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

HAER OH-142-R
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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

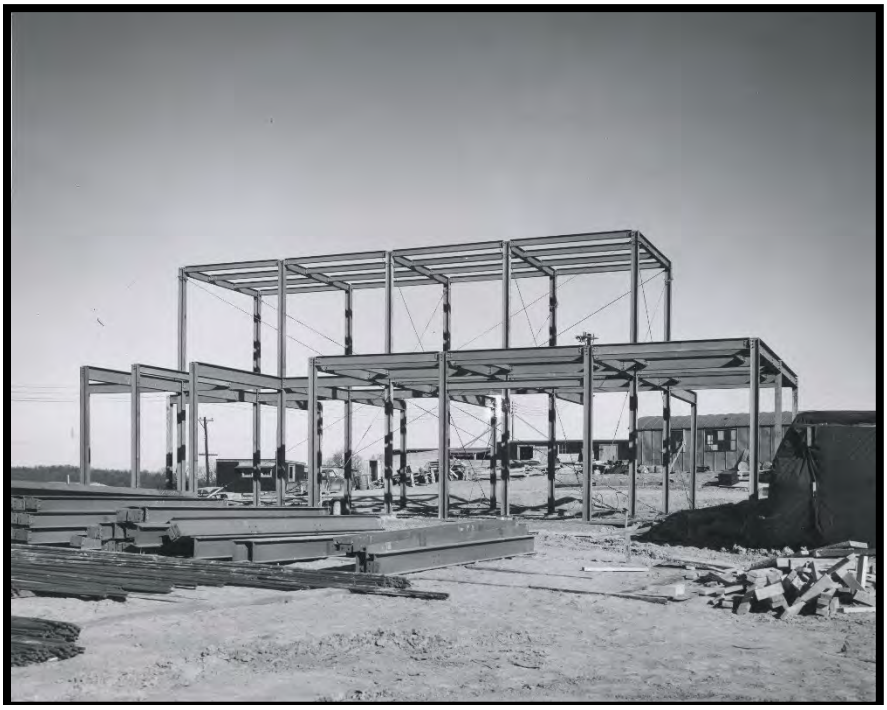

Figure 9: Steel Framework for the X-611 Water Treatment Plant Chemical Building, July 1954

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

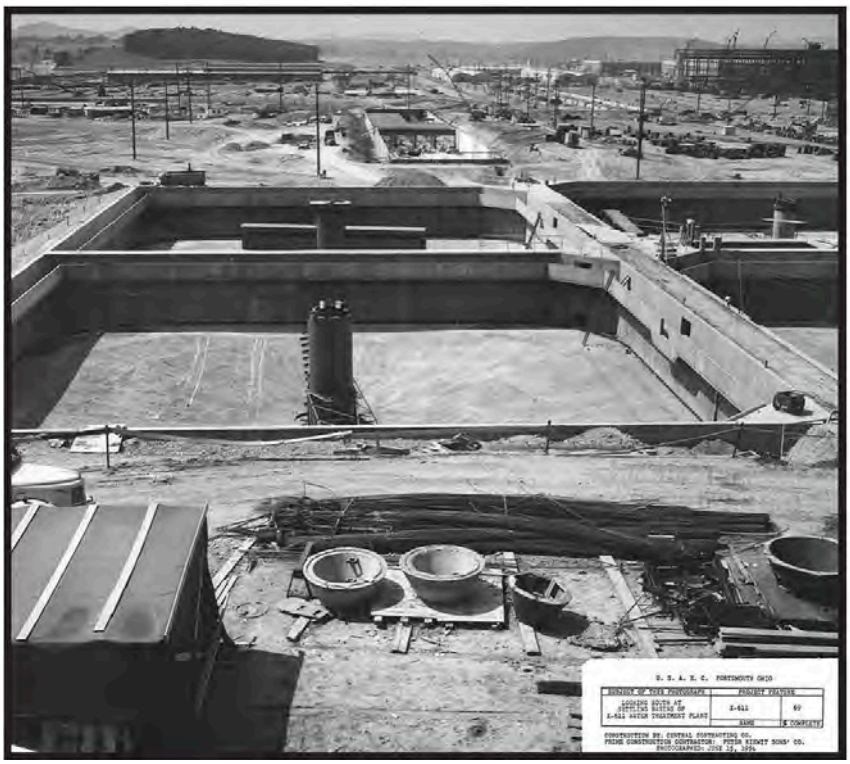

Figure 11: Construction of the X-611 Water Treatment Plant Settling Basins, June 1954

