

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 (UF₆) Sampling Facility and the X-343 Feed, Vaporization, and Sampling Facility took over these operations. The gaseous diffusion process requires the use of UF₆ to separate the uranium-238 and uranium-235 isotopes. By manipulating the temperature and pressure of its container, UF₆ can be maintained as a gas, liquid, or solid making it ideal for use in the diffusion process. UF₆ 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

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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 UF₆ 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 UF₆ 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

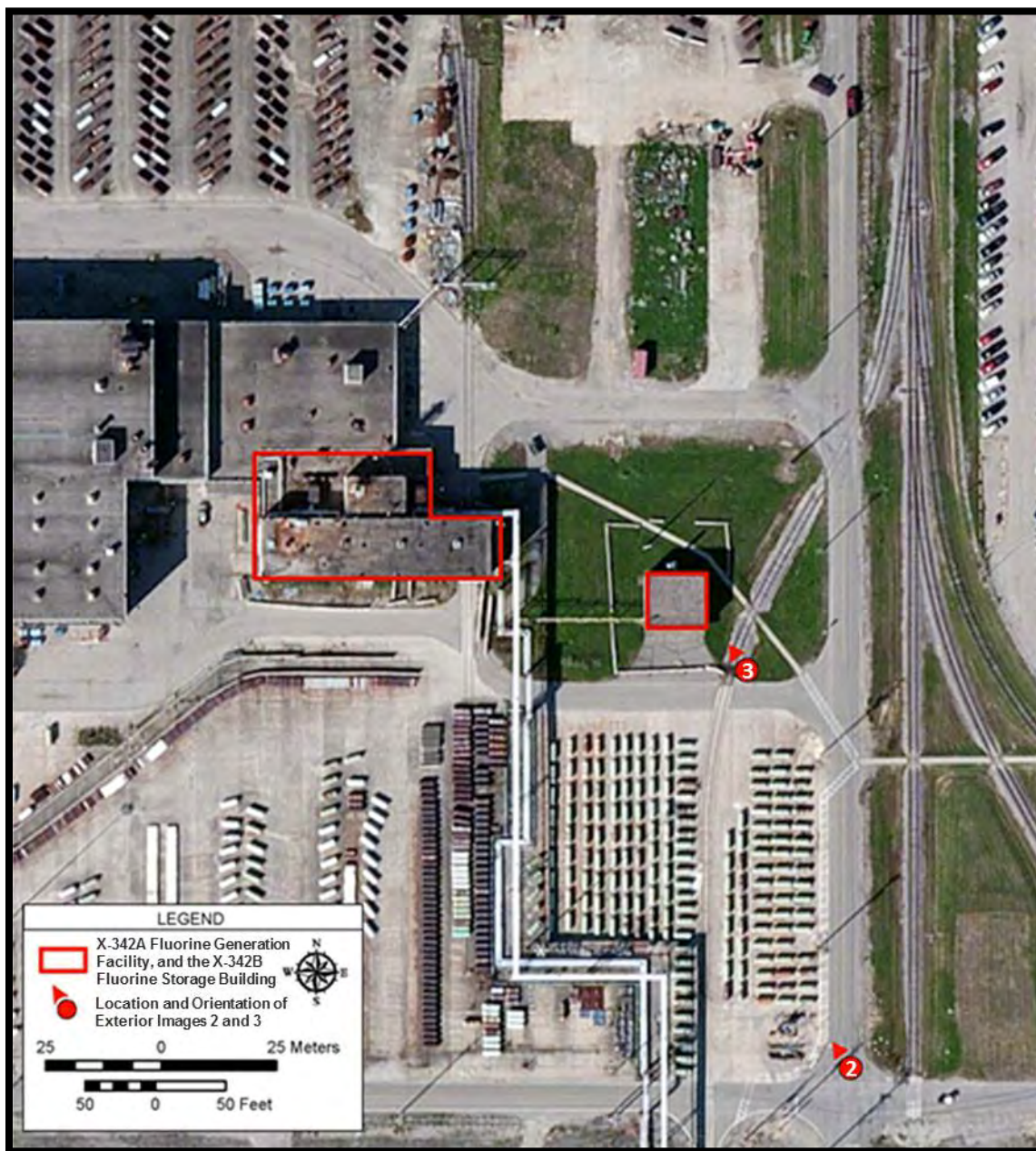


Figure 1: Location and Orientation of Exterior Photographs (1 and 3)



