

Watervliet Arsenal  
Broadway Shops  
(Building 40; Benet Research and Engineering Laboratories)  
West of Broadway between Dalliba Avenue and Westervelt Avenue  
Watervliet  
Albany County  
New York

HAER No. NY-1C

HAER  
NY,  
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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record  
National Park Service  
Department of the Interior  
Washington, D.C. 20013-7127

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HISTORIC AMERICAN ENGINEERING RECORD

WATERVLIET ARSENAL

BROADWAY SHOPS

(Building 40, Benet Research and Engineering Laboratories)

HAER No. NY-1C

Location: West of Broadway between Dalliba Avenue and Westervelt Avenue, Watervliet Arsenal, Watervliet, Albany County, New York.  
UTM: 18.606179.4730220  
Quad: Troy South

Date of Construction: Unit 1: 1865  
Unit 2: 1865  
Unit 3: 1847 and 1863  
Unit 4: c. 1840  
Unit 5: 1865 and 1942  
Unit 6: 1941

Present Owner and Occupant: U.S. Army

Present Use: Laboratories, offices, family housing, dispensary, post exchange, recreation facilities

Significance: As Watervliet's center of manufacture between about 1840 and 1886, the building served an important role in the arsenal's history. The different components, built over a period of 100 years, reflect the growth in activity at the arsenal. The building's siting and the design of the more prominent sections also make it visually distinctive.

Historian: Barbara E. Hightower, February 1985

PART I. HISTORICAL INFORMATION

A. Physical History:

1. Date of erection: Of the building's six sections, Unit 4 appears to have been the first built. A shop was erected on the same site in 1828 (Stephenson, p. 25). According to a May 17, 1840 letter from the arsenal's commander, Major Rufus L. Baker, the shop was destroyed by fire on May 5th (Kyle, pp. 93-94). A new shop was obviously constructed shortly afterwards. The newer shop building appears on the 1845 map of the arsenal (HAER Photo No. NY-1A-79).

An 1847 report (Message from the President, p. 694) indicates that a new finishing shop was under construction in that year. No location or description of the shop was given in the report, but it appears to have been the east end of Unit 3, which is labeled as the old finishing shop on an 1866 drawing of Units 1, 2, and 5 (HAER Photo No. NY-1C-10). The west end of Unit 3 is labeled extension of '63 on the drawing, the same date that the finishing shop was extended on the west by approximately 182'. Units 1, 2, and 5 were erected in 1865, and Unit 5 was enlarged on the west in 1942. Unit 6 was constructed in 1941.

2. Architect: Not known. The units were probably designed by Ordnance Department personnel.
3. Original and subsequent owners: U.S. Army
4. Builder, contractor, suppliers: Not known.
5. Original plans and construction:

Units 1 and 2: The Watervliet Arsenal Museum has four photographs taken in 1865 during the construction of Units 1 and 2 (HAER Photo No. NY-1C-11 through HAER Photo No. NY-1C-14) and a drawing of the north, east, and south elevations and first floor plan of the entire building (HAER Photo No. NY-1C-10). The photographs and drawing illustrate a two-story, L-shaped structure whose facades were articulated by brick pilasters, symmetrically-spaced windows and pedimented gabled pavilions on the east. The porch on the north elevation does not appear on later photographs and may not have been built. On the interior, the first floor of Unit 2 was open; Unit 1 was open with the exception of two smaller rooms at the west end.

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Unit 3: The 1866 drawing shows a two-story, gable-roofed structure bisected on the first floor by a passageway running north-south through the building. On the south elevation, chimneys rose above the pilasters on the west extension, and were symmetrically placed along the original shop. A polygonal, two-story bay extended from the south side of the original shop. The plan was largely open with smaller rooms on the west ends of both the original structure and the extension.

Unit 4: The 1845 map of the arsenal (HAER Photo No. NY-1A-79) is the earliest known representation of Unit 4. The map illustrates a rectangular, gable-roofed structure with an intersecting gabled extension on the south. Four small extensions projected from the north side. On the east, the shop was set perpendicularly to a second rectangular, gable-roofed structure that served as a carriage shop.

Unit 5: An undated photograph (HAER Photo No. NY-1C-15) showing the south and west elevations is the earliest illustration of the exterior of Unit 5 that was found. It shows a one-story, gable-roofed structure with its elevations articulated by brick pilasters. Two sets of double arched doors were set below a pedimented gable end containing a round window of the west elevation. The 1866 drawing indicates that the interior was originally divided into three interconnecting rooms. Much of the west elevation was obscured by the 1942 addition. Plans for the addition are on file in the arsenal's Engineering Division.