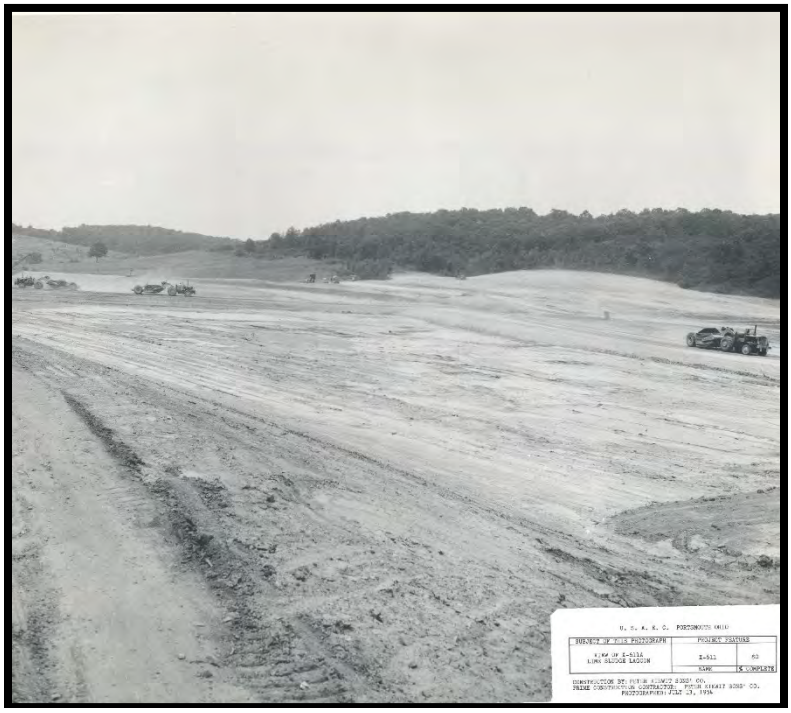

Figure 12: Excavation Work for the X-611A Lime Sludge Lagoon, July 1954

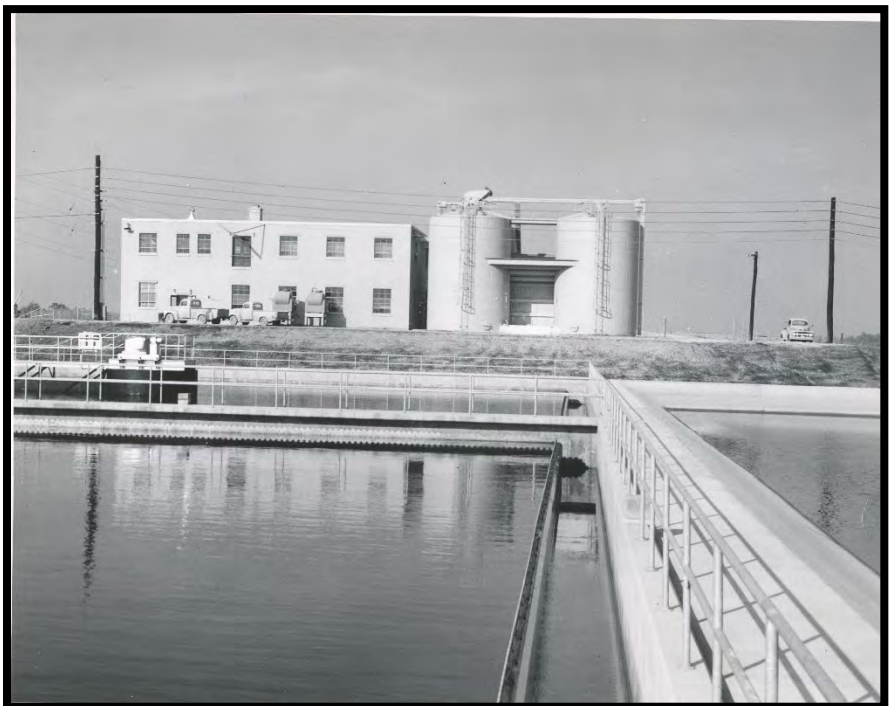