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

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

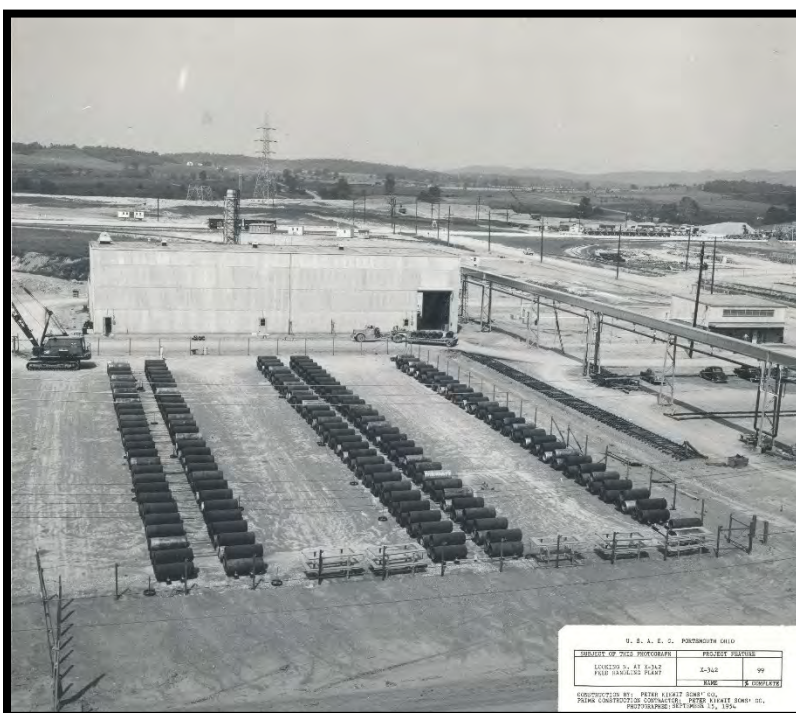


Figure 11: Looking North at the X-342A Feed, Vaporization, and Fluorine
Generation Facility and the X-342B Fluorine Storage Building,
September 1954