Unit 6: A set of drawings dated 1941 for this one-story, gable-roofed structure with large expanses of industrial steel sash is in the Engineering Division.

6. Alterations and additions:

Units 1 and 2: Exterior alterations have been largely limited to modification of window and door openings, most of which were done at undetermined dates. On the north side of Unit 1, door openings replaced windows to provide access to the family quarters placed in the unit in 1960, two of the original door openings were replaced with windows. The new doorways contained paneled glazed personnel doors framed by fluted pilasters and a broken triangular pediment (HAER Photo No. NY-1C-7). Gabled bracketed hoods are above each door. Plans illustrating these changes are on file in the Engineering Division. On the south side of Unit 1, numerous first and second story window openings have been bricked in or replaced either by modern personnel doors or smaller windows and plywood infill. Metal shed-roofed porches

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have been added to the entrances in the end pavilions on the east elevation of Unit 2, and a glass enclosed entry was erected for the Benet Research and Engineering Laboratories on the central pavilion. On the south side, a door with a gabled hood replaced a window opening and a second story opening was bricked in. The open plan of the interior has been divided into offices and family housing since World War II.

Unit 3: The original section of Unit 3 (east end) was extended on the west in 1863 with an addition approximately 182' long. The addition, a two-story, gable-roofed structure, is shown on the 1866 drawing of the building (HAER Photo No. NY-1C-10). The polygonal bay and chimneys along the south elevation were removed at an undetermined date. The open passage on the first floor between the original section, and the addition was enclosed and a gabled hood placed above the door partially obscuring the segmentally-arched opening. A window opening on the second story at the west end of the south elevation has been replaced with a door and wood stairs with a shed-roof covering erected to provide access to the door. The open plan on the interior has been divided into offices since World War II.

Unit 4: The small extensions along the north side shown on the 1845 map (HAER Photo No. NY-1A-79) were removed by 1863 (see HAER Photo No. NY-1A-80). The extension on the north side opposite the south gabled extension was either enlarged or removed and replaced by a gabled addition by 1863. The north extension was enlarged in 1941 with the addition of a one-story, flat-roofed brick structure on the west (plans in the Engineering Division). The open plan on the interior was converted to a double-loaded hall at some time after World War II.

Unit 5: The brick stack, gabled monitors, and small shed-roofed offset on the south side shown on the undated photograph (HAER Photo No. NY-1C-15) were removed at an undetermined date. In 1942 the unit was extended with an addition on the west. The addition is a one-story, gable-roofed structure with concrete walls and large expanses of industrial steel sash. Plans for the addition are in the Engineering Division.

Unit 6: Unit 6 has remained largely unaltered on the exterior since its construction in 1941.

B. Historical Context:

In the early 1820s, the State of New York laid the Erie Canal across the Watervliet grounds. By the end of the decade, the site of the Broadway Shops, adjacent to the Canal on the east, became a center

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for arsenal manufacture. A smith shop and foundry were erected on the site of Unit 4 in 1828, and a sawmill was built to the southeast in the same year (Stephenson, p. 25). West of the sawmill on the location of Unit 3 was a basin for storage of canal boats (Ibid, pp. 36-37).

The proximity to the canal was an important factor in determining the location of the shops. Initially, it provided a route of transportation, in addition to the Hudson River, for materials and finished goods. Beginning about 1833, the shops also derived power from the canal. A resolution of the Board of Canal Commissioners, passed on April 16, 1833, allowed the arsenal to use "as much water as can be drawn over a waste weir, which shall not be less than 3-1/2 ft. above the bottom of the canal and 6 ft. long, so far as the water therefrom may be taken without injury to the navigation and transportation on said canal..." (Stephenson, pp. 29-30). In less than a decade, the arsenal found it necessary to supplement power from the canal; during the winter of 1839-1840, the waterway was closed and drained leaving the shops without power. A steam engine was procured and used in later years when the canal was closed for repairs (see A History of Watervliet Arsenal, pp. 18, 20, 24, 35, 57).

Construction of the current shops buildings began about 1840 when the smith shop and foundry burned. Unit 4 was constructed on the site shortly afterwards. By 1843, a carriage shop was built on the east side of the reconstructed shop. The carriage shop appears on the 1845 map of the arsenal (HAER Photo No. NY-1A-79) as a rectangular gable-roofed structure with two intersecting gables on the east.

In an 1843 letter to the Chief of Ordnance, the arsenal's commander, Major Rufus L. Baker, briefly described work in the shops.

The work now in hand consists of the iron and brass work for fifty 32 pdr. casemate carriages and chassis, ordered April 17, 1841 - and of twelve 6 pdr. carriages besides all the repairs upon all the old carriages and equipments that are worth repairing...

