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

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

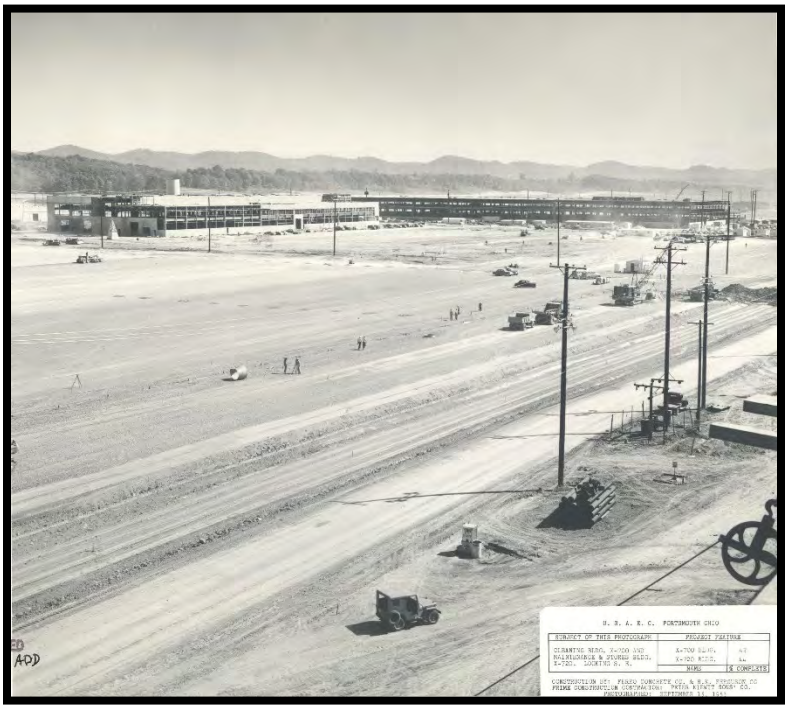

Figure 8: Construction Photograph of the X-700 Converter Shop and Chemical Cleaning Facility, Looking Southeast, September 1953

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

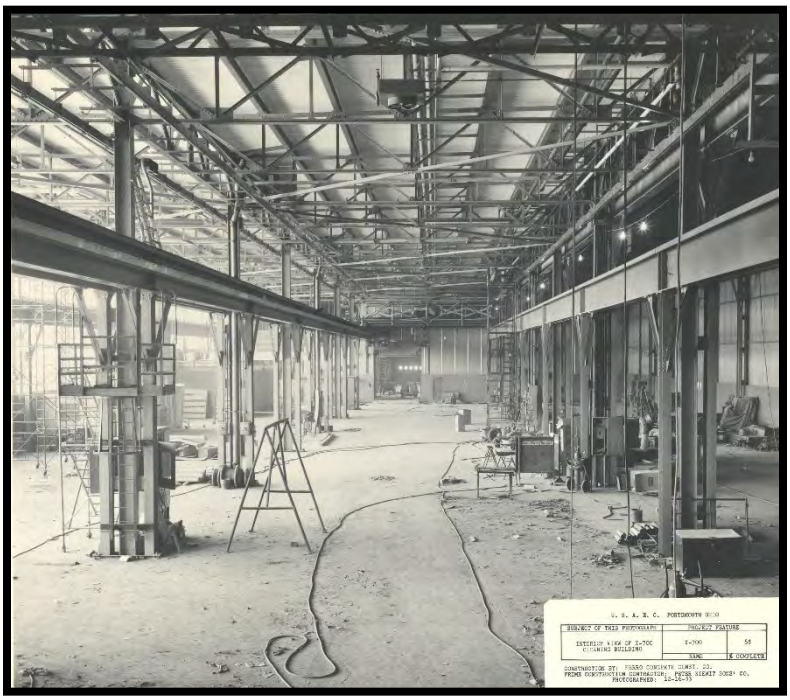

Figure 11: Interior View of the X-700 Converter Shop and Chemical Cleaning Facility, December 1953