Appendix C: Historical Drawings

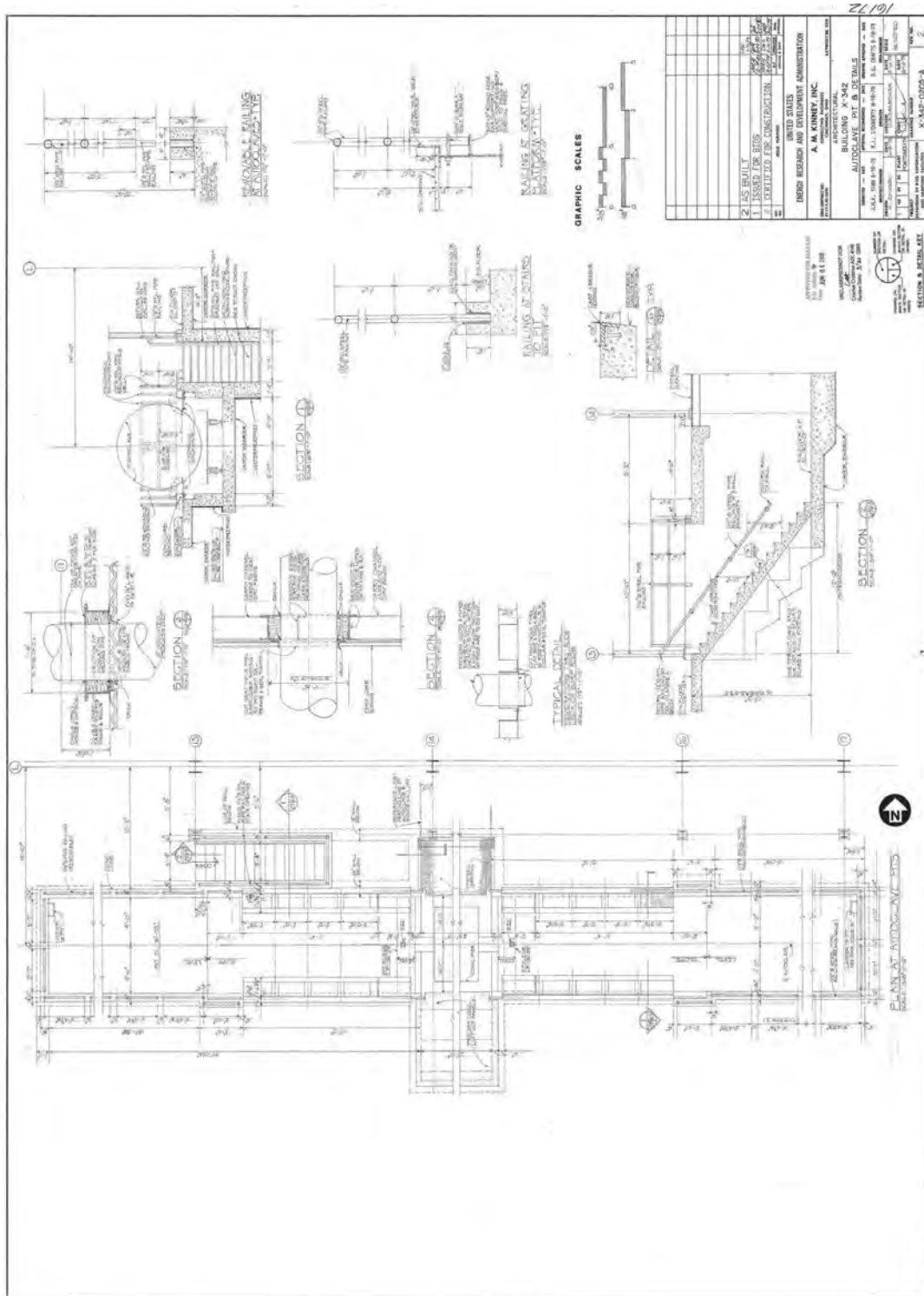


Figure 12: Autoclave Pit and Details

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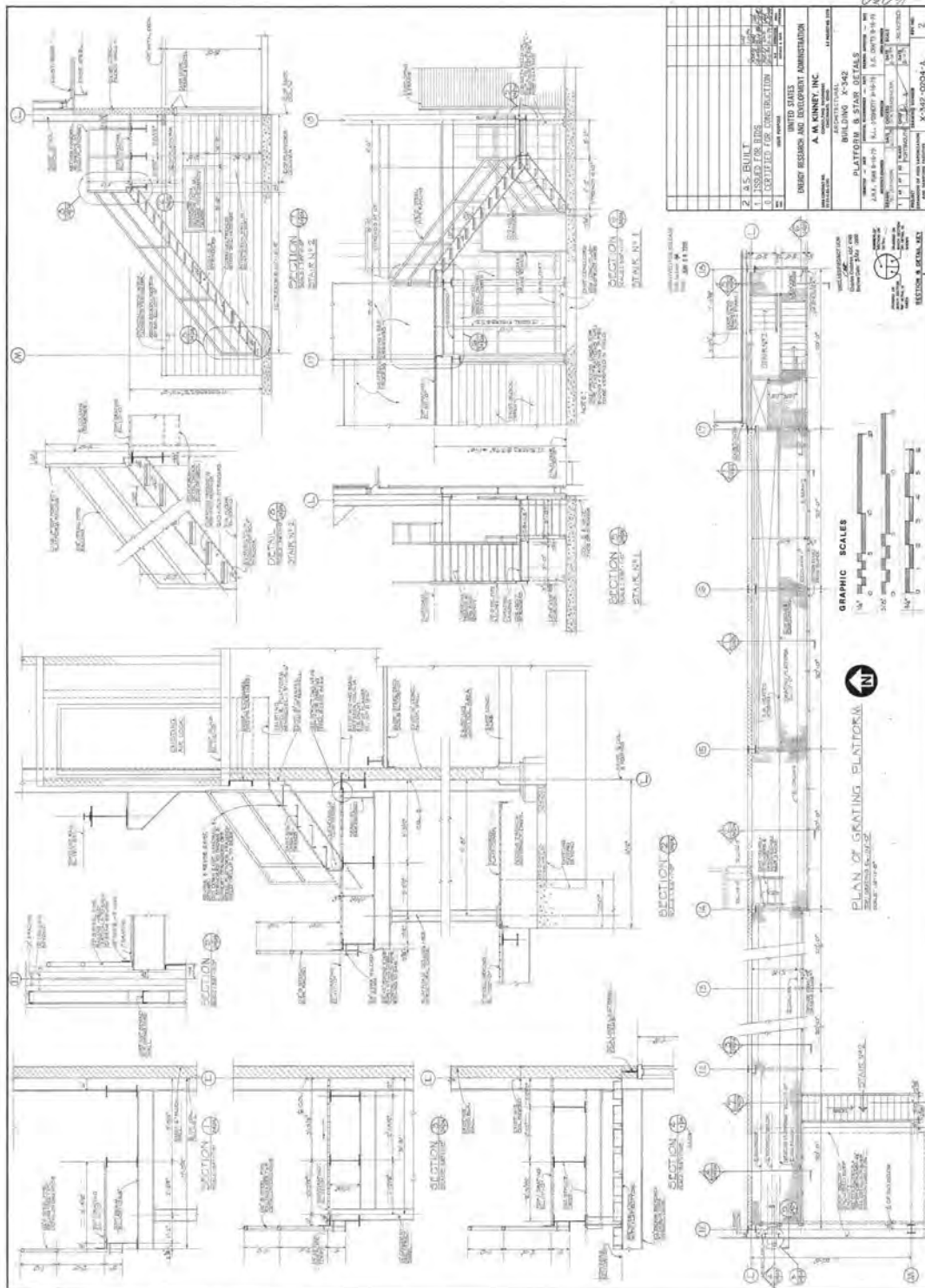