Figure 13: The X-611 Water Treatment Plant, 1955

Appendix C: Historical Drawings

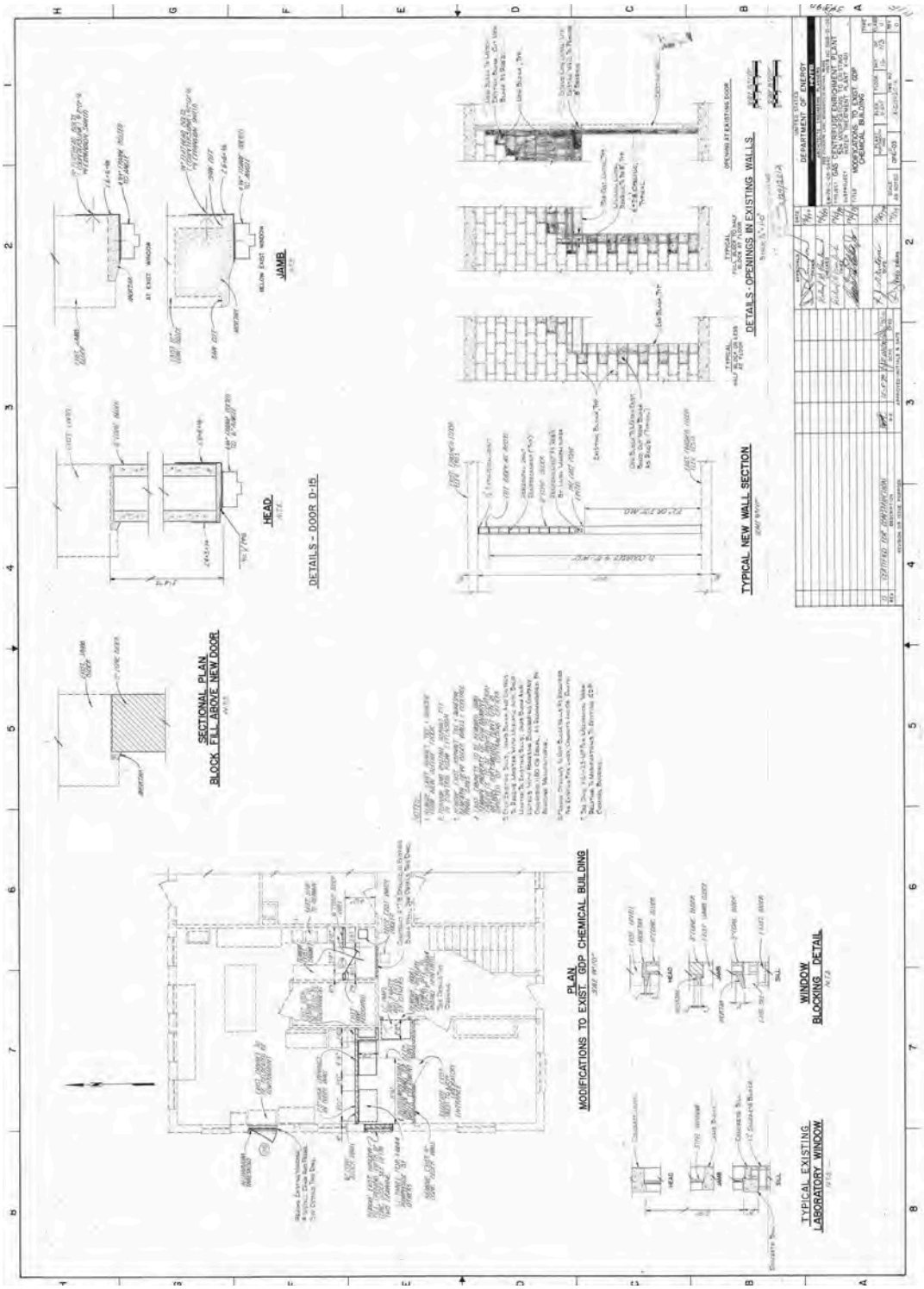