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

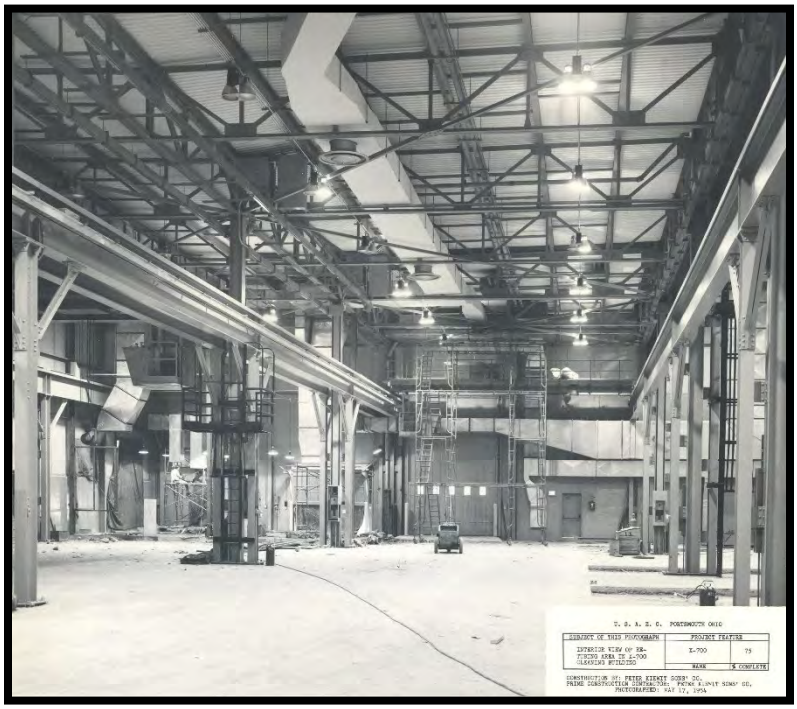

Figure 14: Interior View of the Re-Tubing Area of the X-700 Converter Shop and Chemical Cleaning Facility, May 1954

