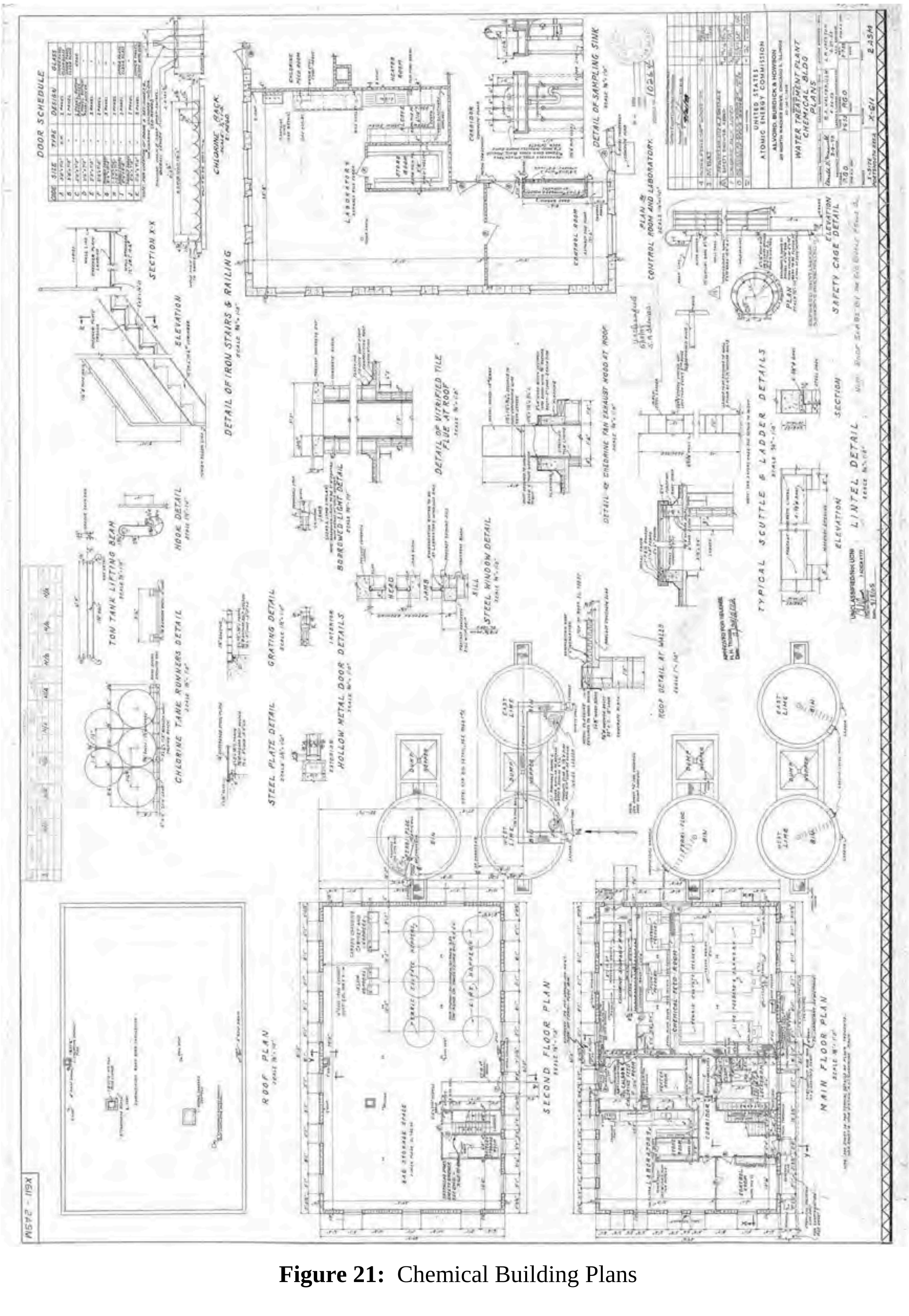

Figure 21: Chemical Building Plans

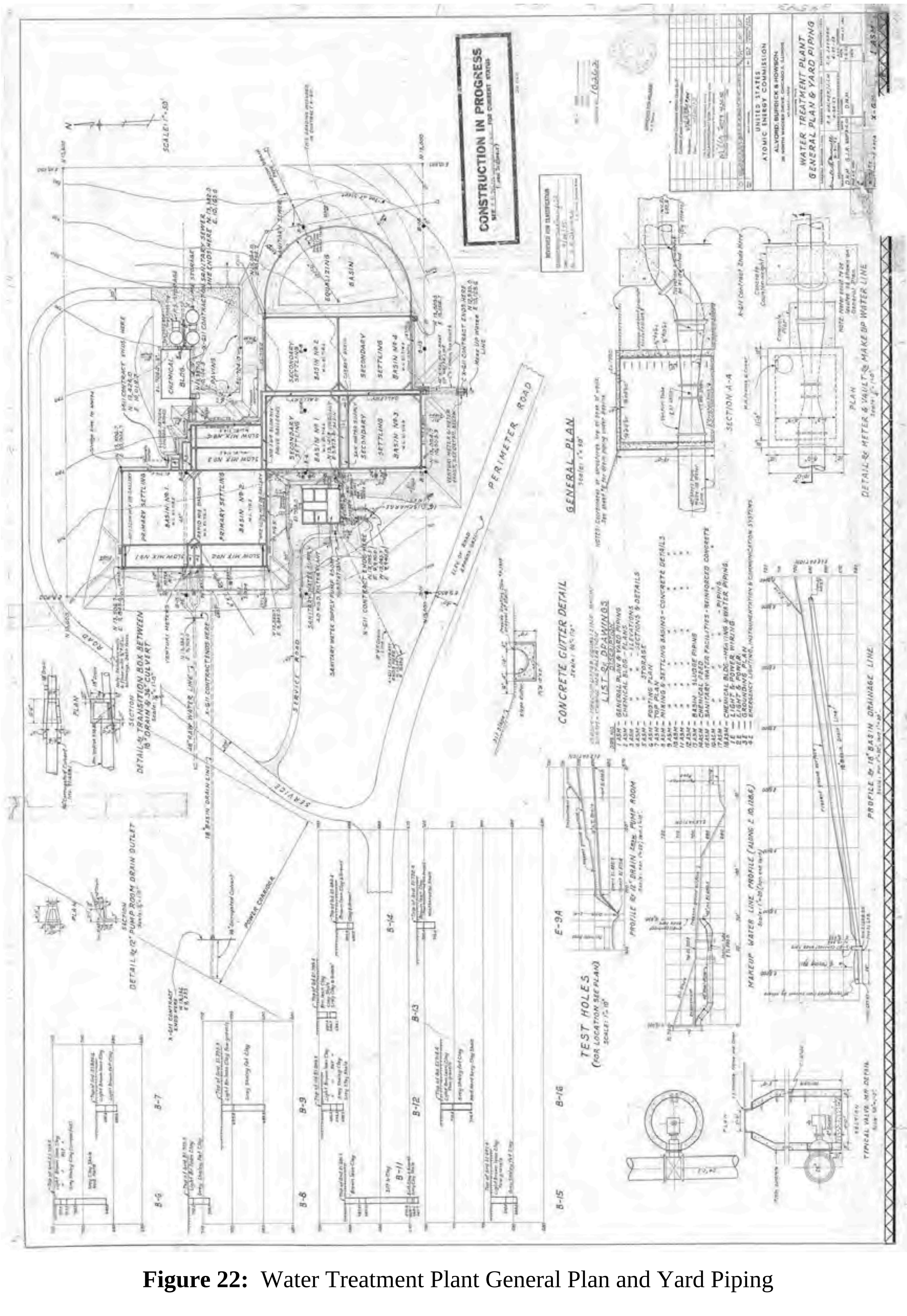

Figure 22: Water Treatment Plant General Plan and Yard Piping

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-612 ELEVATED WATER TANK
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-S

HAER OH-142-S

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-612 ELEVATED WATER TANK

HAER No. OH-142-S

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-612 Elevated Water Tank is located at Ohio State Plane South coordinates at easting 1824529.506314 ft, northing 371777.231478027 ft and at Universal Transverse Mercator Zone 17N, easting 326273.9633 m, northing 4320873.078 m. The coordinate represents the approximate center of the X-612 Elevated Water Tank. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1953
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration (was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	Water storage
Significance:	The X-612 Elevated Water Tank is a sanitary water storage and head tank that provides a source of water for the Sanitary Fire Water system which services the plant for all except the process buildings and the X-343 building. The X-612 Elevated Water Tank stands at 170' above a below ground concrete foundation and has a capacity of 250,000 gallons. Due to its height above the surrounding terrain, the X-612 Water Tank is visible for miles around PORTS and has been a visual landmark of the presence of PORTS and its historic mission. This structure is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-612 Elevated Water Tank HAER was completed in 2021.

Part I. Historical Information

Construction History of the X-612 Elevated Water Tank:

Peter Kiewit Sons' Company subcontracted Chicago Bridge and Iron Company of Chicago, Illinois for construction of the X-612 Elevated Water Tank. Peter Kiewit Sons' Construction Company coordinated work at the site. Excavation was undertaken in August and September 1953, with approximately 420 total cubic yards excavated. Foundation work required approximately 175 cubic yards of concrete placed between September and November 1953. The tower and tank used approximately 157 tons of structural steel and were erected from August to October 1953. The final stage of construction involved painting the structure, which occurred between October and November 1953. The X-612 Elevated Water Tank provides high pressure water for the sprinkler systems in the process buildings and the cooling towers.

Part II. Site Information

Description of the X-612 Elevated Water Tank:

The X-612 Elevated Water Tank is located in the north-western section of PORTS, just west of the northern end of the X-330 Process Building. The water tank consists of a cylindrical tank with a domed top and bottom supported 170' above the foundations by six round legs (Appendix A, Figure 2). A central column connects the main tank with the valve pit at the base of the tower. The tank holds approximately 250,000 gallons of water supplied from the sanitary water system. The X-612 Elevated Water Tank is painted alternating bands of red and white.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0207&D4. Piketon, OH: U.S. Department of Energy, October 2011.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio*, DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

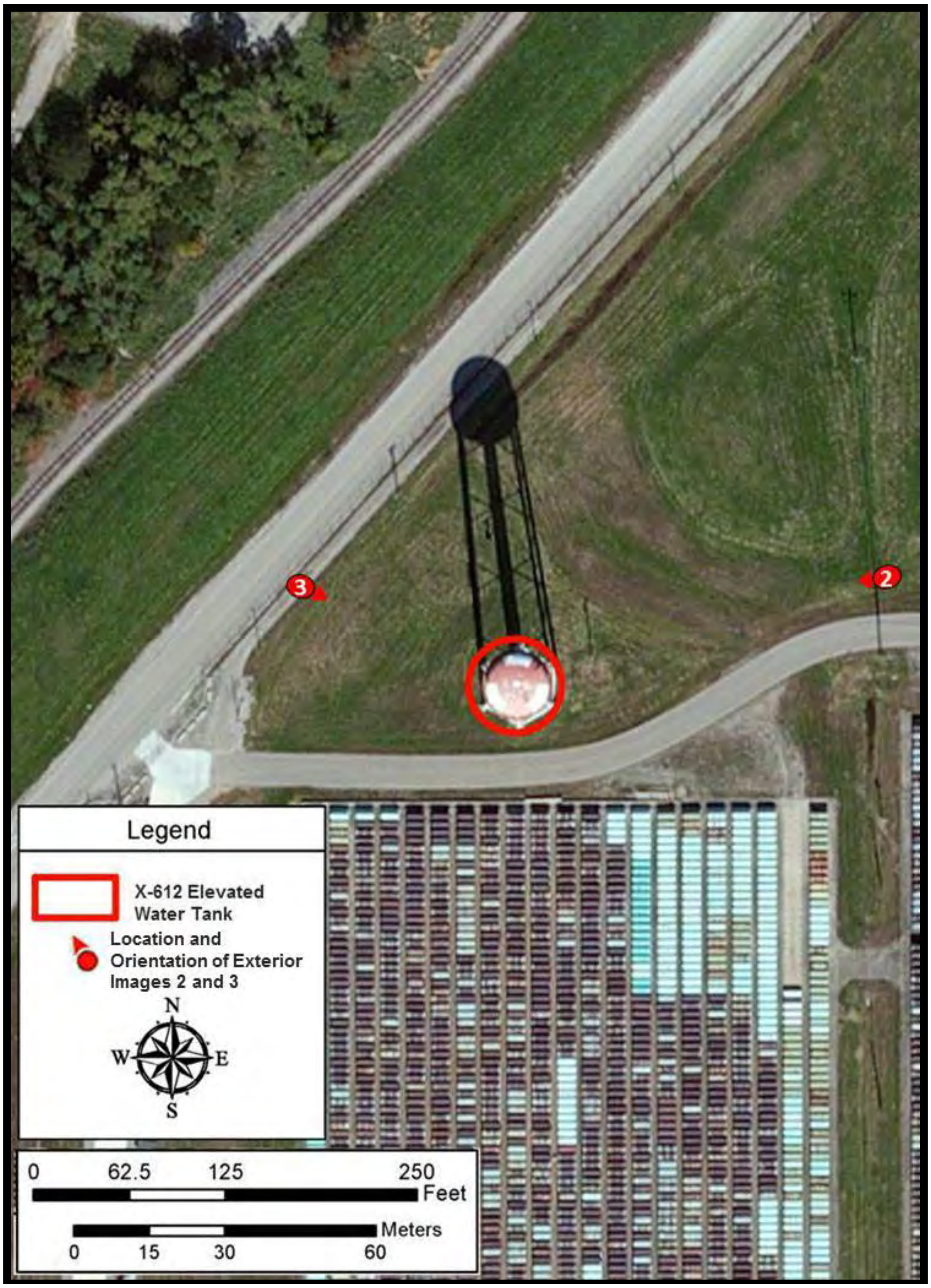

Figure 1: Location and Orientation of Exterior Photograph (Figure 2), Cylinders in Foreground

Figure 2: Northeast Side of the X-612 Elevated Water Tank, Facing Southwest (ca. 1980s)

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-614A SEWAGE PUMPING STATION
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-T

HAER OH-142-T

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-614A SEWAGE PUMPING STATION

HAER No. OH-142-T

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-614A Sewage Pumping Station is located at Ohio State Plane South coordinates at easting 1826376.222858 ft, northing 369476.168001823 ft and at Universal Transverse Mercator Zone 17N, easting 326825.243 m, northing 4320162.542 m. The coordinate represents the approximate center of the X-614A Sewage Pumping Station. This coordinate was obtained on June 20, 2019, by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1955
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	Sewage pumping station
Significance:	The X-614A Station was provided in the outfall main of the sanitary sewer system to pump sanitary waste from the plant area collecting system into a force main, which discharges into the X-6619 Sewage Treatment Plant. The X-614A Sewage Pumping Station is part of PORTS, which is part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-614A Sewage Pumping Station HAER was completed in 2021.

Part I. Historical Information

Construction History of the X-614A Sewage Pumping Station:
The X-614A Sewage Pumping Station was provided in the outfall main of the sanitary sewer system to pump sanitary wastes from the plant area collecting system into a force main, which discharges into the sewage treatment plant. Peter Kiewit and Sons' Company and their principal subcontractors built the facility from February to October 1954.

Part II. Site Information

Description of the X-614A Sewage Pumping Station:
The X-614A Sewage Pumping Station is located immediately south of the X-330 Process Building. The X-614A Sewage Pumping Station is a small, square-shaped, utilitarian building that measures, roughly, 15' square (Figures 1 through 3). Built of cinderblocks, the building stands from 8 to 10' tall. The building is covered with a flat roof that slopes from north to south. A single pedestrian door is located at the south end of the building's east wall. The building rests atop an underground pumping vault.

Controls and pumping equipment motors are located on the interior of the pump house, as well as manholes providing access to the underground pumping vault. Measuring approximately 15' wide by 29' long, the vault is slightly larger than the pump house. The vault extends 27' below the bottom of the pump house. The vault is divided into two sections, with pumps, valves, and piping located in a dry well, and sewage storage located in a wet well.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0207&D4. Piketon, OH: U.S. Department of Energy, October 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

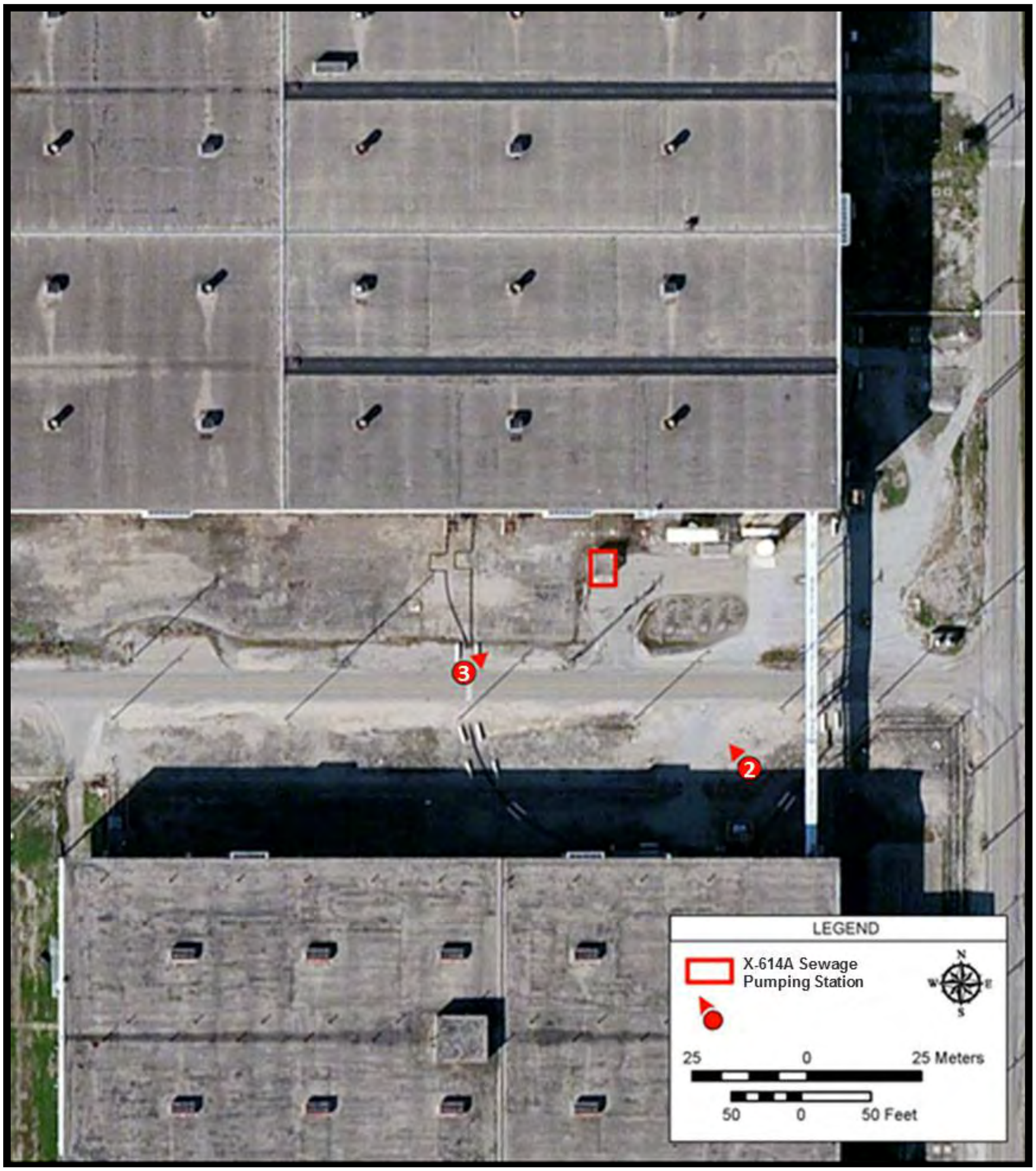

Figure 1: Location and Orientation of Exterior Photographs (2 through 3)

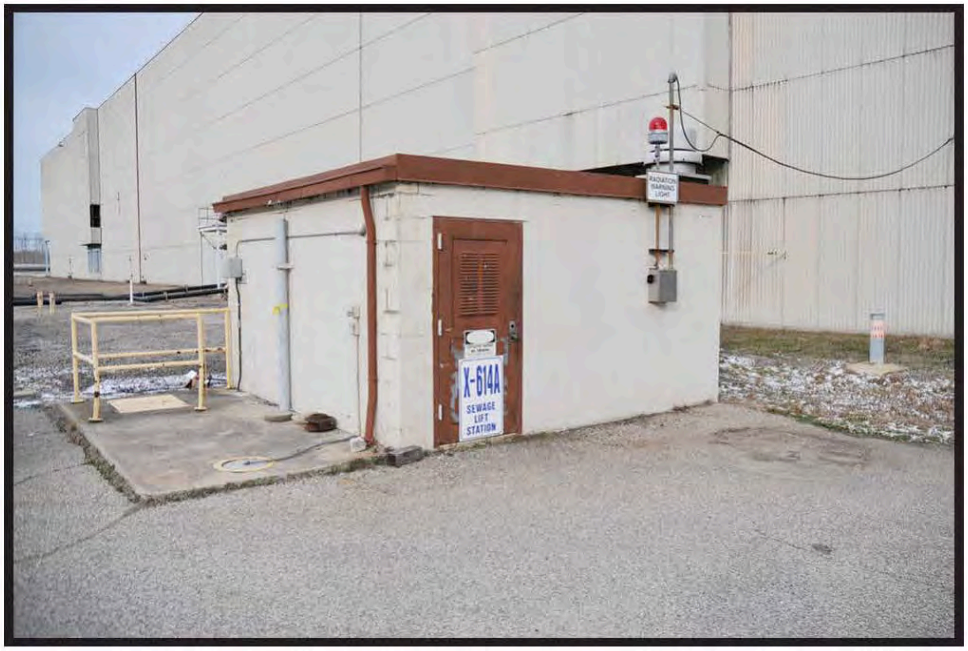

Figure 2: South Side of the X-614A Sewage Pumping Station, August 2014, Facing Northwest

Figure 3: South Side of the X-614A Sewage Pumping Station, August 2014, Facing Northeast

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-626-2 COOLING TOWER
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-U

HAER OH-142-U

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-626-2 COOLING TOWER

HAER No. OH-142-U

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-626-2 Cooling Tower is located at Ohio State Plane South coordinates at easting 1826273.890876 ft, northing 366551.453367760 ft and at Universal Transverse Mercator Zone 17N easting 326779.4009 m, northing 4319271.71 m. The coordinate represents the approximate center of the X-626-2 Cooling Tower. This coordinate was obtained on June 19, 2019, by plotting its location in EnvironInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1954
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	Not in use
Significance:	The X-626-2 Cooling Tower has been identified as a historic processing support facility at PORTS. Although only the X-626-2 Cooling Tower is the focus of this HAER documentation, both the X-626-2 Cooling Tower and the related X-626-1 Recirculating Water Pump House were part of the X-626 Recirculating Cooling Water (RCW) system. The X-626 RCW system was integral to the gaseous diffusion process, as it eliminated heat generated during plant enrichment operations. The X-626-2 Cooling Tower is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor B&W Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-626-2 Cooling Tower HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-626 RCW System:
Peter Kiewit Sons' Company subcontracted Merritt, Chapman & Scott Corporation of New York City for construction of the X-626-1 Pump House, the X-626-2 Cooling Tower basin, piping, and other components. The Marley Company, of Overland Park, Kansas, manufactured and erected the X-626-2 Cooling Tower and much of its associated equipment.

Excavation activities for the cooling tower basin commenced in October 1953. Workers completed all excavation activities for the cooling tower basin and the X-626-1 Pump House in November 1953. Contractors replaced 560 cubic yards of unstable bearing soil with gravel and concrete. A total of 235,000 cubic yards of earth was excavated.

Structural concrete work transpired from January 1954 to August 1954 (Appendix B, Figures 4 through 7). Contractors poured approximately 4,000 cubic yards of concrete. In June 1954, the Crawford Steel Corporation, of Cincinnati, Ohio, erected 45 tons of structural steel. Contractors completed all work for the X-626-1 RCW Pump House and X-626-2 Cooling Tower by December 1954.

Historical drawings of building plans are provided in Appendix C (Figures 8 through 18).

Part II. Site Information

Description of the X-626-1 Recirculating Water Pump House And X-626-2 Cooling Tower:
The X-626 RCW facility consisted of the X-626-1 Recirculating Water Pump House and the X-626-2 Cooling Tower. The X-626-2 Cooling Tower has been identified as a historic processing support facility at PORTS. Although only the X-626-2 Cooling Tower is the focus of this documentation, both the X-626-2 Cooling Tower and X-626-1 Recirculating Water Pump House operated together to remove process heat sent from the X-326 Process Building.

The X-626-1 Recirculating Water Pump House and X-626-2 Cooling Tower are located in the south-central section of PORTS, just south of the X-326 Process Building. The X-626 RCW system includes the X-626-1 Recirculating Water Pump House; X-626-2 Cooling Tower; a 2.2-million-gallon wet well basin; and piping that extends to and from the X-326 Process Building. The X-626 RCW system removed heat from the process gas, as well as waste heat from a few auxiliary processes. Excess energy was removed and dissipated by a double-loop system designed to reduce the possibility of a large amount of water contacting the process gas. The X-626-2 Cooling Tower dissipated this heat to the atmosphere in the form of water vapor.

Within the cooling tower, a forced draft moved cool, atmospheric air across the heated water. The vapor created by this process dissipated into the air or fell to the ground downwind of the facility. The quantity of water vapor exiting the tower, known as drift, was dependent upon weather conditions. The cooled recirculating cooling water accumulated in a basin below the tower.

The X-626-1 Recirculating Water Pump House stands one story tall and encompasses 7,000 square feet. A utilitarian building, the X-626-1 Pump House features steel frame walls clad with corrugated cement asbestos panels (Appendix A, Figures 1 through 3). A flat roof covers the building. There are lower profile wings on the north and south facades, which are primarily used to house equipment. The main building features banded window openings with industrial steel sash. The X-626-1 Pump House sits above a reinforced concrete reservoir that serves as a wet well. A concrete pad, located to the north of the building, supports four power transformers. The X-626-1 Pump House houses seven pumps, which are located near the center of the building.

The X-626-2 Cooling Tower follows a rectangular plan. Built with a steel frame, this utilitarian structure sits above a reinforced concrete basin, which forms portions of the tower's foundation. The basin measures approximately 220' long by 90' wide by 18' deep. The tower itself measures approximately 145' long by 88' wide by 44' high. The walls of the tower are clad with redwood louvers. The tower's flat roof supports walkways, eight fan openings and discharge collars, and other mechanical equipment. Wooden stairways, located on the east and west sides of the tower, provide access to the roof. The series of eight fans are arranged in two rows of four fans. The fans provided the circulation necessary for cooling water as it moved from troughs and the baffled interior of the tower. Cooled water flowed into the basin below the structure.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *Historical Narrative for the X-626 Recirculating Cooling Water Complex,* Revision 1, Portsmouth Gaseous Diffusion Plant, Piketon, Ohio. Washington, D.C.: U.S. Department of Energy, 2011.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio,* DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Department of Energy. *Engineering Evaluation/Cost Analysis for the X-626 and X-630 Recirculating Cooling Water Complexes at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0146&D2. Piketon, OH: U.S. Department of Energy, November 2010.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

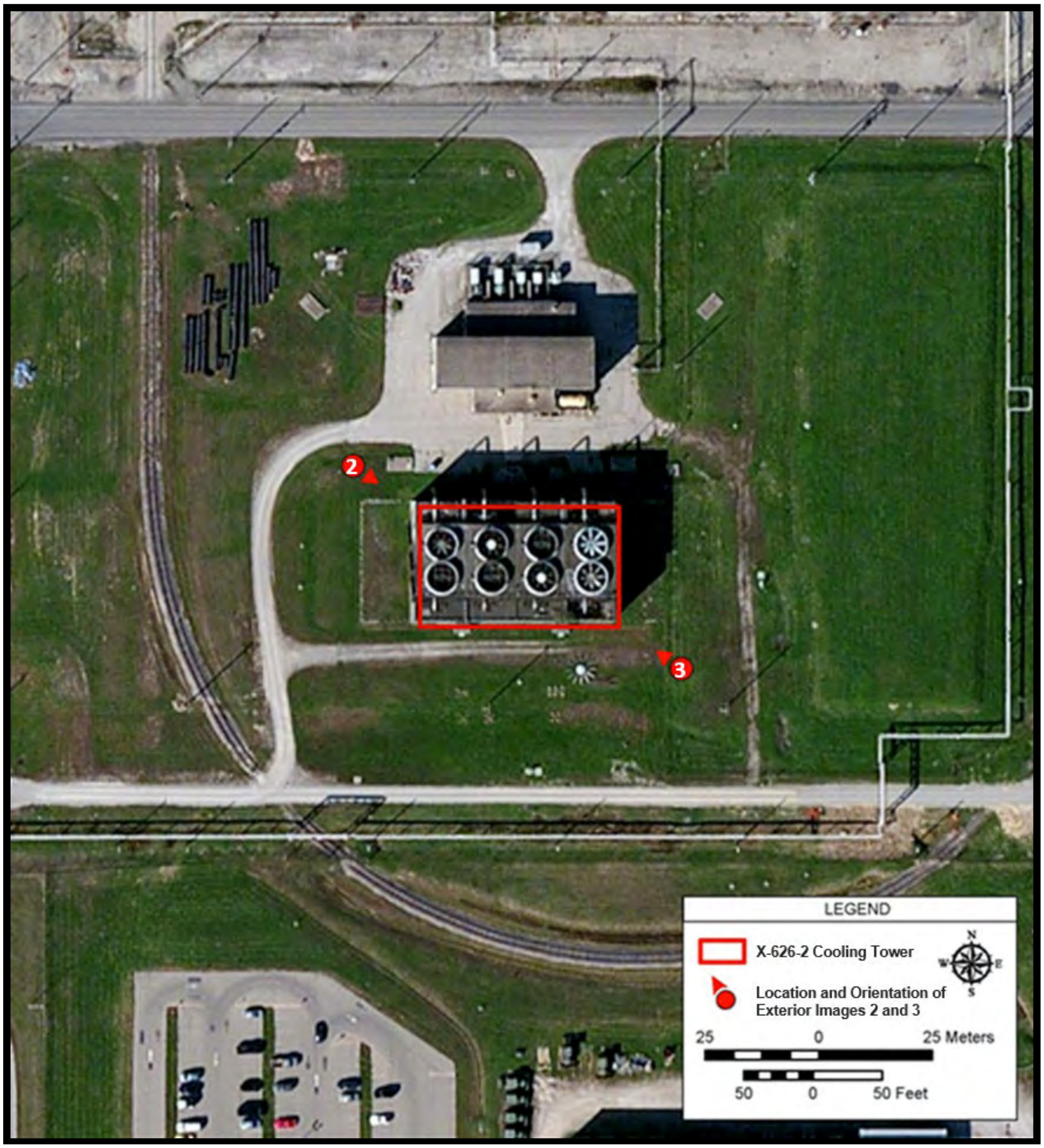

Figure 1: Location and Orientation of Exterior Photographs (1 and 3)

Figure 2: North Side of the X-626-2 Cooling Tower, August 2014, Facing Southeast

Figure 3: South Side of the X-626-2 Cooling Tower, August 2014, Facing Northwest

Appendix B: Historical Photographs

Figure 4: The X-626 Recirculating Cooling Water System, Looking West at the Cooling Tower, January 1954

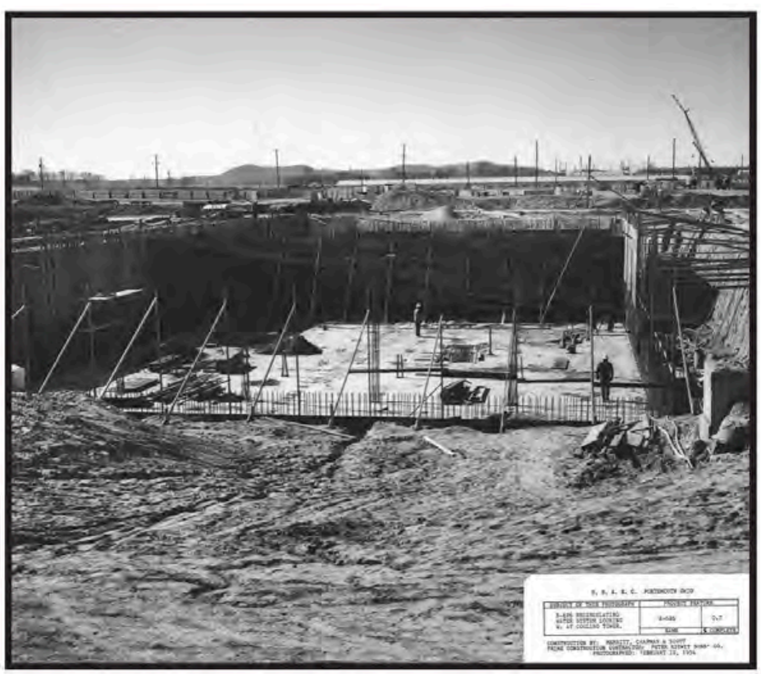

Figure 5: The X-626 Recirculating Cooling Water System, Looking West at the Cooling Tower, February 1954

Figure 6: The X-626 Recirculating Cooling Water System, Looking West at the Pump House, February 1954

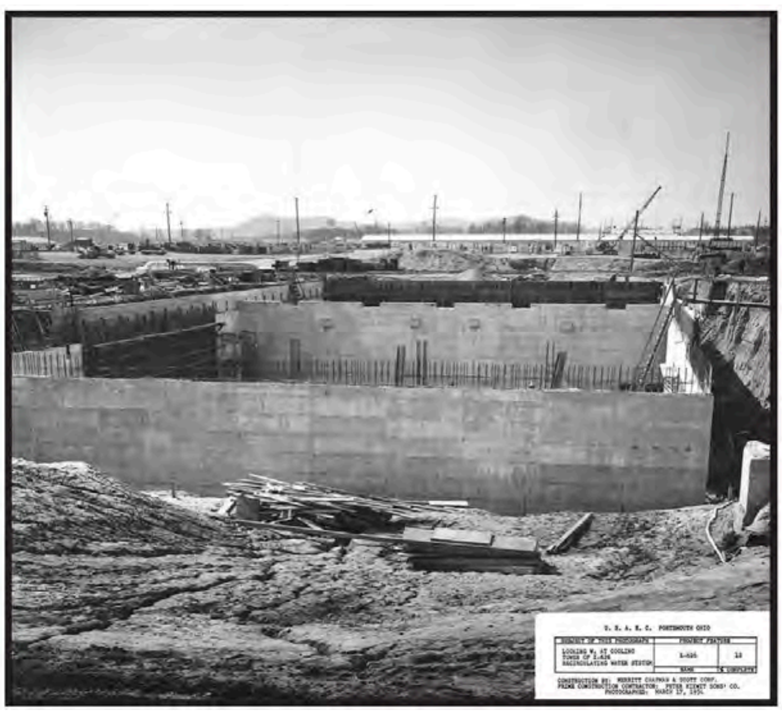

Figure 7: The X-626 Recirculating Cooling Water System, Looking West at the Cooling Tower, March 1954