Figure 14: Modifications to Chemical Building

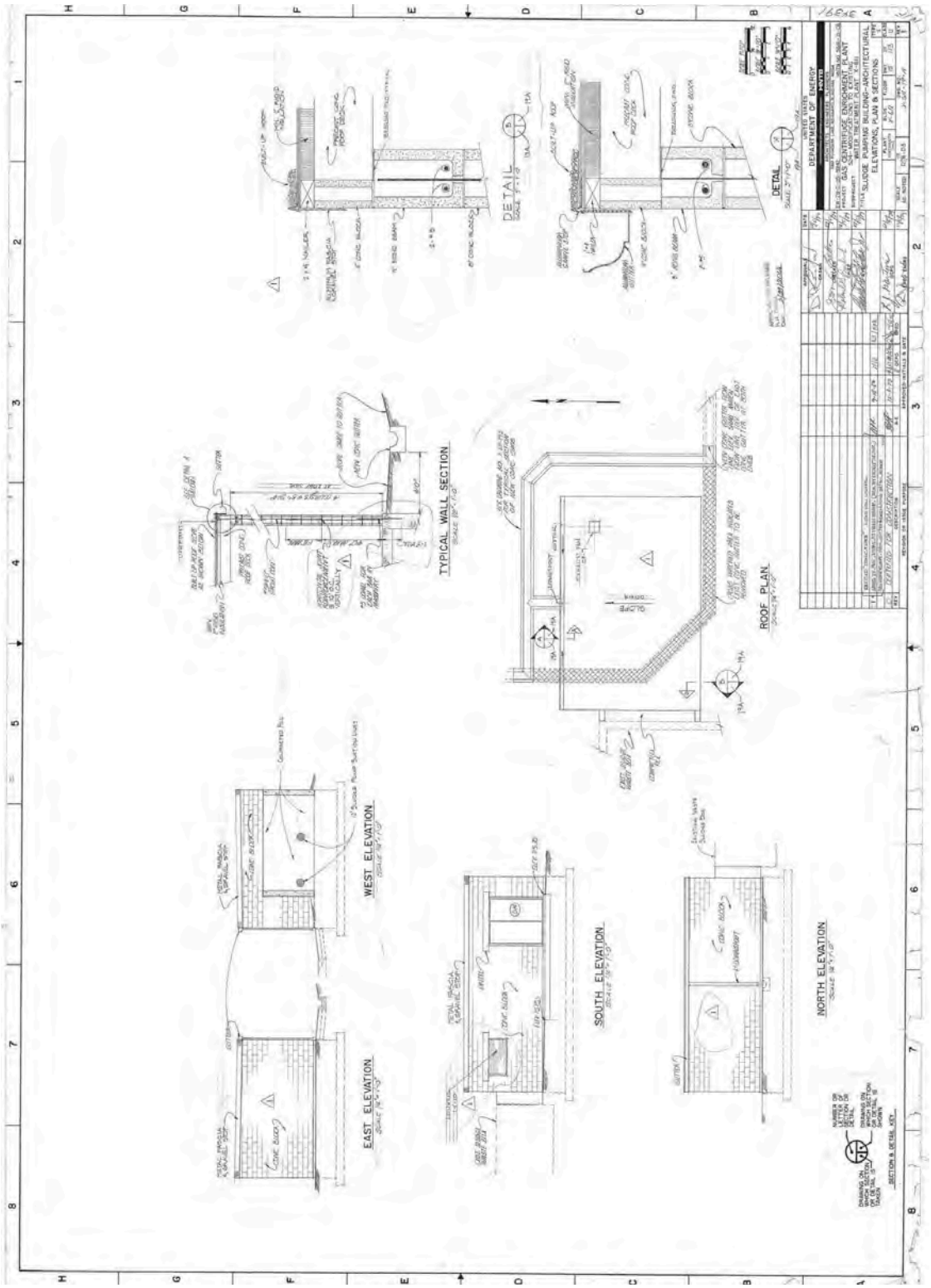

Figure 15: Sludge Building Elevations and Plan

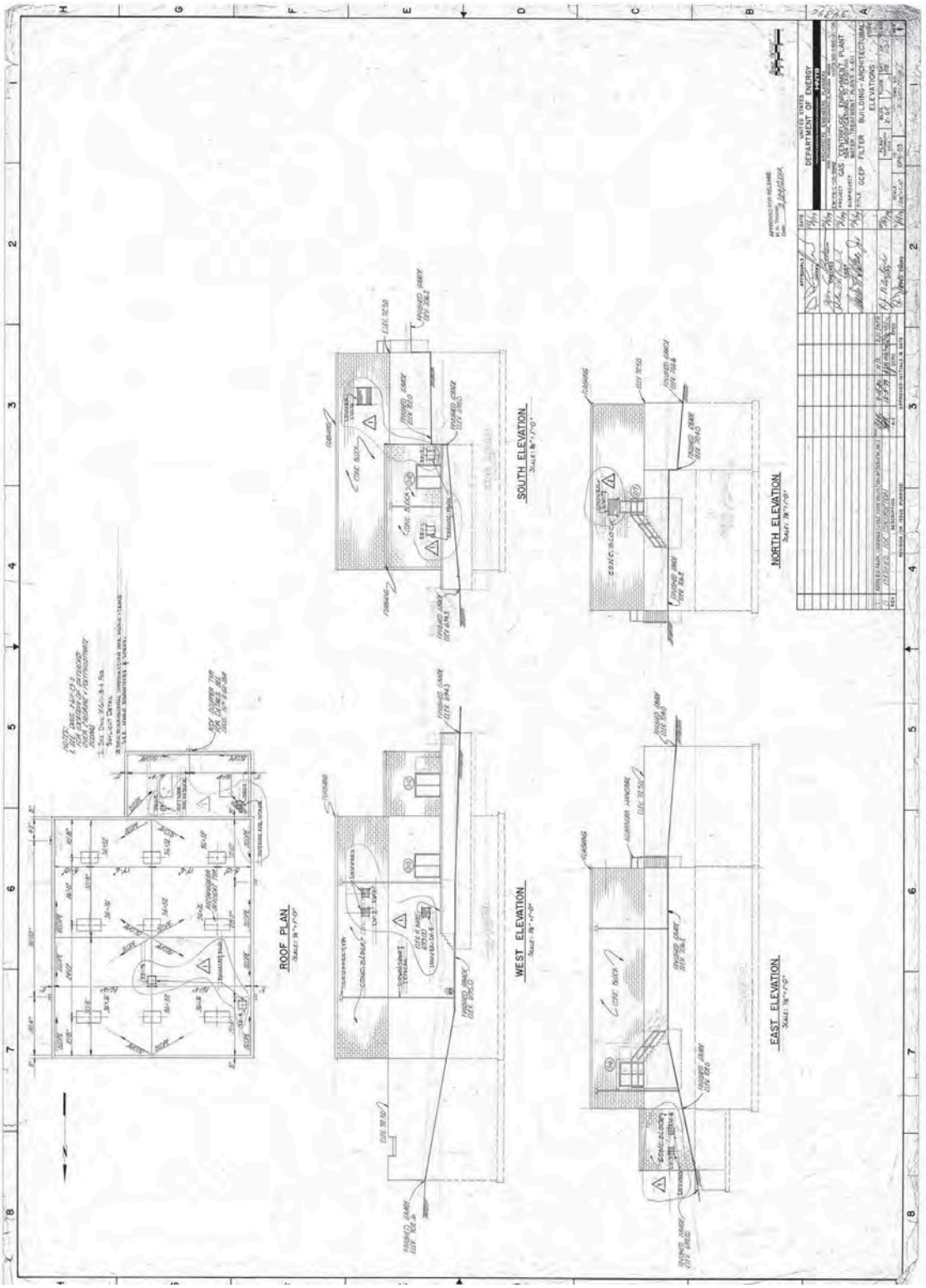