Figure 13: Platform and Stair Details

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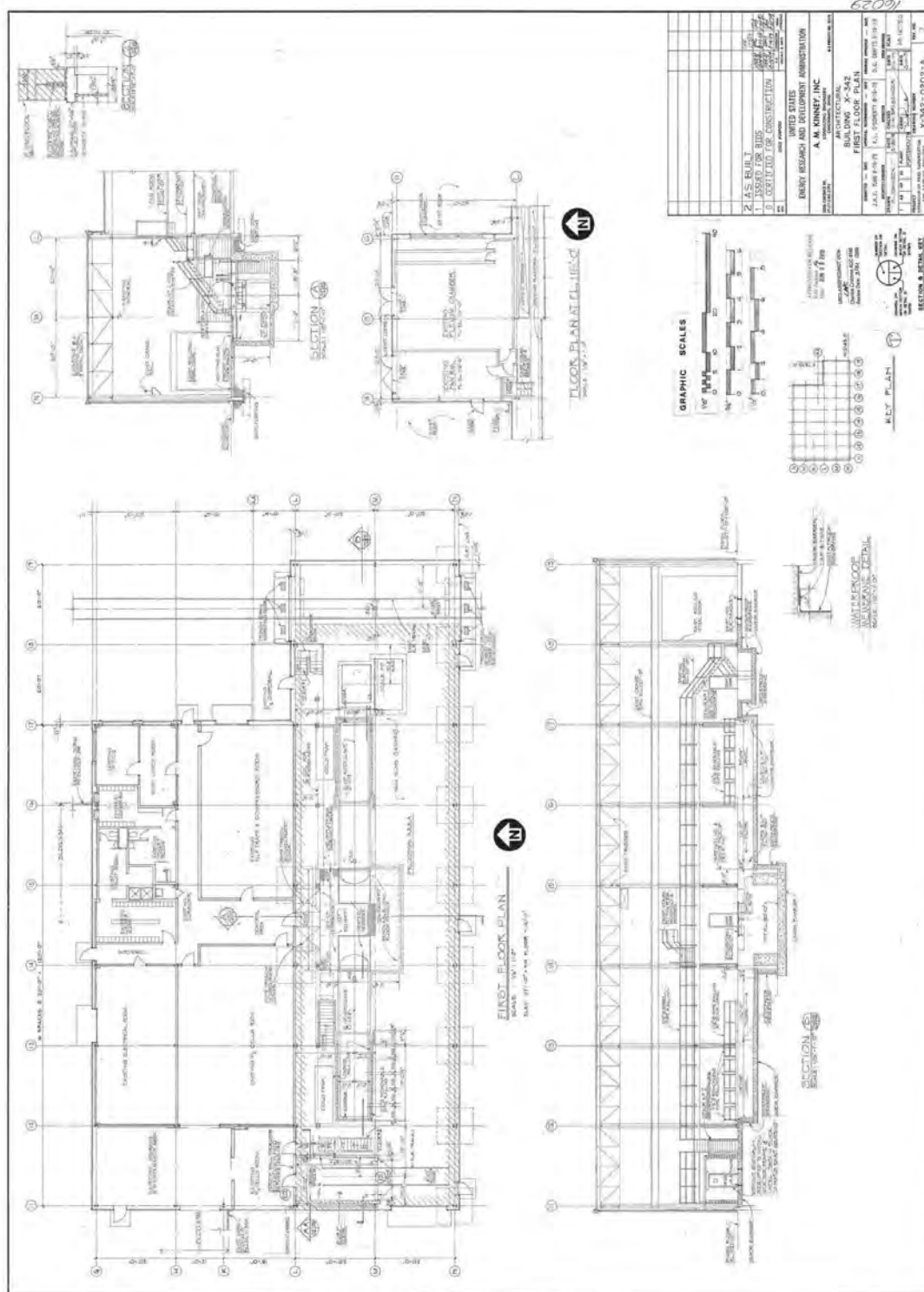