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

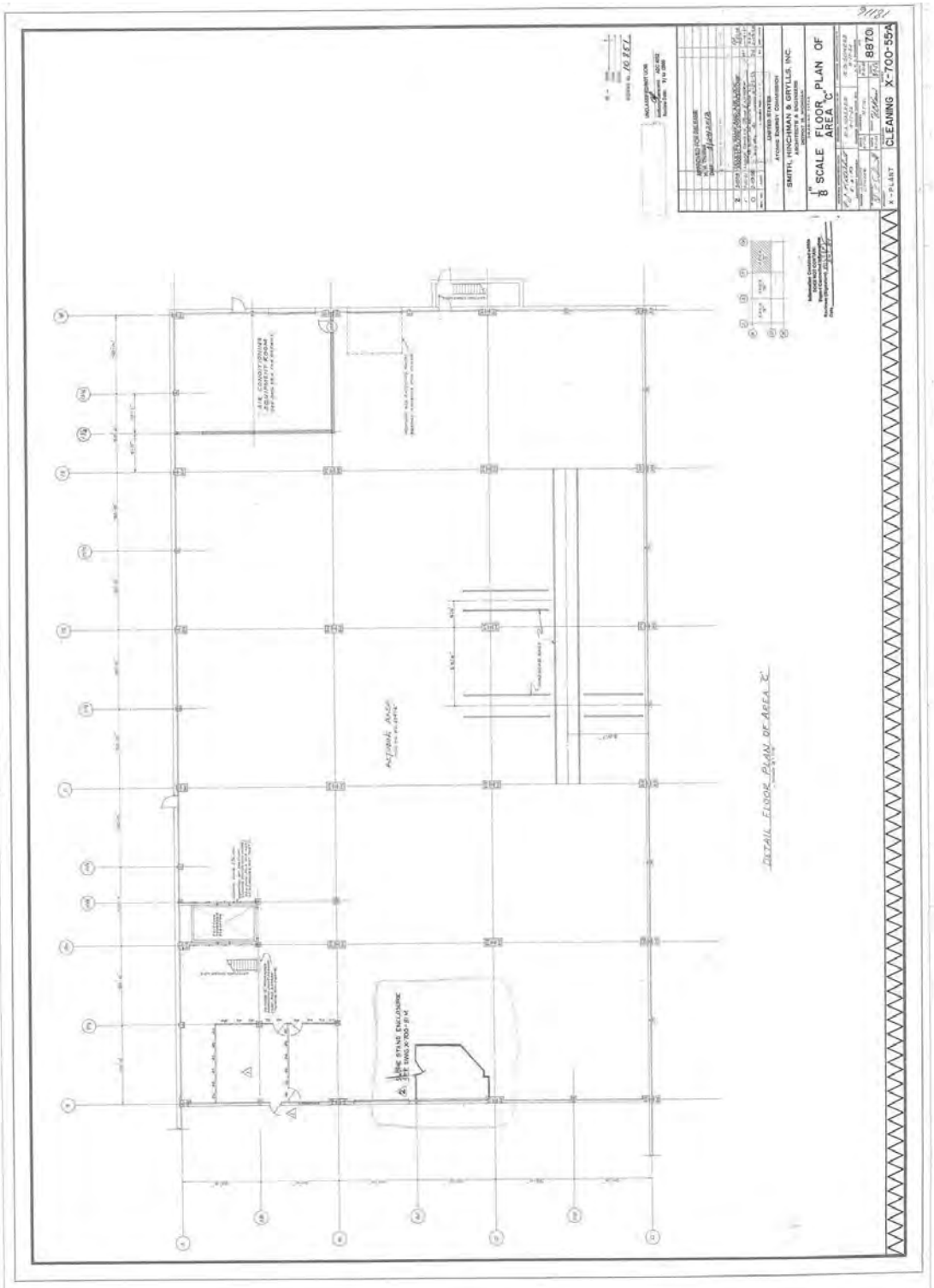

Figure 17: Area C Floor Plan