Figure 16: Filter Building Elevations

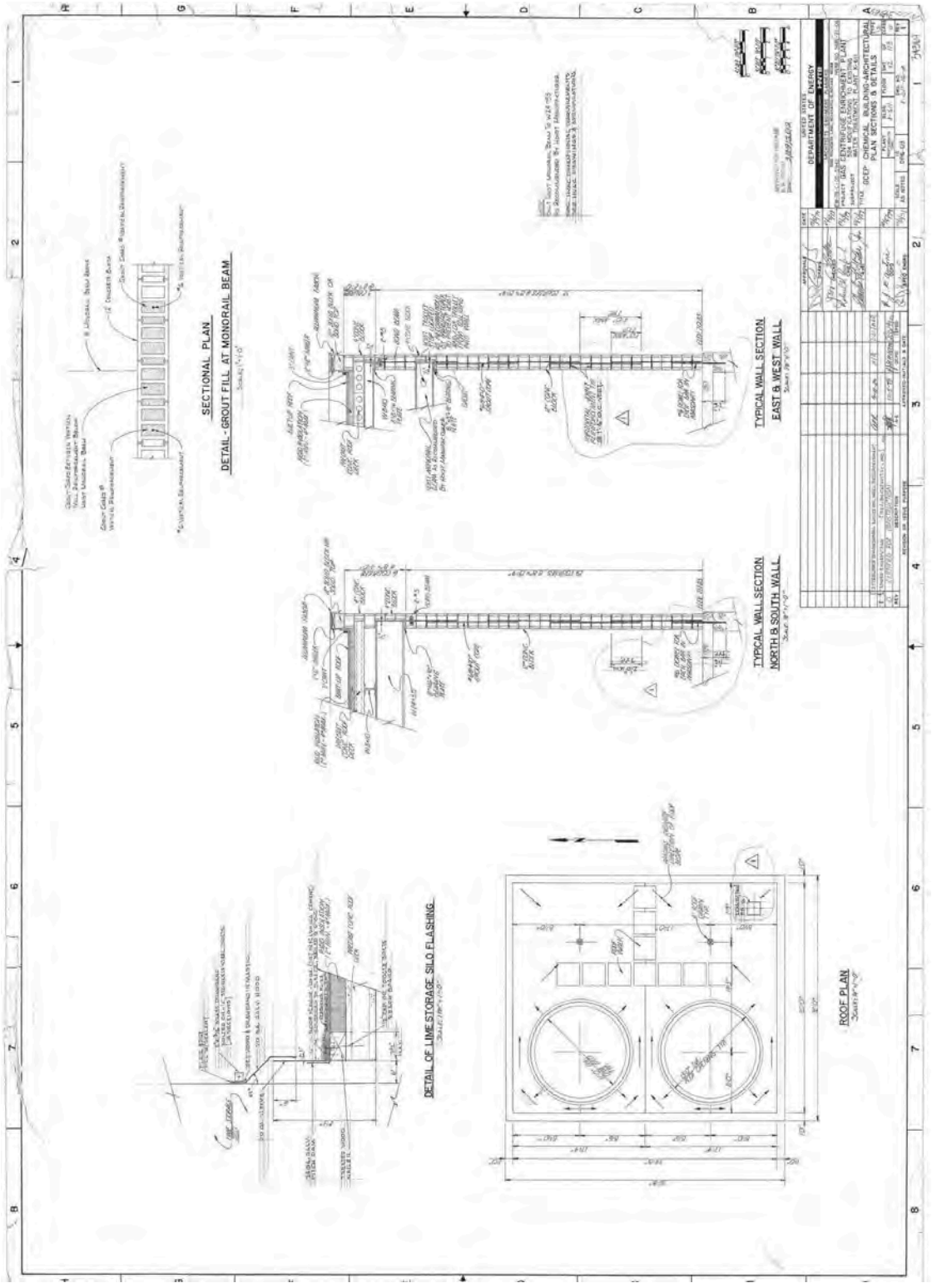

Figure 17: Chemical Building Plan and Details