Appendix C: Historical Drawings

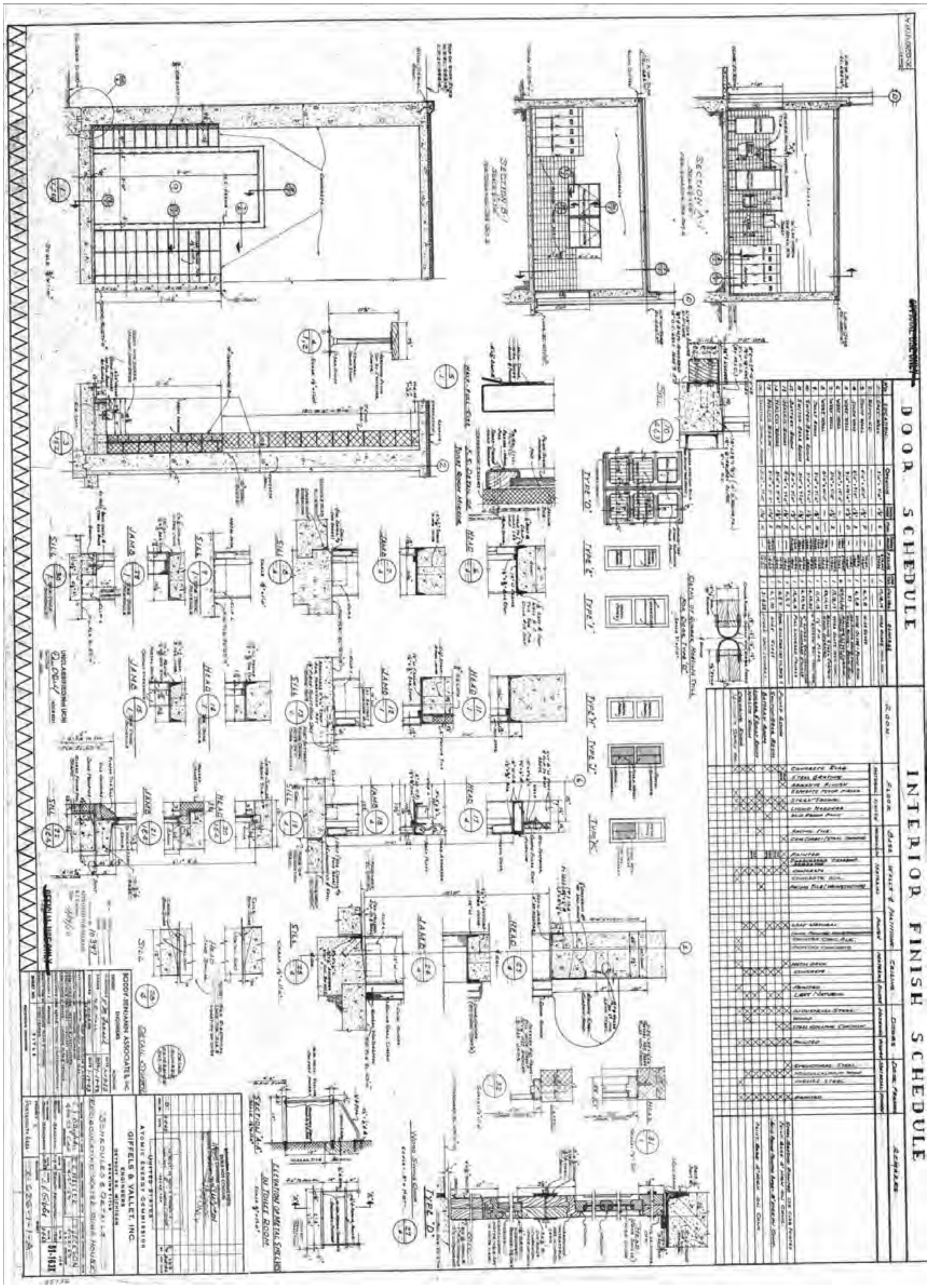

Figure 8: Pump House Schedules and Details

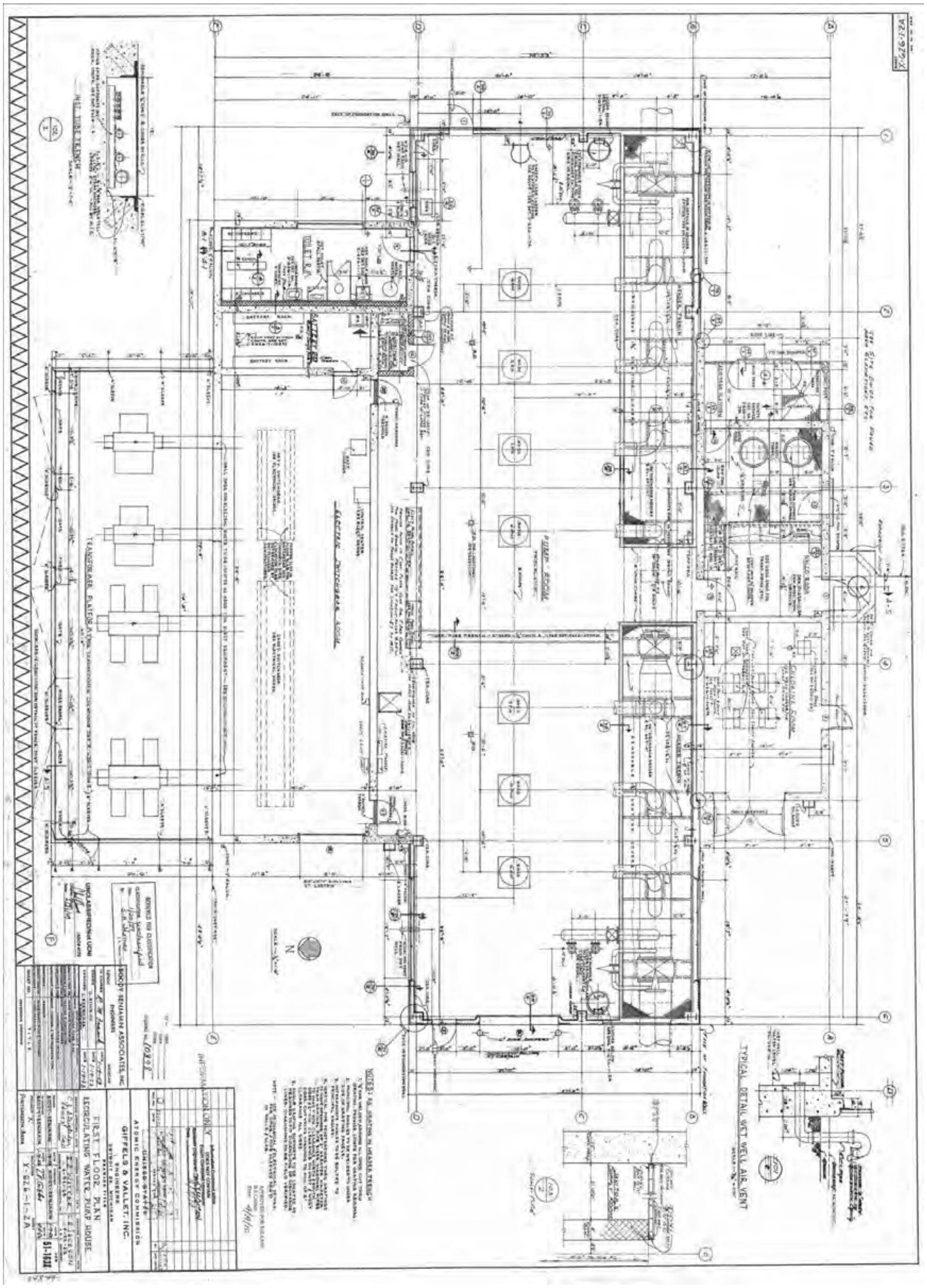

Figure 9: Pump House First Floor Plan

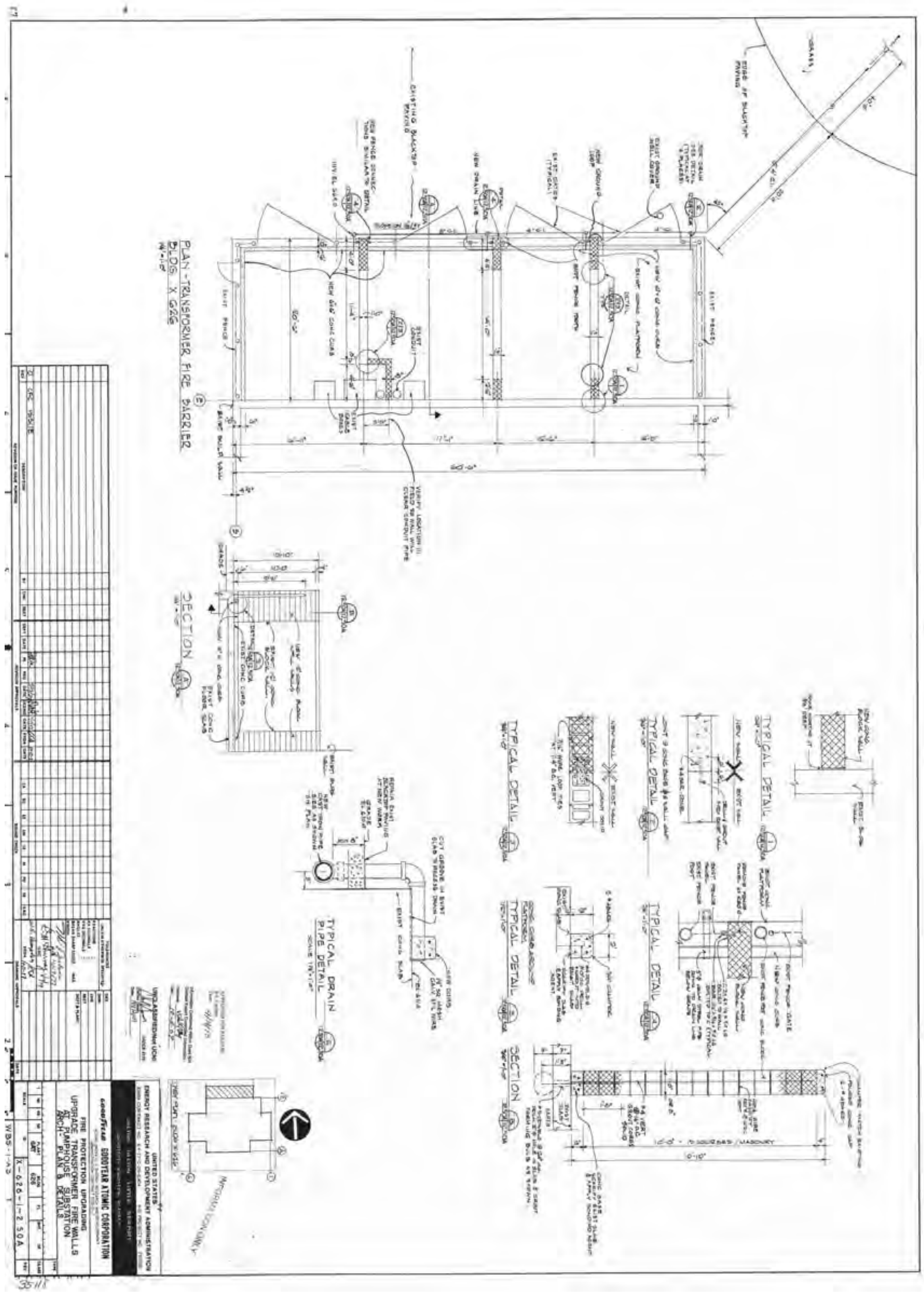

Figure 10: Pump House Transformer Firewalls

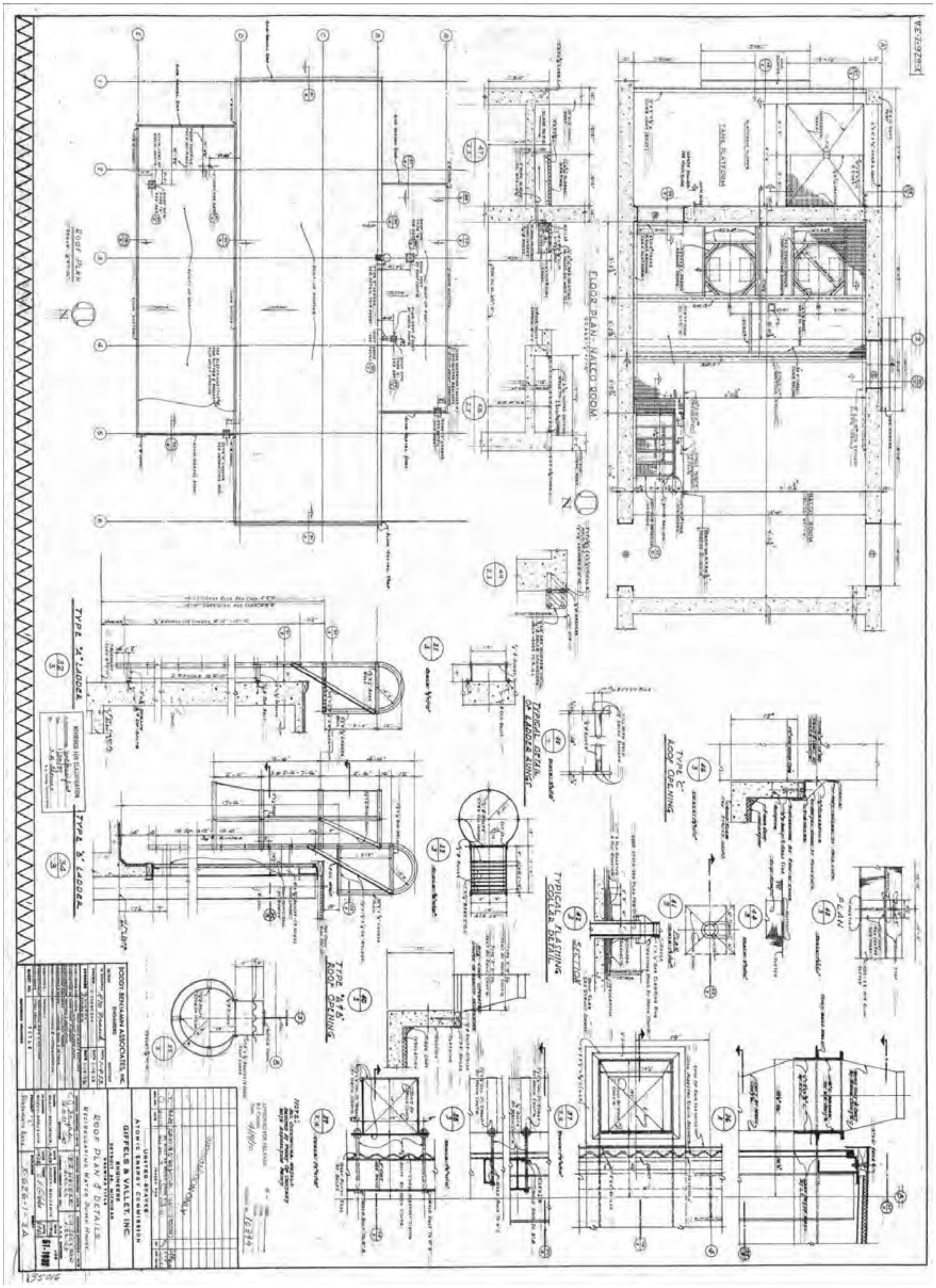

Figure 11: Pump House Roof Plan

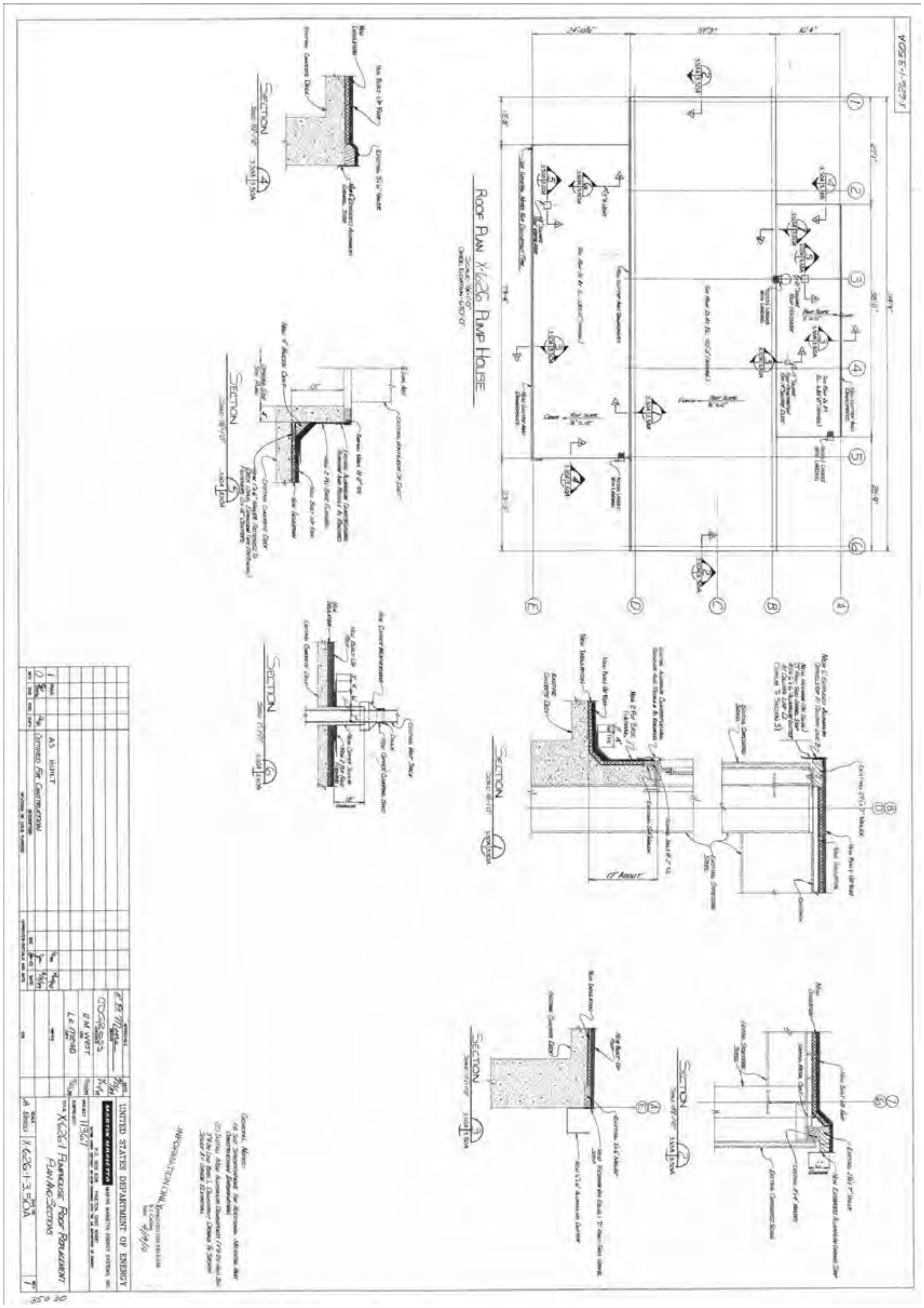

Figure 12: Pump House Roof Plan

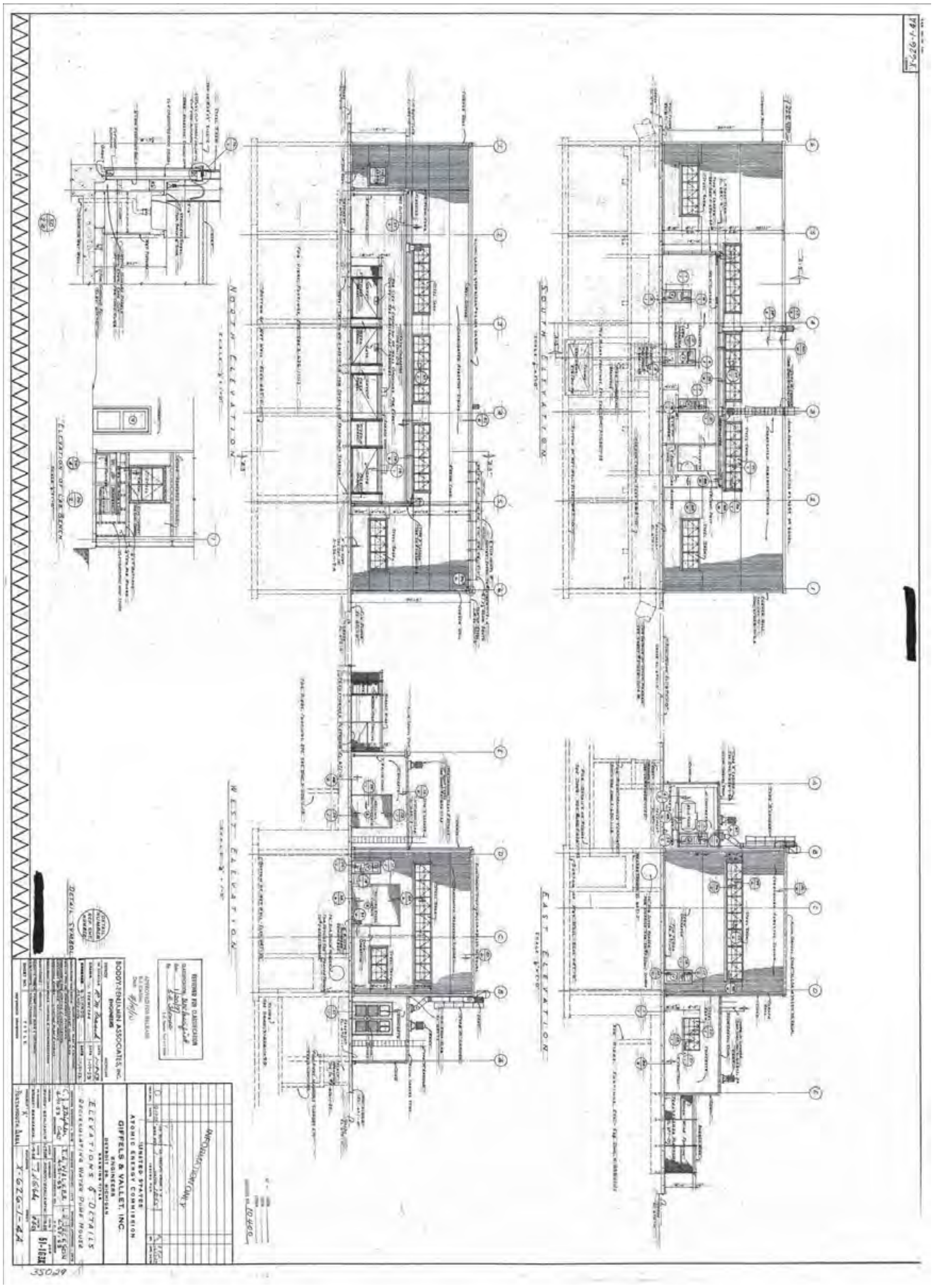

Figure 13: Pump House Elevations

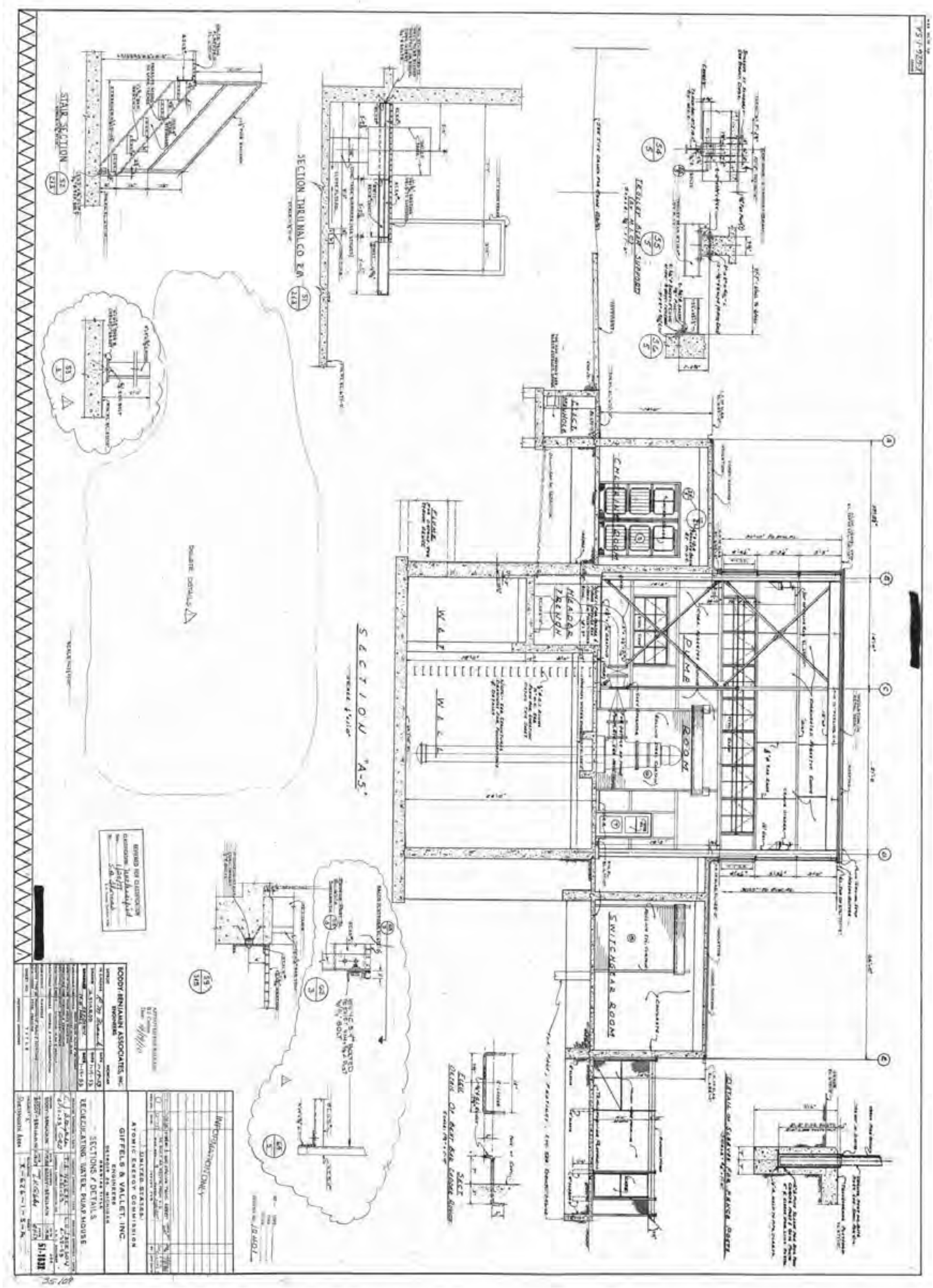

Figure 14: Pump House Sections

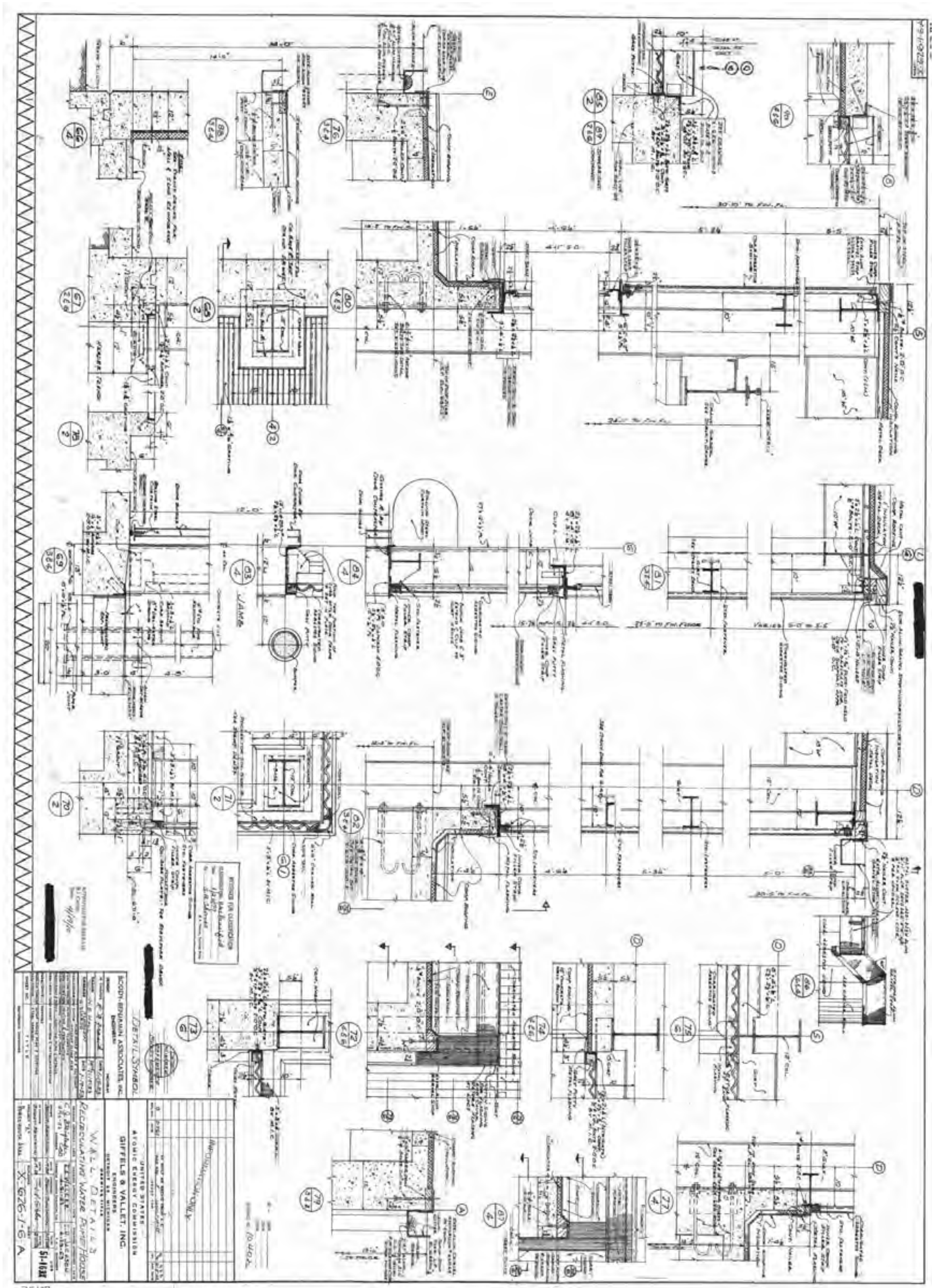

Figure 15: Pump House Wall Details

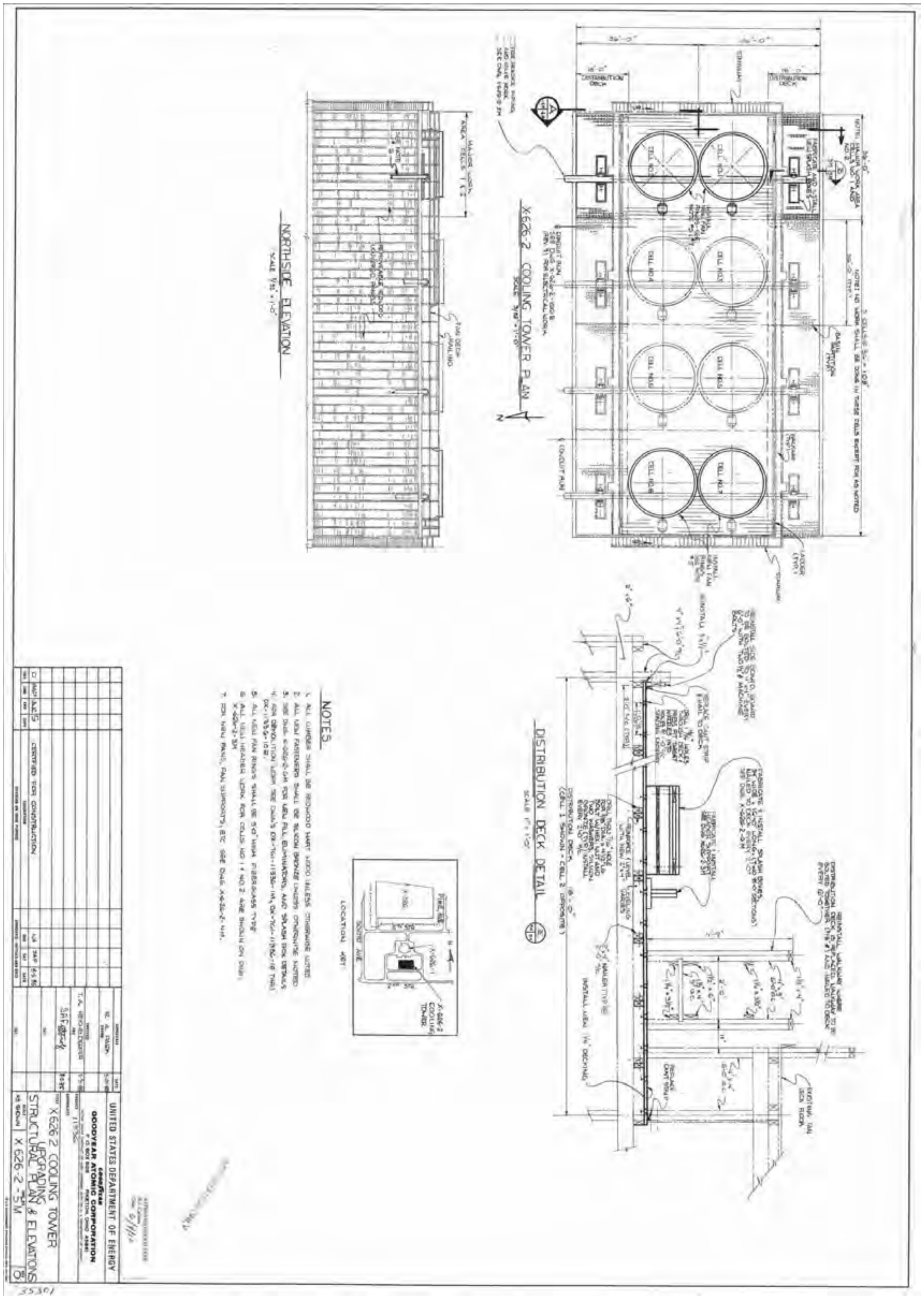

Figure 16: Cooling Tower Structural Plan and Elevations

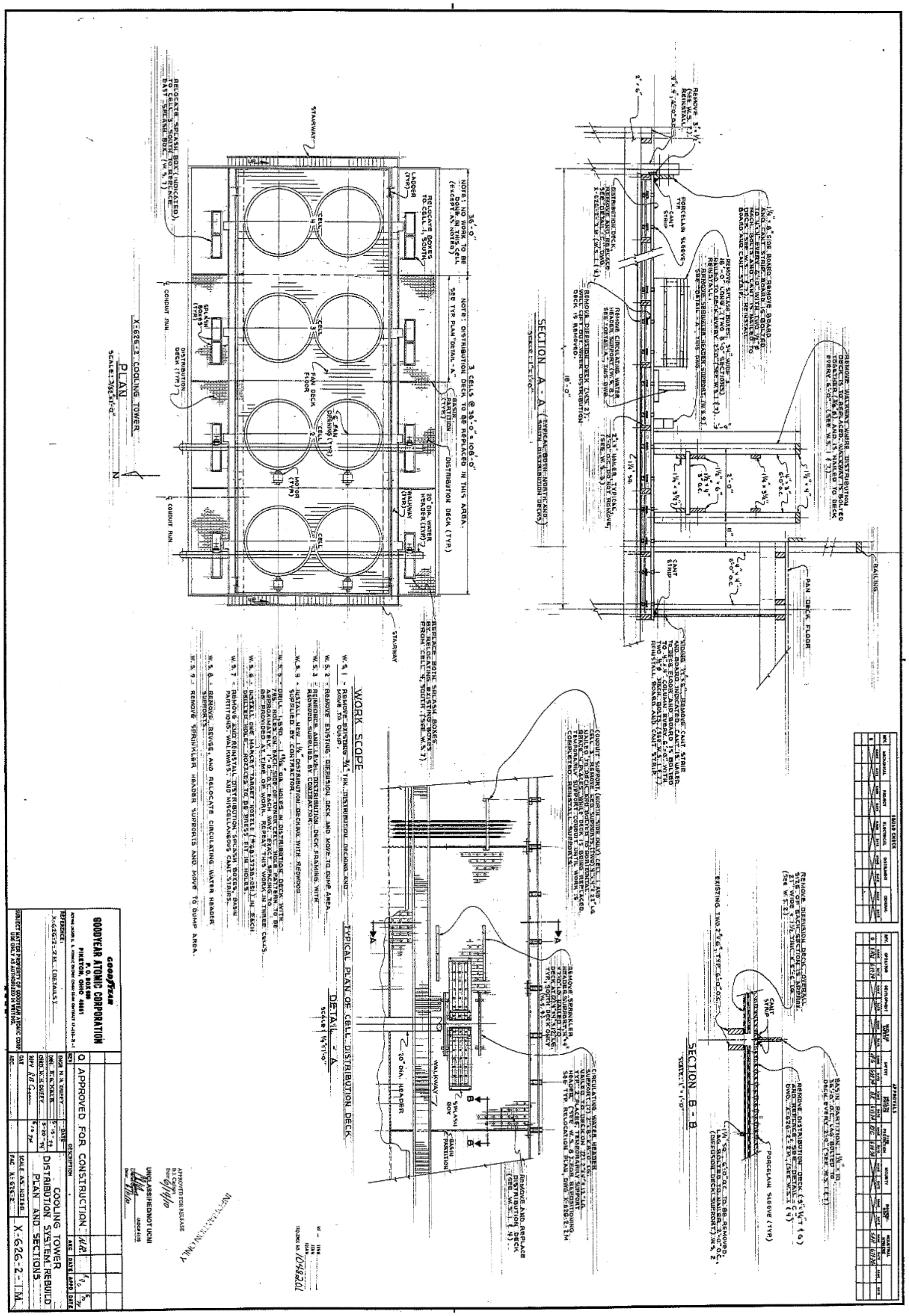

Figure 17: Cooling Tower Distribution System Plan

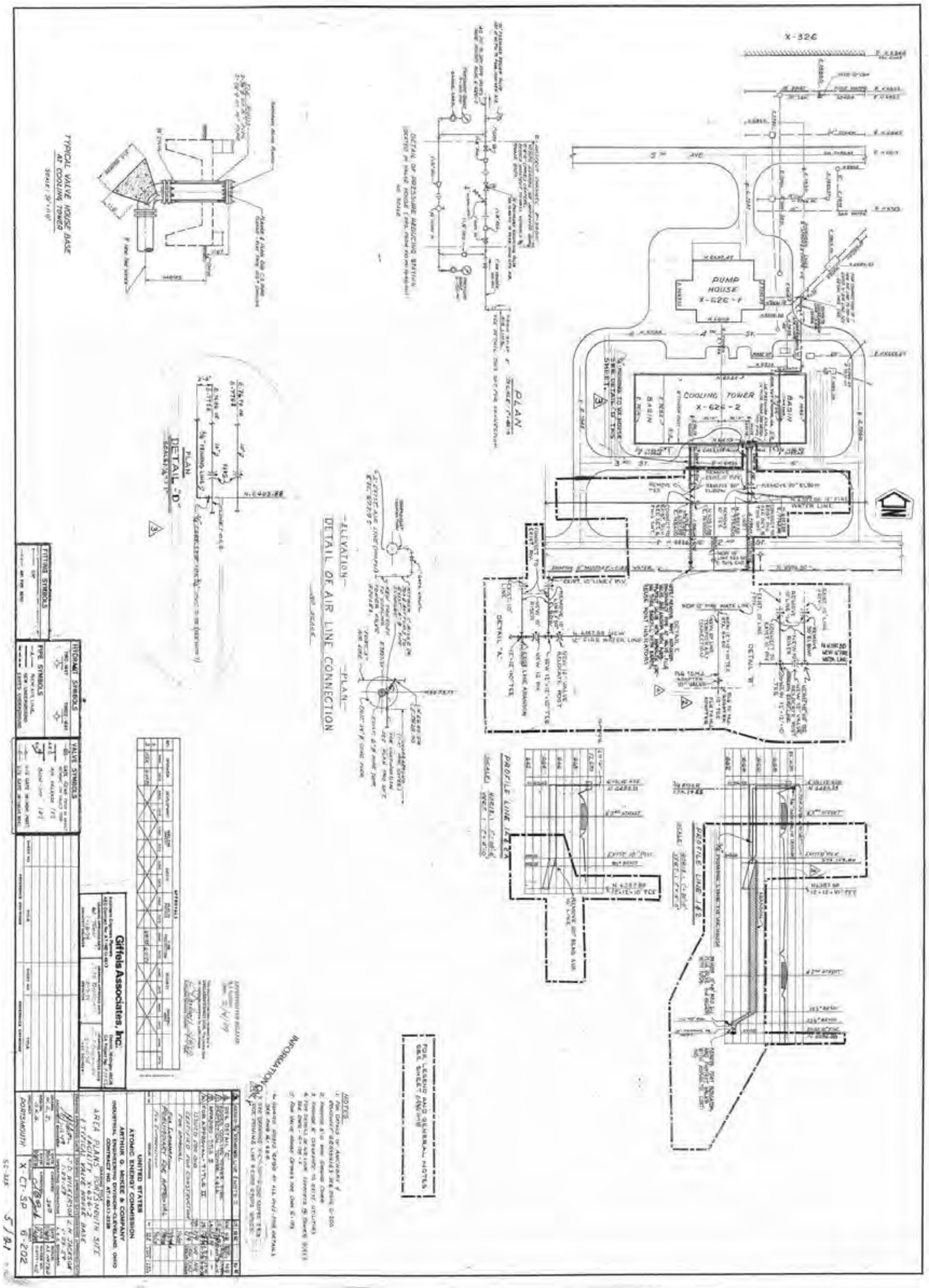

Figure 18: Area Plans

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-700 CONVERTER SHOP AND CHEMICAL CLEANING FACILITY
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-V

HAER OH-142-V

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-700 CONVERTER SHOP AND CHEMICAL CLEANING FACILITY

HAER No. OH-142-V

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-700 Converter Shop and Chemical Cleaning Facility is located at Ohio State Plane South coordinates at easting 1827646.541703 ft, northing 370173.865695858 ft and at Universal Transverse Mercator Zone 17N easting 327215.8858 m, northing 4320368.809 m. The coordinate represents the approximate center of the X-700 Converter Shop and Chemical Cleaning Facility. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1955
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	Equipment maintenance support for non-radioactive or low-level radioactively-contaminated equipment from the diffusion cascade
Significance:	The X-700 Converter Shop and Chemical Cleaning Facility is used for equipment maintenance support for non-radioactive or low-level radioactively contaminated equipment from the diffusion cascade. Originally, this facility was used for chemically cleaning and degreasing pipes, fittings, and other materials and for the re-tubing and re-assembling of converters for continued use in the diffusion cascade. Converters, which contain the porous barrier tubes used to diffuse gaseous uranium hexafluoride (UF_6), were cleaned so that they could be maintained or upgraded. This building is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous

historical records and reports, drawings, photographs and plans.
For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-700 Converter Shop and Chemical Cleaning Facility HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-700 Converter Shop and Cleaning Facility:
Ferro Construction Company, of Cincinnati, Ohio, won the subcontract from Peter Kiewit Sons' Construction Company to erect the X-700 Converter Shop and Chemical Cleaning Facility, including all underground utility service lines and all related piping. The Ferro Construction Company contract also called for installation of structural steel, cleaning tanks, electric cranes, degreasers, and unit substations. The Columbus Heating and Ventilating Company, of Columbus, Ohio, furnished and installed the air conditioning system.

Ferro Construction Company broke ground on the X-700 Facility in March 1953. As encountered elsewhere on the plant construction site, the X-700 Facility site was plagued with fat clay. "Fat clay" is a term used to describe clay with a high plasticity. Workers encountered it throughout the area during construction. Due to its plasticity, it makes for an unstable foundation. Workers countered this problem by excavating the fat clay until they reached a more solid subsurface. This necessitated infilling with concrete and stable fill material. Test borings were completed at the X-700 Facility site to determine how much excavation was required to reach suitable load-bearing soils. Upon removing the fat clay, workers poured three inches of concrete for subgrade protection. When workers completed the grading and backfilling in November 1953, they had excavated 20,933 cubic yards of earth and deposited 9,710 cubic yards of backfill.

Workers began pouring the structural concrete in mid-March 1953 (Appendix B, Figures 3 and 4). By the time they completed the work in December 1953, they had poured 8,897 cubic yards of concrete and placed 402 tons of reinforcing steel.

In May 1953, the Carl Vestal Steel Erector Company, of Indianapolis, Indiana, began erecting the building's steel frame (Figures 5 and 6). Peter Kiewit Sons' Construction Company supplied the 1,676 tons of structural steel required to complete the X-700 Facility. The Carl Vestal Steel Erector Company completed the work in May 1953.

Working under subcontract to Ferro Construction Company, the R.E. Forshee Company, Inc., of Cincinnati, Ohio, began work on the roof deck in July 1953. Industrial Roof and Sheet Metal Company (location not known) installed roughly 1,070 squares of roofing material. As work on the roof progressed, Elwin G. Smith Company, of Pittsburgh, Pennsylvania, installed the asbestos siding on the exterior walls. The siding work began in August 1953 and ended in January 1954.

Subcontractors of Ferro Construction Company installed the mechanical and electrical systems concurrently with the building's erection. Allegheny Electric Company (location not known) performed all electrical work, including lighting, power wiring, substations, switchgear, and control wiring. Wiring work transpired between May 1953 and mid-March 1954. Columbus Heating and Ventilation Company, of Columbus, Ohio, won the subcontract to install air-conditioning in the re-tubing area.

By mid-September 1953, workers had installed the cleaning pits within the cleaning area of the X-700 Facility (Figure 7). By this time, workers had begun installing siding on the exterior of the building and, by mid-October of 1953, much of the building had been enclosed (Figures 8 through 10). From

September 1953 through May 1954, workers installed all of the necessary electrical and mechanical work within the building (Figures 11 through 13).

Work on the brick chimney commenced in July 1953. The Consolidated Chimney Company (location not known) erected the structure. When completed in September 1953, the chimney measured 22' in diameter and stood 70', 3" tall. All work on the X-700 Facility was complete by May 1954 (Figures 15 and 16).

Historical drawings of building plans are provided in Appendix C (Figures 17 through 25).

Part II. Site Information

Description of the X-700 Converter Shop and Chemical Cleaning Facility:
The X-700 Converter Shop and Chemical Cleaning Facility is located just south of the X-333 Process Building and north of the X-720 Maintenance and Stores Building. The X-700 Facility was used for chemically cleaning and degreasing pipes, fittings, and other materials prior to re-tubing and re-assembling converters for continued use in the diffusion cascade. Converters, which contain the porous barrier tubes used to diffuse gaseous UF_6, were cleaned so that they could be maintained or upgraded.

The X-700 Facility is a one-story building that measures 202' wide by 523' long and stands 37' high and provides a floor area of approximately 116,000 square feet (Appendix A, Figures 1 and 2). The X-700 Facility consists of two, parallel, steel-framed structures with flat roofs. Like a number of other buildings around the plant site, the lower 8' of the side walls consist of concrete block. The concrete block portion of the end walls is slightly taller. The remainder of the walls above the concrete block consists of corrugated asbestos cement panels over steel framing. The building's designers specified concrete block as a means of withstanding daily abuse and because concrete block is also easier to clean.

The building is divided down its length by a full-height steel frame and asbestos panel partition. The east side of the divide consists of a two-bay wide cleaning area. It features ten cleaning pits along the east side of the bay. The west side consists of a three-bay shop and re-tubing area. The two areas are separated by a transverse partition, with the shop area located on the south side of the building and the re-tubing area located to the north. The south-central portion of the tubing area features a mezzanine that was used for tube storage. Each of the bays contain a mezzanine transformer room adjacent the end walls. The X-700 Facility is serviced by a railroad spur at the south end of the building. A gantry crane, which straddles the spur, facilitated the loading and unloading of converters.

Like many of the buildings on the plant site, the X-700 Facility was designed to withstand an earthquake of 2.0 percent gravity, which was slightly less than what was specified by the Pacific Coast Building Code for a Zone 1 Earthquake Area. The 70' tall brick stack meets the Pacific Coast Building Code.

The cleaning tanks in the east half of the building are no longer in use. The tanks were arranged to provide a sequence for cleaning process support systems. Each of the eight tanks measure 8' wide by 45' long by 10' deep. The tanks were filled with fluid to a depth of eight and-a-half feet. One tank was filled with warm water, one with alkali, two with trioxide, one with cold water, one with chromic acid, one with ammonium hydroxide, and one with hot water. Heated jet streams, external heat exchangers, and submerged coils provided the necessary heating as required by specific operations. Process support system pipes were cleaned by immersion within the various vats. Ventilation was provided by a series of eight fans, all located in a line along the east wall of the building. The fans forced fumes from the cleaning process up through a 70' tall, brick stack. The stack is located near the center of the east wall.