Figure 14: First Floor Plan

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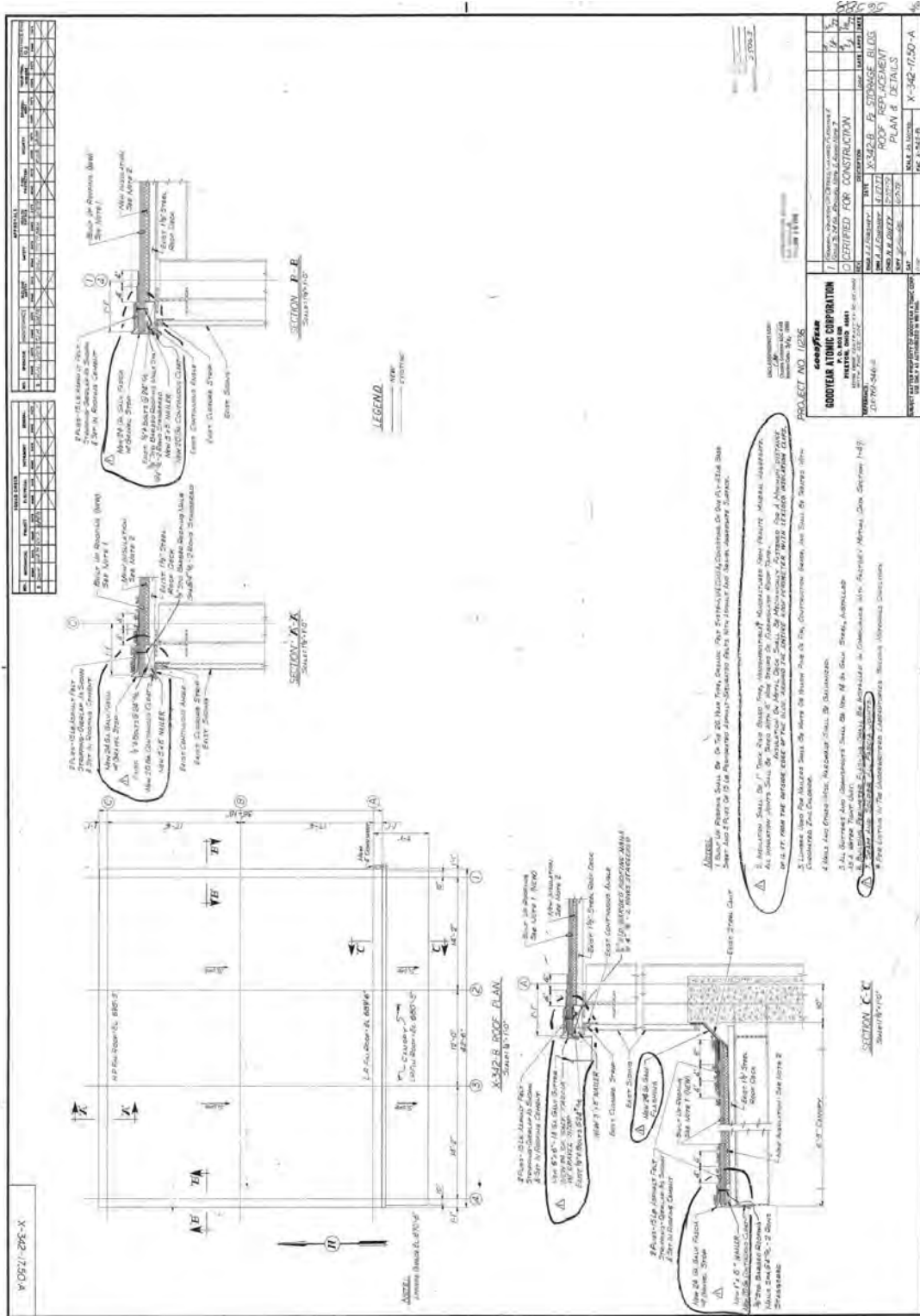