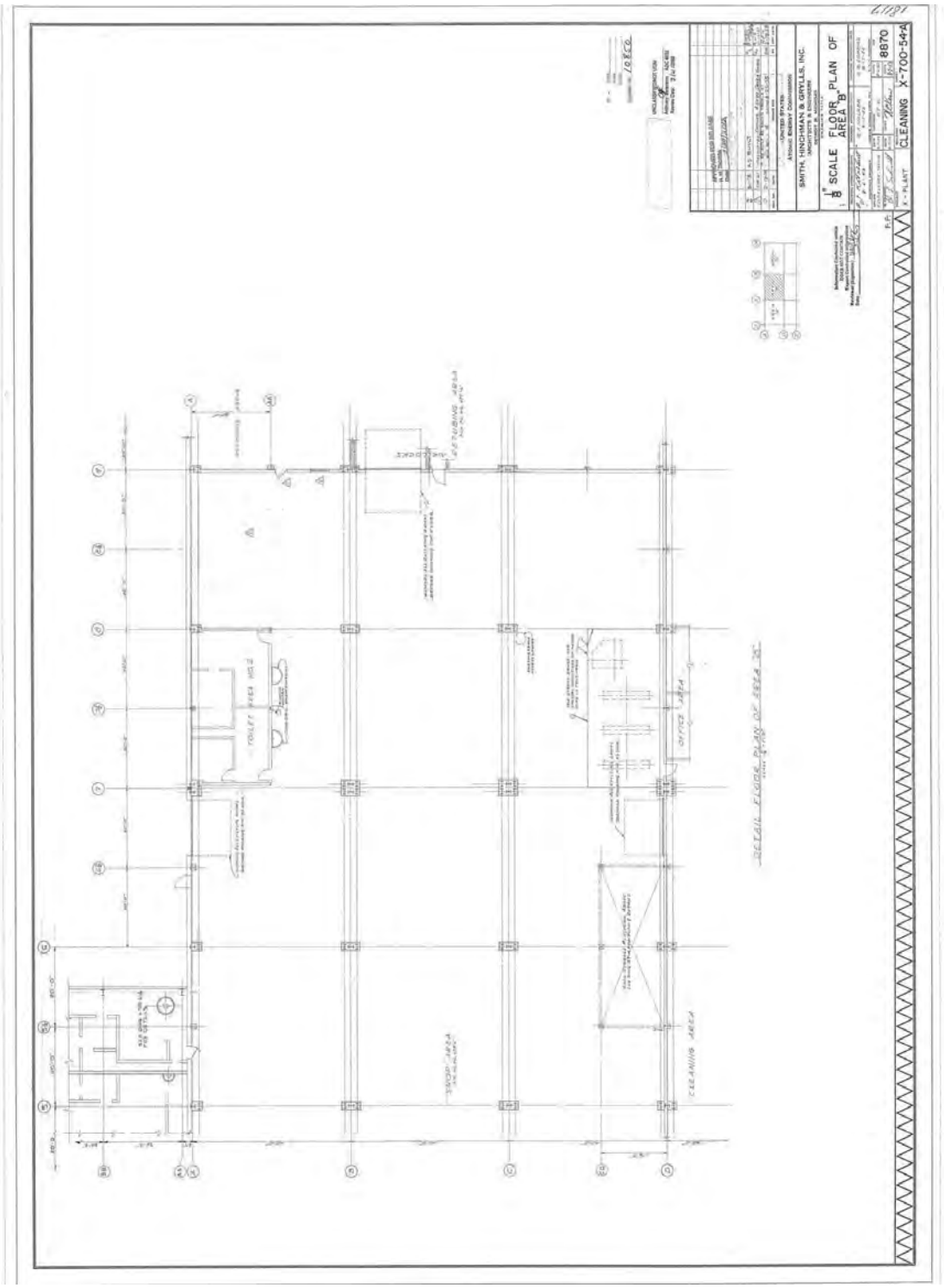

Figure 18: Area B Floor Plan

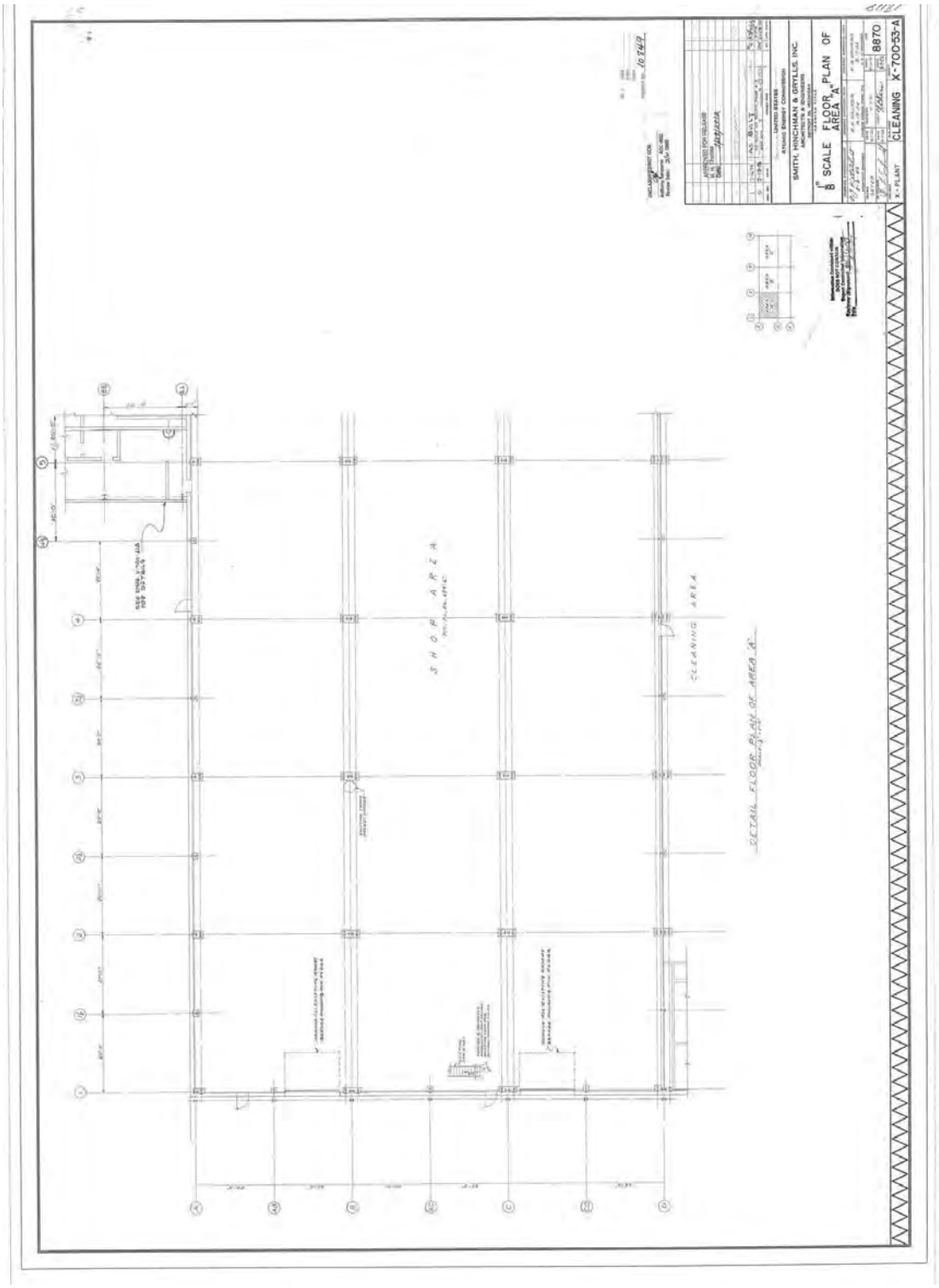