A pair of trichloroethylene vapor degreaser tanks is located at the south end of the cleaning tanks. The degreaser tanks are about the same shape and size as the eight cleaning tanks. The trichloroethylene is stored in a 12,000 gallon tank next to the degreasers. The trichloroethylene was delivered to the X-700 Facility via railroad tank cars.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio,* DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

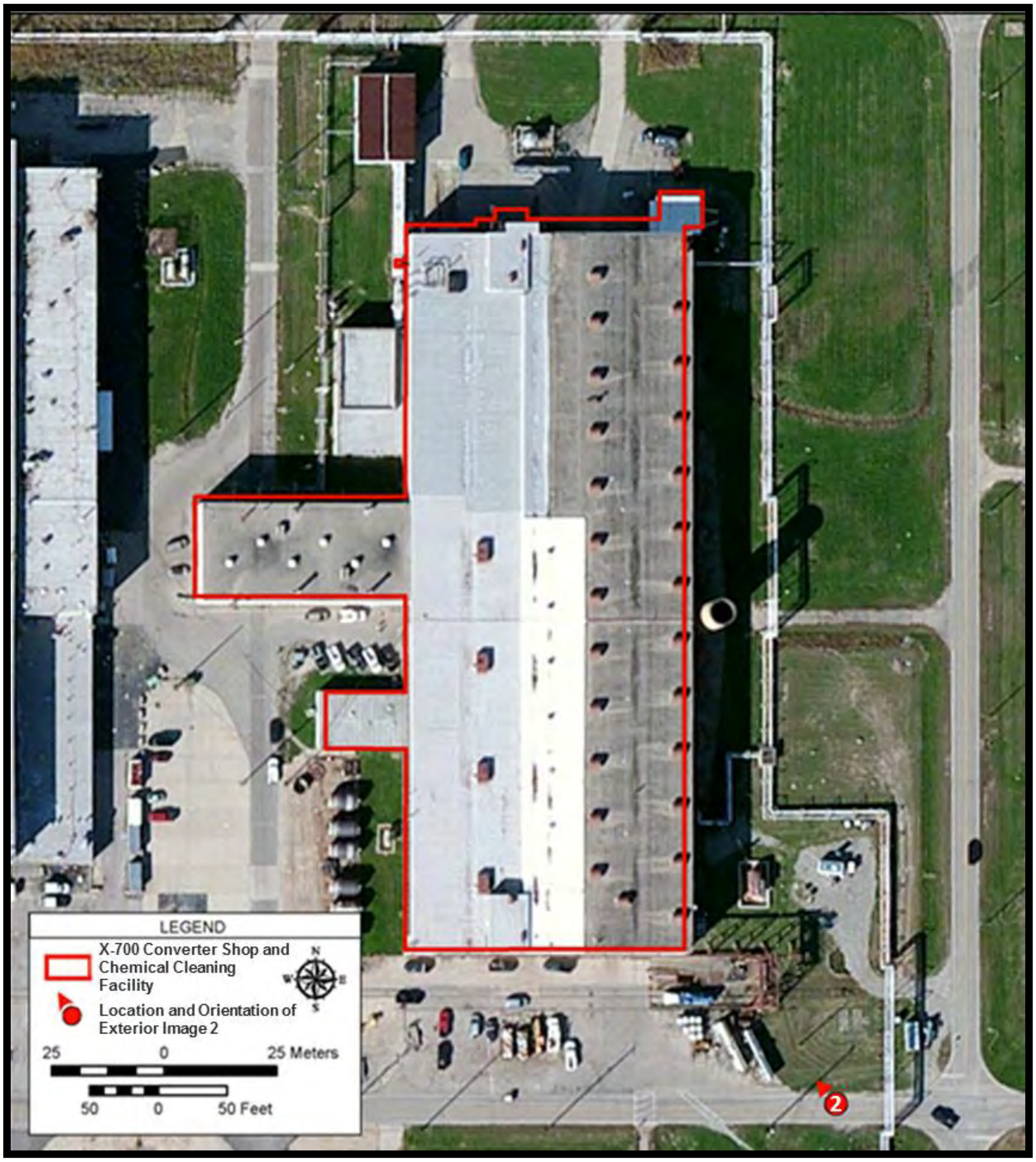

Figure 1: Location and Orientation of Exterior Photograph (2)

Figure 2: South Side of the X-700 Converter Shop and Chemical Cleaning Facility, August 2014, Facing Northwest

Appendix B: Historical Photographs

Figure 3: Excavation and Foundation Work for the X-700 Converter Shop and Chemical Cleaning Facility, March 1953

Figure 4: Steel Frame Erection for the X-700 Converter Shop and Chemical Cleaning Facility, May 1953

Figure 5: Excavation and Foundation Work for the X-700 Converter Shop and Chemical Cleaning Facility, May 1953

Figure 6: Steel Frame Erection for the X-700 Converter Shop and Chemical Cleaning Facility, Looking Northeast, July 1953

Figure 7: Cleaning Tank Installation for the X-700 Converter Shop and Chemical Cleaning Facility, September 1953

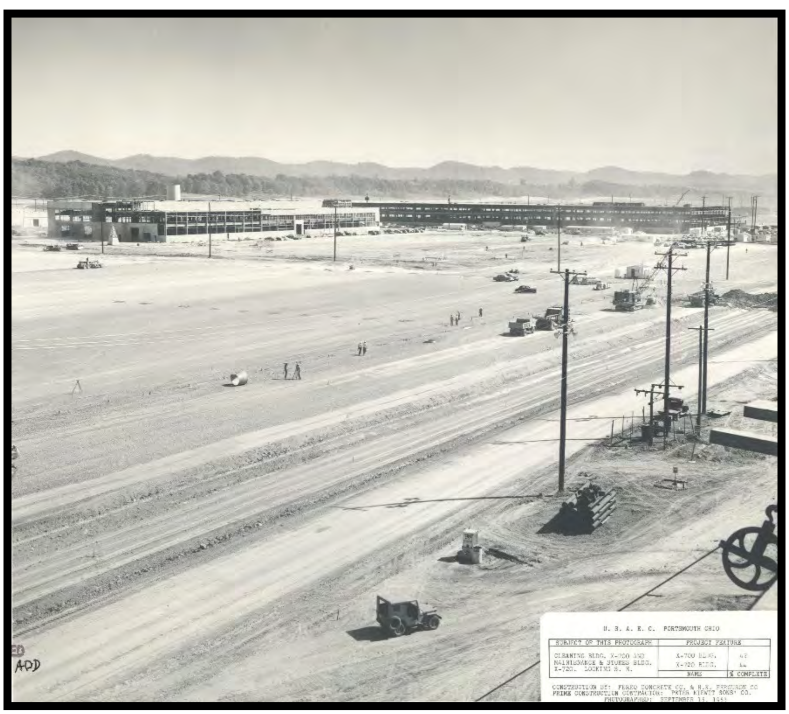

Figure 8: Construction Photograph of the X-700 Converter Shop and Chemical Cleaning Facility, Looking Southeast, September 1953

Figure 9: Construction Photograph of the X-700 Converter Shop and Chemical Cleaning Facility, Looking Northwest, October 1953

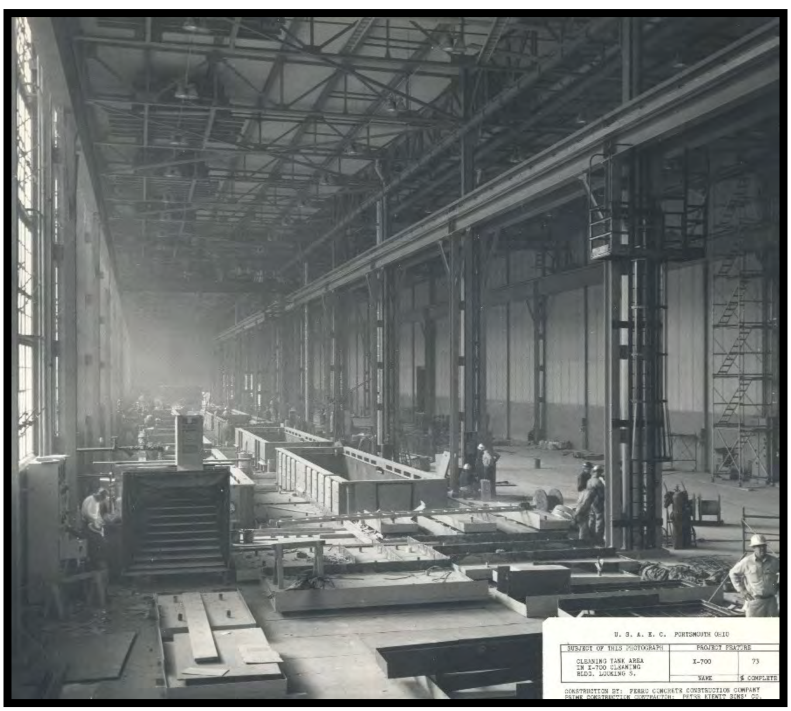

Figure 10: Cleaning Tank Area Inside the X-700 Converter Shop and Chemical Cleaning Facility, Looking South, October 1953

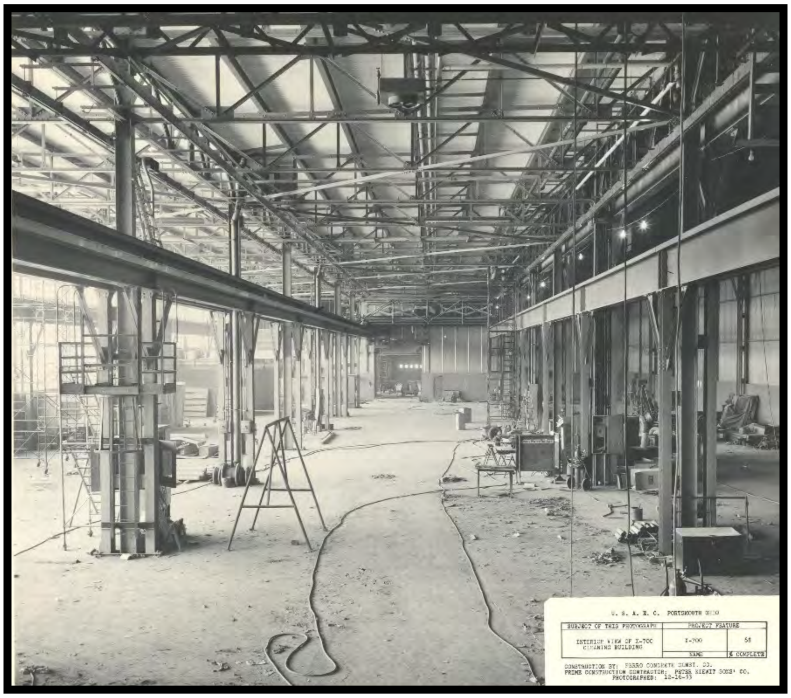

Figure 11: Interior View of the X-700 Converter Shop and Chemical Cleaning Facility, December 1953

Figure 12: Interior View of the X-700 Converter Shop and Chemical Cleaning Facility, February 1954

Figure 13: Interior View of the Re-Tubing Area of the X-700 Converter Shop and Chemical Cleaning Facility, March 1954

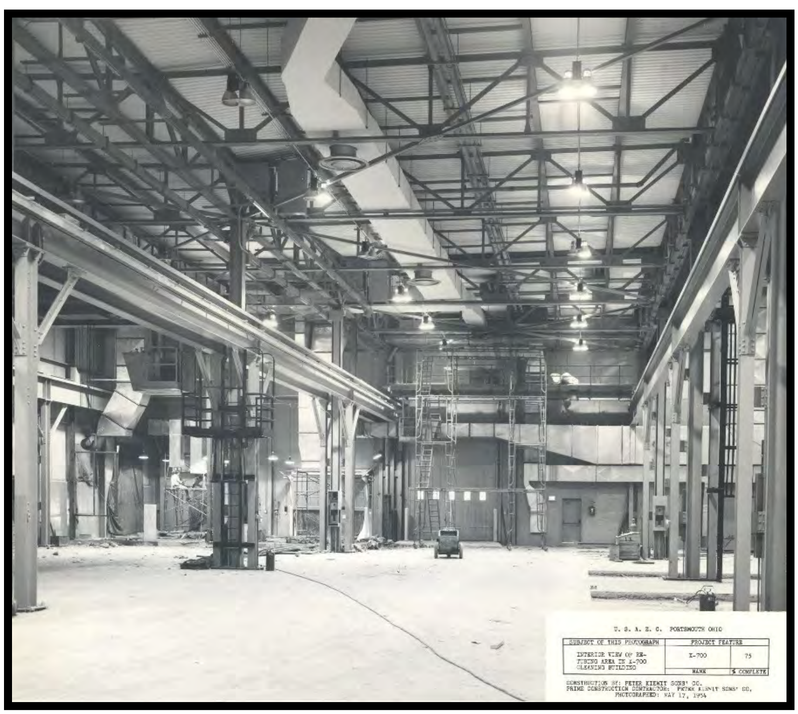

Figure 14: Interior View of the Re-Tubing Area of the X-700 Converter Shop and Chemical Cleaning Facility, May 1954

Figure 15: The Water Ionization Facility for the X-700 Converter Shop and Chemical Cleaning Facility and the X-705 Decontamination Facility, June 1954

Figure 16: Interior View of the X-700 Converter Shop and Chemical Cleaning Facility, June 1954

Appendix C: Historical Drawings

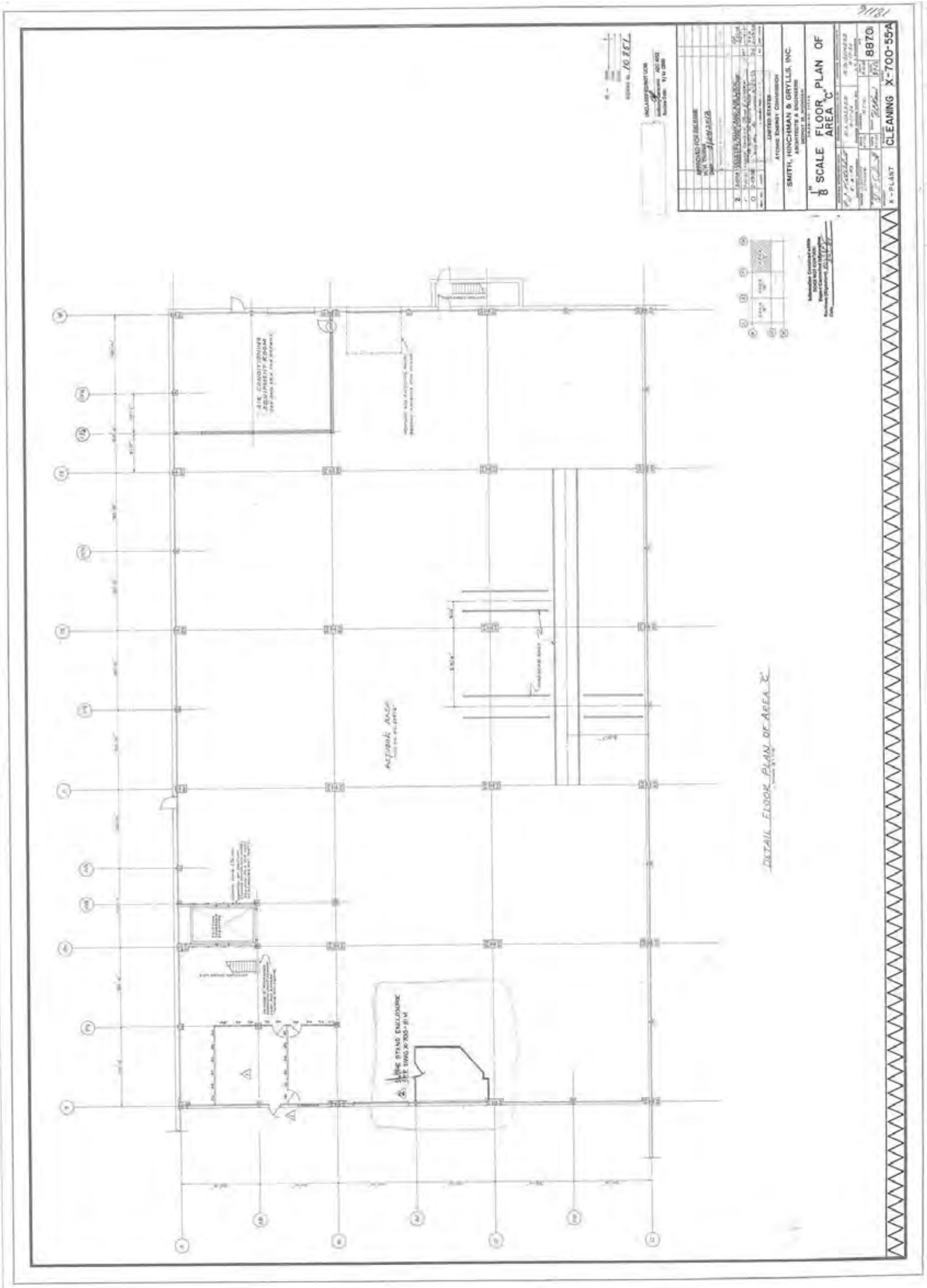

Figure 17: Area C Floor Plan

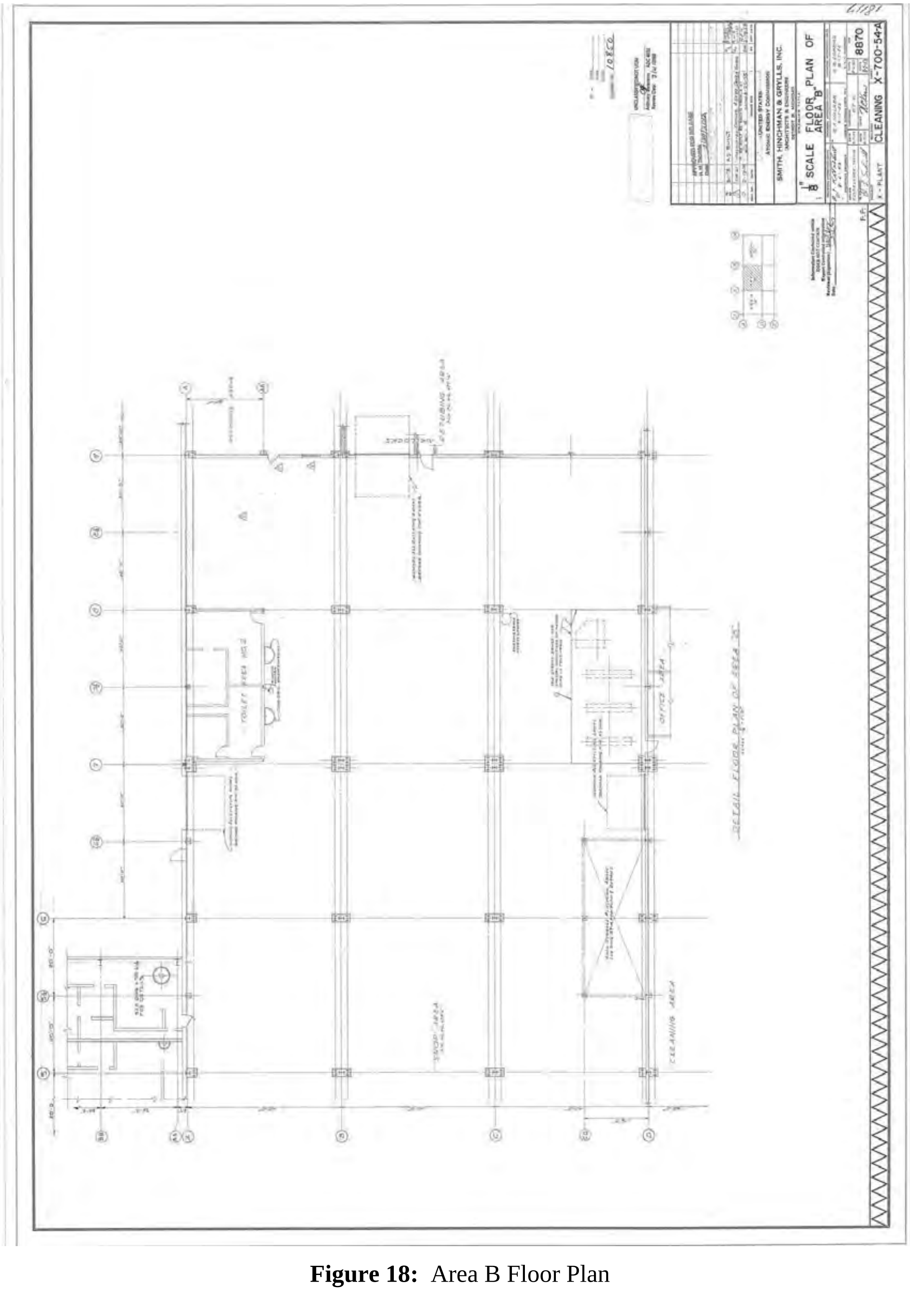

Figure 18: Area B Floor Plan

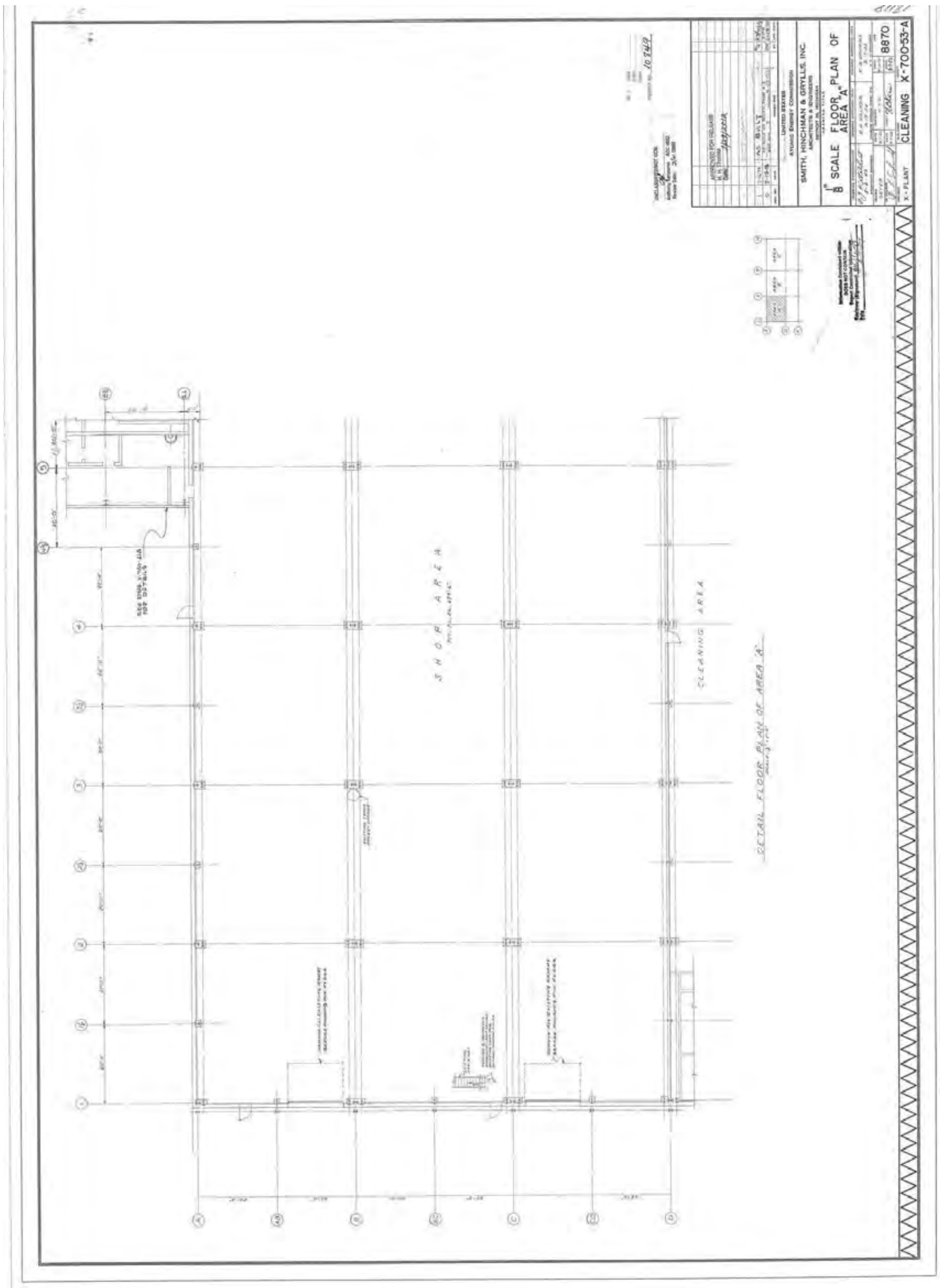

Figure 19: Area A Floor Plan

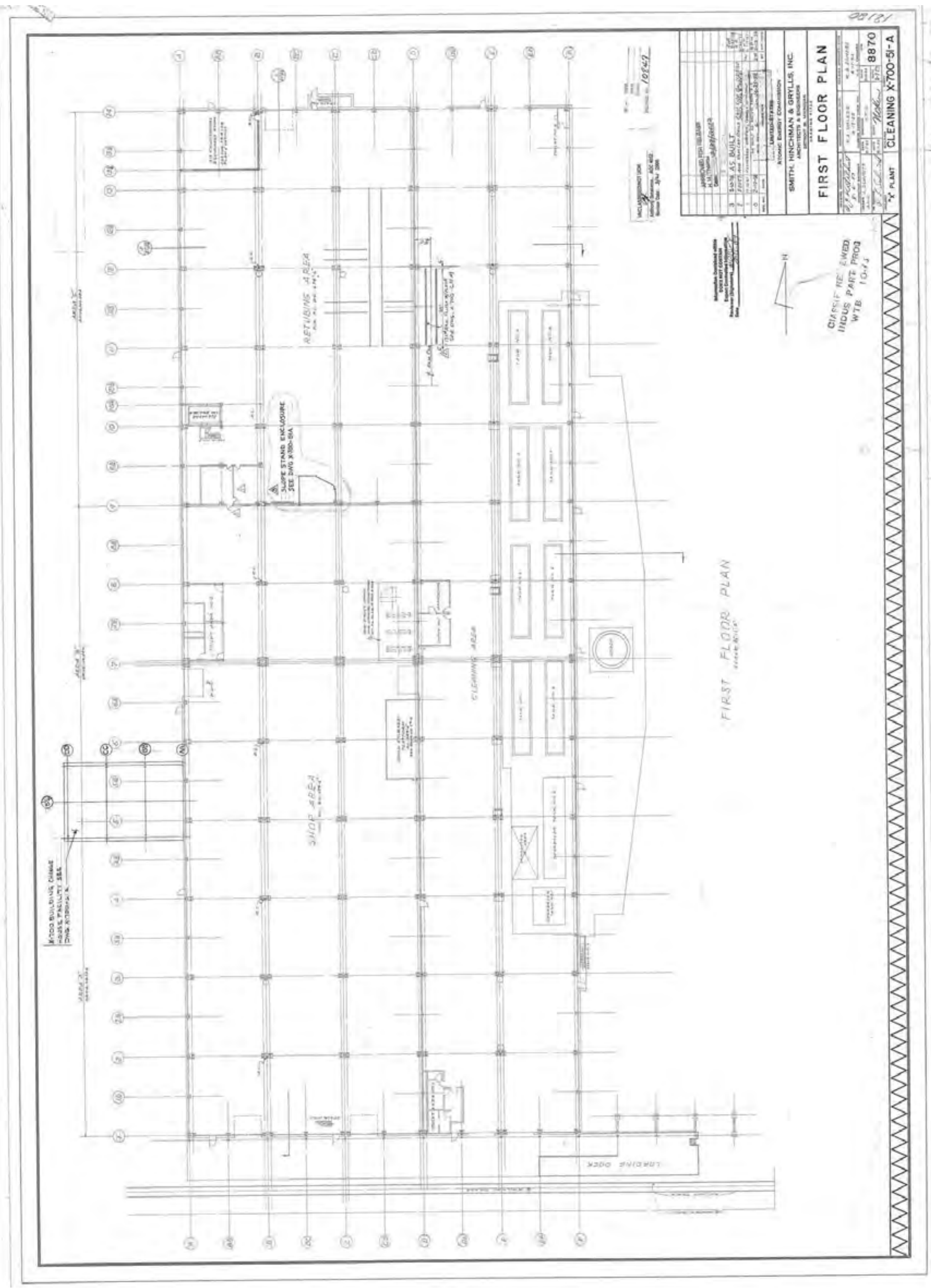

Figure 20: First Floor Plan

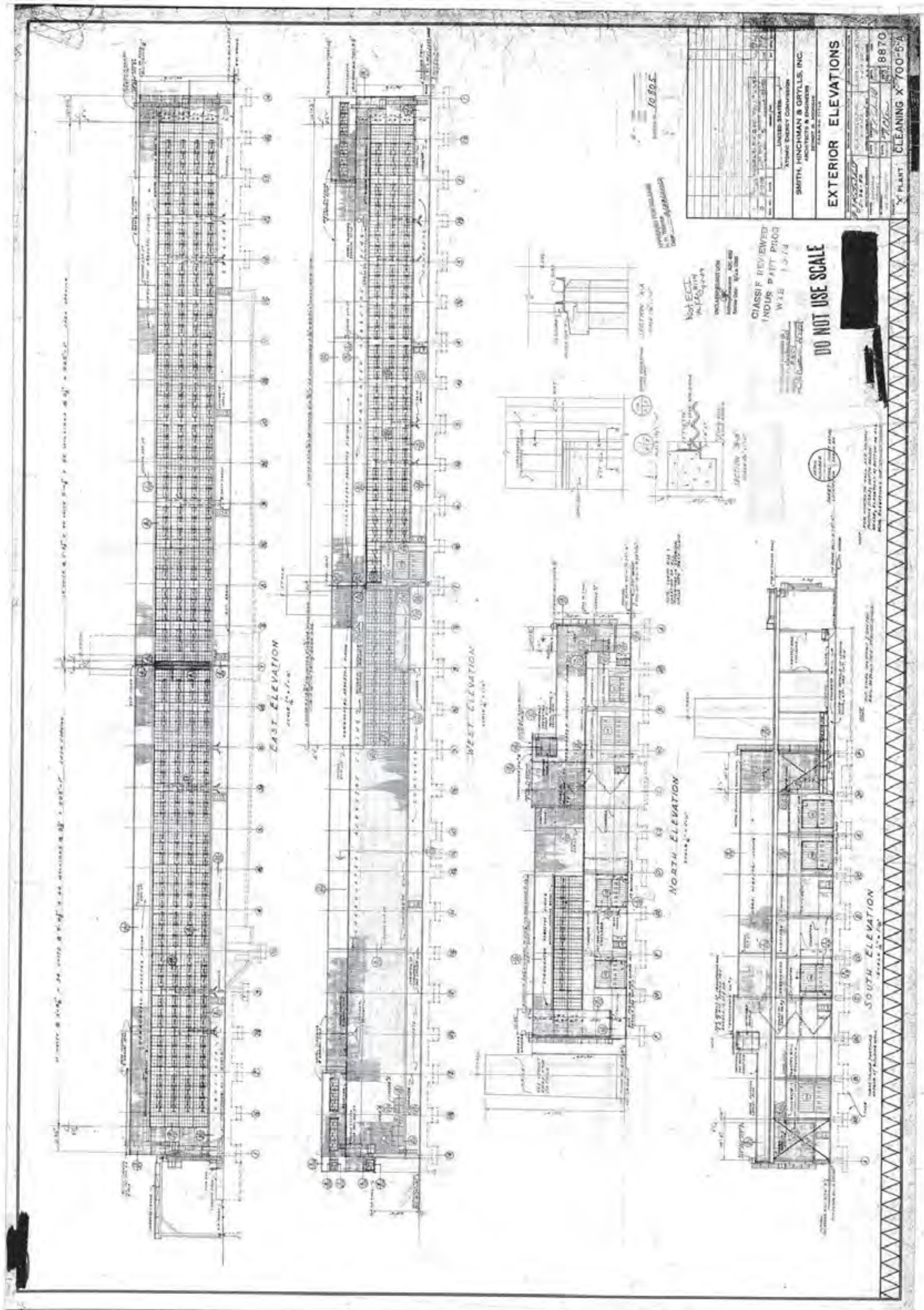

Figure 21: Exterior Elevations

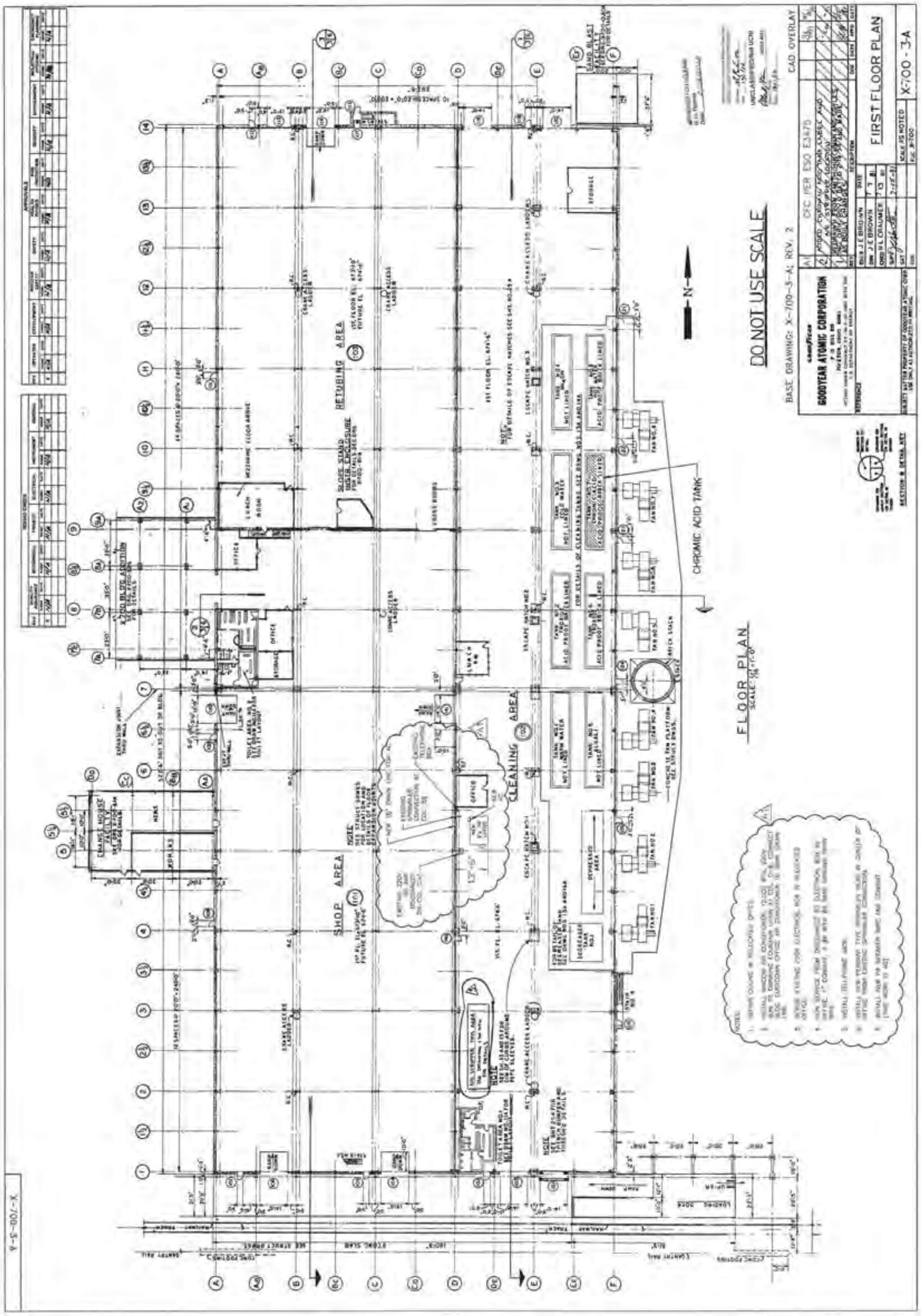

Figure 22: First Floor Plan

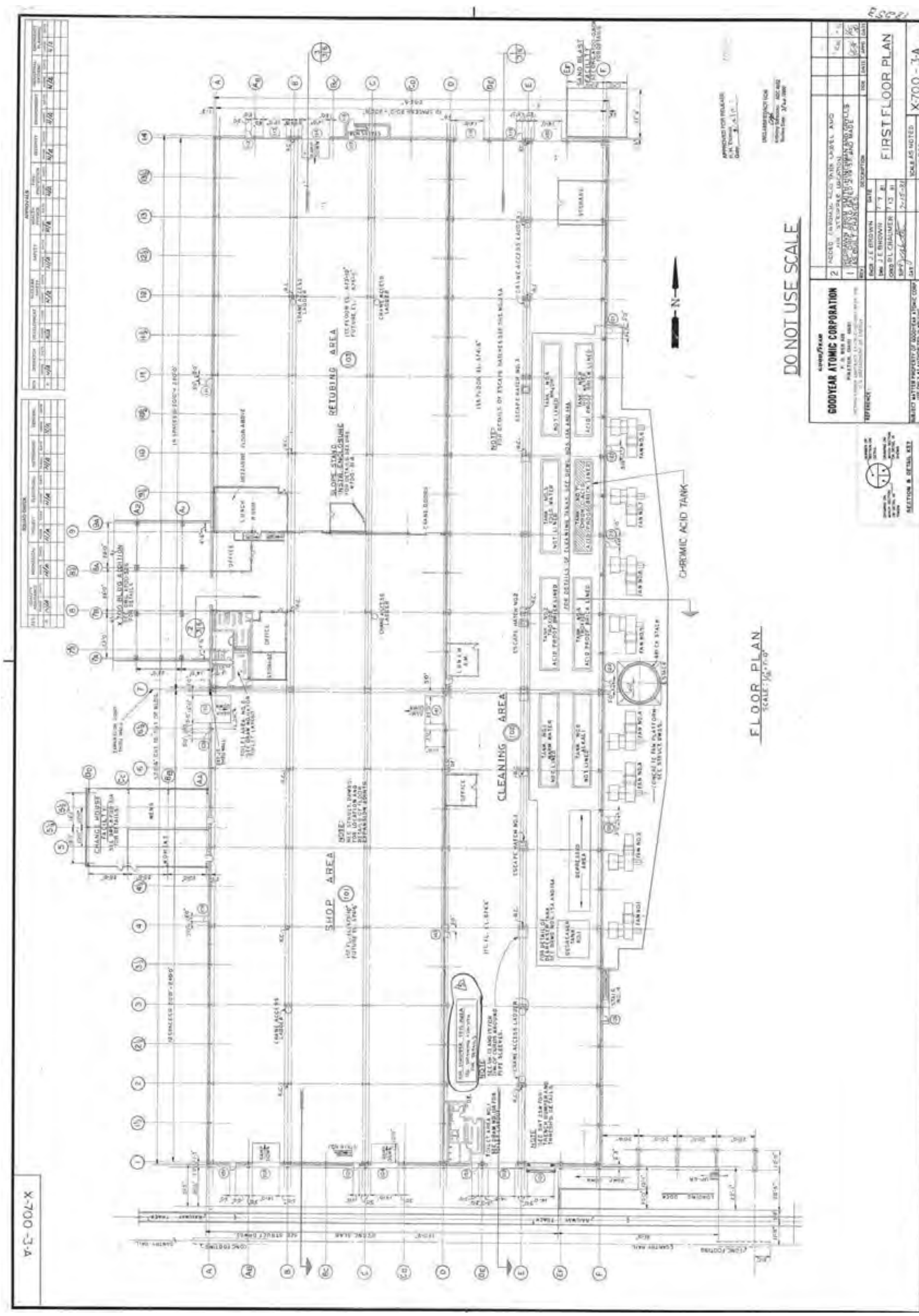

Figure 23: First Floor Plan

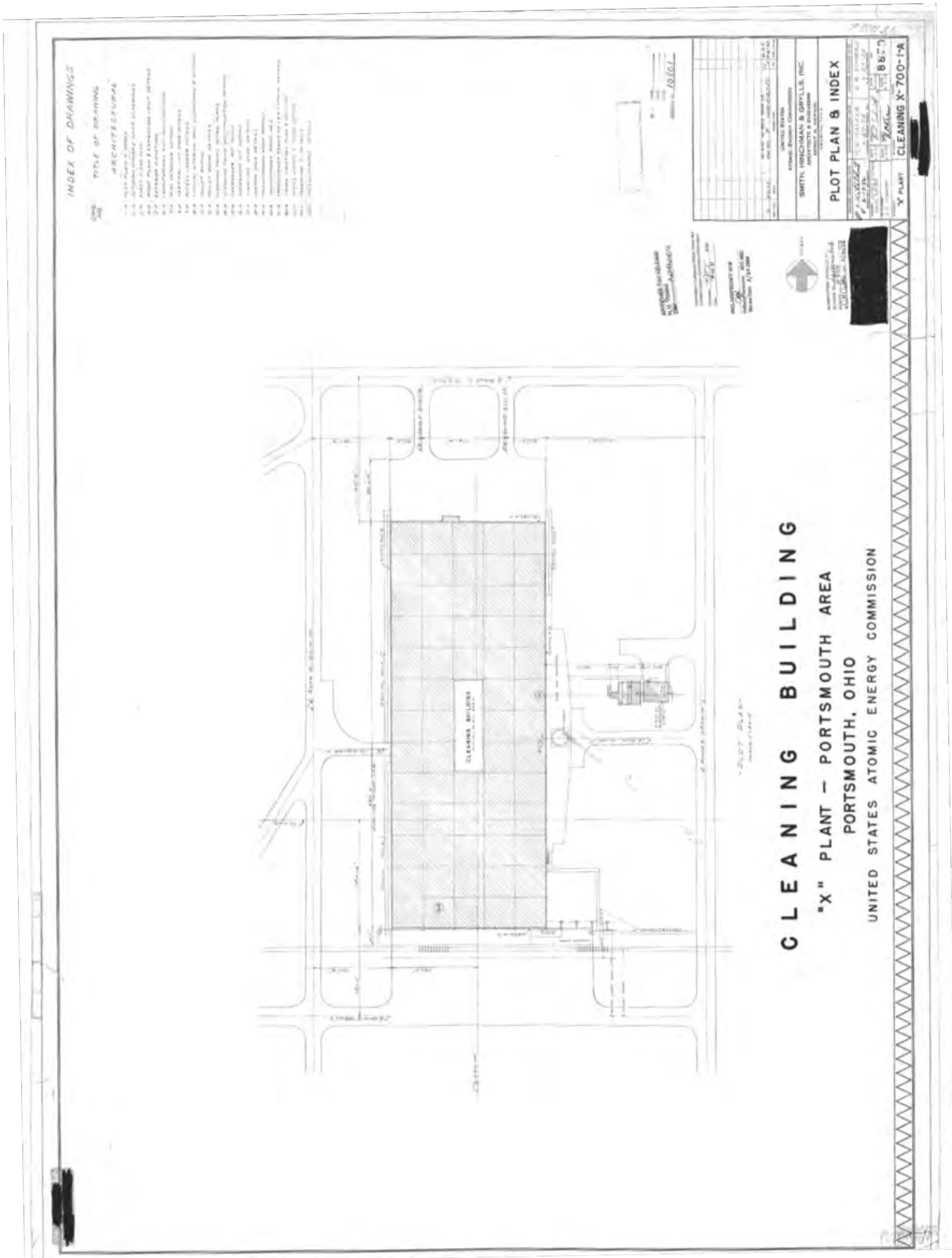

Figure 24: Plot Plan and Index

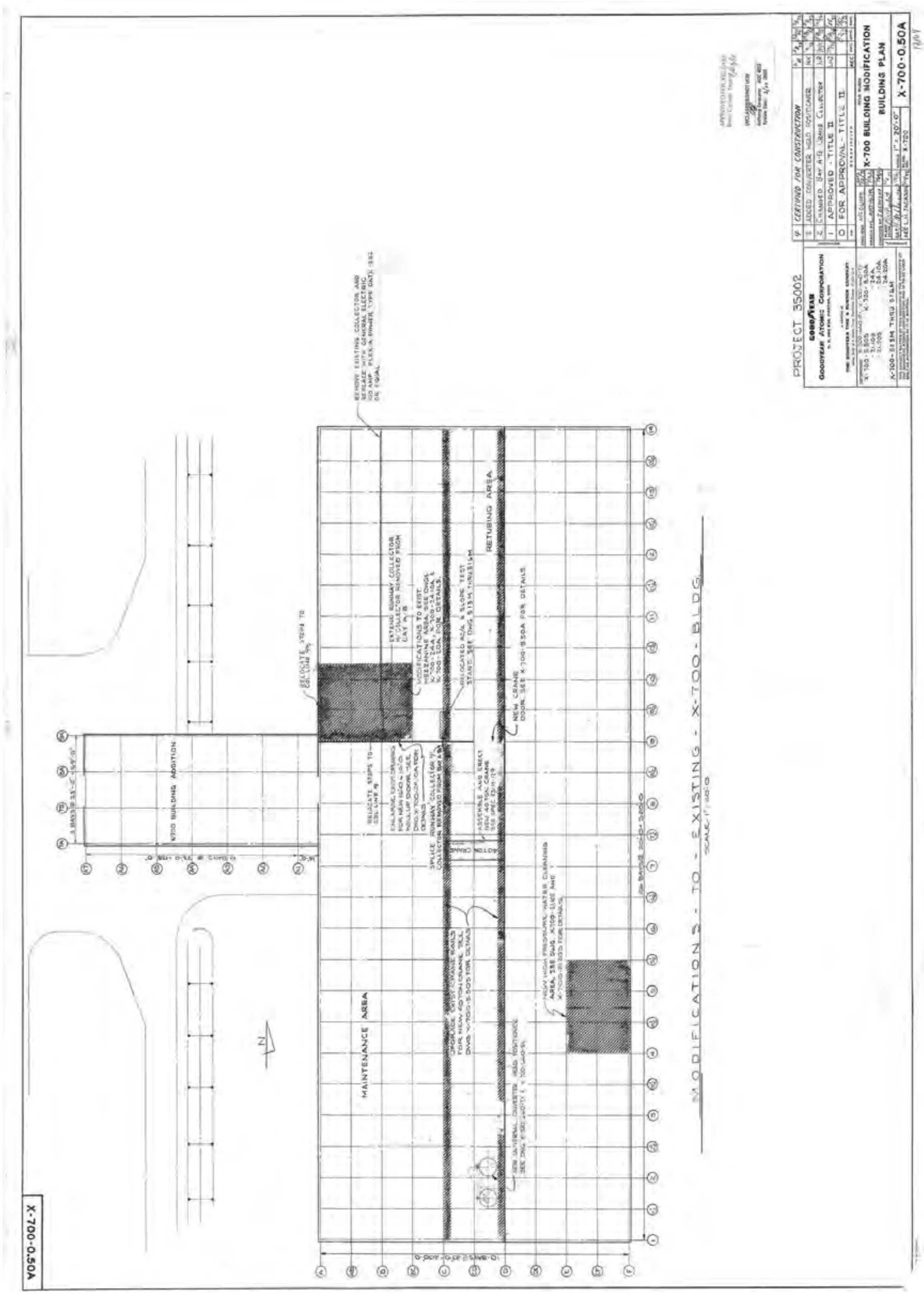

Figure 25: Building Plan

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-705 DECONTAMINATION BUILDING
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-W
HAER OH-142-W

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-705 DECONTAMINATION BUILDING

HAER No. OH-142-W

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-705 Decontamination Building is located at Ohio State Plane South coordinates at easting 1827233.292842 ft, northing 370241.633413935 ft and at Universal Transverse Mercator Zone 17N easting 327090.2825 m, northing 4320391.533 m. The coordinate represents the approximate center of the X-705 Decontamination Building. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1955
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	The X-705 Decontamination Building facilitates the ongoing process of equipment decontamination.
Significance:	The X-705 Decontamination Building is used for the disassembly and decontamination of process equipment and decontamination and cleaning of small parts. The gaseous diffusion X-705 Decontamination Building also supports chemical analysis for the X-705 Decontamination Building itself, as well as the X-700 Converter Shop and Cleaning Facility, X-720 Maintenance and Stores Building, and the X-342A Feed, Vaporization and Fluorine Generation Building. The X-705 Decontamination Building is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014 and November 2017. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs, and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant,

HAER no. OH-142. This X-705 Decontamination Building HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-705 Decontamination Building:

To expedite construction of the X-705 Decontamination Building, the Peter Kiewit Sons' Construction Company issued a lump-sum sub-contract for its construction. They issued three subcontracts altogether, with the George Sheaf & Company, of Columbus, Ohio, winning the contract to build the entire building. A second subcontract went to the Blount Brothers Construction Company, of Montgomery, Alabama, to furnish and install a long list of items, including monorails, cranes, hoists, conveyor systems, catwalks, stairs, piping, and many other systems within the X-705 Decontamination Building. The third sub-contract went to the Brown-Neil Corporation, of Clarksburg, West Virginia, for furnishing and installing the spray-booth equipment. Peter Kiewit Sons' installed the building's fire alarm system.