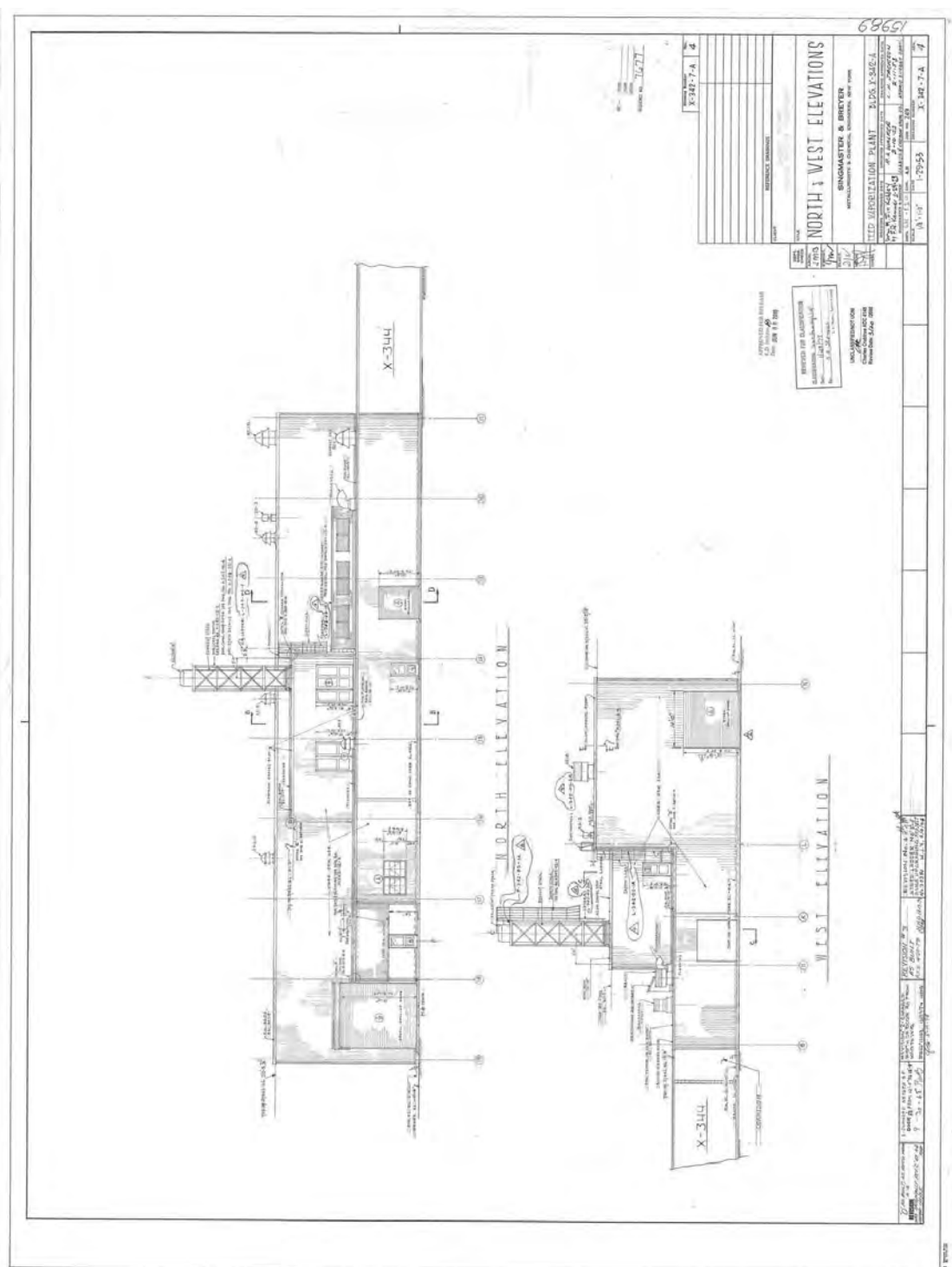
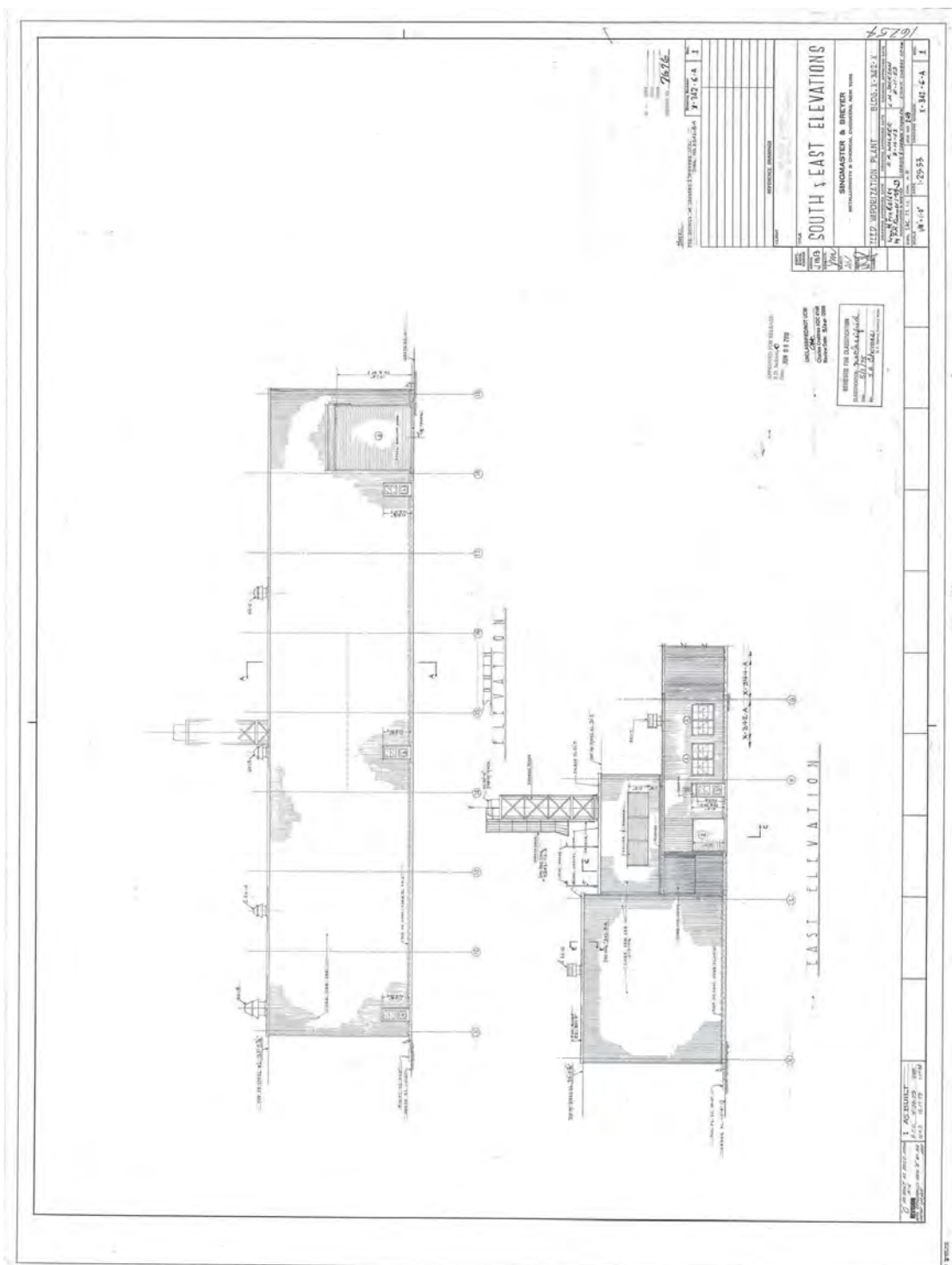