Figure 19: Area A Floor Plan

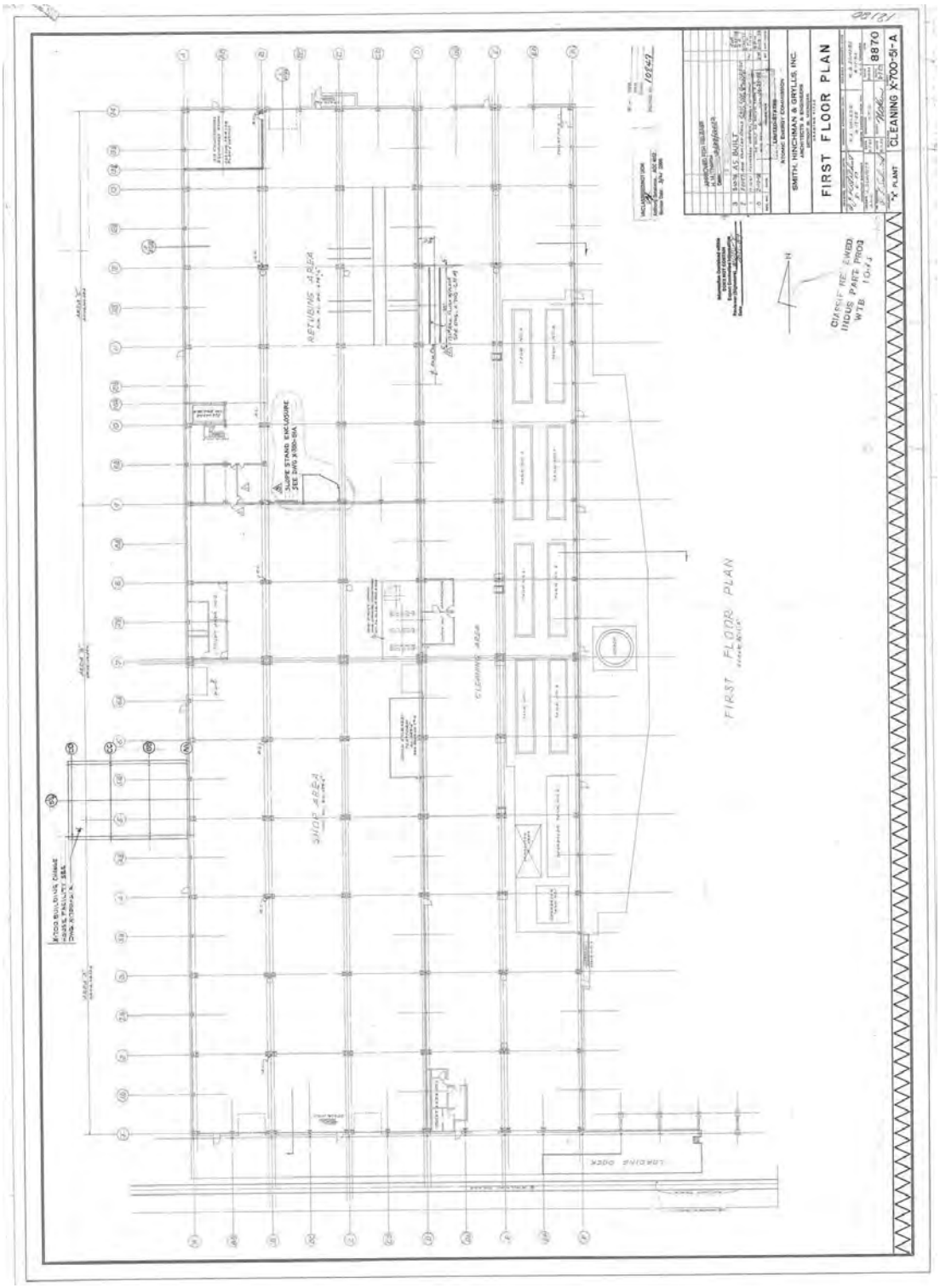

Figure 20: First Floor Plan