Excavation for footers commenced in October 1953 (Appendix B, Figures 5 through 8). As encountered elsewhere on the PORTS construction site, workers soon discovered "fat clay" (clay with high plasticity) within the X-705 Decontamination Building construction site. This unstable soil required removal and backfilling with class D concrete. By November 1953, construction crews had completed excavation work.

Concrete work began in early October 1953. The H.E. Pederson Company, Inc. (location not known) was in charge of placing the reinforcing steel, while the George Sheaf Company performed the actual concrete work. They poured class D concrete under the footers. Due to cold conditions, workers covered the concrete with straw and canvas, and in some instances, used electric heaters to keep the concrete warm. By mid-December 1953, workers had completed pouring concrete for the building's footers, foundation walls, piers, machine bases, and slabs. Altogether the foundation work required 4,848 cubic yards of concrete.

Ironworkers of the Crawford Steel Corporation, of Cincinnati, Ohio, began erecting the building's steel frame in January 1954 (Figures 9 and 10). By mid-April, they had advanced far enough that workers began installing the steel roof decking (Figure 11). Electrical and plumbing work began in early October. Workers began installing equipment within the building in December 1954 (Figures 12 through 19), and all work on the building was complete by mid-June 1955.

Historical drawings of building plans are provided in Appendix C (Figures 20 through 30).

Part II. Site Information

Description of the X-705 Decontamination Building:

The X-705 Decontamination Building is located roughly 600' east of the X-330 Process Building and about 230' south of the X-333 Process Building. The building was used for decontaminating radioactive materials found on process equipment and clothing, as well as reclaiming uranium residues during the decontamination process.

The building measures 163' wide by 532' long and houses 102,500' of floor space. Built of steel frame construction, the X-705 features a flat roof with a clerestory down the length of the building (Appendix A, Figures 1 through 4). An 8' tall concrete block wall extends around the bottom of the building. A continuous band of multi-light steel sash industrial windows rests atop this wall. Additional steel sash windows are located at the mezzanine levels and on both sides of the clerestory. Like many of the buildings on the PORTS reservation, the X-705 Decontamination Building is clad with corrugated asbestos-cement panels.

At the time of its construction, the steel framing of the building conformed to the Pacific Coast Building Code for Zone 1 earthquake hazard. All catwalks and access platforms are comprised of steel framing. Floors consist of reinforced concrete with a rating of 4,000 pounds per square foot. There are a number of tunnels and pits formed within the concrete floor. Below grade, the concrete walls were coated with ironite to protect them against moisture.

The interior of the building includes several mezzanines in addition to the ground floor level. The interior space is divided into seven operating areas and areas for storage, maintenance, administration, laboratory, and auxiliary service use, such as hot and cold changing rooms, showers, toilets, laundry, and lunch room for 150 staff members. A mezzanine along the north side of the building features a five-ton hydraulic elevator moving chemicals and other materials. A series of pits and tunnels are located below the ground level for the process piping and equipment. Monorails, hoists, and jib cranes are used to handle materials that require cleaning. The south bay features a pair of 23-ton cranes.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio*, DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

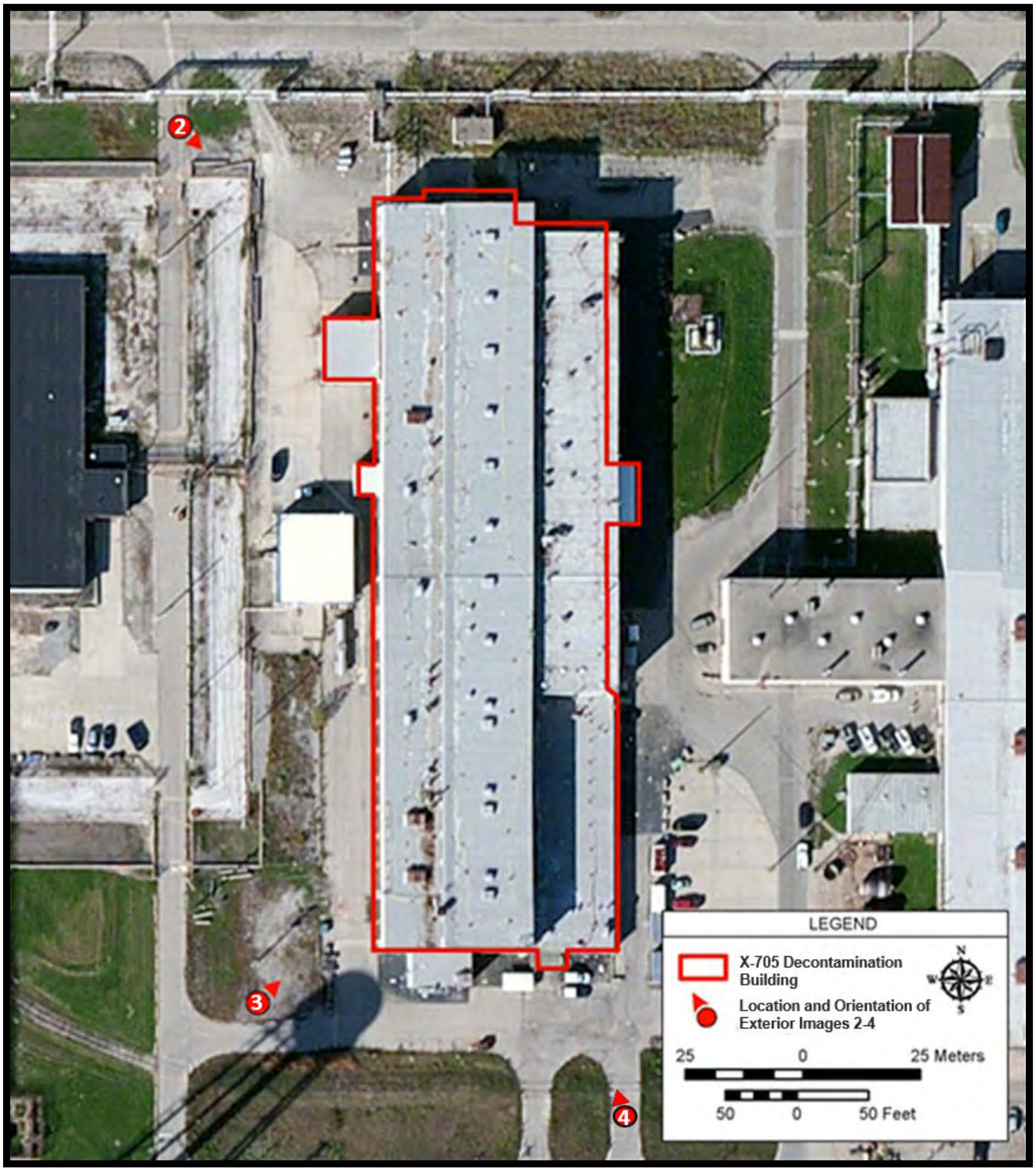

Figure 1: Location and Orientation of Exterior Photographs (2 through 4)

Figure 2: North Side of the X-705 Decontamination Building, August 2014, Facing Southeast

Figure 3: South Side of the X-705 Decontamination Building, August 2014, Facing Northeast

Figure 4: South Side of the X-705 Decontamination Building, November 2014, Facing Northwest

Appendix B: Historical Photographs

Figure 5: Interior View of the X-705 Decontamination Building Site, Looking North, September 1953

Figure 6: Looking North at the X-705 Decontamination Building Site, December 1953

Figure 7: Looking North at the X-705 Decontamination Building Site, January 1954

Figure 8: Looking North at the X-705 Decontamination Building, February 1954

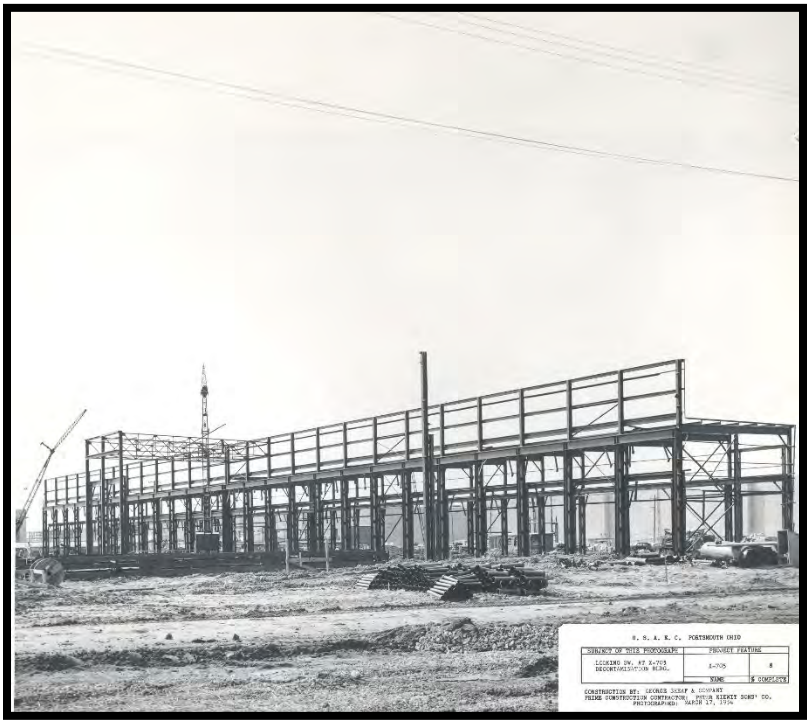

Figure 9: Looking Southwest at the X-705 Decontamination Building, March 1954

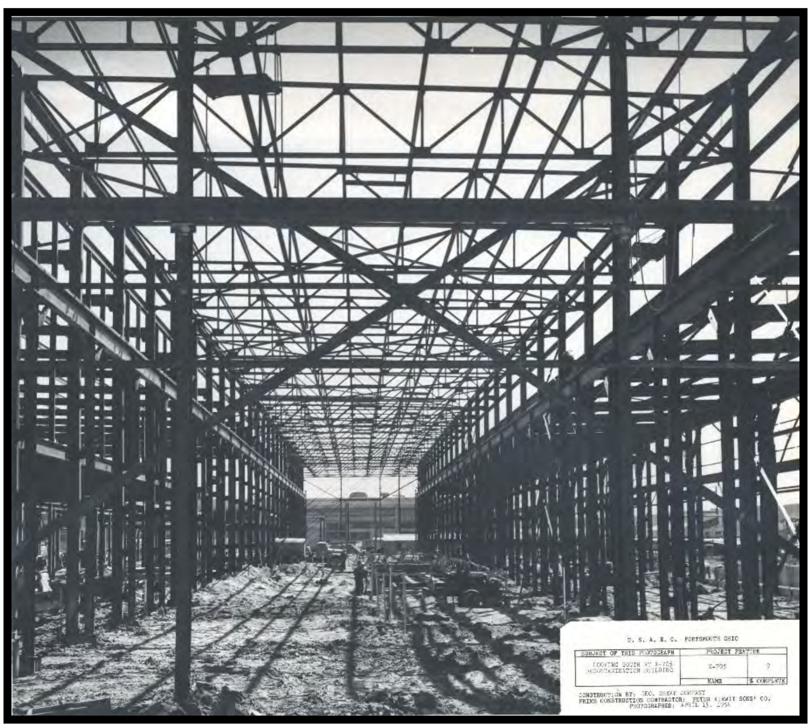

Figure 10: Looking South at the X-705 Decontamination Building, April 1954

Figure 11: Looking Southwest at the X-705 Decontamination Building, June 1954

Figure 12: Interior View of the X-705 Decontamination Building, July 1954

Figure 13: Interior View of the X-705 Decontamination Building, July 1954

Figure 14: The X-705 Decontamination Building, July 1954

Figure 15: Interior View of the X-705 Decontamination Building, July 1954

Figure 16: Interior View of the X-705 Decontamination Building, July 1954

Figure 17: Overall View of the X-705 Decontamination Building, Looking North, July 1954