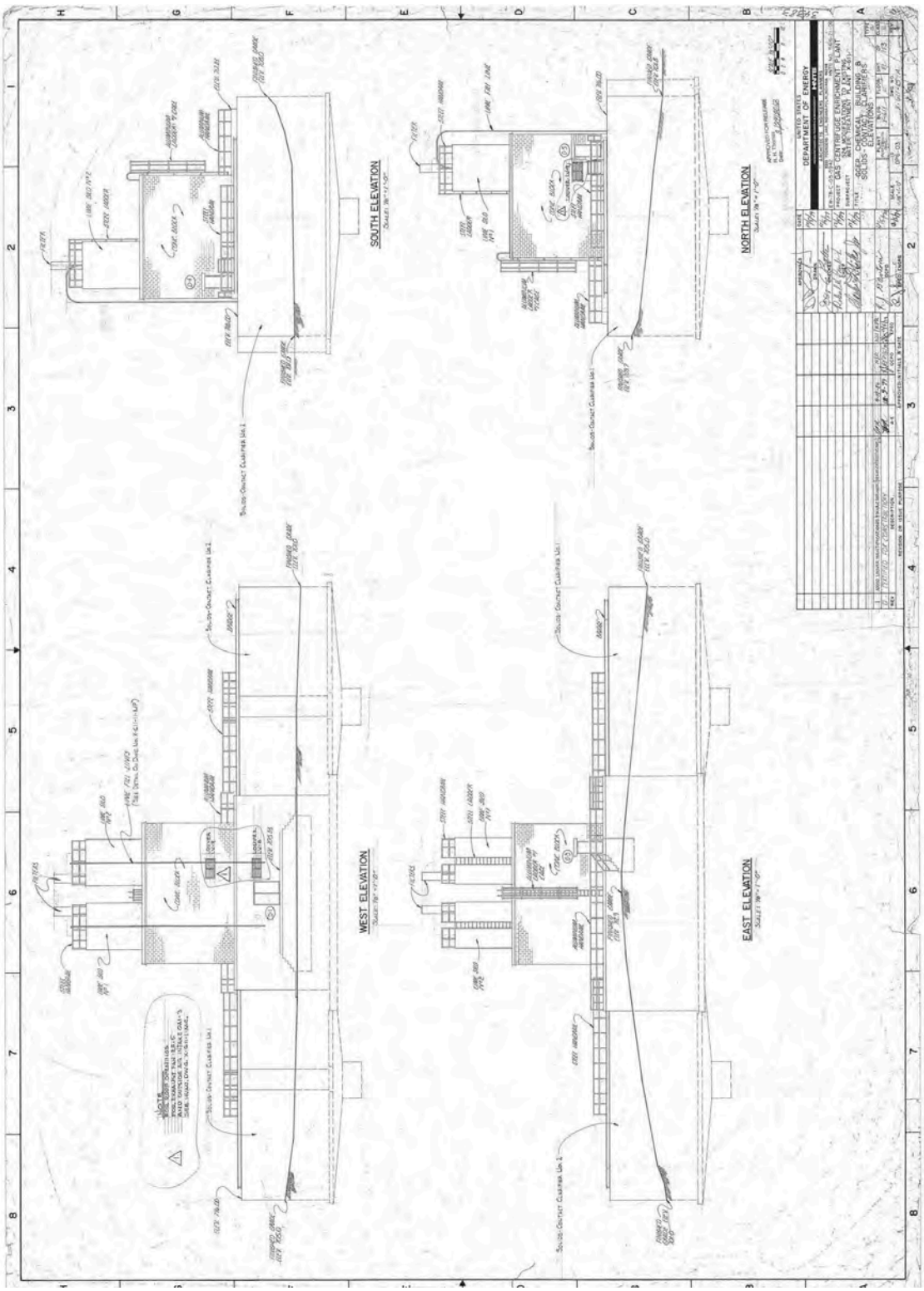

Figure 18: Chemical Building Elevations

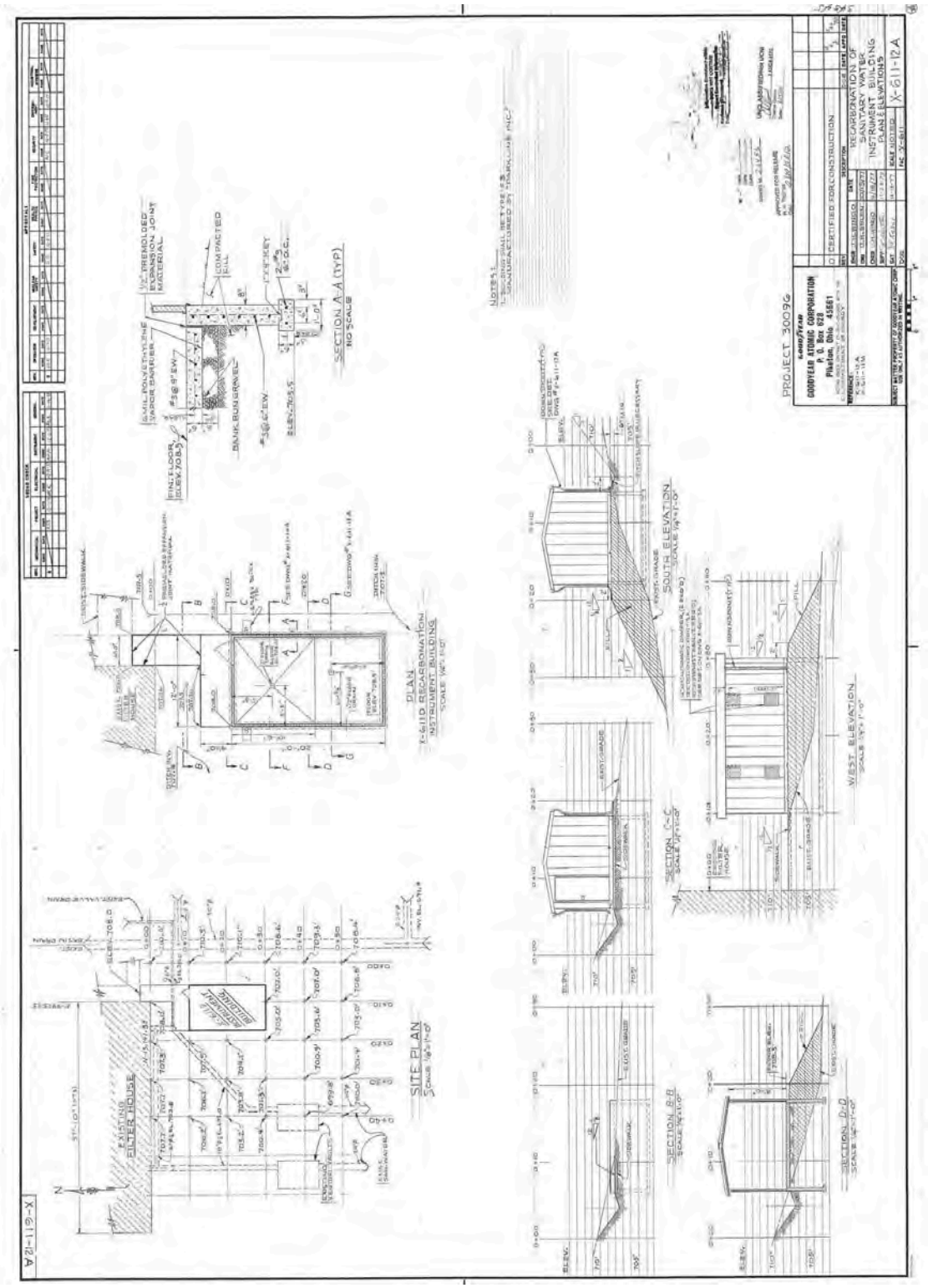

Figure 19: Sanitary Water Instrument