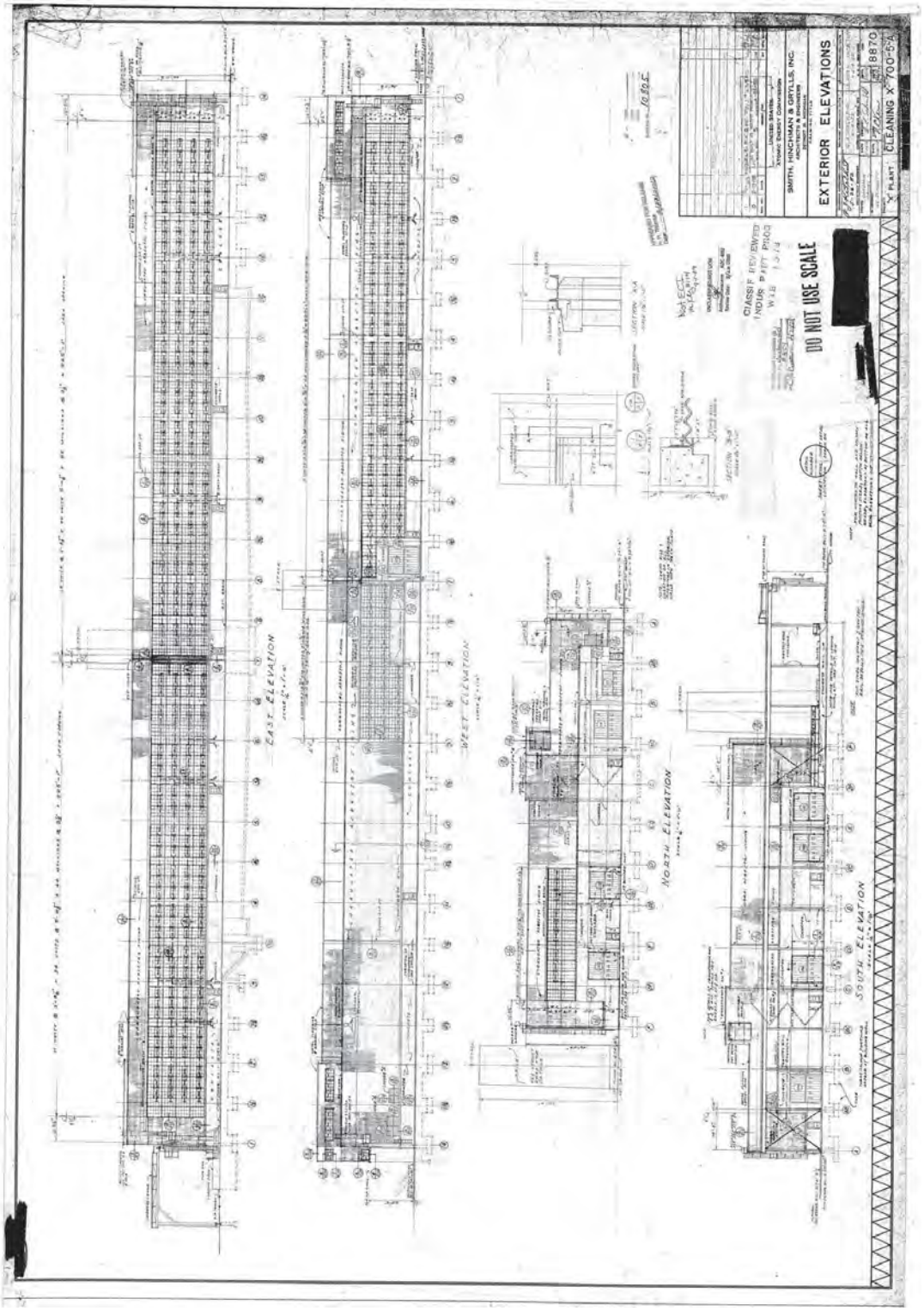

Figure 21: Exterior Elevations

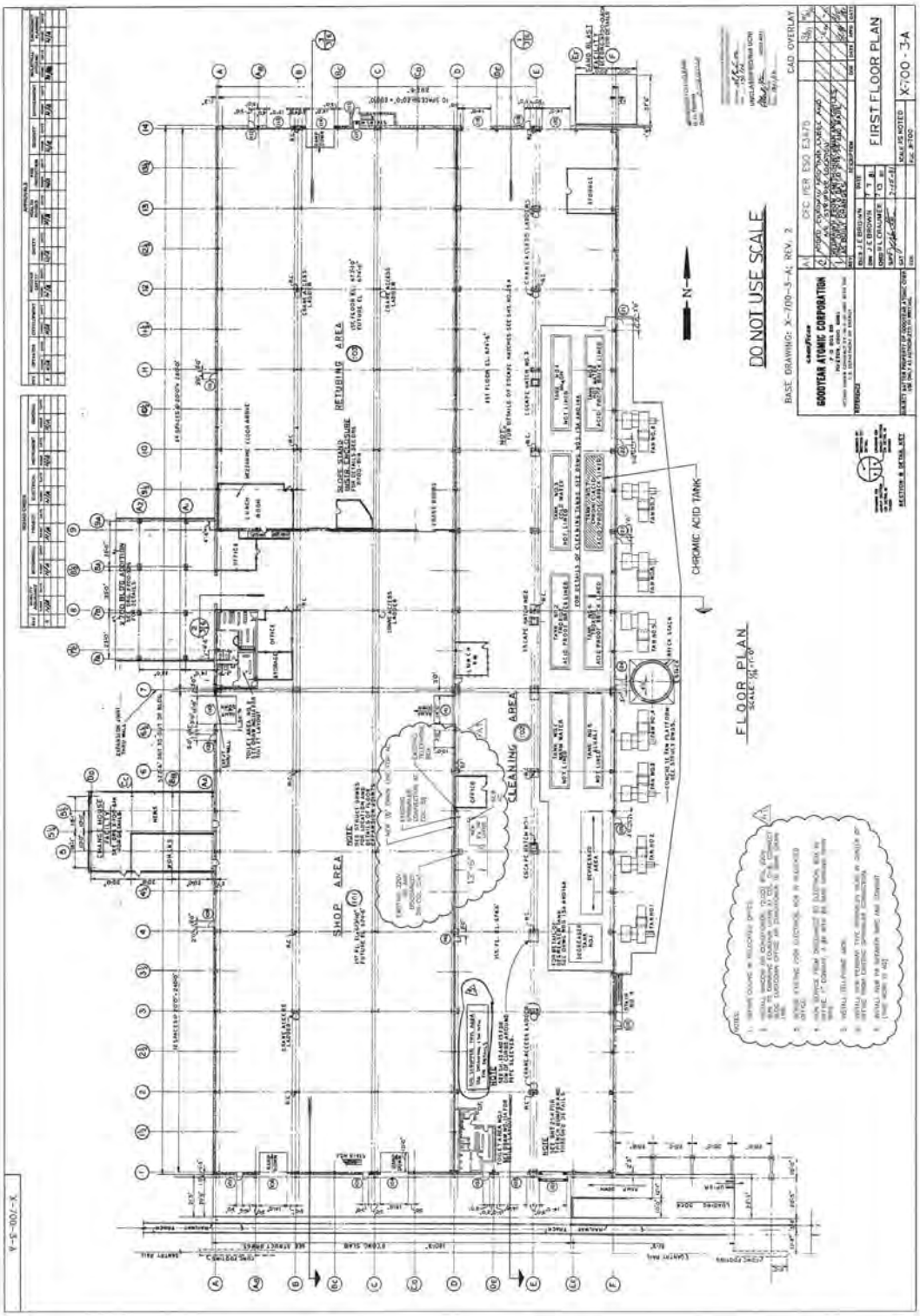