Figure 18: The X-705 Decontamination Building, July 1954

Figure 19: Interior View of the X-705 Decontamination Building, July 1954

Appendix C: Historical Drawings

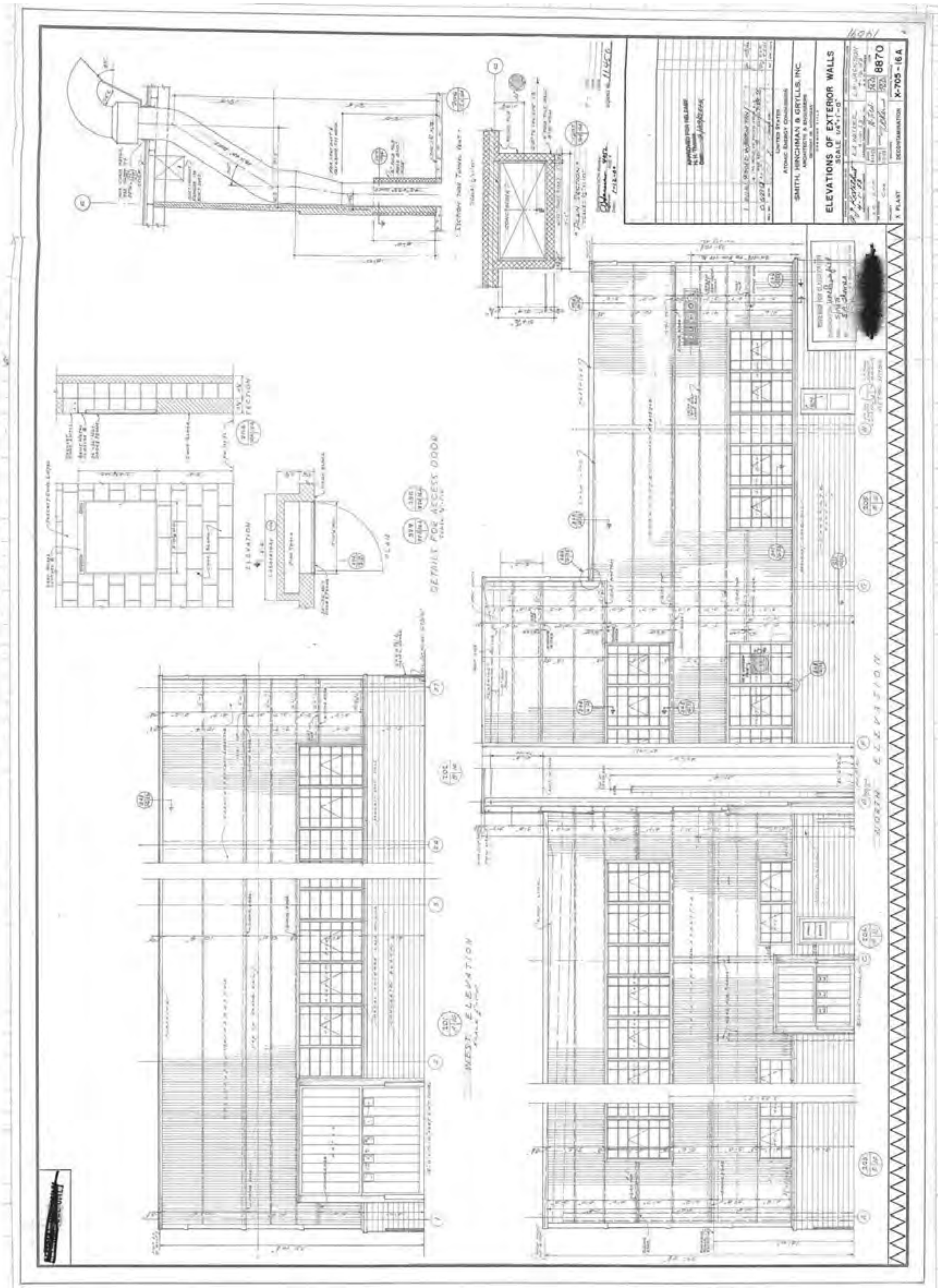

Figure 20: Elevations of Exterior Walls

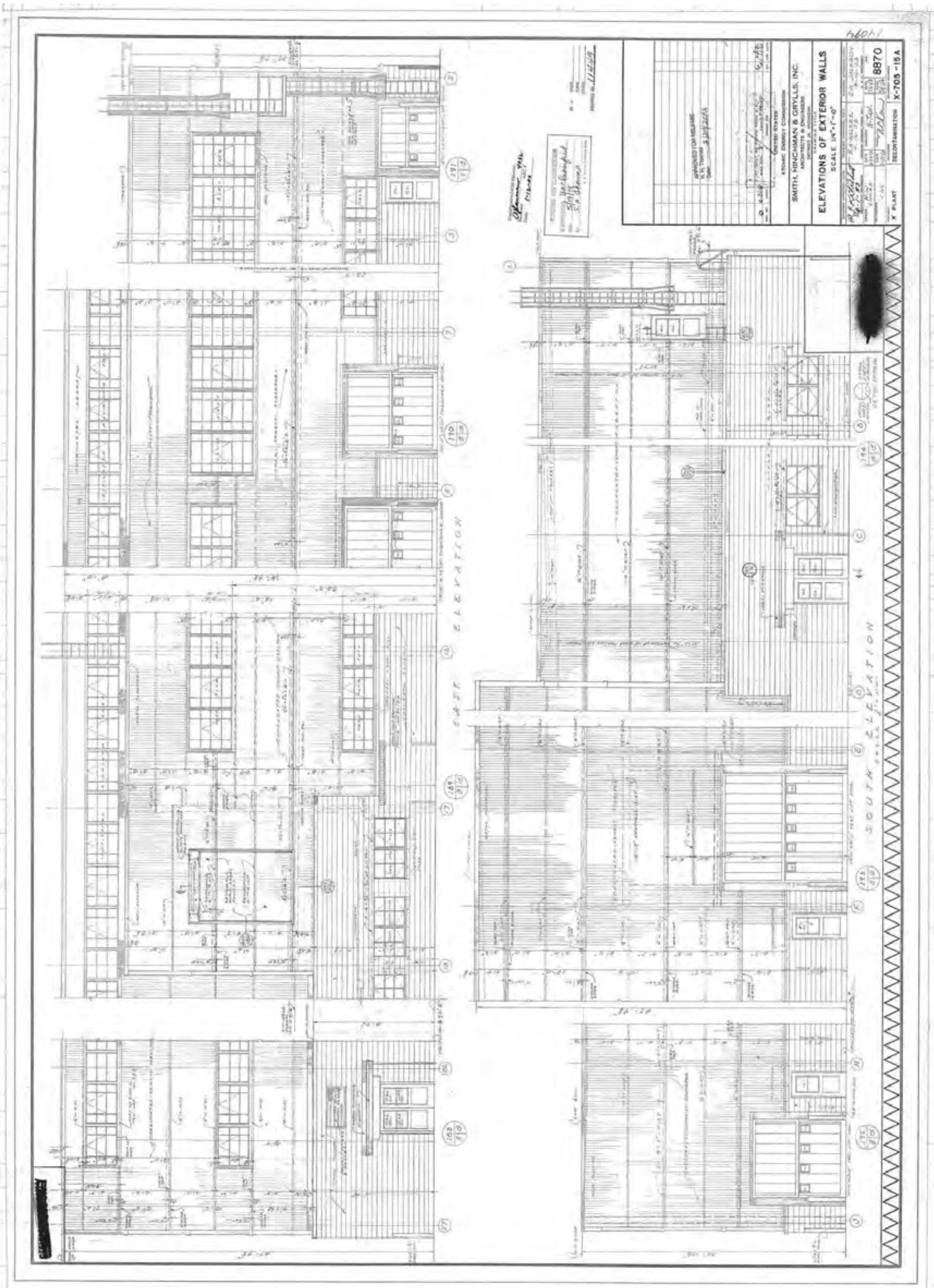

Figure 21: Elevations of Exterior Walls

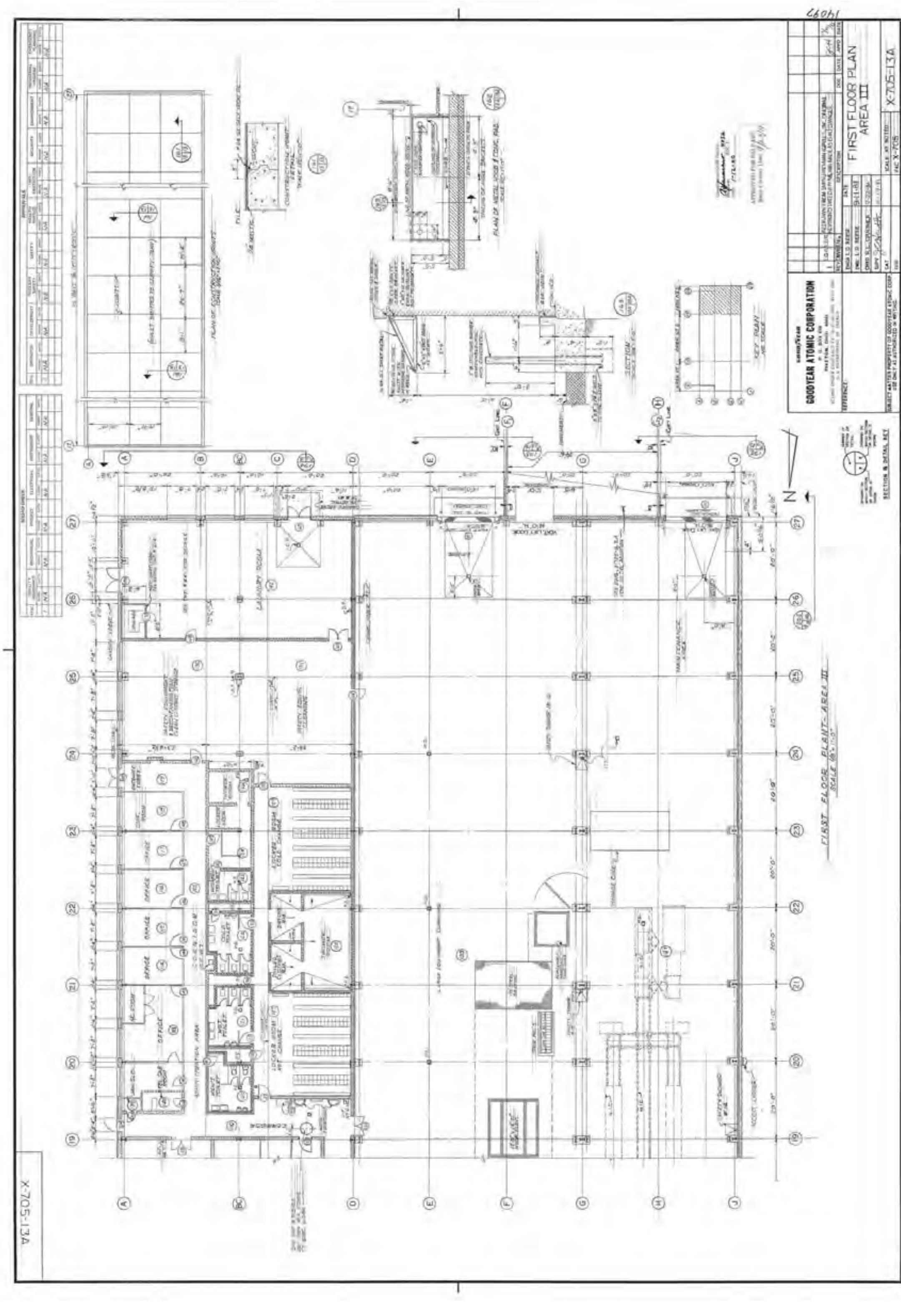

Figure 22: First Floor Plan Area 3

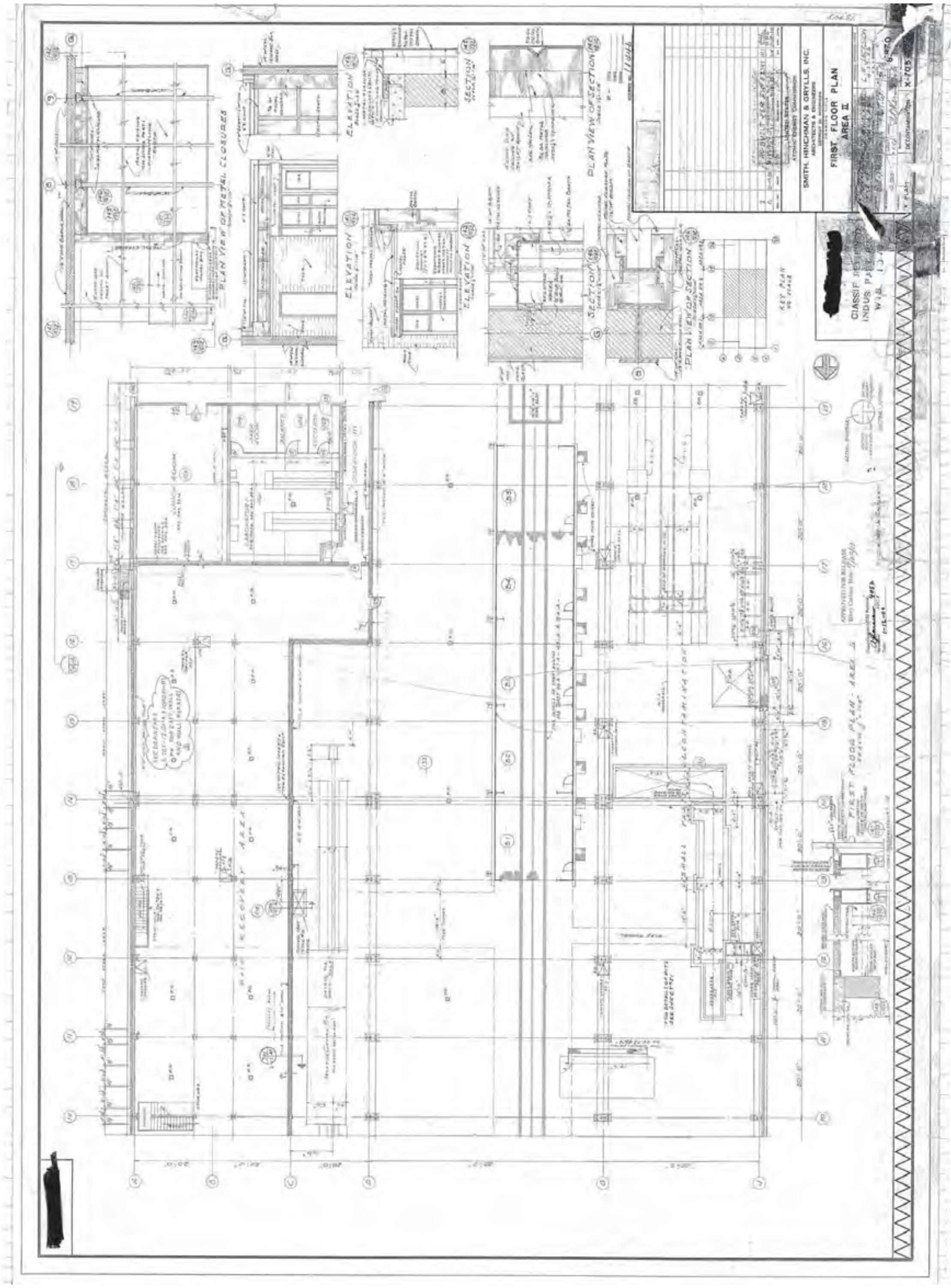

Figure 23: First Floor Plan Area 2

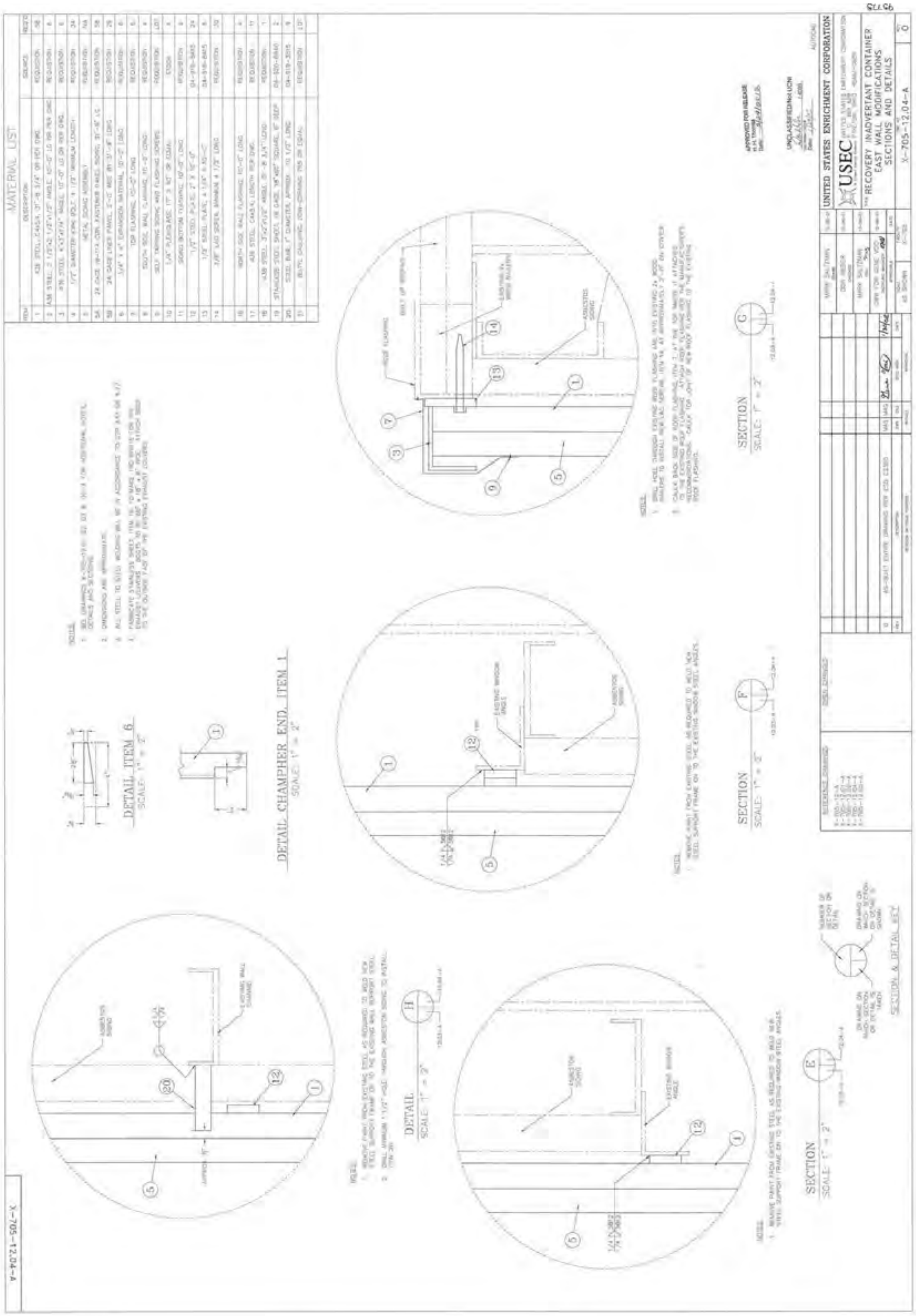

Figure 24: Recovery Inadvertent Container East Wall

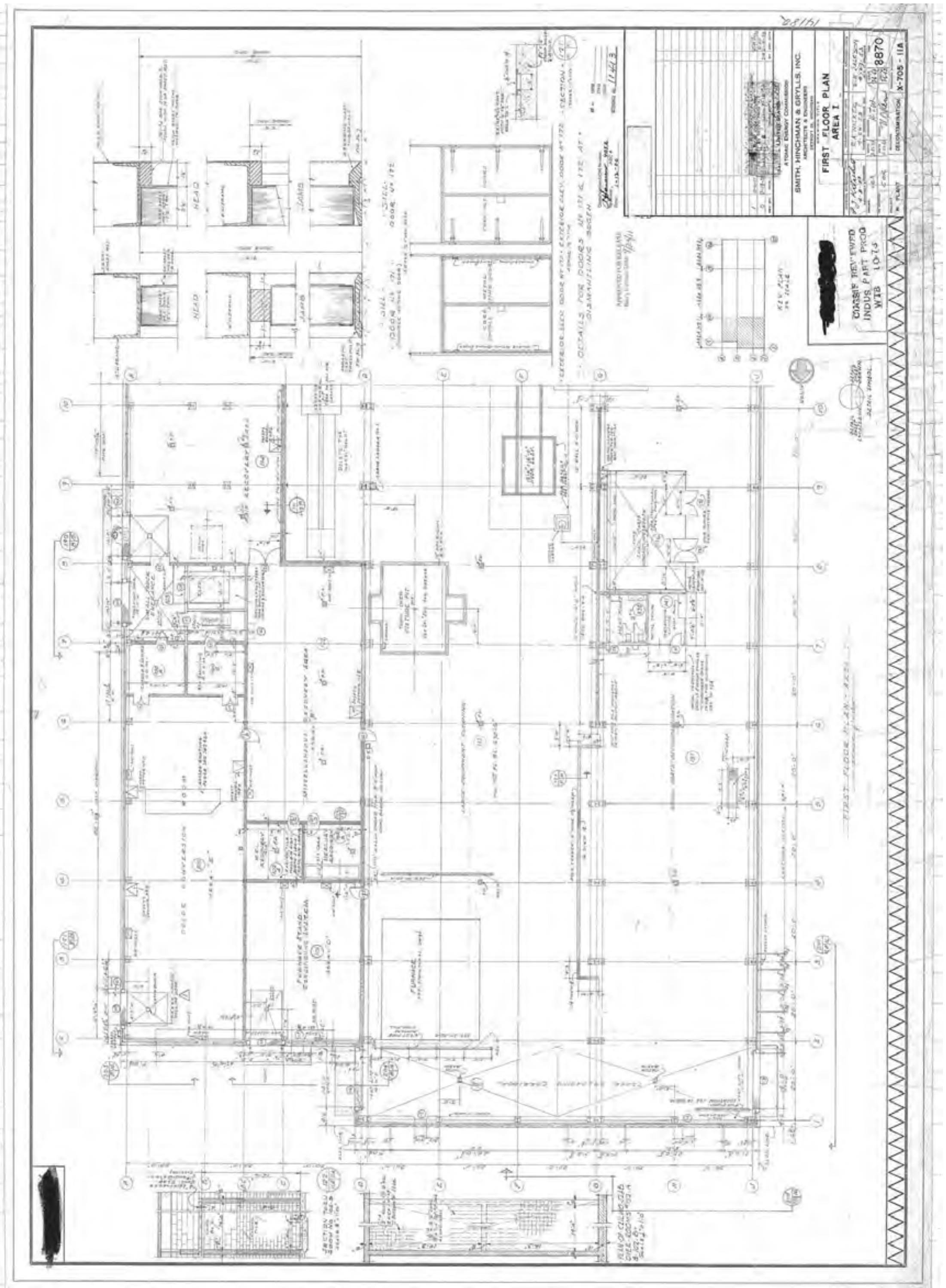

Figure 25: First Floor Plan Area 1

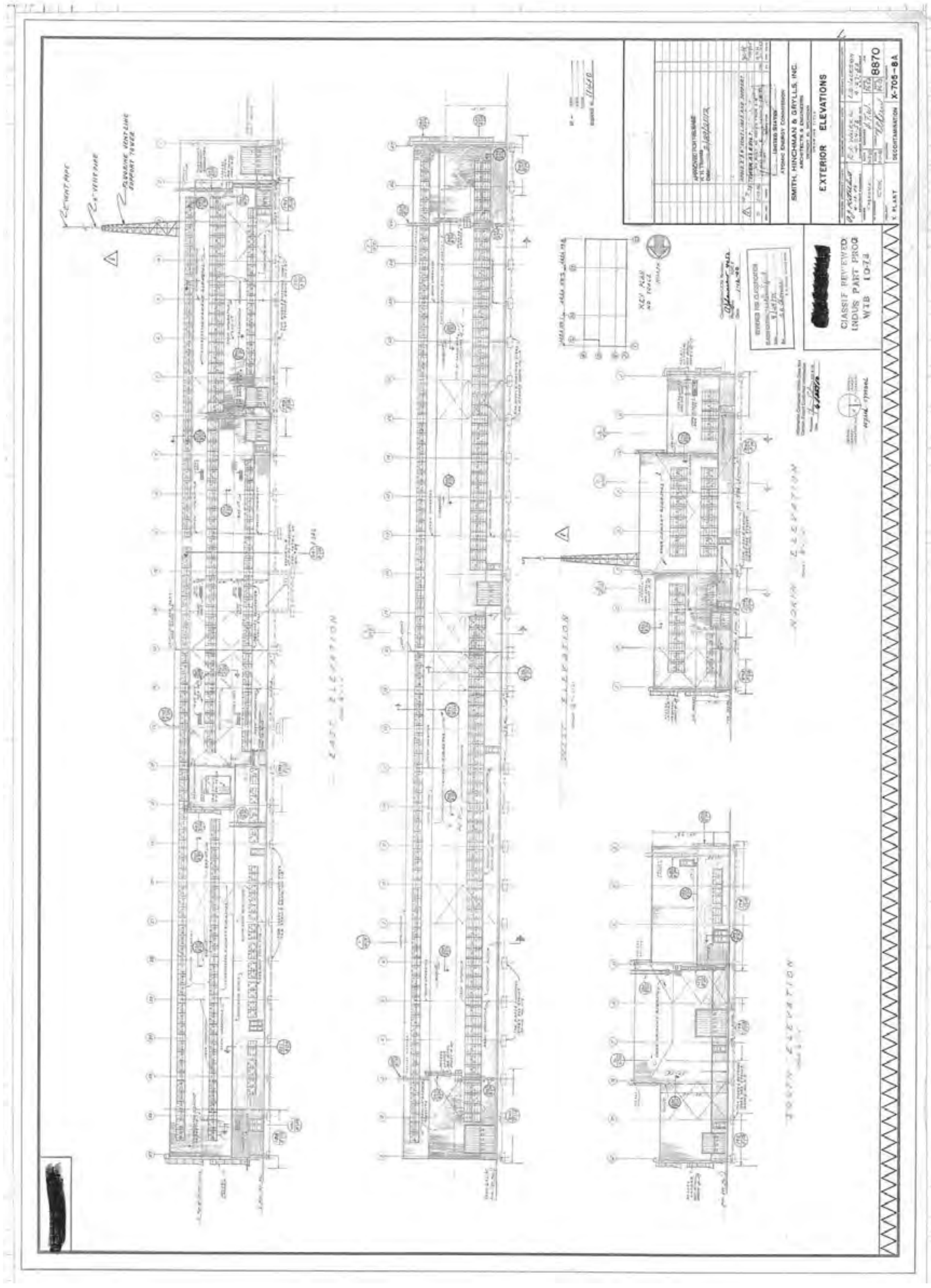

Figure 26: Exterior Elevations

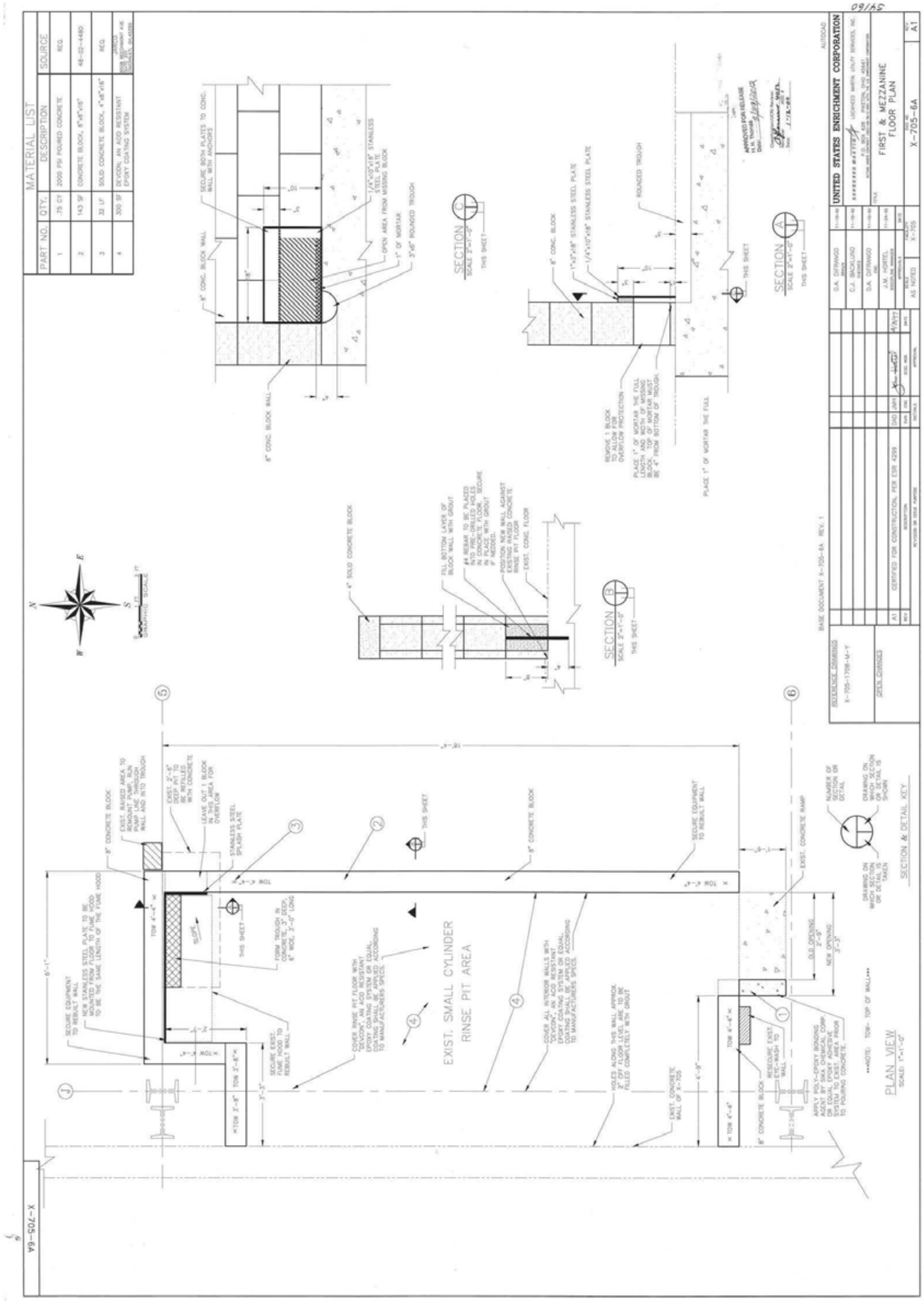

Figure 27: First and Mezzanine Floor Plan

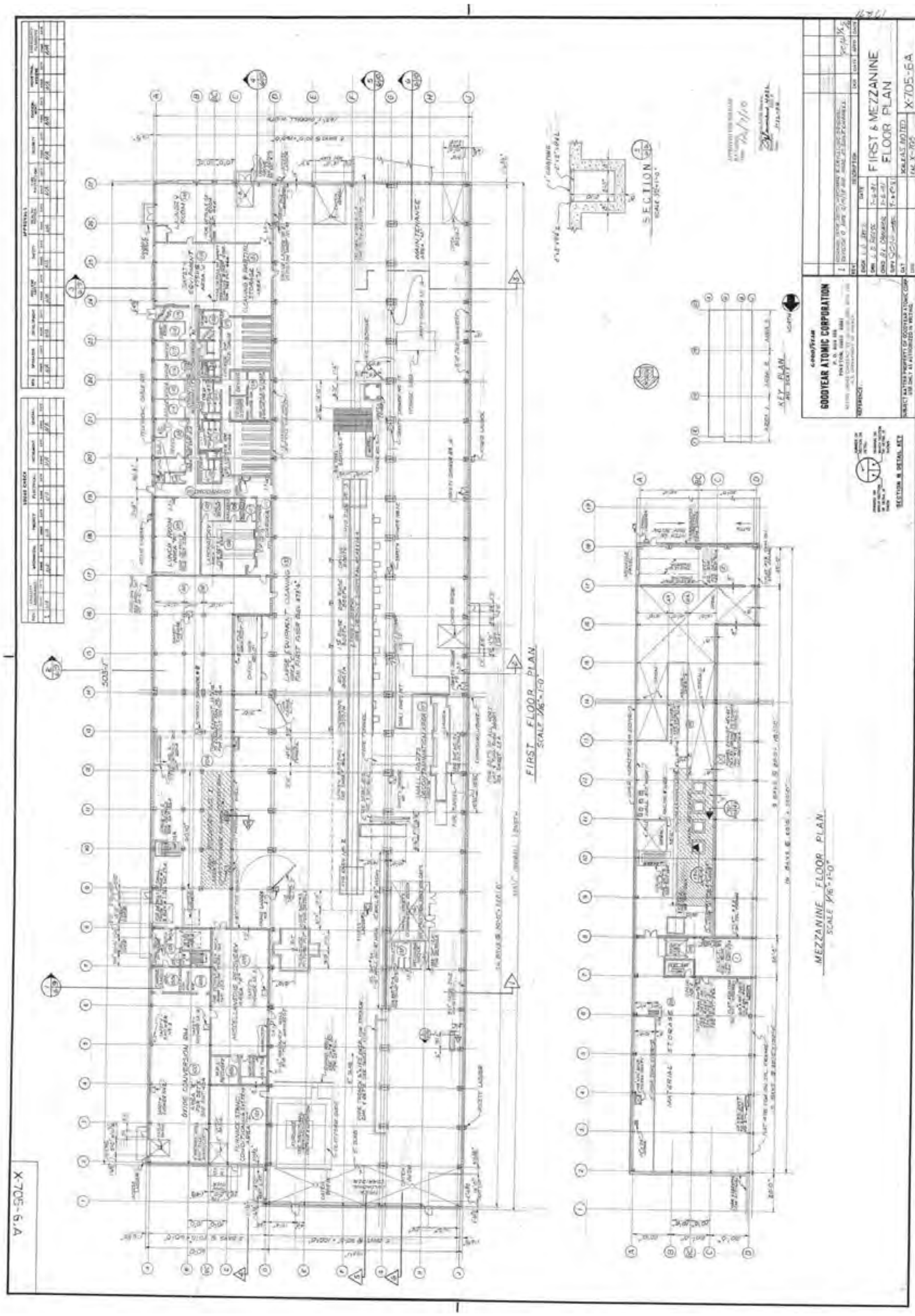

Figure 28: First and Mezzanine Floor Plan

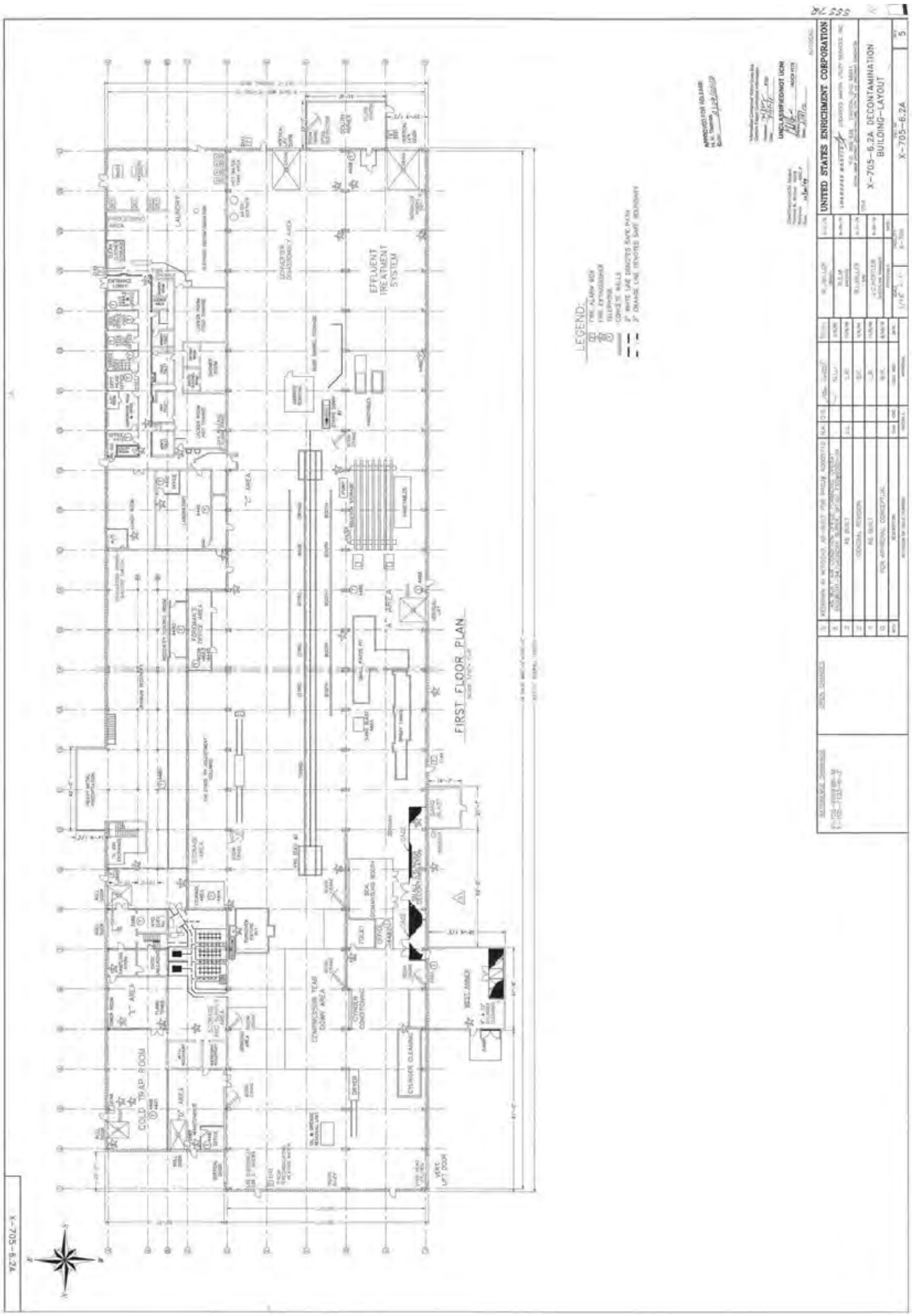

Figure 29: Decontamination Building Layout

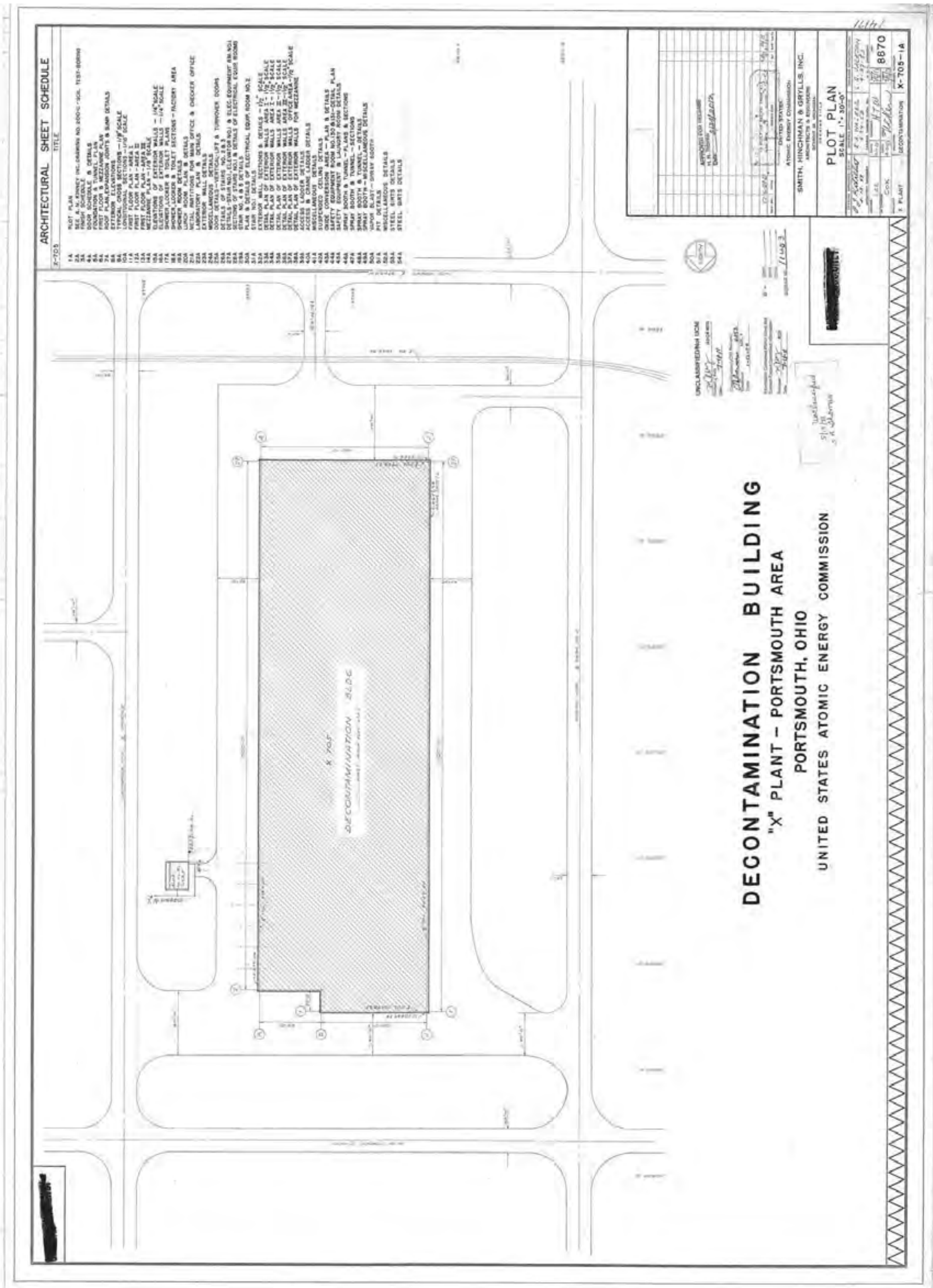

Figure 30: Plot Plan

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-710 TECHNICAL SERVICES BUILDING
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-X
HAER OH-142-X

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-710 TECHNICAL SERVICES BUILDING

HAER No. OH-142-X

Location: Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio

The X-710 Technical Services Building is located at Ohio State Plane South coordinates at easting 1826906.493089 ft, northing 367871.106517806 ft and at Universal Transverse Mercator Zone 17N easting 326978.8068 m, northing 4319670.722 m. The coordinate represents the approximate center of the X-710 Technical Services Building. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.

Date of Construction: 1955

Designer/Builder: Peter Kiewit Sons' Construction Company

Previous Owner: N/A

Present Owner: The Atomic Energy Commission (AEC) oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.

Present Use: Environmental testing and monitoring

Significance: The X-710 Technical Services Building housed the plant's laboratory for testing, research, and development associated with uranium enrichment, cascade testing and evaluation, and other mission-related purposes. This building is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.

Project Information: Fluor-BWXT Portsmouth LLC photographed the site in August 2014 and in November 2017. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-710 Technical Services Building HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-710 Technical Services Building:
The James Leck and Steenberg Construction Company, of Minneapolis, Minnesota, received the construction subcontract for the X-710 Technical Services Building. Union Carbide, of Houston, Texas, and Peter Kiewit Sons’ Construction Company installed certain special equipment in the building, while Leck and Steenberg handled the general excavation and construction of the facility. When excavation began in August 1953, construction crews found unsuitable bearing soil, which necessitated placement of concrete backfill for the concrete footings to rest upon. In total, nearly 9,000 cubic yards of earth were excavated. Excavation work finished in May 1954. Concrete pouring for the building footings began in August 1953, with the first building columns poured in October 1953. The columns were completed in May 1954 (Appendix B, Figure 6). Construction crews placed a total of 6,150 cubic yards of concrete in the X-710 Technical Services Building and its related facilities and laid 155,000 concrete blocks. Mechanical and electrical work began in early November 1953 and was completed with equipment installation in January 1955 (Figures 7 through 10). The building was officially completed in April 1955, although it was partially occupied prior to this date.

Historical drawings of building plans are provided in Appendix C (Figures 11 through 20).

Part II. Site Information

Description of the X-710 Technical Services Building:
The X-710 Technical Services Building, located near the center of the site, is roughly 300' east of the X-326 Process Building and roughly 150' south of the X-300 Plant Control Facility. The X-710 Technical Services Building houses the main laboratory for PORTS. For much of its history, plant scientists and technicians carried out research and development within the X-710 Technical Services Building. Activity conducted here included material sampling and testing, chemical analysis and laboratory services, information services and management, instrumentation development and testing, cascade testing and evaluation, development testing and evaluation and fabrication. The building also houses numerous offices, including those for technical services management, equipment repair and fabrication shops, a store room, and a mechanical equipment room. With the decline of uranium enrichment operations at the site, activities within the X-710 Technical Services Building shifted toward environmental testing and monitoring. The X-710 Technical Services Building also includes the X-710A Gas Manifold Building, X-710B Explosion Test Facility, and a neutralization pit.

Built of reinforced concrete, the X-710 Technical Services Building is a rather generic, utilitarian type building with a flat roof and exposed concrete framing and cinderblock infill (Figures 1 through 5). Window openings with galvanized steel industrial sash are located on the north and east façades. As completed in 1955, the original portion of the building measured 179', 8" by 290', 7" and housed 109,000 square feet of floor space. In 1975, Goodyear Atomic extended the south end of the building an additional 80', giving the X-710 Technical Services Building another 30,000 square feet of floor space. The addition is clad in vertical aluminum sheathing. The building’s cinderblock bays total 13 on the east and west sides of the building, with another 10 bays dividing the north and south sides of the building. A projecting wing is located near the center of the original building on the east façade. The wing features a recessed porch on the southeast corner.

The interior of the building is divided into cinder block partitions in general areas and movable metal partitions in the laboratory areas to provide for adjustment in laboratory room sizes. All interior finishes are utilitarian and provide for functionality and cleanliness control. In the laboratory spaces, electrical and mechanical installations are concealed above metal pan ceilings, and exposed masonry walls are plastered and painted with acid-proof paint to allow for cleaning and decontamination operations. Floors in corridors and laboratories are coated with vinyl plastic tile to allow for cleanup and decontamination. Power is distributed to four substations within the X-710 Technical Services Building, each controlling separate functions within the facility. Additionally, a 90-kilowatt diesel generator provides power to the building for emergency use in the event of an outage from the X-530 Switchyard.

The X-710A Gas Manifold Shed is located just west of the X-710 Technical Services Building, and constitutes the facility for receiving, storing, and distributing oxygen, hydrogen, and bottled gas to the X-710 Technical Services Building. The building sits on a 37' by 26' concrete pad and consists of a corrugated cement asbestos panel roof supported by steel framing and enclosed by a metal fence.
A 6'-wide loading dock is on one side of the structure. The X-710B Explosion Test Facility is located approximately 75' west of the X-710 Technical Services Building and consists of a reinforced concrete reaction cell 8' in diameter by 10' high, and a 12' by 14' adjacent work area of similar construction. The X-710B Building was built to conduct experiments involving unstable compounds that could potentially result in explosions. The X-710B Explosion Test Facility design meets AEC criteria for blast proof construction to withstand 750 pounds per square foot.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio,* DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio,* DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

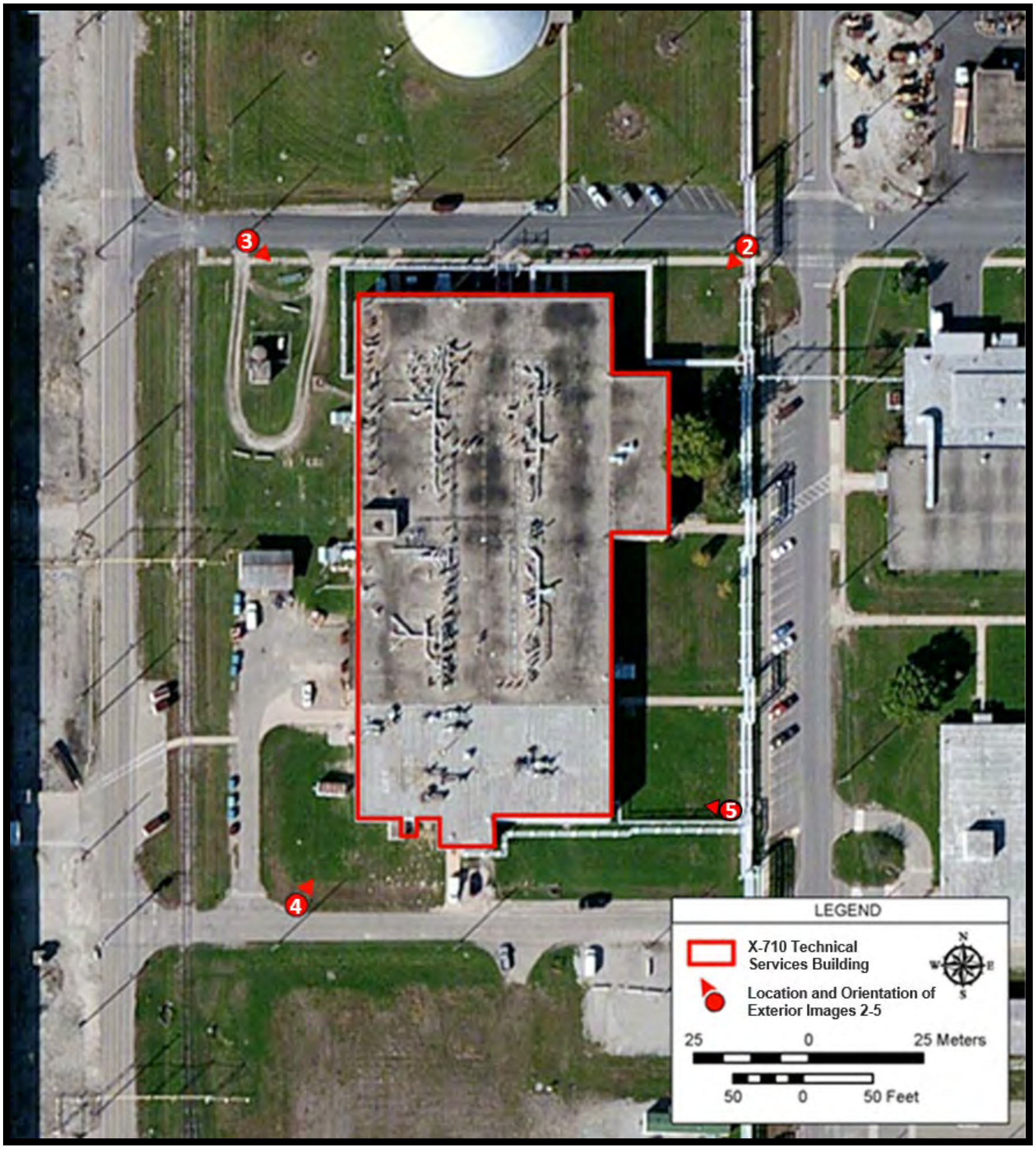

Figure 1: Location and Orientation of Exterior Photographs (2 through 5)

Figure 2: North Side of the X-710 Technical Services Building, August 2014, Facing Southwest

Figure 3: North Side of the X-710 Technical Services Building, August 2014, Facing Southeast

Figure 4: South Side of the X-710 Technical Services Building, November 2017, Facing Northeast

Figure 5: South Side of the X-710 Technical Services Building, November 2017, Facing Northwest

Appendix B: Historical Photographs

Figure 6: The X-710 Technical Services Building Construction Site, February 1953

Figure 7: Interior View of the X-710 Technical Services Building Construction, February 1953