Figure 15: Roof Replacement Plan

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NOTES:

1. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE NOTED.
2. ALL WALLS TO BE CONCRETE.
3. ALL FLOORS TO BE CONCRETE.
4. ALL ROOFS TO BE FLAT.
5. ALL EXTERIOR WALLS TO BE FINISHED WITH STUCCO.
6. ALL INTERIOR WALLS TO BE FINISHED WITH PLASTER.
7. ALL CEILING TO BE PLASTER.
8. ALL FLOORS TO BE FINISHED WITH POLISHED CONCRETE.
9. ALL ROOFS TO BE FINISHED WITH FLAT ROOFING.
10. ALL EXTERIOR DOORS TO BE FINISHED WITH WOOD.
11. ALL INTERIOR DOORS TO BE FINISHED WITH WOOD.
12. ALL WINDOWS TO BE FINISHED WITH WOOD.
13. ALL STAIRS TO BE FINISHED WITH WOOD.
14. ALL ELEVATORS TO BE FINISHED WITH WOOD.
15. ALL MECHANICAL EQUIPMENT TO BE FINISHED WITH WOOD.
16. ALL ELECTRICAL EQUIPMENT TO BE FINISHED WITH WOOD.
17. ALL PIPING TO BE FINISHED WITH WOOD.
18. ALL PLUMBING TO BE FINISHED WITH WOOD.
19. ALL HEATING TO BE FINISHED WITH WOOD.
20. ALL COOLING TO BE FINISHED WITH WOOD.

LEGEND:

- 1. CONCRETE
- 2. STUCCO
- 3. PLASTER
- 4. POLISHED CONCRETE
- 5. FLAT ROOFING
- 6. WOOD
- 7. STUCCO
- 8. PLASTER
- 9. POLISHED CONCRETE
- 10. FLAT ROOFING
- 11. WOOD
- 12. STUCCO
- 13. PLASTER
- 14. POLISHED CONCRETE
- 15. FLAT ROOFING
- 16. WOOD
- 17. STUCCO
- 18. PLASTER
- 19. POLISHED CONCRETE
- 20. FLAT ROOFING

TITLE BLOCK:

SHOMASTER & MEYER
 BUILDING
 GROUND FLOOR PLAN
 X-344

Figure 18: Ground Floor Plan

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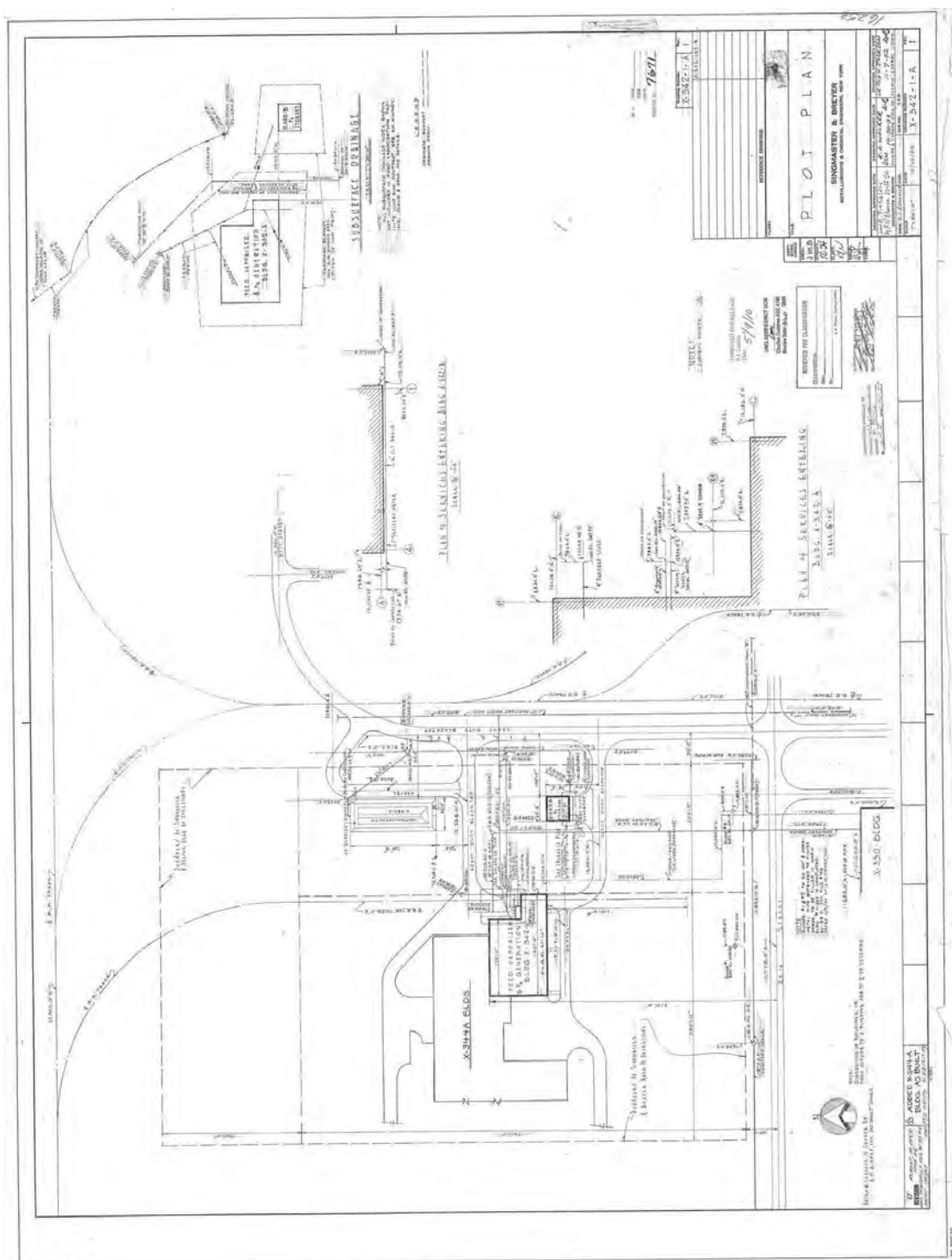


Figure 19: Plot Plan

The image displays a set of architectural drawings for the F4 Storage Building, specifically focusing on the elevations and sections of the main structure. The drawings are oriented vertically on the page.

Elevations:

- WEST ELEVATION:** Shows the left side of the building with a series of vertical supports and a flat roofline.
- NORTH ELEVATION:** Shows the front of the building, featuring a large central entrance with a gabled roof and several smaller windows.
- SOUTH ELEVATION:** Shows the back of the building, with a similar structure to the north elevation but with different window placements.
- EAST ELEVATION:** Shows the right side of the building, with a series of vertical supports and a flat roofline.

Sections:

- SECTION A-A:** A cross-section through the main body of the building, showing the internal structure, floor, and roof.
- SECTION B-B:** A cross-section through the entrance area, showing the internal structure, floor, and roof.

Details:

- DOOR DETAIL:** A detailed view of the entrance door, showing the frame, hinges, and locking mechanism.
- WINDOW DETAIL:** A detailed view of a window, showing the frame, sash, and hardware.

Notes:

1. ALL DIMENSIONS ARE IN FEET AND INCHES.
2. ALL MATERIALS ARE TO BE OF THE BEST QUALITY AVAILABLE.
3. ALL WORK IS TO BE DONE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE BUILDING CODES.
4. ALL WORK IS TO BE DONE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE BUILDING CODES.
5. ALL WORK IS TO BE DONE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE BUILDING CODES.

Project Information:

PROJECT: F4 STORAGE BUILDING
 DRAWING NO.: 7687
 DATE: 10/1/50
 ARCHITECT: SHUMAKER & BRYNER
 CLIENT: U.S. AIR FORCE

Figure 20: Storage Building