Figure 22: First Floor Plan

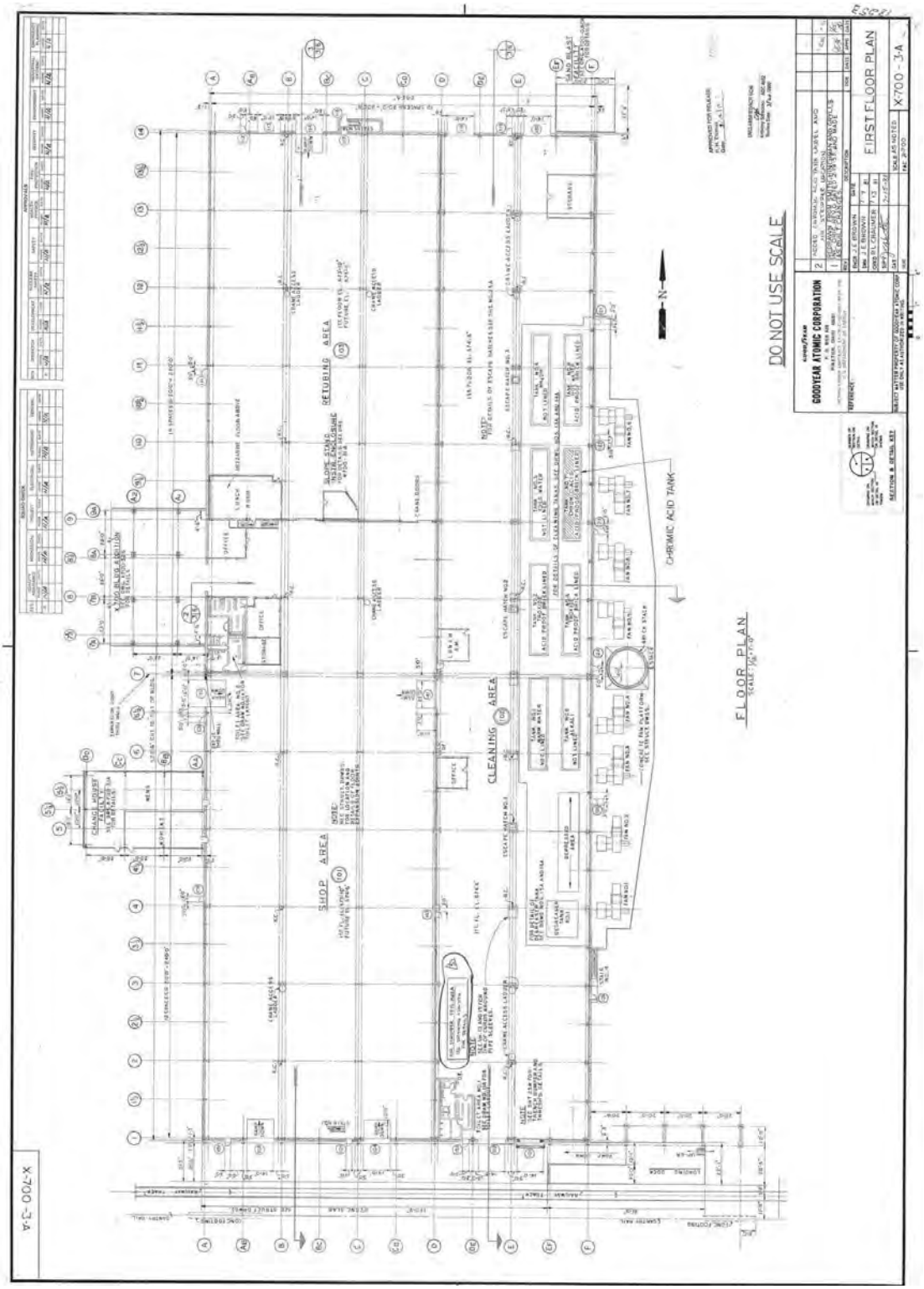

Figure 23: First Floor Plan

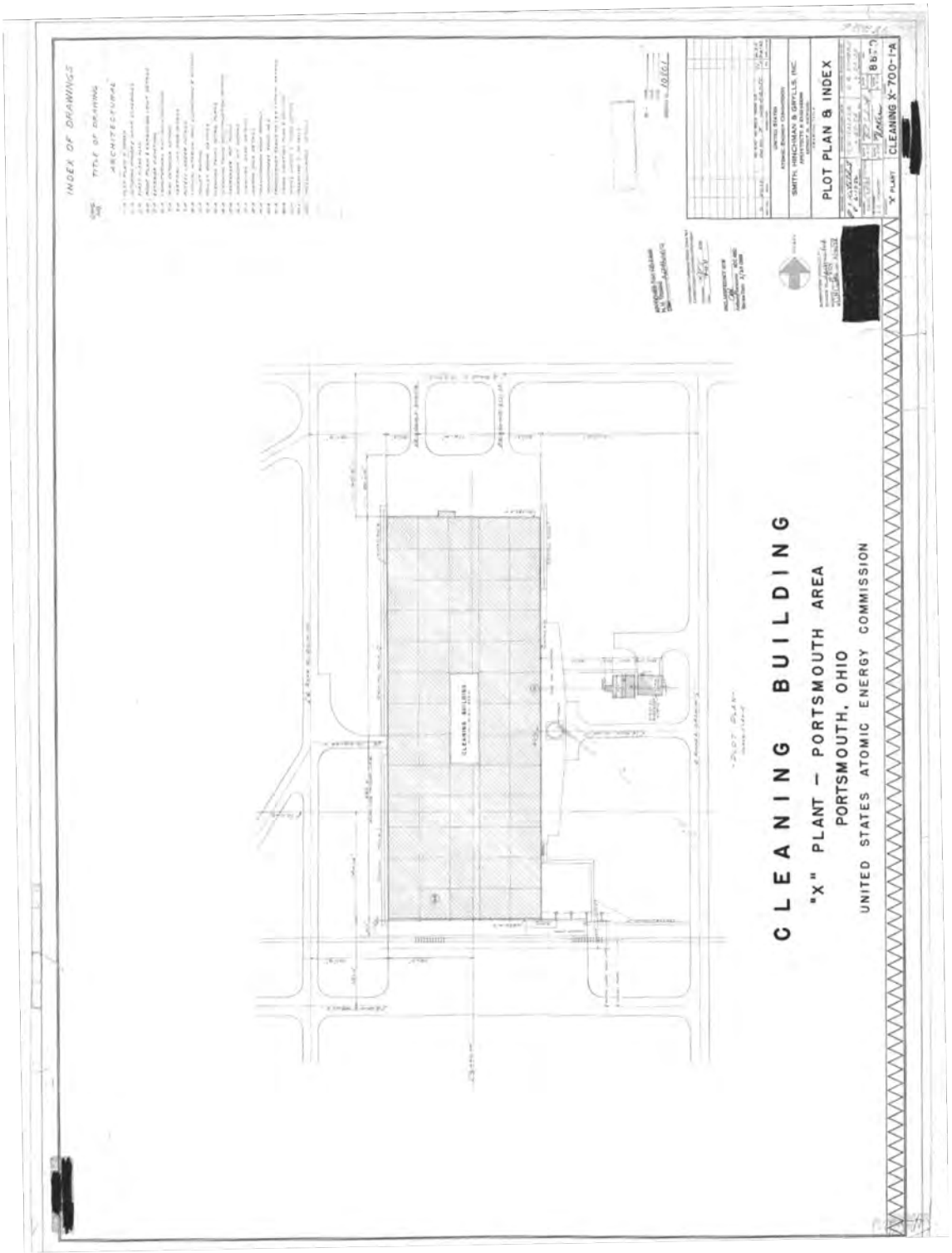