Figure 8: North End of the X-710 Technical Services Building, May 1954

Figure 9: Interior View of the X-710 Technical Services Building, May 1955

Figure 10: Interior View of the X-710 Technical Services Building, May 1955

Appendix C: Historical Drawings

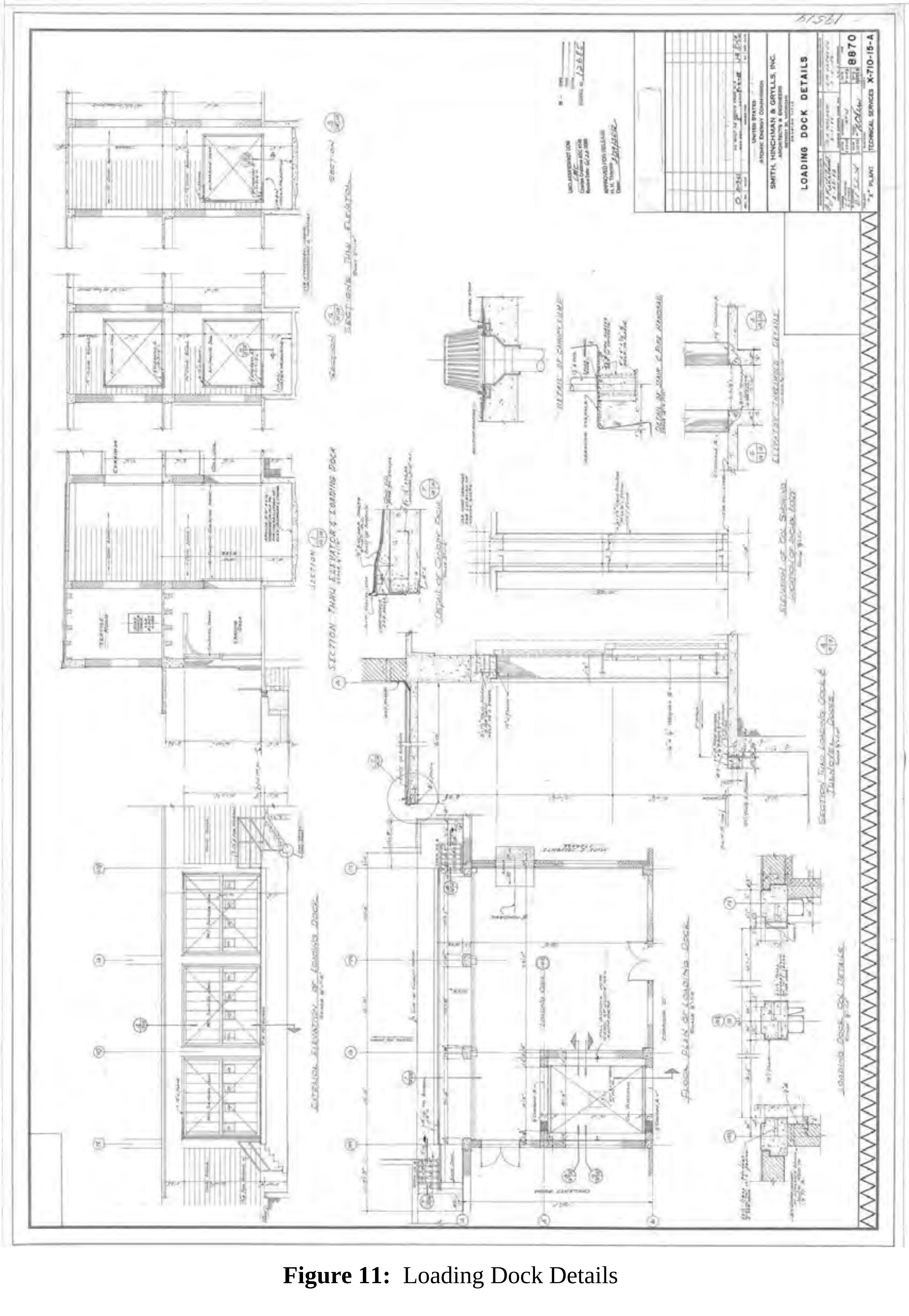

Figure 11: Loading Dock Details

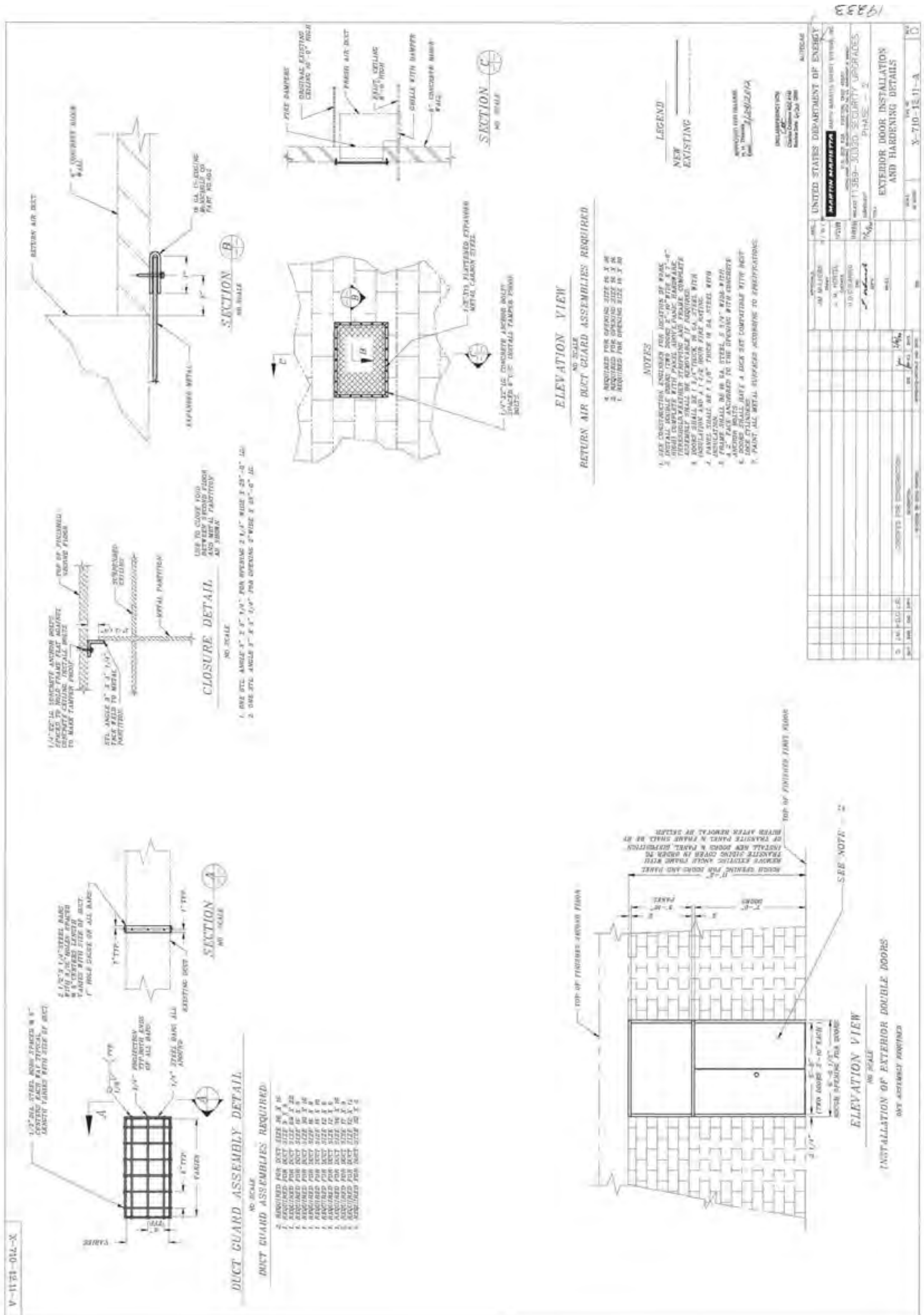

Figure 12: Exterior Door Installation

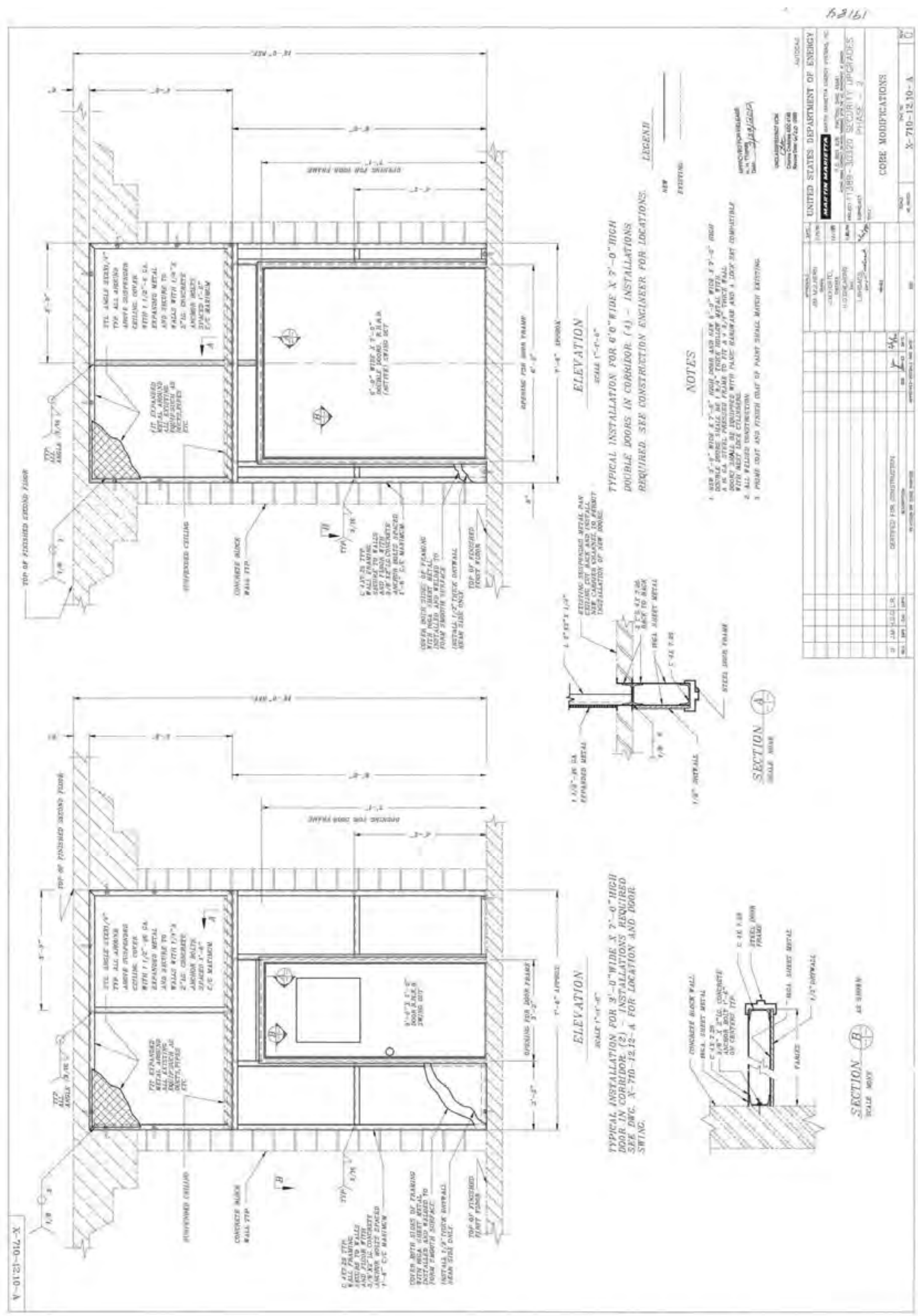

Figure 13: Core Modifications

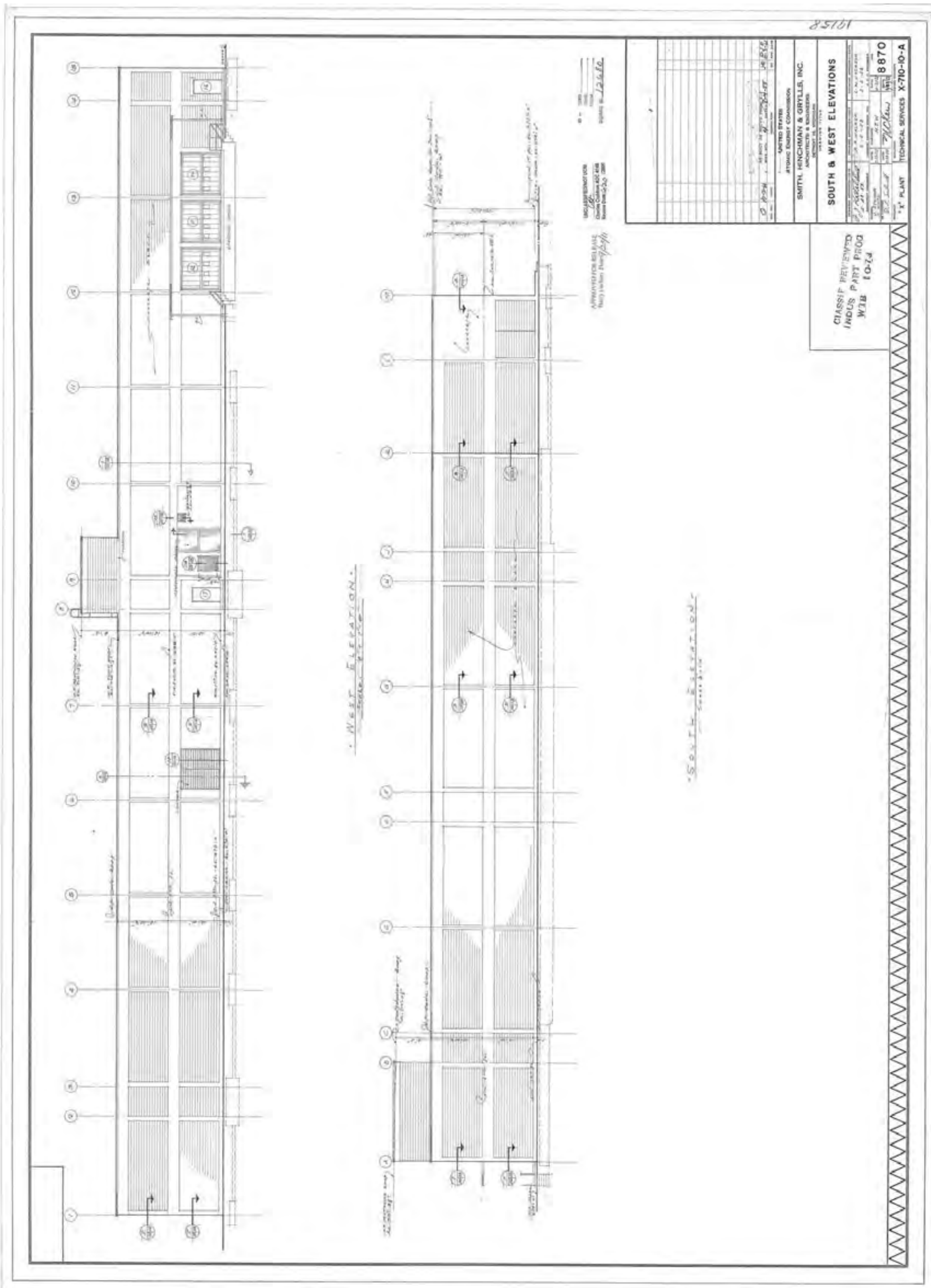

Figure 14: South and West Elevations

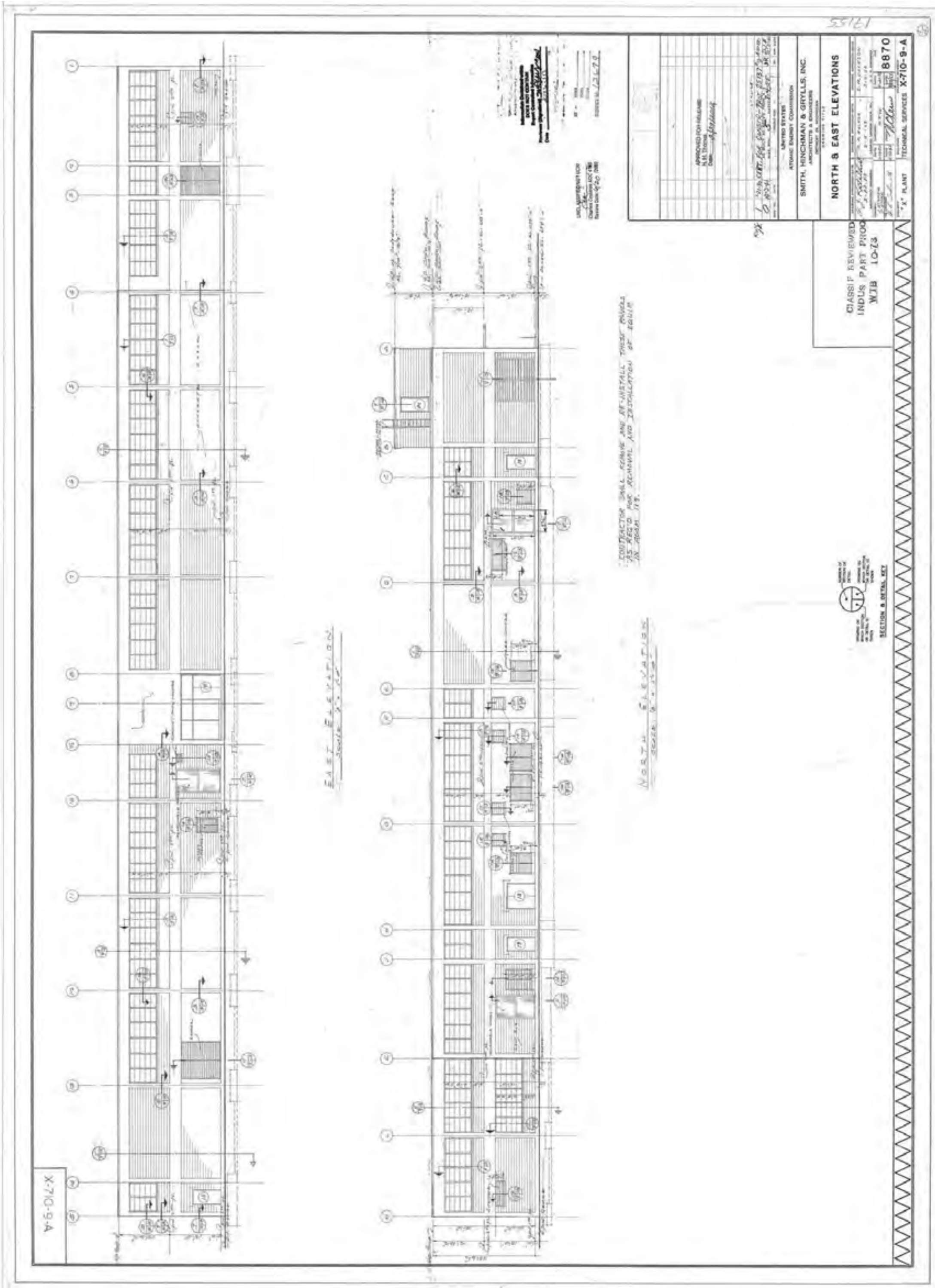

Figure 15: North and East Elevations

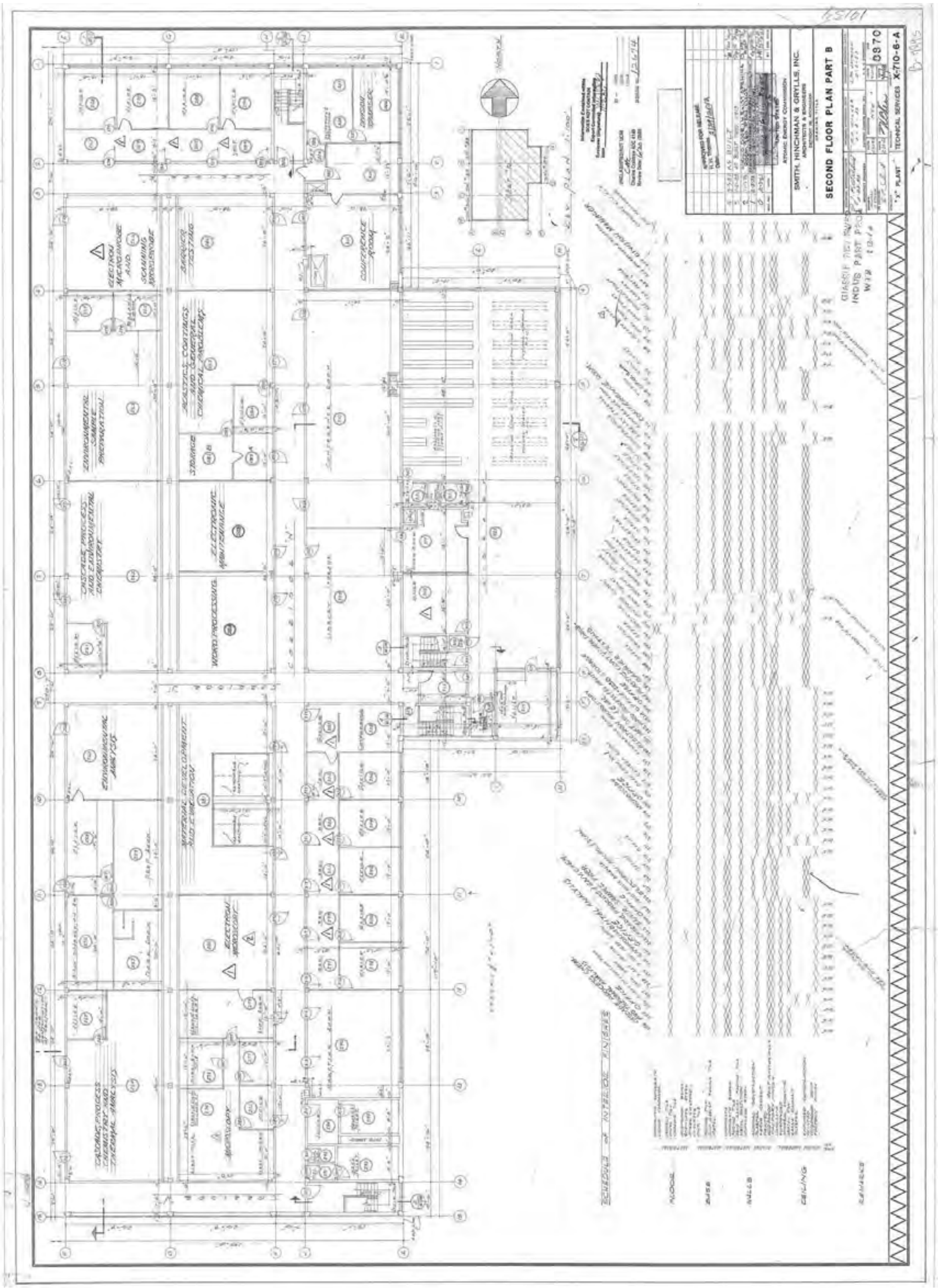

Figure 16: Second Floor Plan Part B

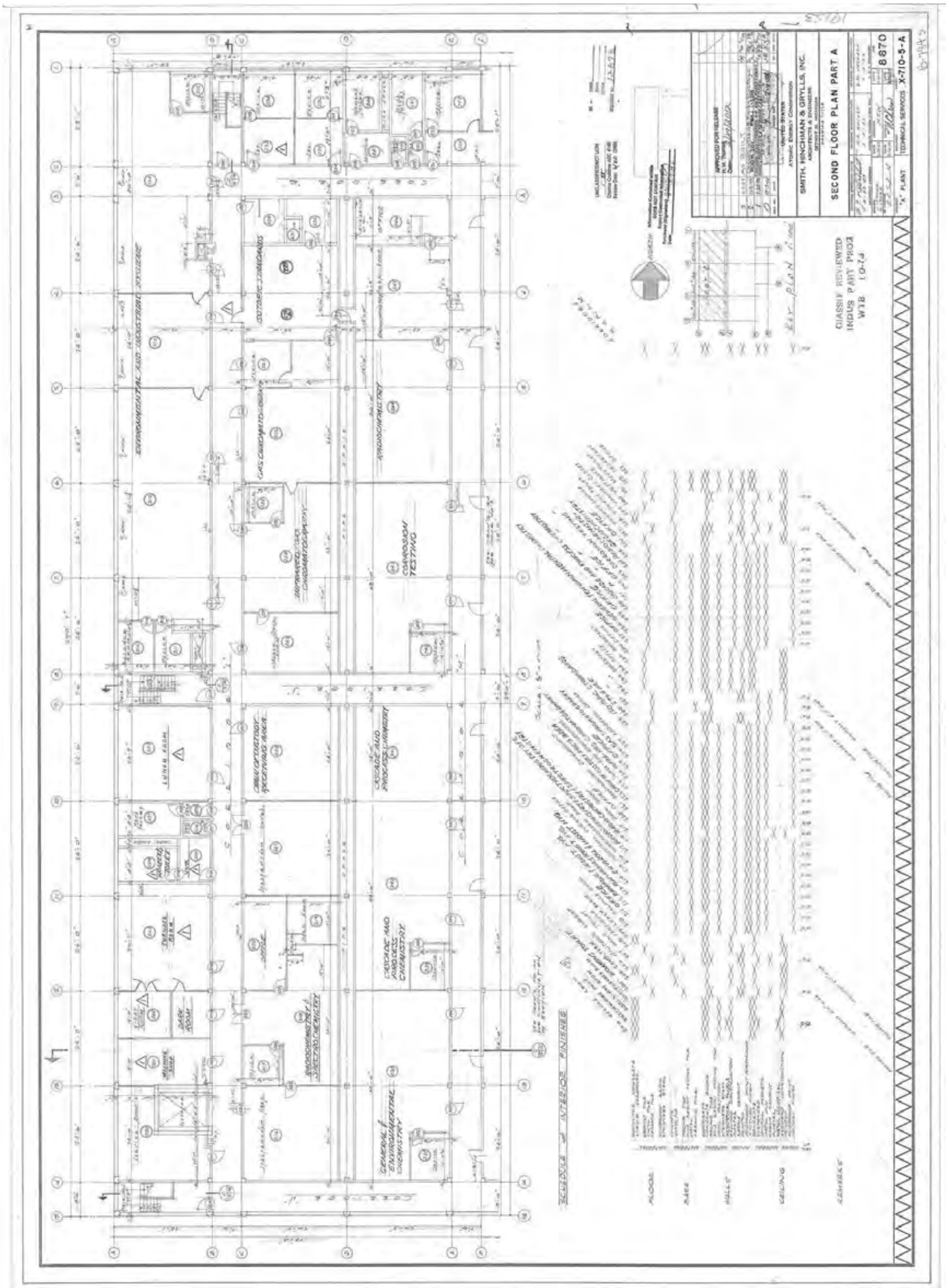

Figure 17: Second Floor Plan Part A

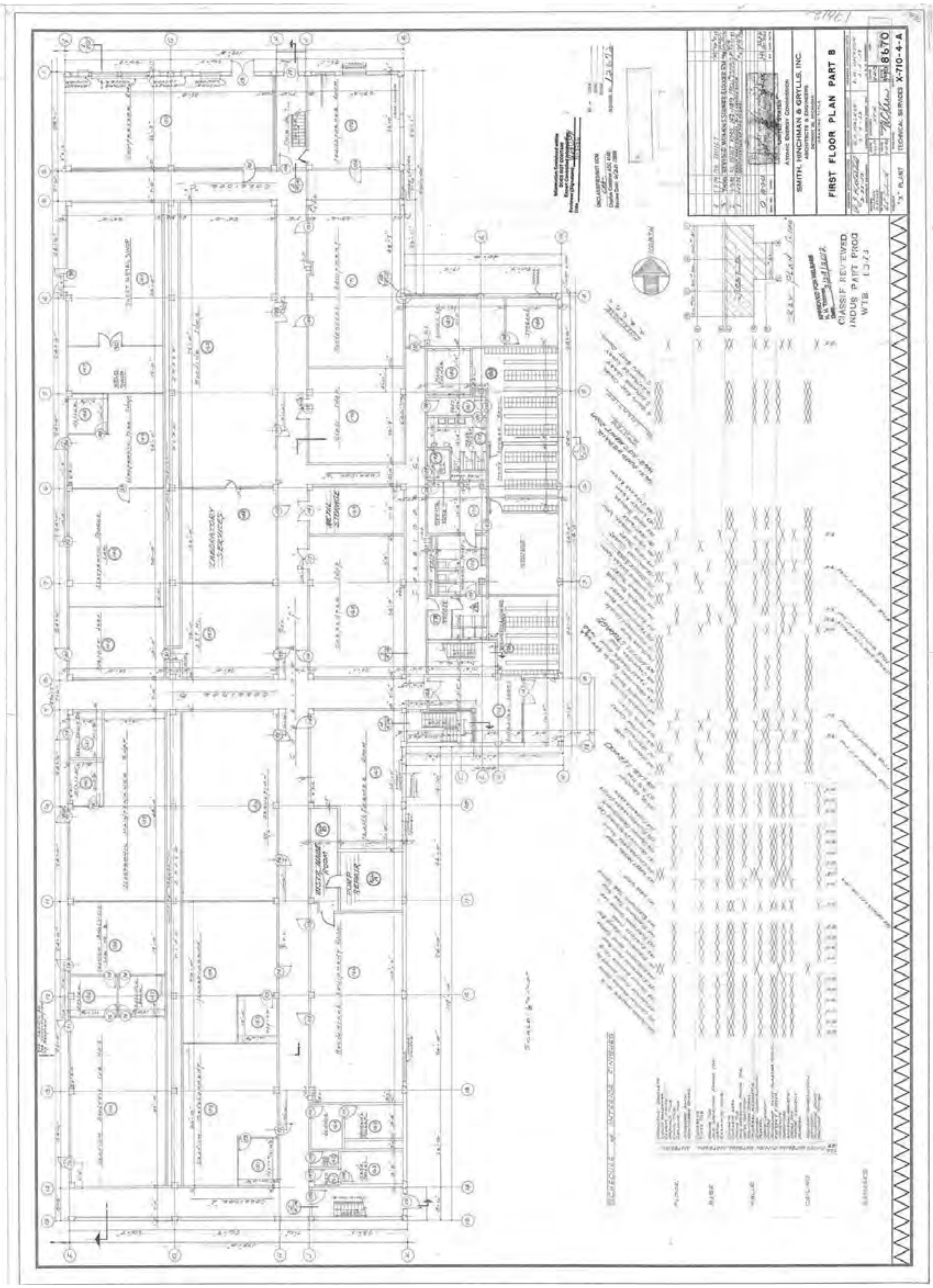

Figure 18: First Floor Plan Part B

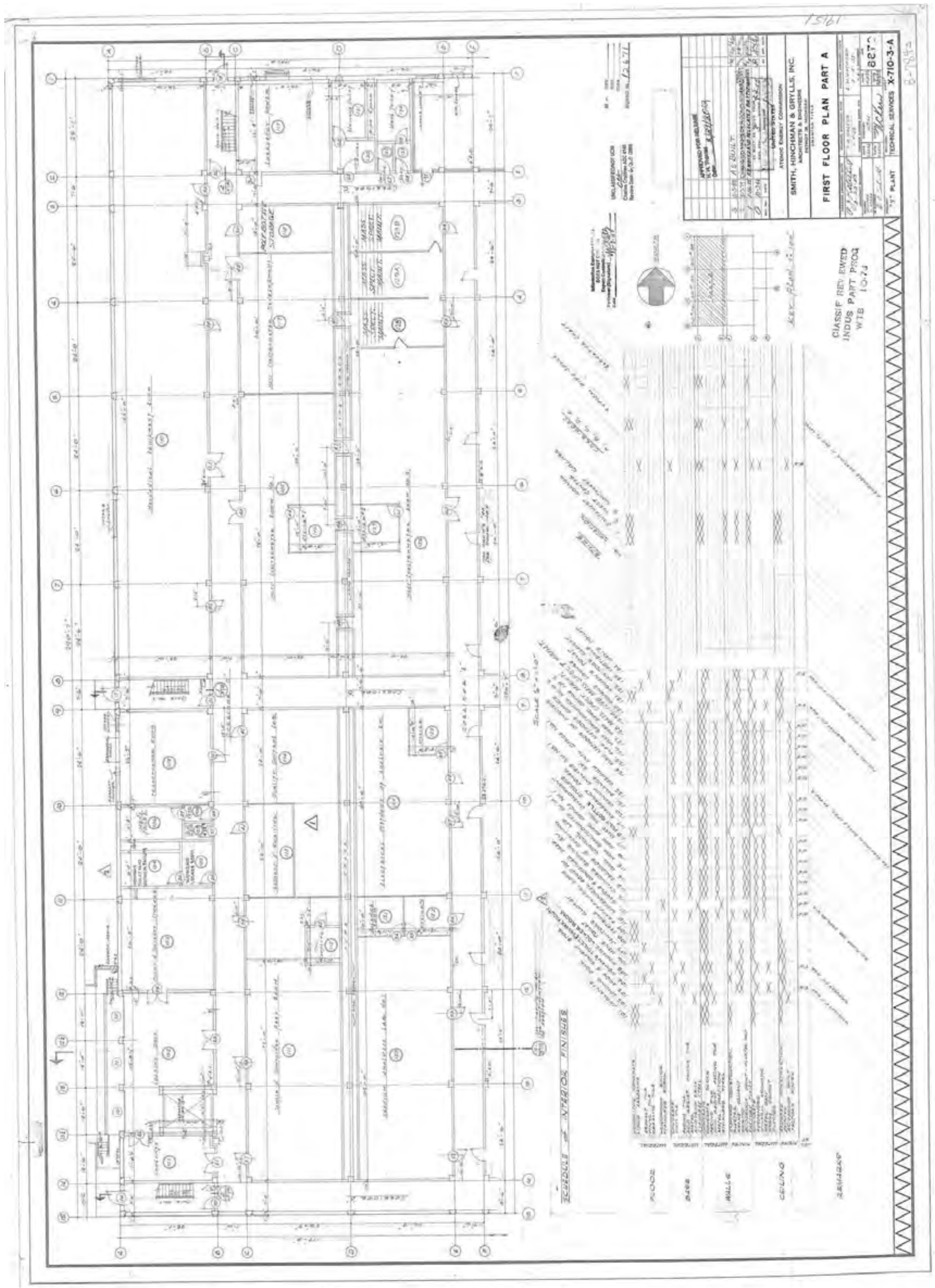

Figure 19: First Floor Plan Part A

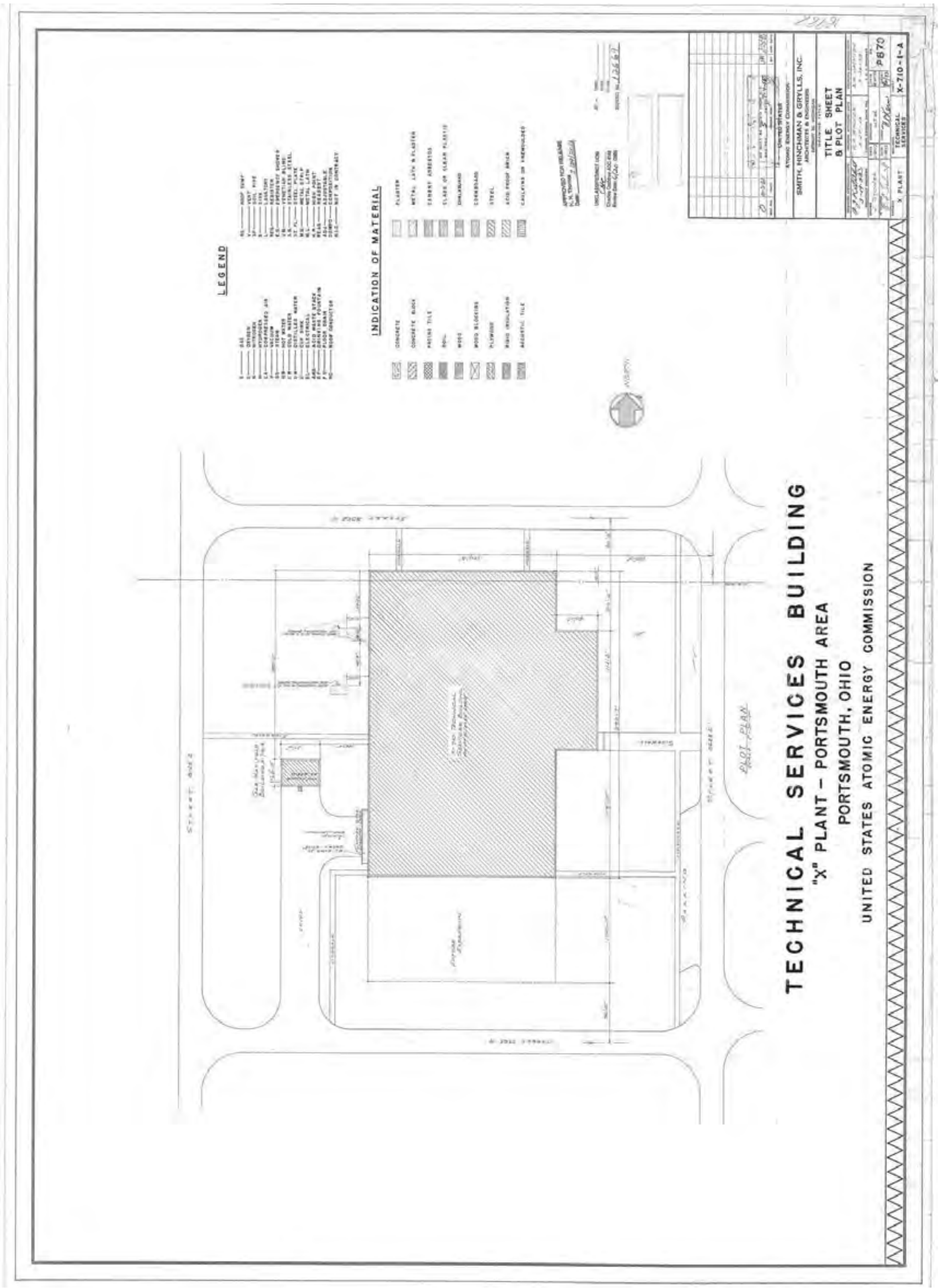

Figure 20: Title Sheet and Plot Plan

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-720 MAINTENANCE AND STORES BUILDING
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-Y
HAER OH-142-Y

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-720 MAINTENANCE AND STORES BUILDING

HAER No. OH-142-Y

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-720 Maintenance and Stores Building is located at Ohio State Plane South coordinates at easting 1827492.345671 ft, northing 369445.868768993 ft and at Universal Transverse Mercator Zone 17N easting 327165.2441 m, northing 4320147.715 m. The coordinate represents the approximate center of the X-720 Maintenance and Stores Building. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1954
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration (was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy was established, overseeing operations at PORTS.
Present Use:	The X-720 Maintenance and Stores Building is used for process and auxiliary equipment maintenance, as a storage area for spare parts and maintenance equipment, and for equipment testing and inspection.
Significance:	The X-720 Maintenance and Stores Building is used for a variety of shop activities, offices, and storage of parts. The building is also used for the testing and inspection of process and auxiliary equipment. This building is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-720 Maintenance and Stores Building HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices that are provided: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-720 Maintenance and Stores Building:
Subcontractors to Peter Kiewit Sons' Construction Company built the X-720 Maintenance and Stores Building under a lump-sum subcontract. Peter Kiewit Sons' Construction Company furnished some of the critical equipment and materials required to build the X-720 Maintenance and Stores Building. Goodyear Atomic Corporation, in conjunction with the Atomic Energy Commission, supplied most of the maintenance equipment, tools, furnishings, and other supplies required to operate the building.

H. K. Ferguson Company, of Cleveland, Ohio, received the contract for excavation, as well to erect the X-720 Maintenance and Stores Building; the X-720A Gas Manifold Shed; the neutralization pit; dust collector; loading dock; concrete aprons around the building ramp; concrete platform and fence for the test station; and storm and sanitary sewers. They also installed critical items of equipment supplied by Peter Kiewit Sons' Construction Company. Charles A. Koch Erecting Company, of Louisville, Kentucky, furnished and installed the screens and blinds. E. F. Hauserman Company, of Cleveland, Ohio, furnished and installed the metal partitions. Standard Asbestos Manufacturing and Insulating Company, of Kansas City, Missouri, furnished and installed all pipe insulation, and the Portsmouth Glass Company, of Portsmouth, Ohio, furnished the glass and glazing work for the building's many windows.

Excavation work commenced in March 1953 (Appendix B, Figure 4). As elsewhere on the plant site, workers encountered difficulties with "fat clay," forcing them to conduct test borings to determine how much earth would have to be removed to reach a solid bearing. Fat clay is a term used to describe clay with a high plasticity. Workers encountered it throughout the area during construction. Due to its plasticity, it makes for an unstable foundation. Workers countered this problem by excavating the fat clay until they reached a more solid subsurface. This necessitated infilling with concrete and stable fill material. Ultimately, workers excavated 80,000 cubic yards of earth in preparation of pouring concrete.

Concrete work began in early April 1953. The concrete contractor erected a mixing plant onsite (Figure 5). The floors and footers required 14,300 cubic feet of Class A concrete, which has a mixture strength of 3,500 pounds per square feet. The contractor completed all concrete work by late November 1953. Atop the concrete slab, steel workers from Crawford Steel Corporation, of Cincinnati, Ohio, began erecting the structural members for the building (Figures 6 through 11). Steel erection began in May 1953 and continued until the end of September 1953. Unlike the larger process buildings, which relied on bolted connections, plans for the X-720 Maintenance and Stores Building called for riveted connections.

H. K. Ferguson Company contracted for the roofing work (Figures 14 and 15). They in turn subcontracted with Hunt Construction Company, of Indianapolis, Indiana, who began installing the steel roof deck in June 1953. By the end of November 1953, they had completed installing the 2,840 square foot roof. The Industrial Roof and Sheet Metal Company, also under subcontract with H. K. Ferguson Company, was in charge of the built-up roof work.

Paras Sheeting and Painting Company, a subcontractor of H. K. Ferguson Company, installed the asbestos siding. Hatfield Electric Company, of Indianapolis, Indiana, installed all electrical equipment, including substations, switchgear, voltage regulators, lighting, and power wiring. Hatfield began work in

June 1953 and completed the job in May 1954. Subcontractors of H. K. Ferguson Company installed the mechanical systems, including the plumbing, heating and ventilation, elevators, cranes, sprinkler systems and other items (Figures 16 through 23).

Historical drawings of building plans are provided in Appendix C (Figures 24 through 30).

Part II. Site Information

Description of the X-720 Maintenance and Stores Building:
The X-720 Maintenance and Stores Building is located just east of the X-326 and X-330 Process Buildings, and south of the X-705 Decontamination Building and the X-700 Converter Shop and Chemical Cleaning Facility. Measuring 373' wide by 763' long (approximately 284,600 square feet), the X-720 Maintenance and Stores Building is among the largest buildings at PORTS. The building stands 42' tall and features two floors in the center and south sides of the building. The remainder of the building consists of one tall story. Like the other buildings on site, the X-720 Maintenance and Stores Building is utilitarian in appearance (Appendix A, Figures 1 through 3). Construction consists of steel framing. The north, east, and west walls feature extensive bands of steel sash windows. The remaining wall surfaces are clad with corrugated cement-asbestos panels.

The interior of the building is divided into the maintenance area and the stores and mezzanine area. A cinderblock wall extends the length of the interior of the building, separating the major work and storage areas. Within the stores area, cinderblock walls further divide the space into a large bin area, special storage rooms, stairwells, toilet rooms, and smaller shop areas. Two rows of offices are located within the mezzanine. A central corridor extends the length of the mezzanine, providing access to the offices. The stairwell within the mezzanine is comprised of cinderblock. The offices themselves were originally fitted with gypsum board partitions.

Metal partitions separate work areas within the main shop. The various spaces include tools and equipment for swapping out seals, working on compressors, and performing welding, carpentry, painting, sheet metal work, electrical and instrument work, and vacuum testing. Overhead cranes assist with the movement of heavy equipment and machinery. These cranes range in capacity from 23 tons to 7½ tons. The floors in the X-720 Maintenance and Stores Building consist of monolithic concrete slabs. The contractor chemically hardened the concrete in areas that were not covered with tiles. The floors in the mezzanine offices and lounge were covered with asphalt tiles. The locker and restroom floors were covered with ceramic tiles, and the dismantling and cleaning room of the electric room received a covering of vinyl tiles.

As with most buildings at PORTS, the interior finishes of the X-720 Maintenance and Stores Building were designed to be easy to clean and safe for workers. Any exposed ferrous metal and concrete block surfaces were painted for protection against corrosion and leakage. General use areas were painted for light reflection and to promote efficiency of workers. Safety stripes were applied to walkways, stairs, and obstructions. The built-in removable office partitions were covered with flush-panel, glazed wood installations.

The overall building was designed to support equipment and live loads, as well as to resist earthquake forces equal to two percent gravity. At the time of its construction in 1953, this was slightly less than the Pacific Coast Building Code for a Zone I Earthquake area.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio,* DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

Figure 1: Location and Orientation of Exterior Photographs (Figures 2 and 3)

Figure 2: North Side of the X-720 Maintenance and Stores Building, August 2014, Facing Southwest

Figure 3: South Side of the X-720 Maintenance and Stores Building, August 2014, Facing Northeast

Appendix B: Historical Photographs

Figure 4: Grading Work for the X-720 Maintenance and Stores Building, February 1953

Figure 5: Steel Framing for the X-720 Maintenance and Stores Building, May 1953

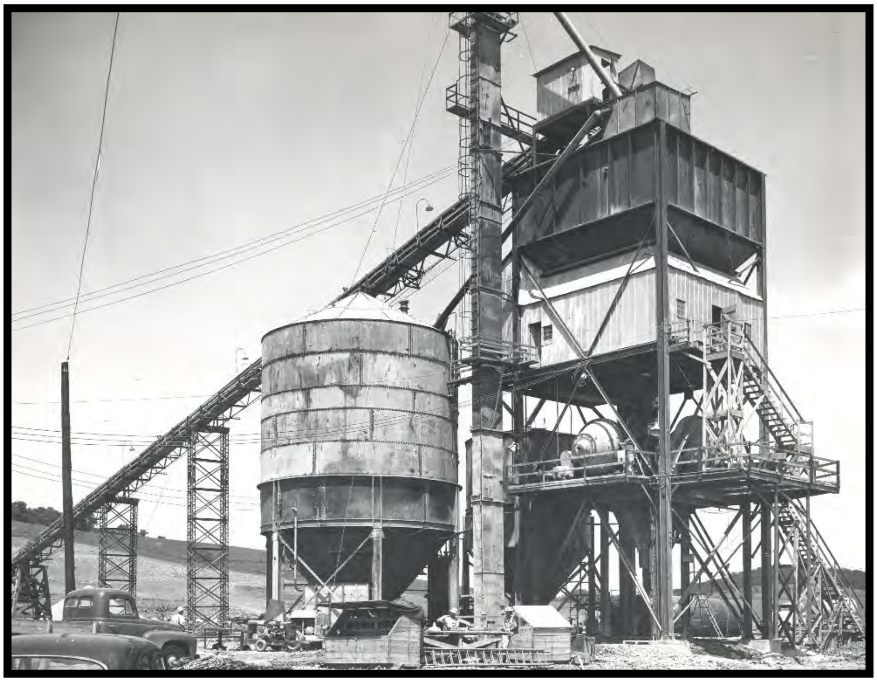

Figure 6: Batch Plant for the X-720 Maintenance and Stores Building, May 1953

Figure 7: Steel Framing for the X-720 Maintenance and Stores Building, May 1953

Figure 8: Looking Southwest at the X-720 Maintenance and Stores Building, August 1953

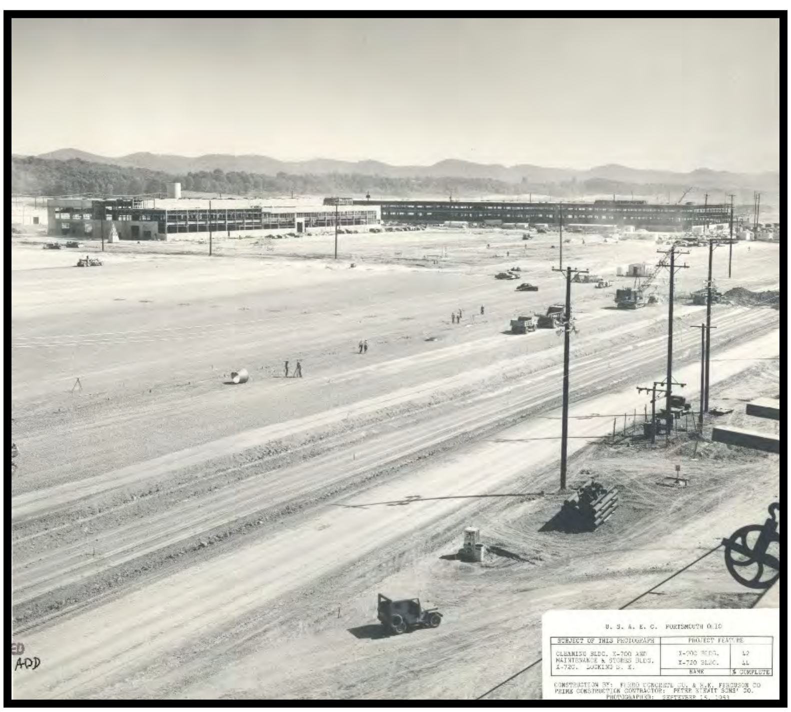

Figure 9: The X-700 Cleaning Building and the X-720 Maintenance and Stores Building, Looking Southeast, September 1953

Figure 10: Looking Southwest at the X-720 Maintenance and Stores Building, September 1953

Figure 11: Looking Southwest at the X-720 Maintenance and Stores Building, October 1953

Figure 12: Looking North at the Interior of the X-720 Maintenance and Stores Building, November 1953

Figure 13: Looking Northwest at the X-720 Maintenance and Stores Building, November 1953

Figure 14: Interior View of the Stores Area of the X-720 Maintenance and Stores Building, January 1954

Figure 15: Interior View of the X-720 Maintenance and Stores Building, January 1954

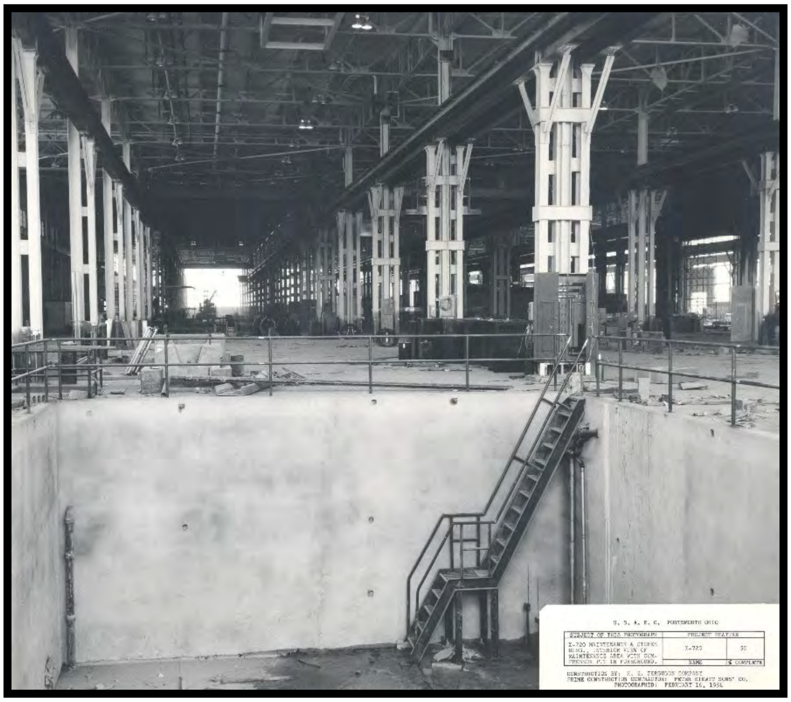

Figure 16: Interior View of the X-720 Maintenance and Stores Building Showing Compressor Pit in the Foreground, February 1954

Figure 17: Interior View of the Stores Area of the X-720 Maintenance and Stores Building, February 1954

Figure 18: Interior View of the X-720 Maintenance and Stores Building, March 1954

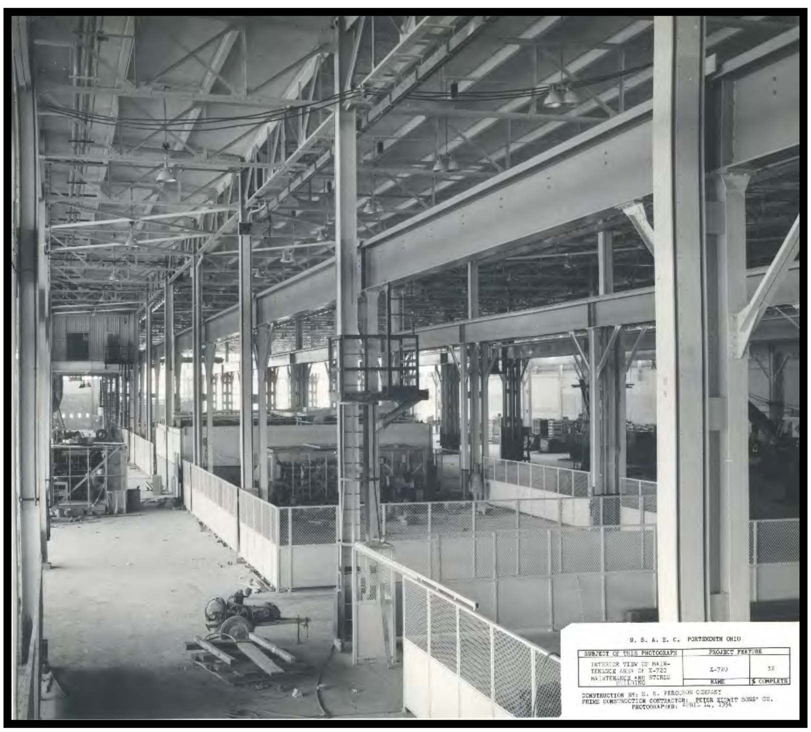

Figure 19: Interior View of the Maintenance Area of the X-720 Maintenance and Stores Building, April 1954

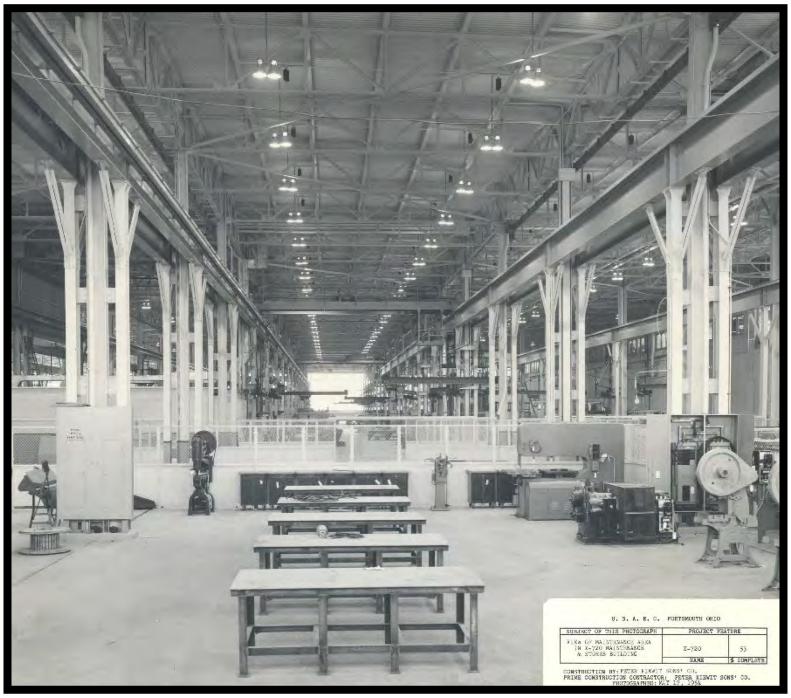

Figure 20: View of Maintenance Area in the X-720 Maintenance and Stores Building, May 1954

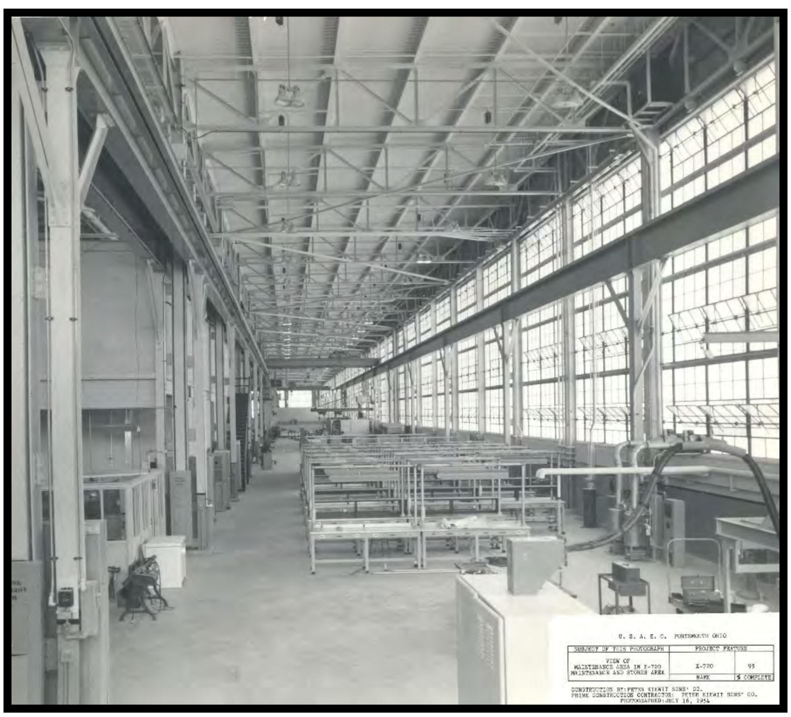

Figure 21: View of the Maintenance Area in the X-720 Maintenance and Stores Building, July 1954.