Building Plan and Elevations

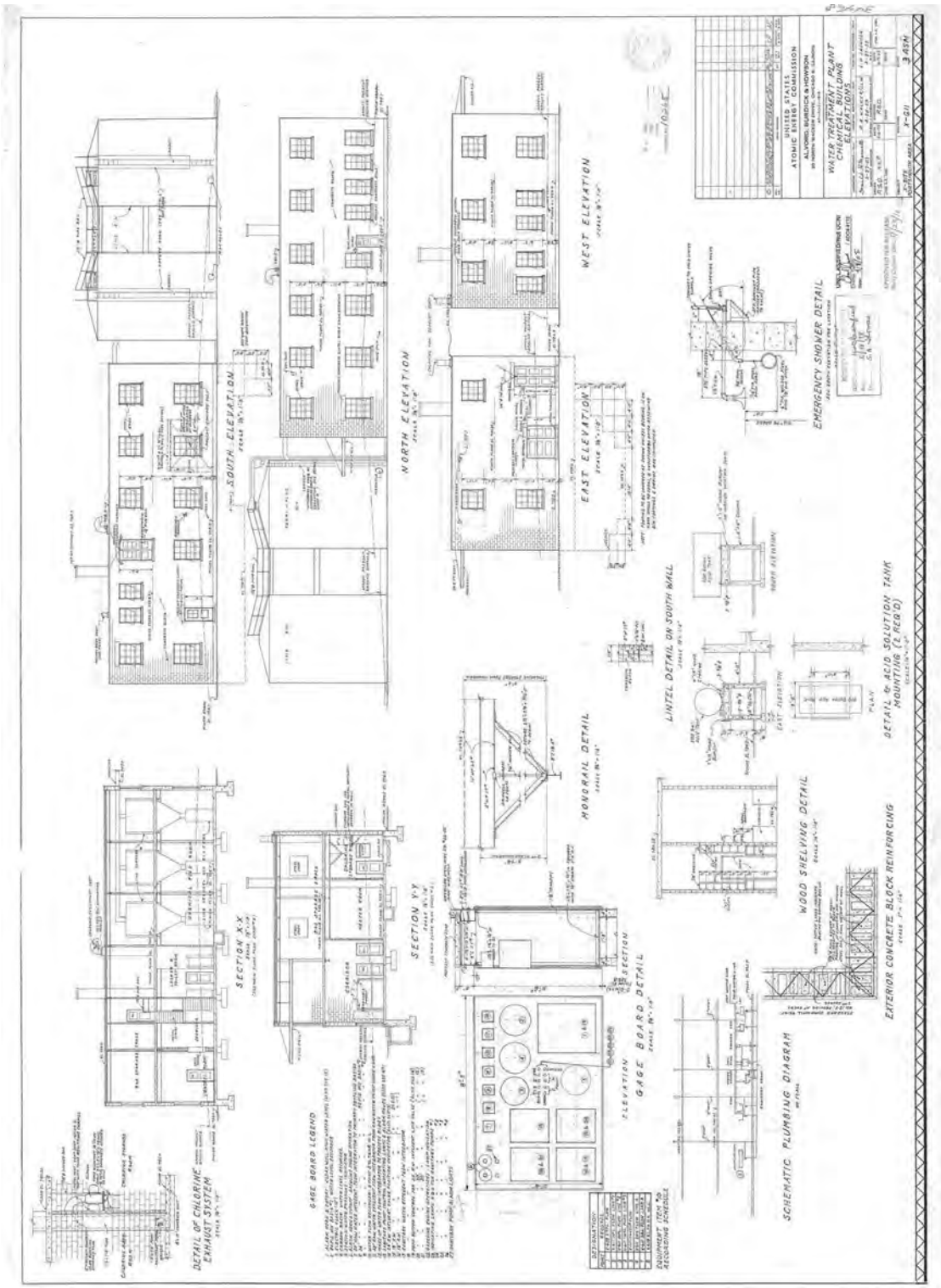

Figure 20: Chemical Building Elevations

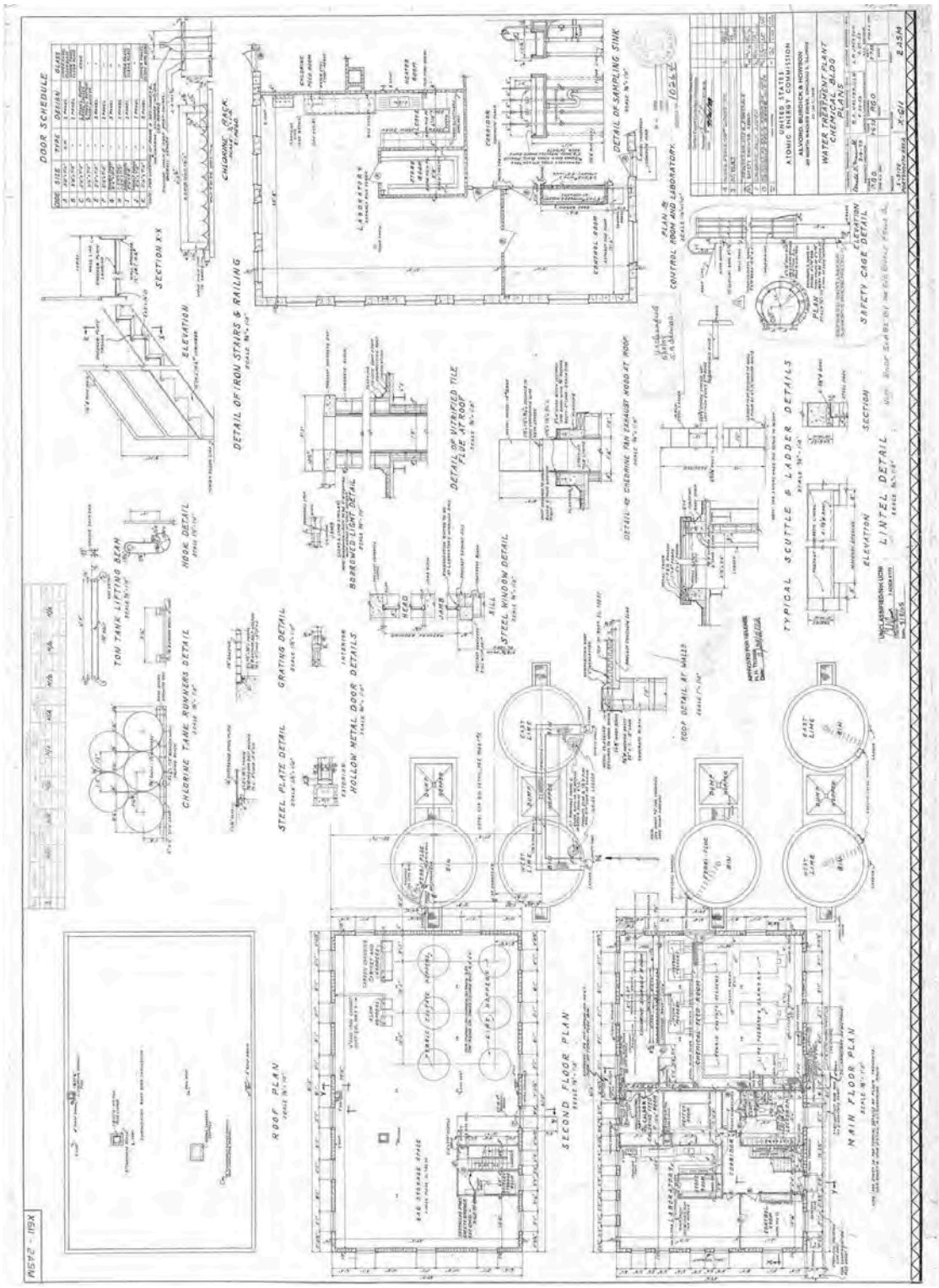