Figure 24: Plot Plan and Index

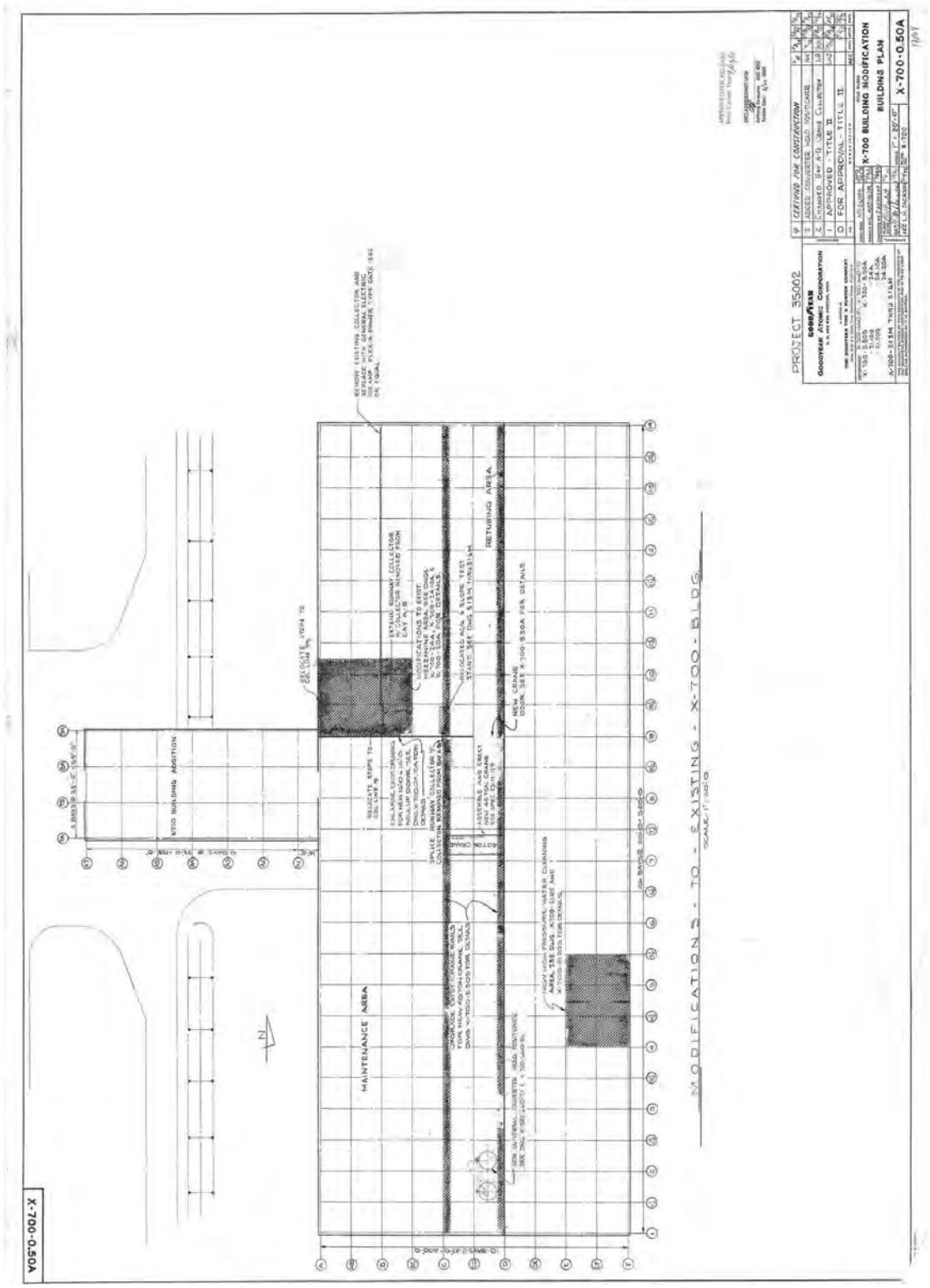

Figure 25: Building Plan