Figure 22: The X-720 Maintenance and Stores Building Equipment Foundation, October 1955

Figure 23: Machine Installation in the X-720 Maintenance and Stores Building, December 1955

Appendix C: Historical Drawings

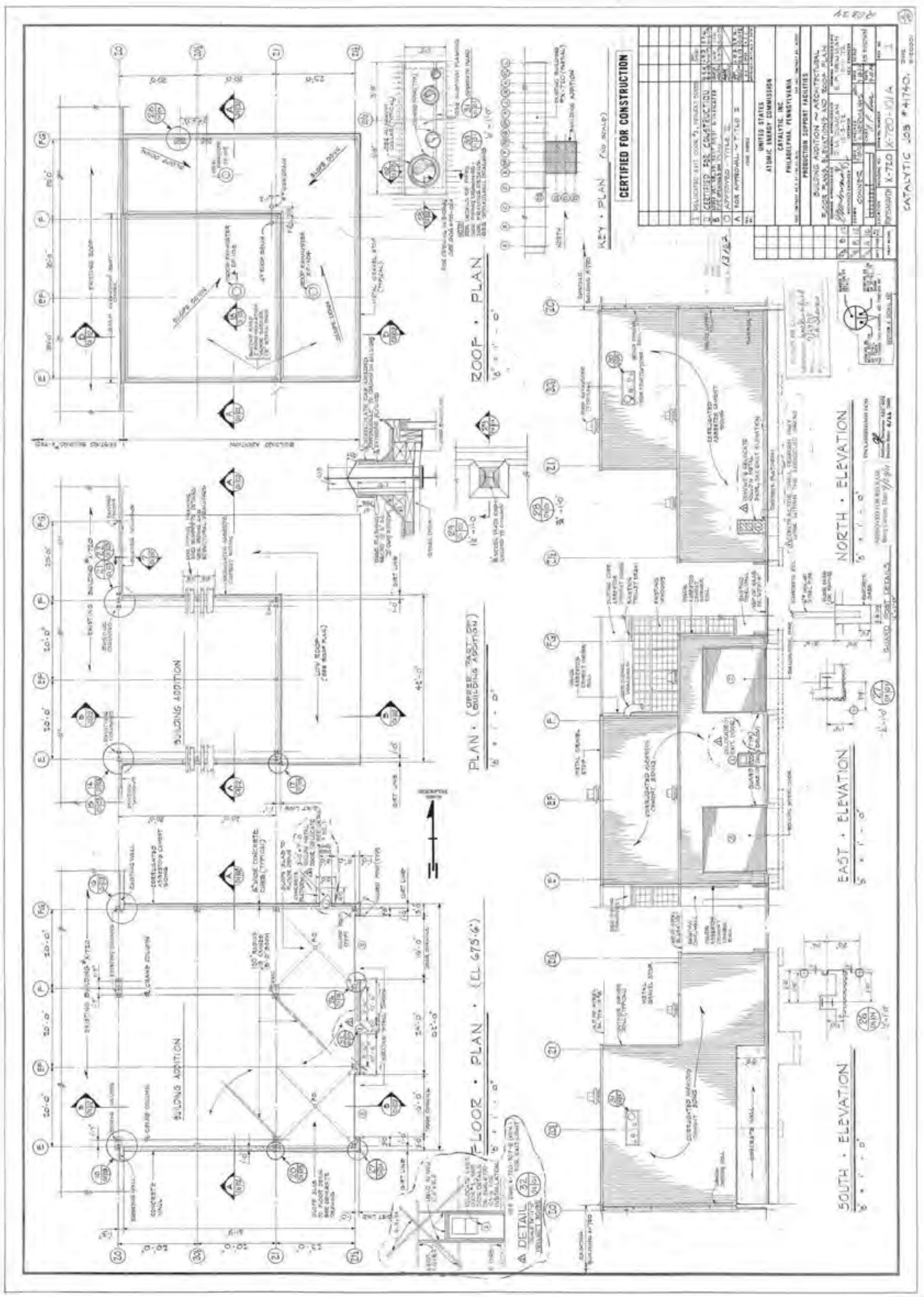

Figure 24: Floor Plans, Elevations, and Roof Plan

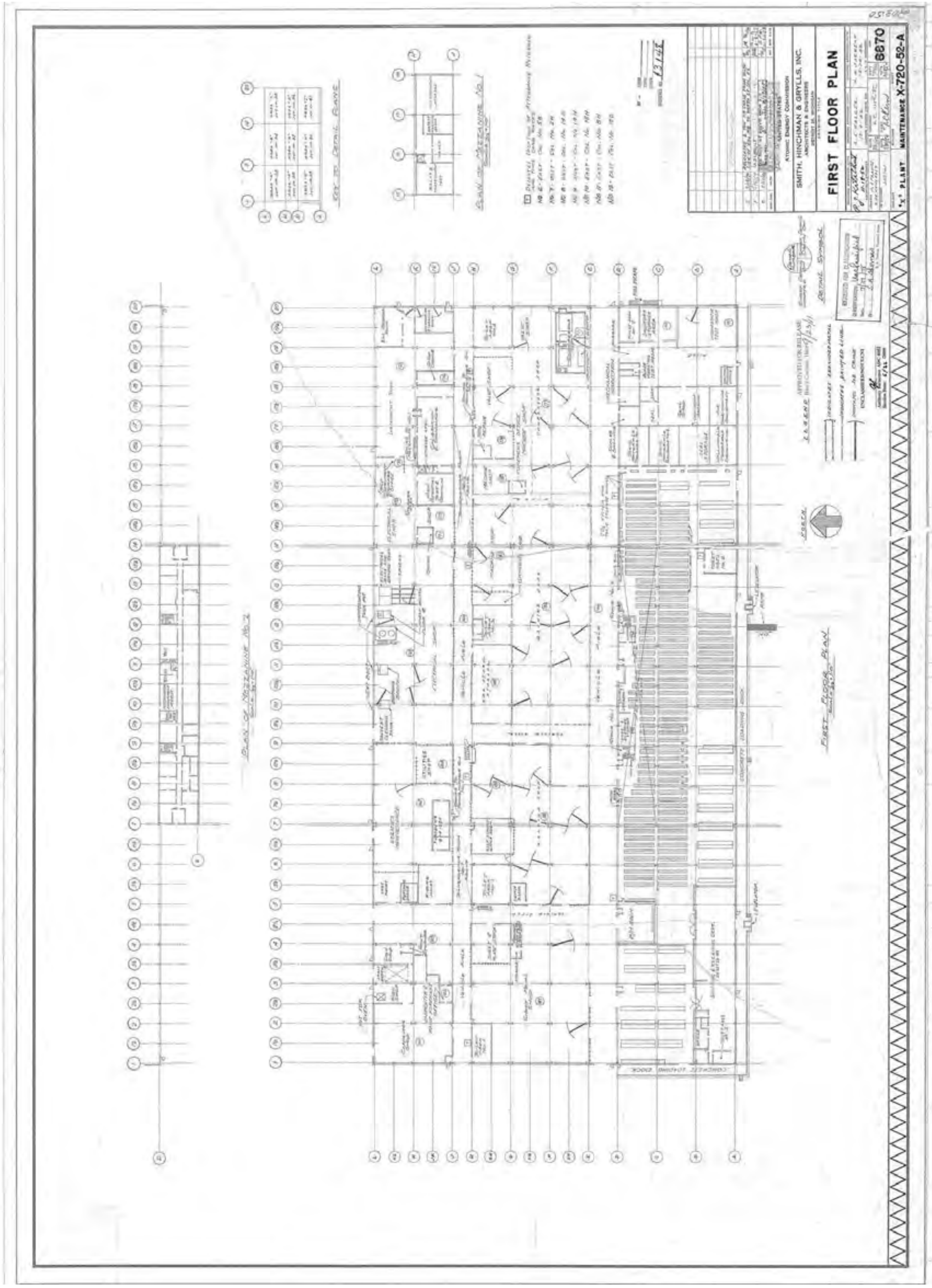

Figure 25: First Floor Plan

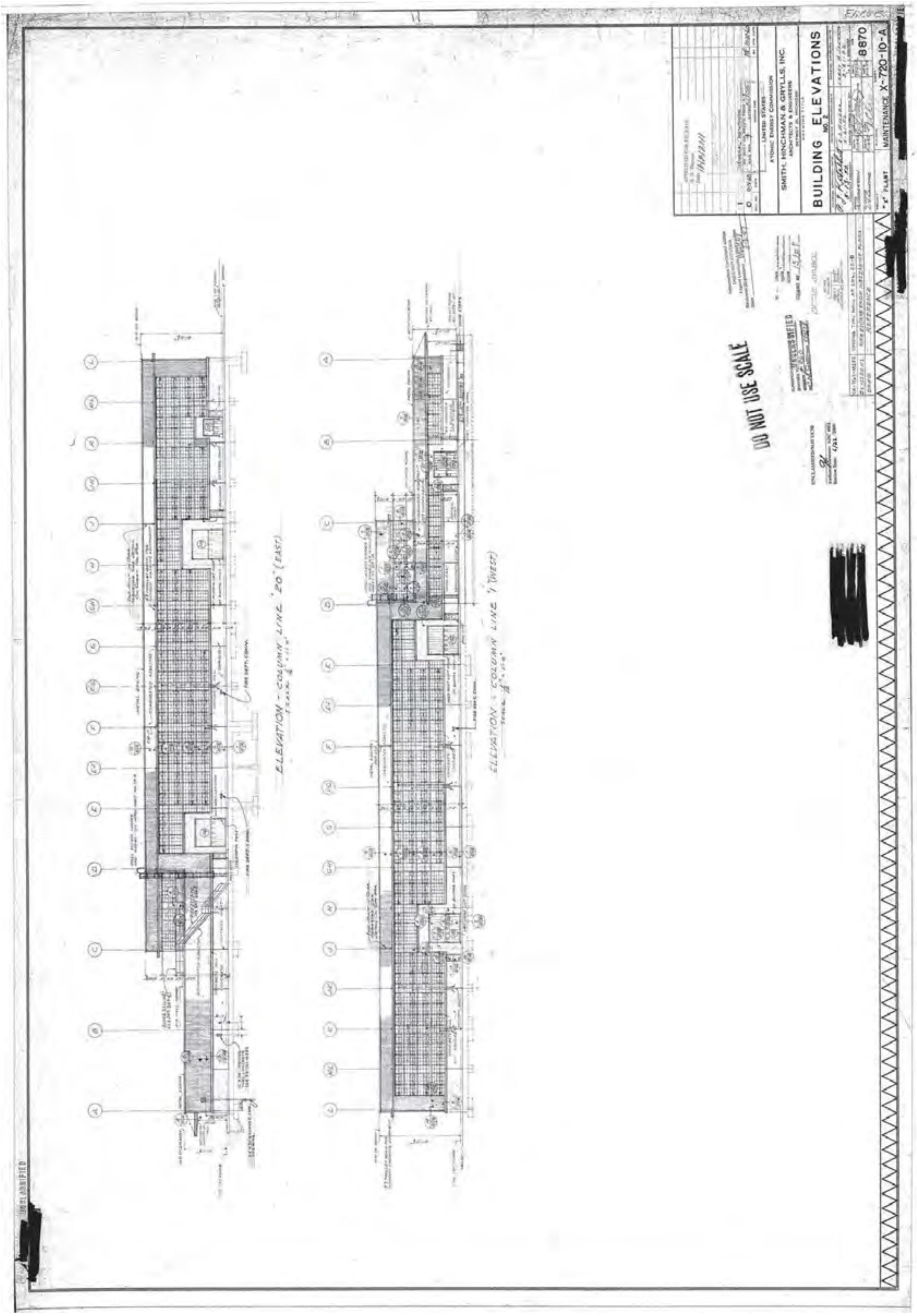

Figure 26: Building Elevations

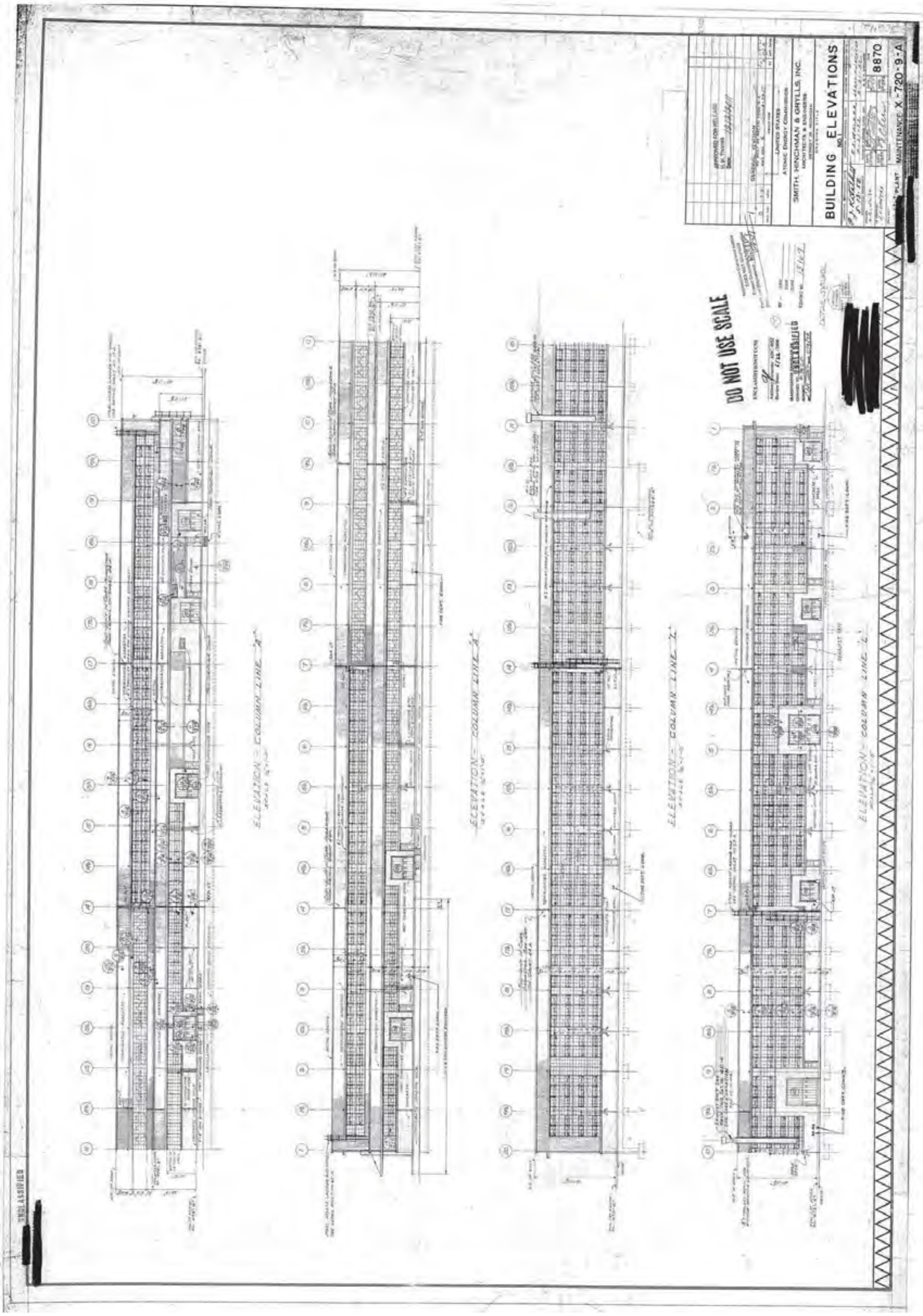

Figure 27: Building Elevations

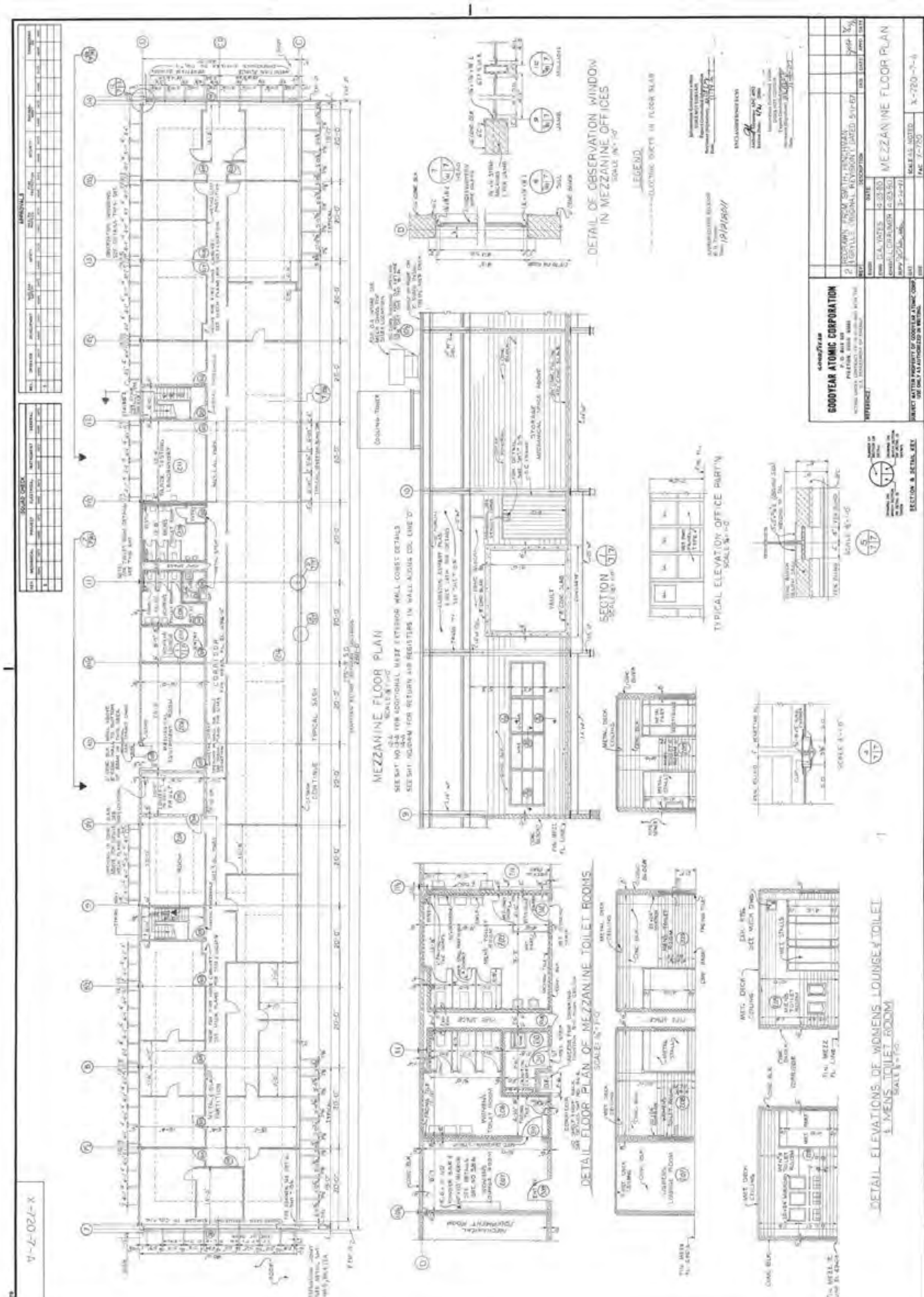

Figure 28: Mezzanine Floor Plan

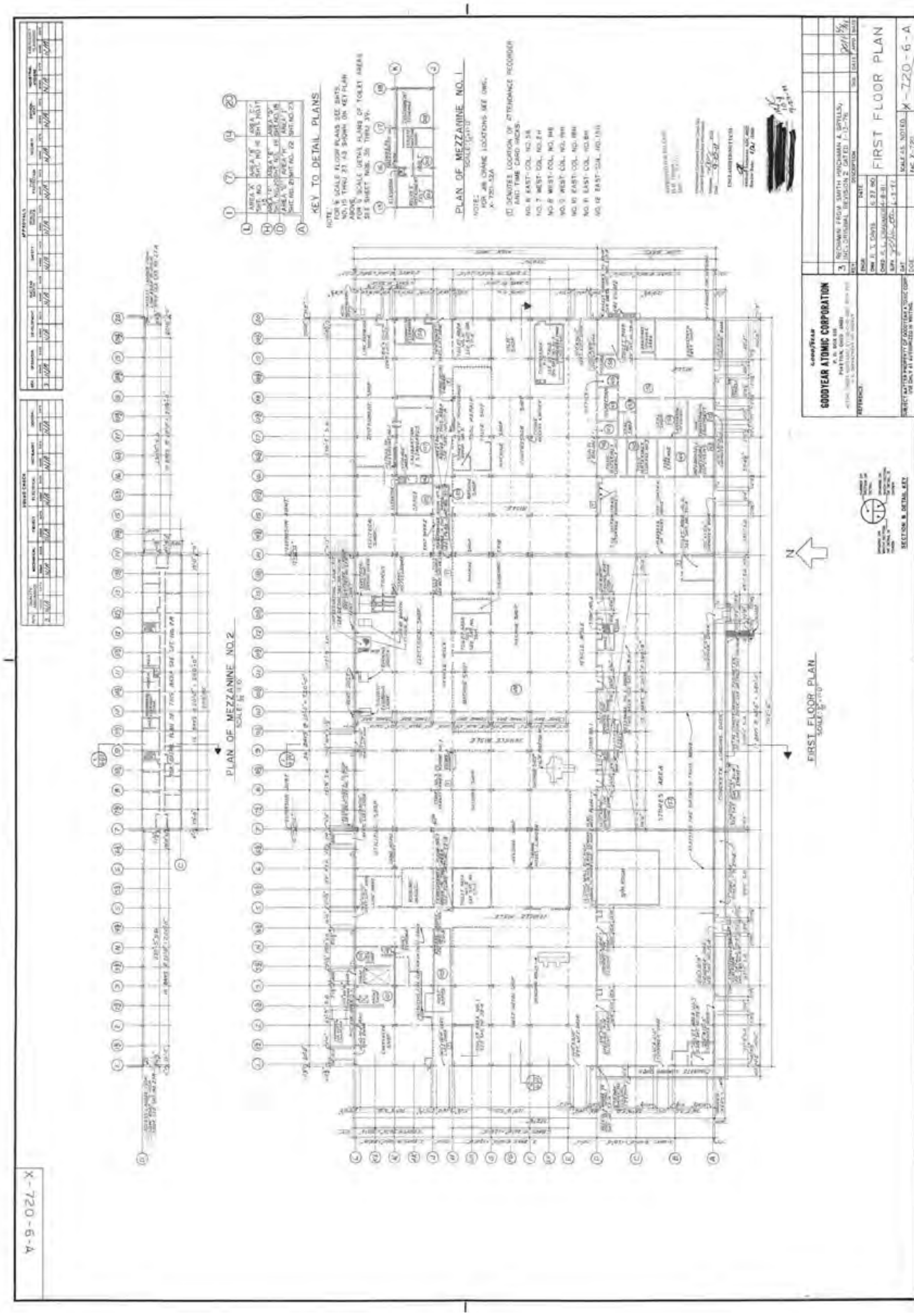

Figure 29: First Floor Plan

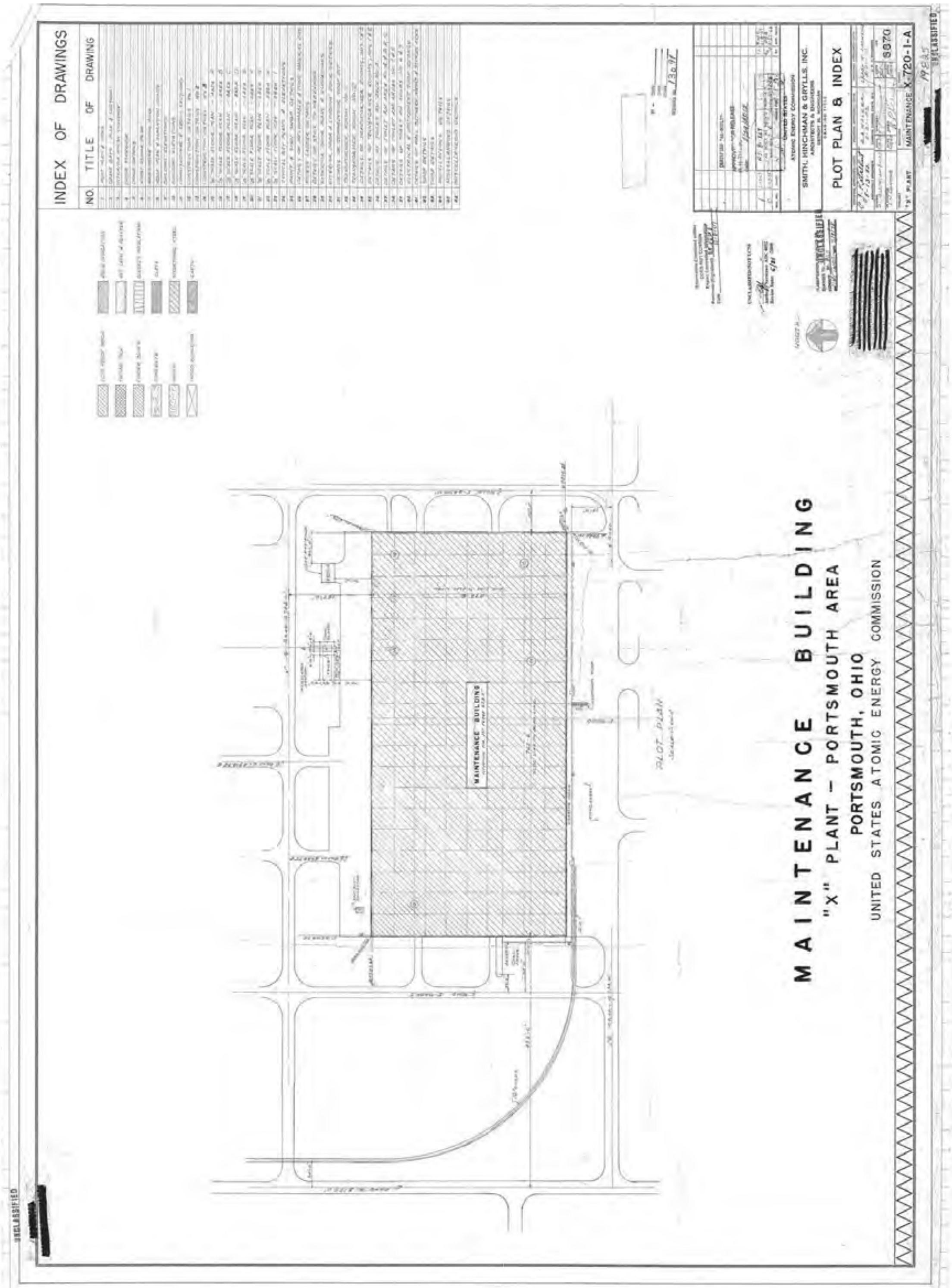

Figure 30: Plot Plan and Index

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-744H BULK STORAGE BUILDING
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-Z
HAER OH-142-Z

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-744H BULK STORAGE BUILDING

HAER No. OH-142-Z

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-744H Bulk Storage Building is located at Ohio State Plane South coordinates at easting 1828380.863815 ft, northing 370192.151502801 ft and at Universal Transverse Mercator Zone 17N easting 327439.7714 m, northing 4320370.701 m. The coordinate represents the approximate center of the X-744H Bulk Storage Building. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1953
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy (DOE) was established, overseeing operations at PORTS.
Present Use:	Storage
Significance:	The X-744H Bulk Storage Building was used as a fabricating shop and workshop in 1953 and 1954. The DOE converted the building into a warehouse in 1956. From 1958 through 1964, the DOE used the X-744H Bulk Storage Building for supplemental storage of cylinders containing both pure and depleted material (uranium hexafluoride). Storage cylinders were made of metal, ranging from 2.5 to 14 tons. This building is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor-BWXT Portsmouth LLC photographed the site in August 2014 and in November 2017. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-744H Bulk Storage Building HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are two appendices: Appendix A and Appendix B, consisting of survey photographs and historical drawings, respectively.

Construction History of the X-744H Bulk Storage Building:
Built in 1953, the X-744H Bulk Storage Building was used for fabricating and as a workshop until 1956, when Goodyear Atomic converted the building to a warehouse. At that time, workers removed the water lines to the building and capped the drains.

Historical drawings of building plans are provided in Appendix B (Figures 5 and 6).

Part II. Site Information

Description of the X-744H Bulk Storage Building:
The X-744H Bulk Storage Building is a 58,700 square foot, single-story, steel-framed structure with corrugated metal siding and roof over a concrete pad. The X-744H Building is located slightly east of the middle of the site, roughly 250' southeast of the X-333 Process Building. It consists of two long and narrow buildings that are paired together to create one warehouse (Appendix A, Figures 1 through 4). Each of the two structures has its own arched roof. The overall building measures approximately 100' by 600'. Siding over the steel frame consists of corrugated steel. The building rests atop a concrete slab.

The X-744H Bulk Storage Building was built during the initial phases of PORTS construction and was originally used for fabricating and as a workshop. From 1958 to 1964, the X-744H Bulk Storage Building served for supplemental storage of pure uranium materials and for storage of cylinders containing small quantities of uranium hexafluoride leftover from the uranium enrichment process, as well as spare parts and pieces of equipment related to the gaseous diffusion process. The concern was that production could not slow down, and spare parts were readily available should immediate repairs need to be made. In addition, the building housed spill control equipment. It currently houses numerous crates with spare parts from the Goodyear Atomic era.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *Historical Narrative for the X-744H Bulk Storage Building*, Portsmouth Gaseous Diffusion Plant, Piketon, Ohio. Washington, D.C.: U.S. Department of Energy, 2011.

Department of Energy. *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0207&D4. Piketon, OH: U.S. Department of Energy, October 2011.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio*, DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

Figure 1: Location and Orientation of Exterior Photographs (2 through 4)

Figure 2: North Side of the X-744h Bulk Storage Building, August 2014, Facing Southwest

Figure 3: South Side of the X-744H Bulk Storage Building, August 2014, Facing Northeast

Figure 4: South Side of the X-744H Bulk Storage Building, November 2017, Facing Northwest

Appendix B: Historical Drawings

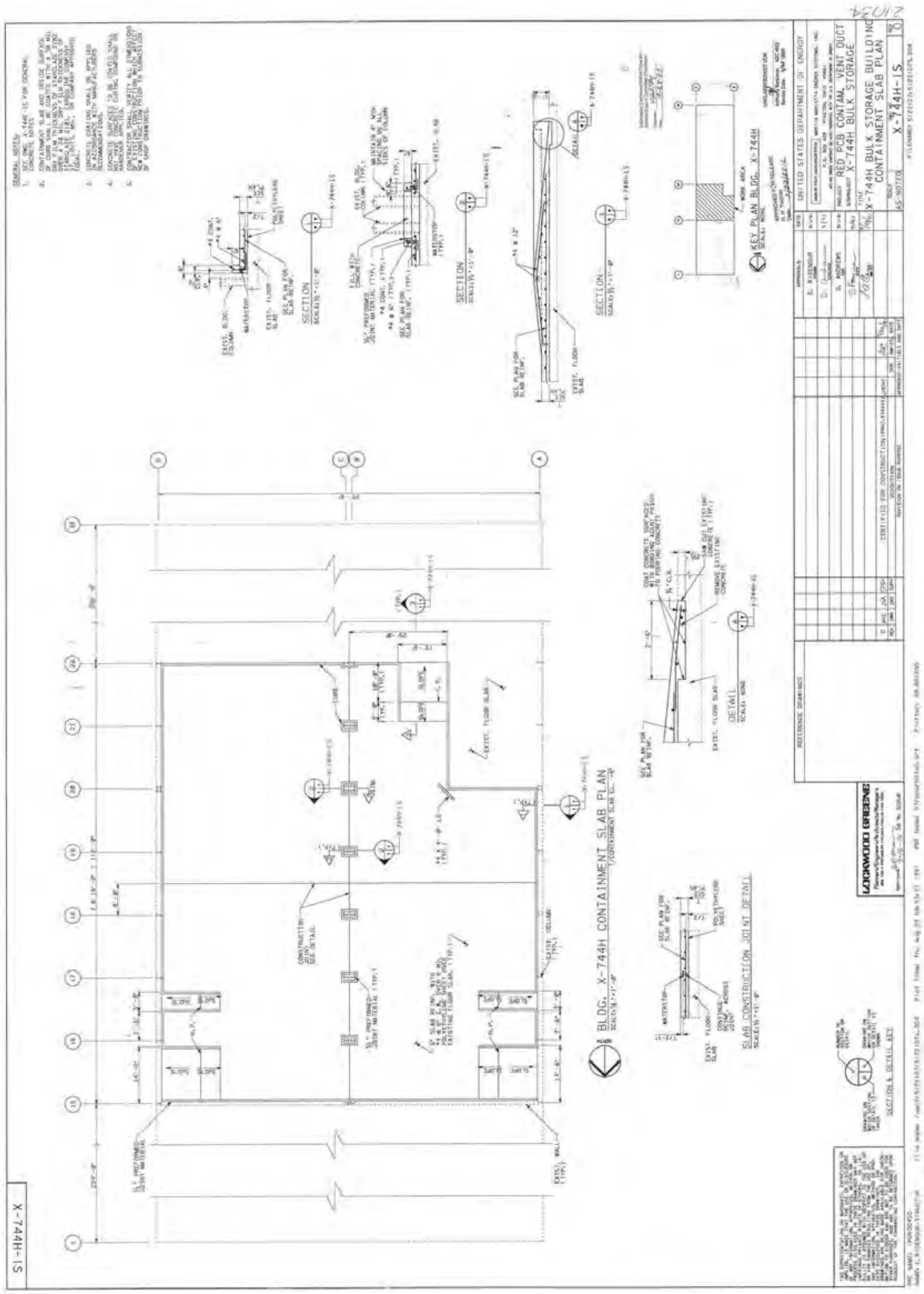

Figure 5: Containment Slab Plan

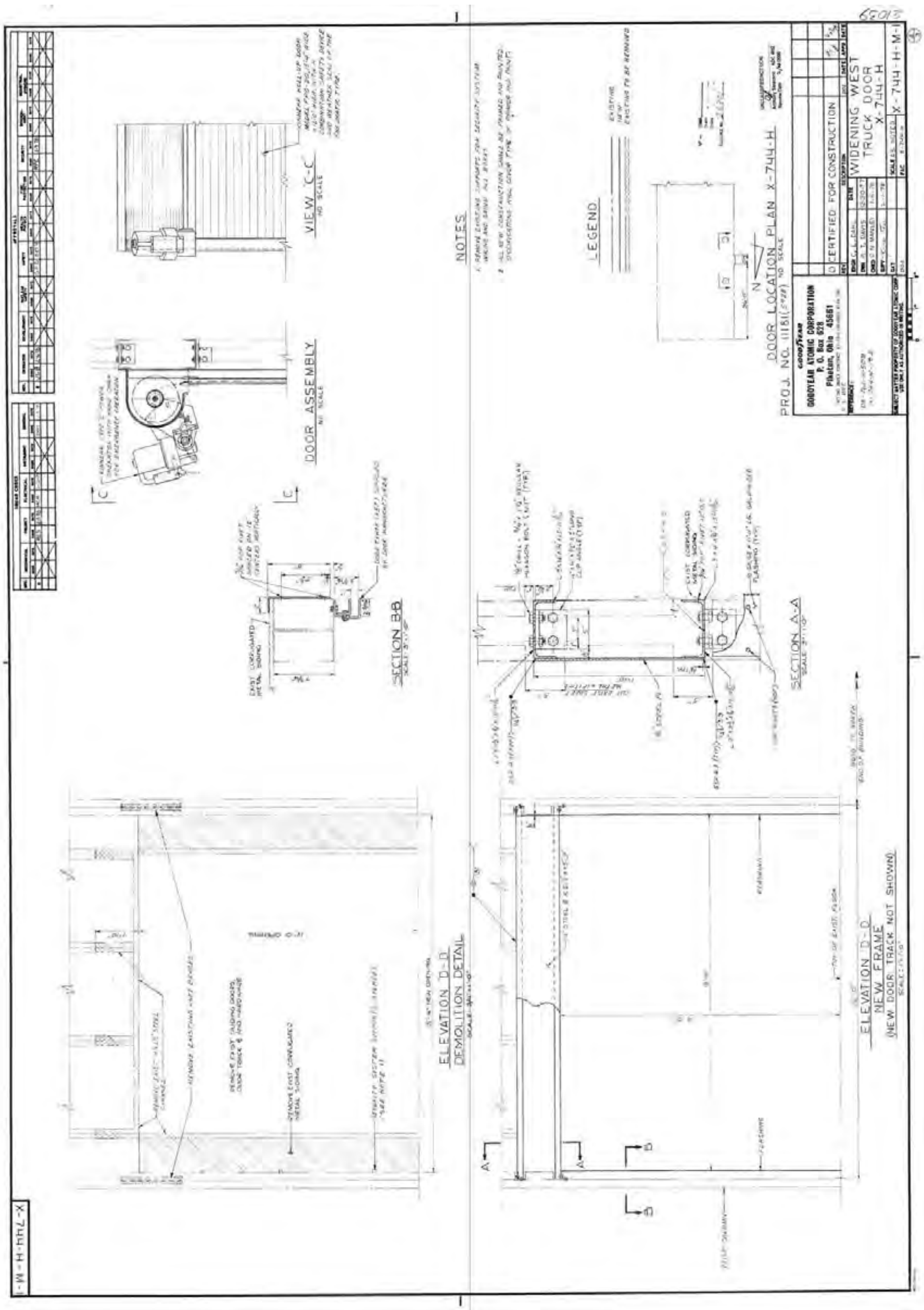

Figure 6: West Truck Door

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-750 MOBILE EQUIPMENT MAINTENANCE GARAGE
3930 U.S. Route 23 South
Piketon vicinity
Pike County
Ohio

HAER OH-142-AA
HAER OH-142-AA

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

PORTSMOUTH GASEOUS DIFFUSION PLANT, X-750 MOBILE EQUIPMENT MAINTENANCE GARAGE

HAER No. OH-142-AA

Location:	Portsmouth Gaseous Diffusion Plant (PORTS), 3930 U.S. Route 23 South, Piketon vicinity, Scioto Township, Pike County, Ohio The X-750 Mobile Equipment Maintenance Garage is located at Ohio State Plane South coordinates at easting 1827369.036262 ft, northing 368237.940382617 ft and at Universal Transverse Mercator Zone 17N easting 327121.6108 m, northing 4319780.201 m. The coordinate represents the approximate center of the X-750 Mobile Equipment Maintenance Garage. This coordinate was obtained on June 19, 2019 by plotting its location in EnviroInsite 10.0.0.37. The accuracy of the coordinates is +/- 12 meters. The coordinate datum is North American Datum 1983.
Date of Construction:	1954
Designer/Builder:	Peter Kiewit Sons' Construction Company
Previous Owner:	N/A
Present Owner:	The Atomic Energy Commission oversaw construction and operation of PORTS until 1974, when the Energy Research and Development Administration was established with responsibility for research and development duties from 1974-1977. In 1977, the U.S. Department of Energy (DOE) was established, overseeing operations at PORTS.
Present Use:	Maintenance of mobile equipment
Significance:	The X-750 Mobile Equipment Maintenance Garage was the main onsite fuel storage and refueling station for DOE vehicles. The garage is also used for the general maintenance of PORTS mobile equipment. This building is part of PORTS, which was a part of the U.S. Cold War nuclear weapons complex. PORTS' primary Cold War era mission was the production of highly enriched uranium by the gaseous diffusion process for defense/military purposes.
Project Information:	Fluor B&W Portsmouth LLC photographed the site in July 2006 and in November 2017. Gray & Pape, Inc., Cincinnati, Ohio, served as the primary author of the historical narrative and resource descriptions drawing from numerous historical records and reports, drawings, photographs and plans. For additional contextual information, see Portsmouth Gaseous Diffusion Plant, HAER no. OH-142. This X-750 Mobile Equipment Maintenance Garage HAER was completed in 2021.

Part I. Historical Information

In support of this report, there are three appendices: Appendix A through C, which consist of survey photographs, historical photographs, and historical drawings, respectively.

Construction History of the X-750 Mobile Equipment Maintenance Garage:
In May 1953, Clark Construction Company, of Owensboro, Kentucky, received a fixed-fee subcontract from Peter Kiewit Sons' Construction Company to erect the X-750 Mobile Equipment Maintenance Garage. Groundbreaking commenced in June 1953, when Clark Construction Company began excavating trenches for the wall footers (Appendix B, Figures 4 and 5). In some areas of the site they encountered unsuitable bearing soil, which required workers to excavate below the plan footing elevation. Having excavated to a sufficient depth, workers backfilled the trench with 94 cubic yards of lean concrete to get it back to the required elevation.

Structural concrete work commenced in June 1953. The footers required roughly 156 cubic yards of concrete. Piers, grade beams, and columns consumed 53 cubic yards, and the floor slabs would ultimately require 412 cubic yards. The final pour in the slab occurred in November 1954. As work progressed on the foundation, E. R. Moyer (location not known), a subcontractor of Clark Construction Company, laid the cinderblock that would comprise the east and west walls, as well as parts of the north and south walls (Figures 6 and 7). E. R. Moyer completed its task in October 1953, having laid a total of 8,655 square feet of cinderblock.

Clark Construction Company purchased 78 tons of structural steel that was erected by subcontractor, Carl Vestal Steel Erector Company. Work began in August 1953 and was completed by October 1953, with all steel being riveted. Roofing began in November 1953 and was completed by December 1953. Approximately 162 squares of roofing were installed. The steel roof deck was installed by the Carl Vestal Steel Erector Company and the built-up roofing was completed by the Tri-State Roofing Company, a subcontractor of the Clark Construction Company. Clark Construction Company completed the asbestos siding erection in December of 1953, totaling approximately 880 square feet.