Figure 21: Chemical Building Plans

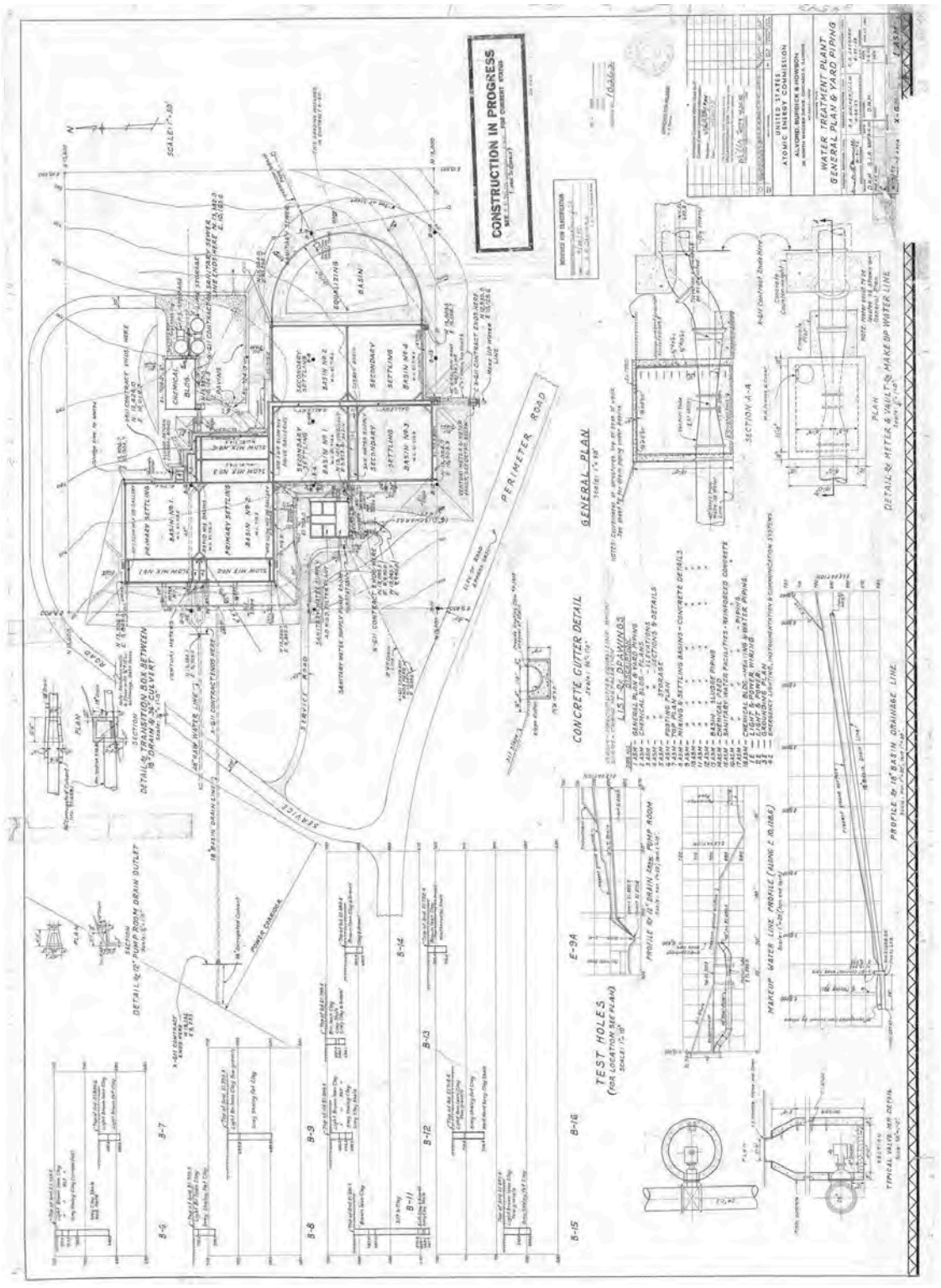

Figure 22: Water Treatment Plant General Plan and Yard Piping