Mechanical and electrical installations transpired, while work on the outer and inner structure continued. Subcontractors of the Clark Construction Company installed plumbing, heating ventilation, safety lane equipment, and sprinkler system. Contractors completed all mechanical work by March 1953. The Griffin Electric Company (location not known) began electrical work in late August 1953. The electrical work included lighting installation, panel boards, lighting circuits, power circuits, grounding, and other standard electrical items. The electrical work was completed in April 1954 (Figure 9). Carpentry was also completed in April. Due to a carpenters' strike, the building's planned completion date in March was extended to April 1954.

Historical drawings of building plans are provided in Appendix C (Figures 10 through 17).

Part II. Site Information

Description of the X-750 Mobile Equipment Maintenance Garage:
The X-750 Mobile Equipment Maintenance Garage is located slightly southeast of the center of the site, just east of the X-326 Process Building. The X-750 Mobile Equipment Maintenance Garage provided facilities for servicing, testing, repairing, and maintenance of mobile equipment used in the operation of PORTS. The X-750 Mobile Equipment Maintenance Garage is a vernacular L-shaped utility building

with a relatively flat roof (Appendix A, Figures 1 through 3). Oriented from north to south, the X-750 Mobile Equipment Maintenance Garage consists of three connected service units of varying roof and ceiling heights that overall contain 15,500 square feet of floor space. These include the main repair area, which comprises the central portion of the building. It measures 61' by 140' and has a ceiling height of 25'. A second unit is located directly to the east of the main repair area. This wing measures 24' by 146' and has a ceiling height of 11'. The third wing is attached to the southwest corner of the main repair area. It measures 57' by 62' and has a ceiling height of 15'. Overall, the building is utilitarian in appearance, with a concrete slab floor and exposed steel framing.

The building consists largely of cinderblock and steel frame construction. Much of the cinderblock construction is concentrated in the south and north walls of the building, which features large overhead doors for mobile equipment access. These two sides of the building are almost identical to one another, with the central unit featuring a single, large overhead door in the center of the north and south walls. The west wing features three overhead doors along the width of the north and south walls. The central unit is the only unit of the three that features a slight gable in the roof. The pitch is quite low, with perhaps only ten percent slope. The ridge extends from north to south along the main axis of the building. The central wing stands approximately two stories tall but features only one floor. The wing to the west stands only about two-thirds the height of the central wing. With the exception of the overhead doors in the north and south walls, the west wing walls consist entirely of cinderblock construction. The only windows in the west wing consist of a series of three glass panels located in each of the overhead doors.

The east and west sides of the center unit, as well as the east side of the east unit, consist largely of galvanized steel sash industrial windows. A steel-framed structure and steel roof trusses support these windows, as well as the roof of the units. The large open spans within the central unit provide for an unobstructed work area through the length of the building. Truss-suspended monorails, located along the length of the east and west sides of the work area, provide a platform for travelling electric hoists. The building contains seven hoists of varying load capacities. The lower 4' of wall is comprised of cinderblock. The industrial windows rest atop this low wall. The windows extend the length of the building. This provides for ample natural light within the center and east units of the building.

Part III. Sources of Information

Department of Energy. *The Role of the Portsmouth Gaseous Diffusion Plant in Cold War History*. Piketon, OH: U.S. Department of Energy, 2017.

Department of Energy. *Remedial Investigation and Feasibility Report for the Process Buildings and Complex Facilities Decontamination and Decommissioning Evaluation Project at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0245&D3. Piketon, OH: U.S. Department of Energy, 2014.

Department of Energy. *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio*, DOE/PPPO/03-0207&D4. Piketon, OH: U.S. Department of Energy, October 2011.

Department of Energy. *National Historic Preservation Act Section 110 Survey of Architectural Properties at the Portsmouth Gaseous Diffusion Plant in Scioto and Seal Townships, Piketon, Ohio*, DOE/PPPO/03-0147&D1. Piketon, OH: U.S. Department of Energy, January 2011.

Giffels & Vallet, Inc. *Gaseous Diffusion Plant at Portsmouth, Ohio, Project History and Completion Report* (Redacted). Washington, D.C.: U.S. Atomic Energy Commission, 1957.

Appendix A: Survey Photographs

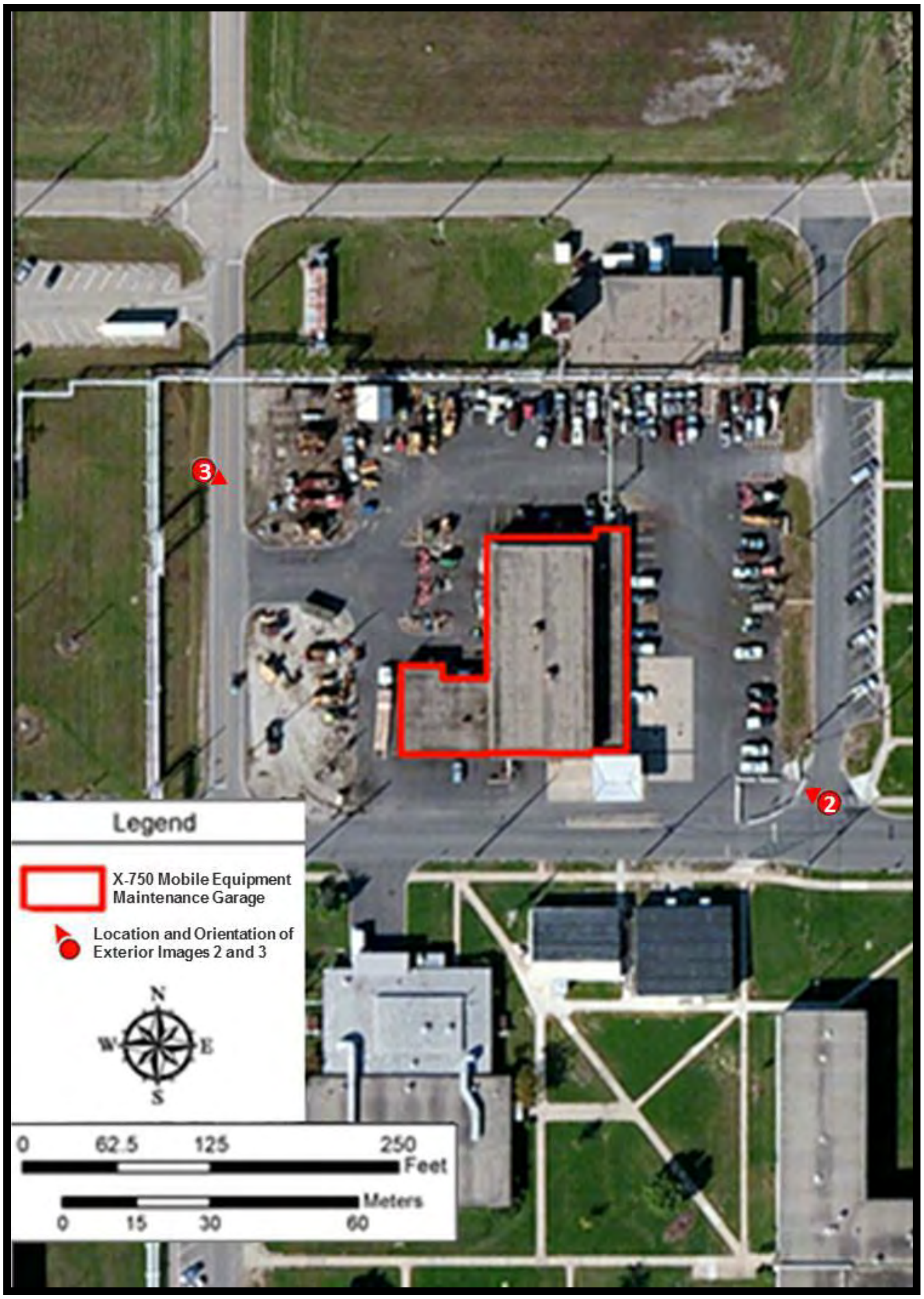

Figure 1: Location of Exterior Photographs (Figures 2 and 3).

Figure 2: South Side of the X-750 Mobile Equipment Maintenance Garage, November 2017, Looking Northwest.

Figure 3: Aerial View of the X-750 Mobile Equipment Maintenance Garage, July 2006, Looking Northwest.

Appendix B: Historical Photographs

Figure 4: The X-750 Mobile Equipment Maintenance Garage Construction Site, July 1953

Figure 5: X-750 Mobile Equipment Maintenance Garage Construction Site, Looking Southwest, August 1953

Figure 6: The X-750 Mobile Equipment Maintenance Garage, Looking North, September 1953

Figure 7: The X-750 Mobile Equipment Maintenance Garage, Looking Southwest, October 1953

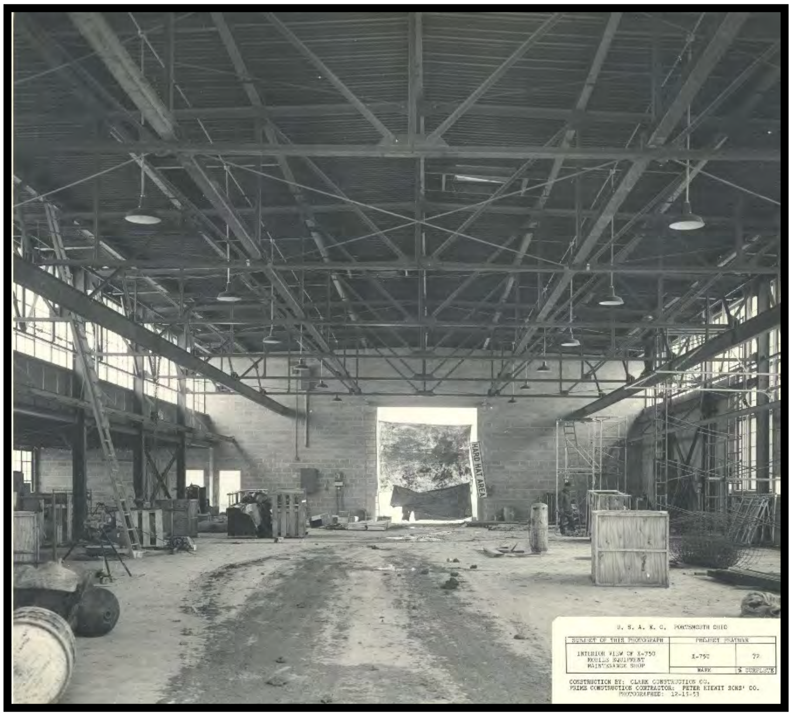

Figure 8: Interior View of the X-750 Mobile Equipment Maintenance Garage, December 1953

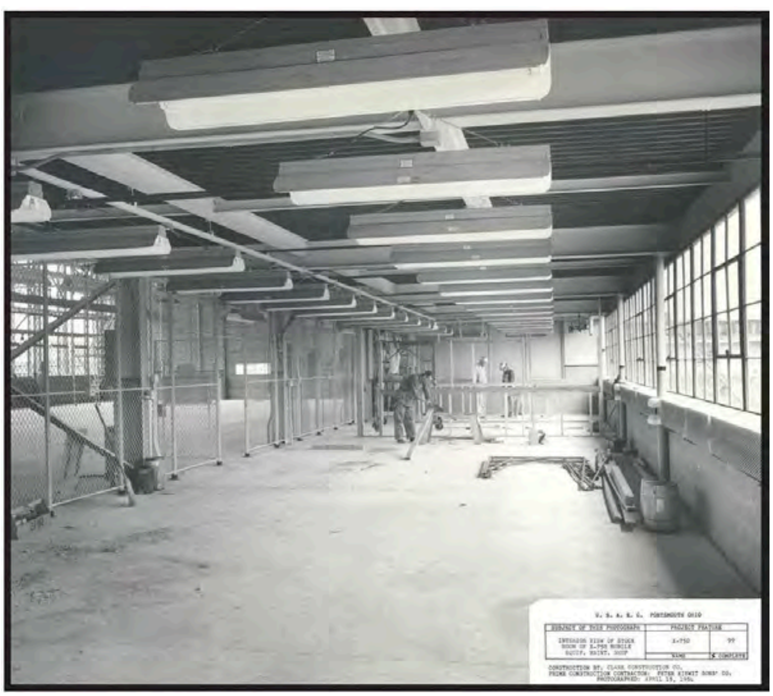

Figure 9: Interior View of Stock in the X-750 Mobile Equipment Maintenance Garage, April 1954

Appendix C: Historical Drawings

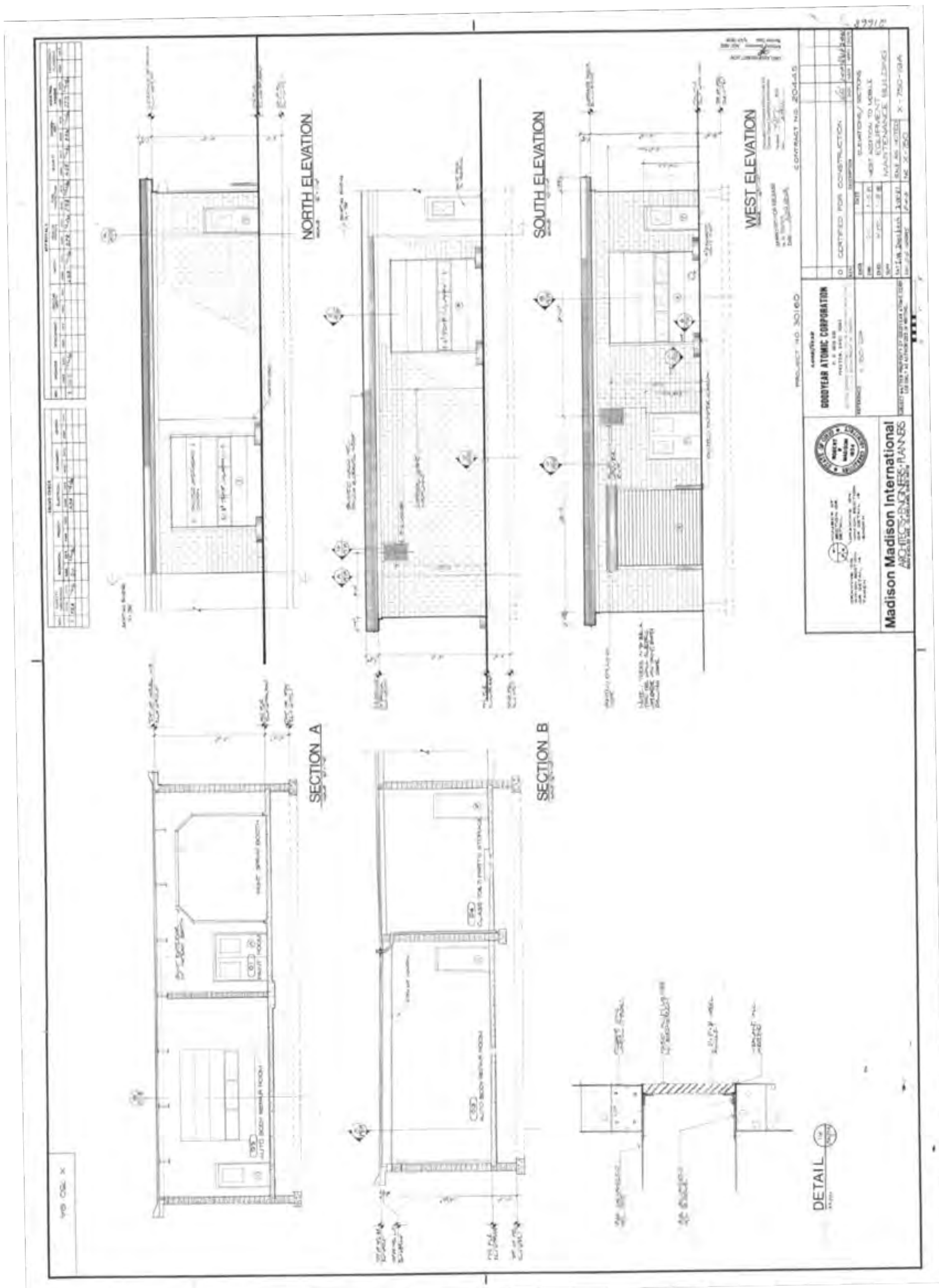

Figure 10: Elevations and Sections

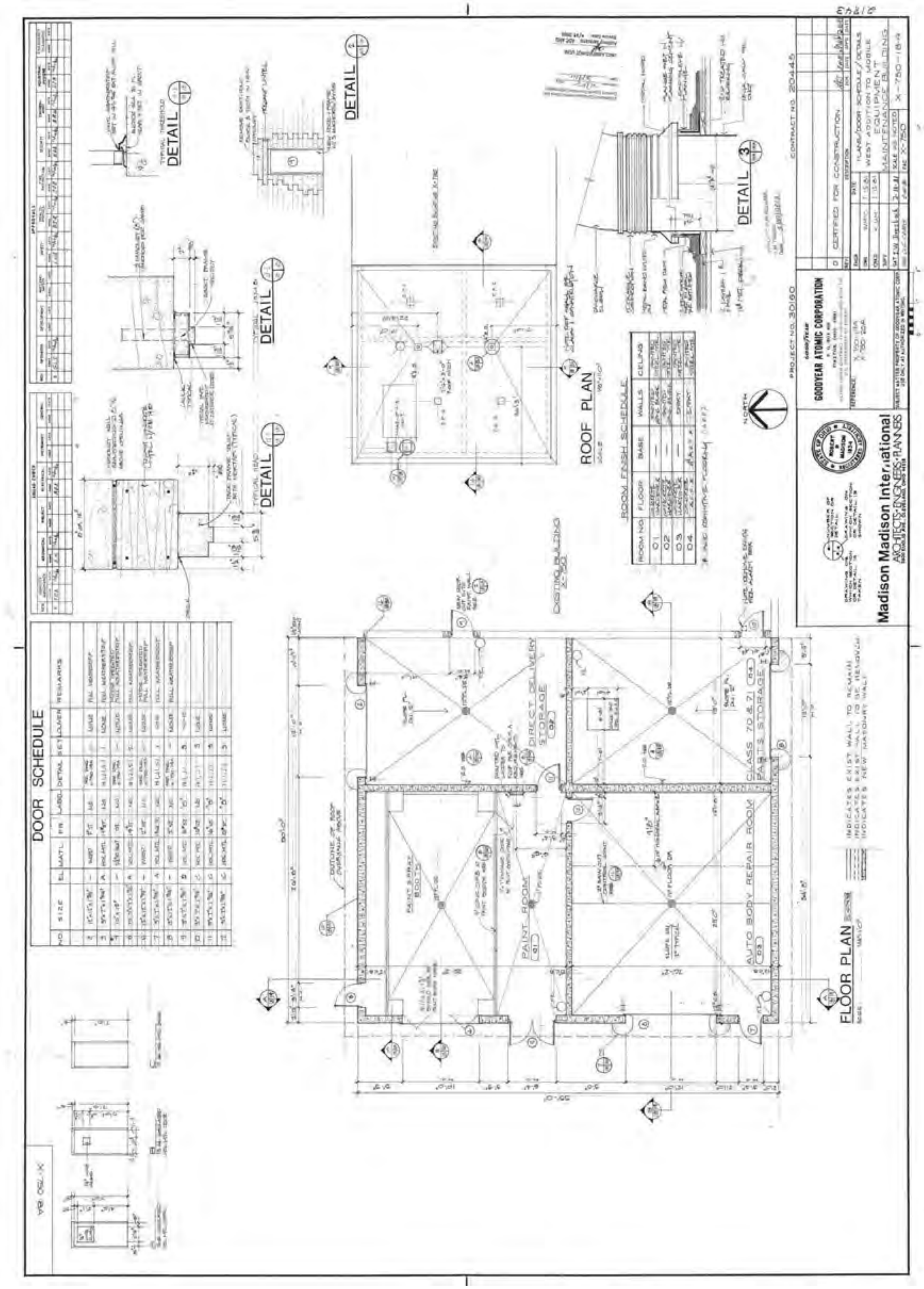

Figure 11: West Addition Plans

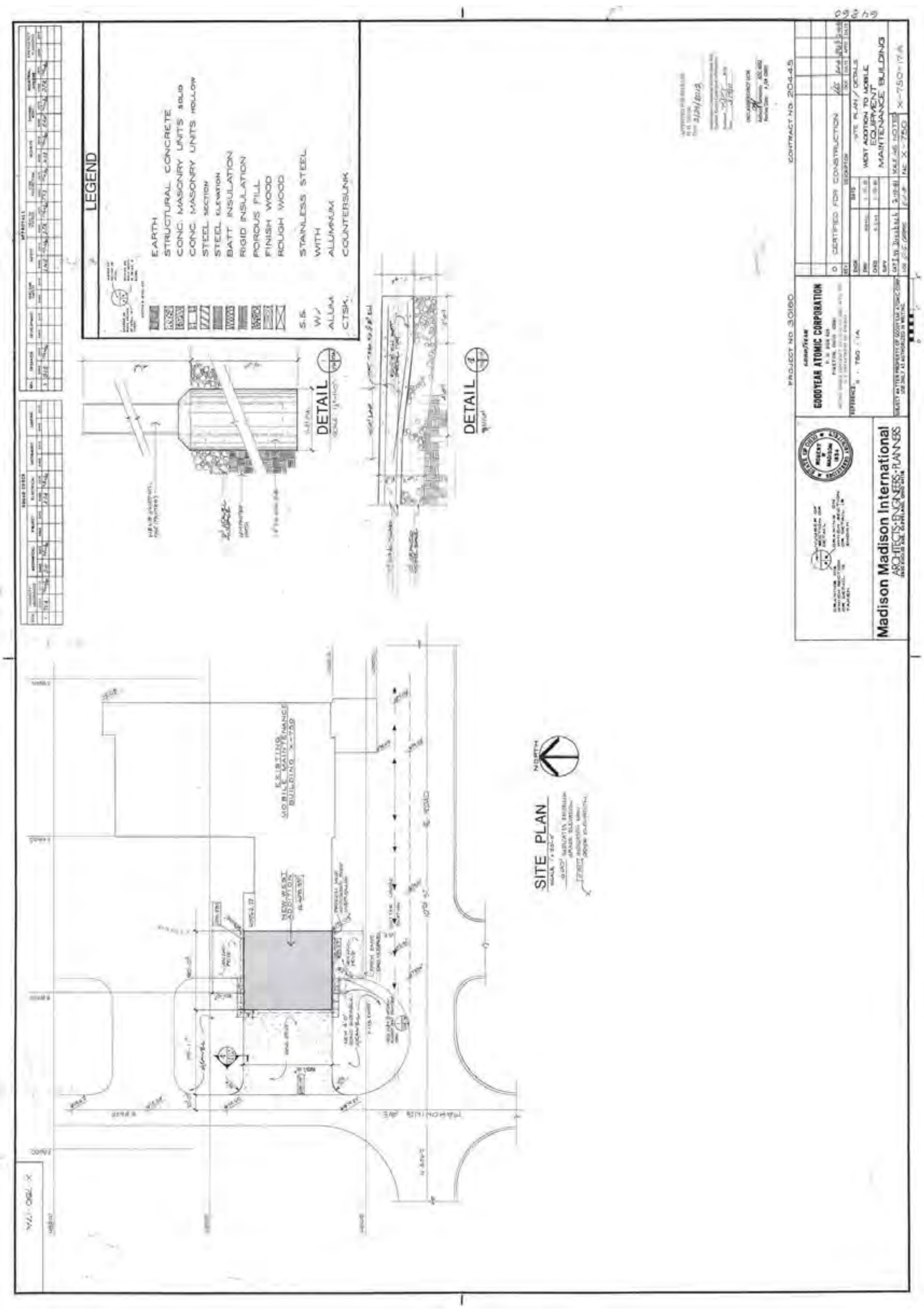

Figure 12: West Addition Plans

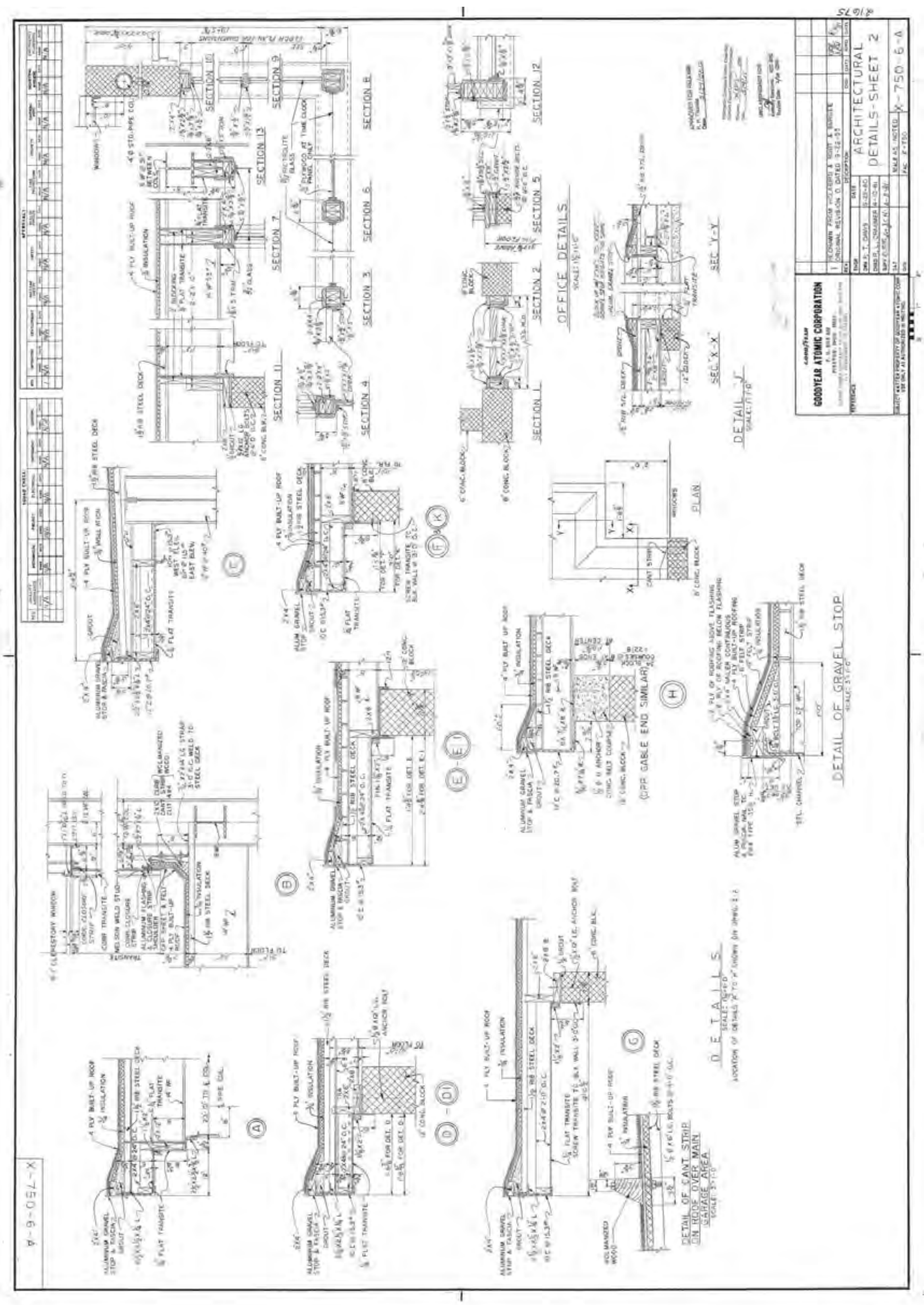

Figure 13: Details

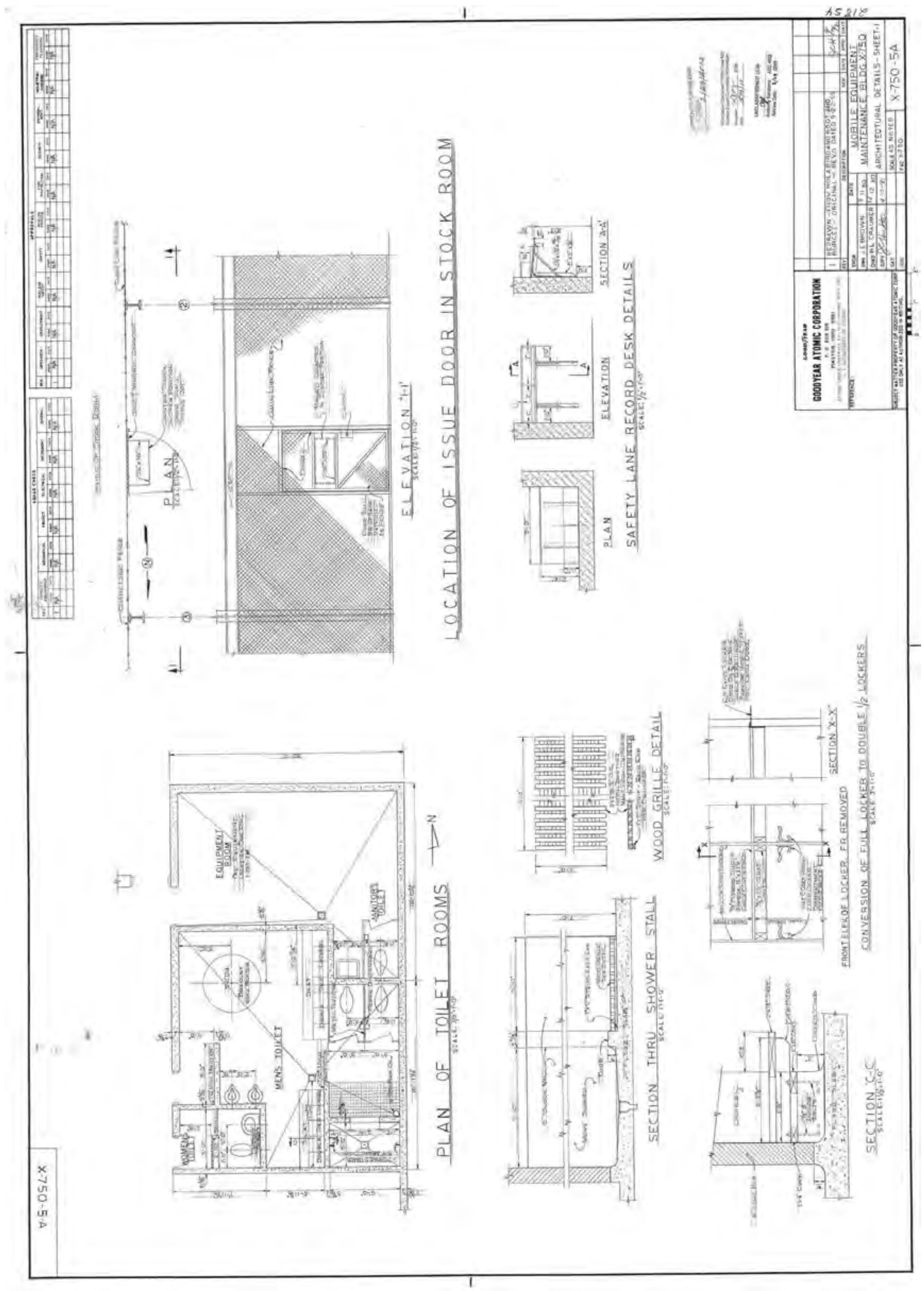

Figure 14: Details

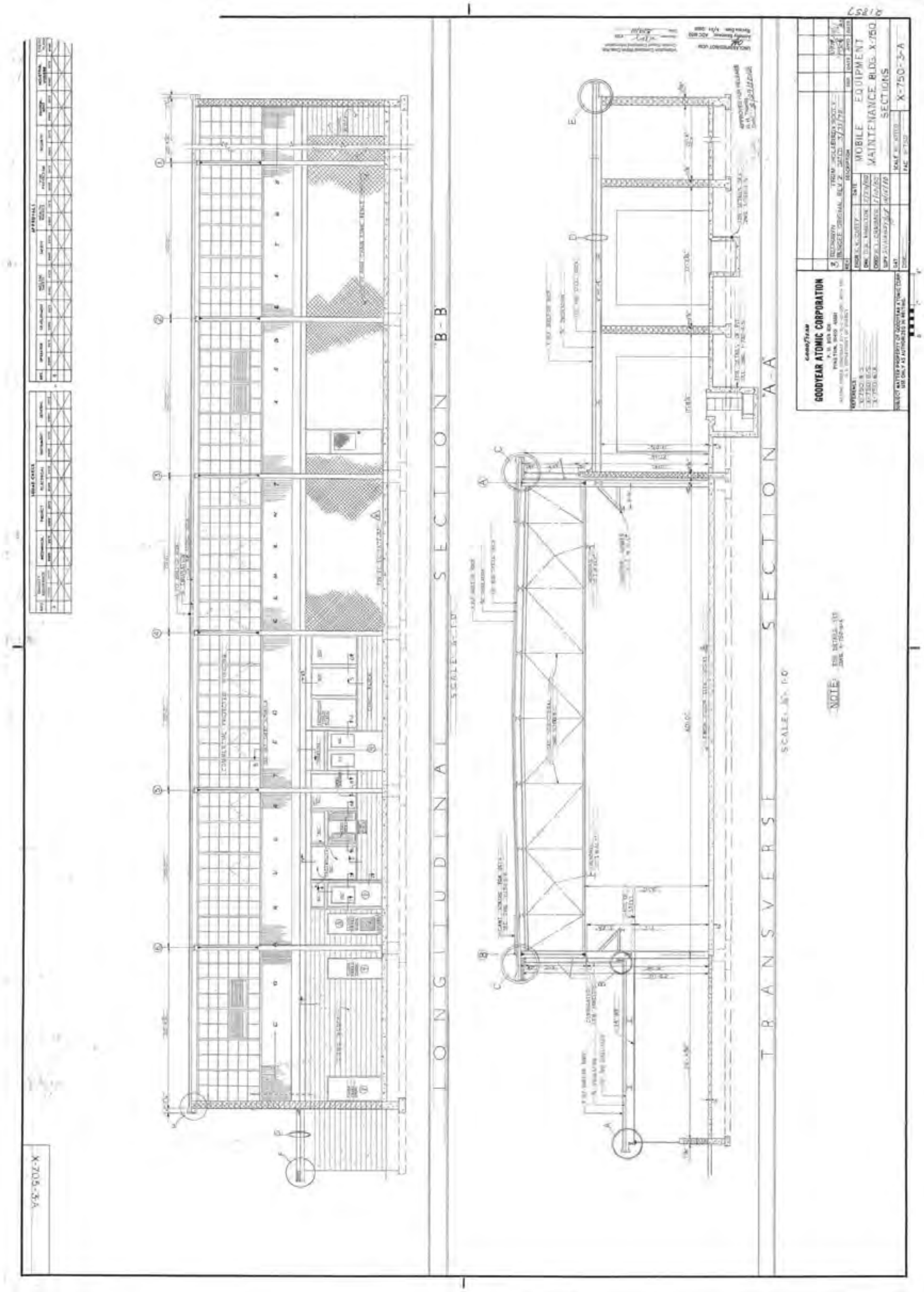

Figure 15: Sections

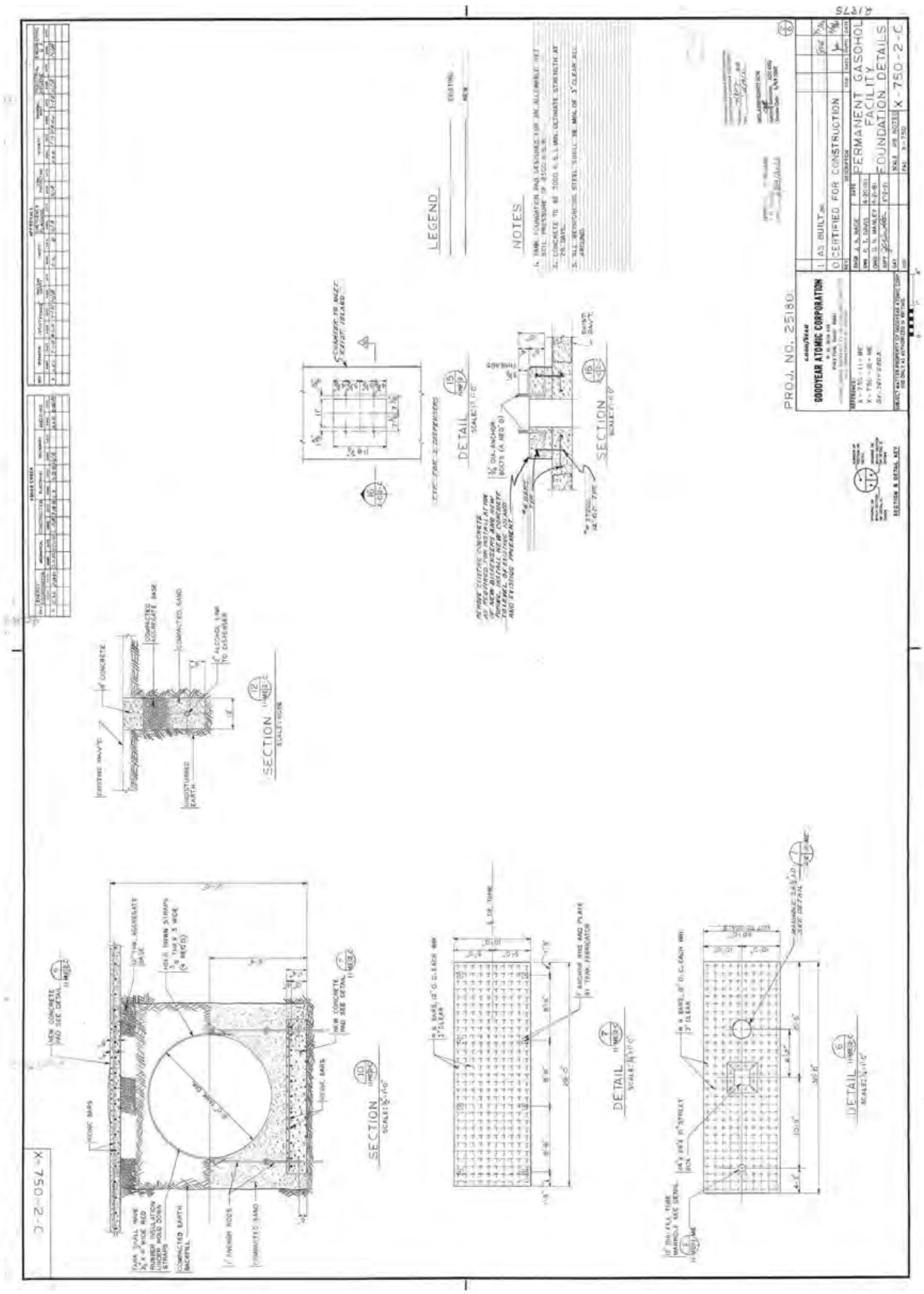

Figure 16: Foundation Details

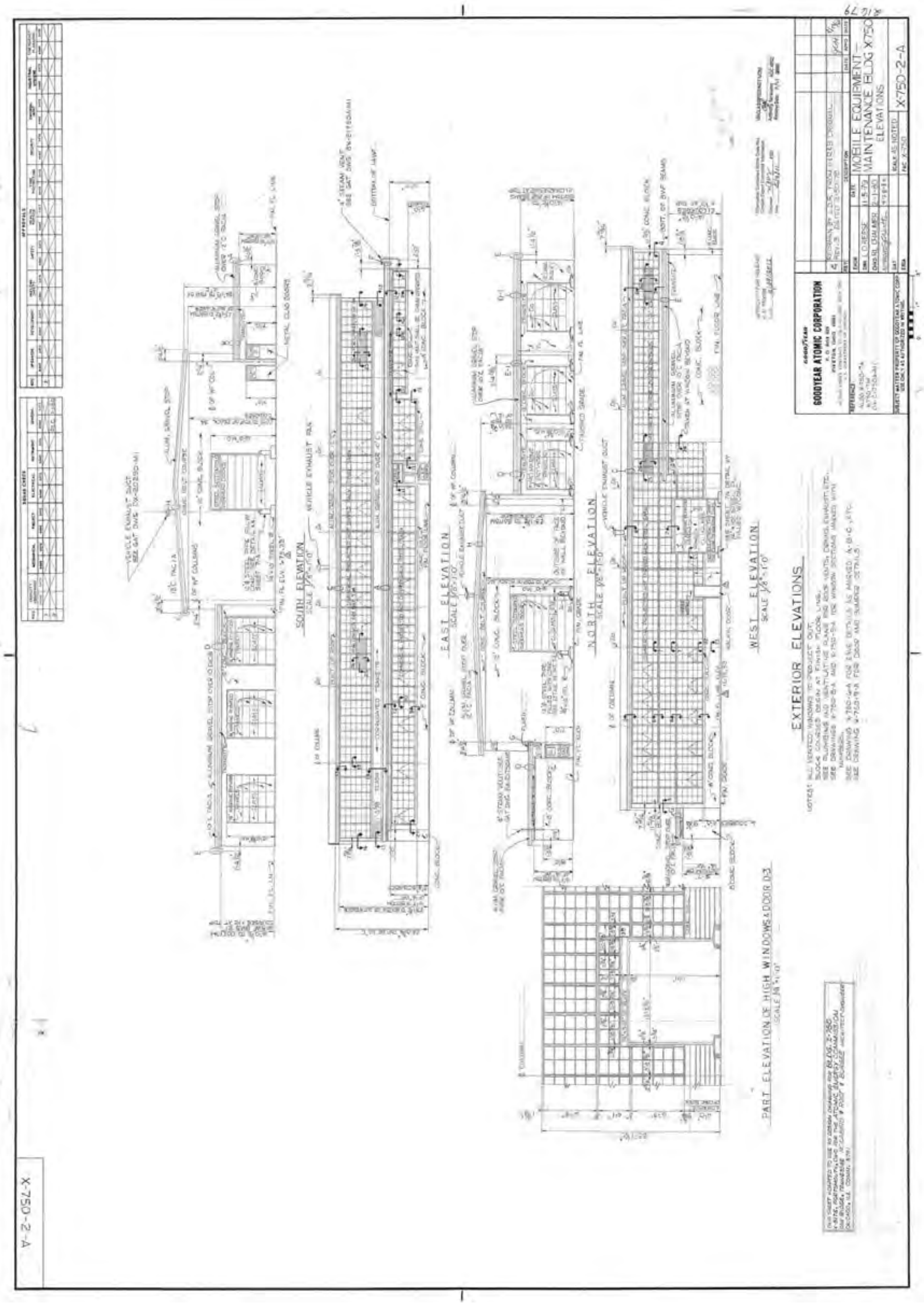

Figure 17: Elevations