Our present number of workmen in the shops is about forty only, including master workmen and armorers, and this seems to be about as small a number as can possibly be employed to any advantage considering the capacity of our shops and the extent of the machinery (Kyle, p. 107).

The Mexican War of 1845-1848 quickened the pace at Watervliet. Employment nearly doubled, and the manufacture of gun carriages and infantry accoutrements increased. In the decade before the Civil War, the shops were occupied with the manufacture of new types of gun

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carriages. Construction of the "prairie carriage," developed by the Baker, began by 1850. Lighter than earlier models and painted a cream color to reflect the sun, the carriage was designed for use on the plains and deserts of the western United States (A History of Watervliet Arsenal, p. 31). Another improvement in gun carriage production was implemented in the late 1850s, when the arsenal started producing seacoast gun carriages of wrought iron instead of timber.

By the 1860s, the shops and their complement of machinery were considered inadequate. No new facilities had been added since 1847 when the finishing shop (the east end of Unit 3) was built to accommodate an increased workload during the Mexican War. The pressing demands for increased production during the Civil War led the arsenal's commander, Lt. Colonel W. A. Thornton, to complain in 1863:

During the past two years, the demand for Field and Fortress carriages have been very pressing, and if we had had more shop room and machinery, we could have furnished double the work we have accomplished, with but little more trouble in its production besides the saving of contractor's profits.

If the future demands on this Arsenal are to be coextensive with the past, then action should be taken to enlarge our working means, by the addition of shops and machinery, the nature of the work to be accomplished to control these additions. (Kyle, p. 226)

Enlargement of the shops began by the end of the year. Both the finishing and carriage shops were extended. Two years later, the carriage shop was demolished and replaced by a large L-shaped structure consisting of a storehouse (Unit 1) and a new carriage shop (Unit 2) (HAER Photo No. NY-1C-10 and HAER Photo No. NY-1C-11 through HAER Photo No. NY-1C-14). A boiler house (Unit 5) was added at the same time. Enlargement of the building allowed expansion of the types of wares produced there. An 1875 map of the arsenal lists smith, finishing, carriagemakers, carpenters, paint, foundry, armorer's, saddler's, and polishing and brazing shops in the building (Report of the Secretary of War, 1875).

By this time, the arsenal had access to a third transportation facility, the Delaware and Hudson Canal Company Railroad, located west of the installation's boundary. Access to the rail line was improved after establishment of the Army's gun factory at Watervliet in 1887, at which time tracks connecting the rail line with the Hudson River were laid adjacent to the shops on the south.

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In 1889 the carpenter shop, located on the ground floor of Unit 3, became a finishing shop for projectiles manufactured in the foundry in the adjacent cast-iron storehouse (HAER No. NY-1, Building 38) (Report of the Secretary of War, 1889, p. 345). The new shop initially contained "four light lathes borrowed from the gun factory and a set of light rolls to shape the strips for hammering into the grooves on the projectiles" (Report of the Secretary of War, 1890, p. 139). Work in the shop was shortlived; the foundry was transferred to Watertown Arsenal in 1894.

By the early 1890s, the water-power plant, which had a capacity of 35-horse power, was inadequate to meet the needs of the shops. In his 1893 report to the Ordnance Department, the arsenal's commander complained that:

The present condition of the water-power plant at this post is very deplorable and has been for years. The plant was established many years ago and on a plan inconsistent with modern intelligence and progress. Turbines have been located in the different shops from time to time. They are all badly worn and have been repeatedly repaired in recent years. The present arrangement of turbines does not allow of the utilization of more than one-third of the available water power. Appropriations have been asked for yearly, but were granted only at the last session of Congress. The sums appropriated do not equal the estimate of the cost, as has been previously reported to you, and an additional sum will be needed to secure satisfactory results. The plan approved by you during your last visit, is to remove the old and locate four new turbines, each of 30-horse power capacity, on the site of the present two water-wheels in the machine shop. The electric station will be on the first floor above it. The new arrangement will no doubt furnish great conveniences and reduce expenses. (Annual Report of the Secretary of War, 1893, p. 310)

The new plant, located in the machine shop, was finished in the autumn of 1895. It was capable of operating both by water power from the Erie Canal and by electricity transmitted from the Seacoast Gun Shop (Building 110, HAER No. NY-1B). Drainage of the canal and spring freshets, which flooded the basement floor where the turbines were located, necessitated use of power from the gun shop. On those occasions, the Broadway Shops' two Siemens and Halske shunt-wound dynamos each with a 48 kilowatt capacity were run as motors (Annual Report of the War Department, 1899, p. 221).

Through the 1890s, the Broadway Shops continued to produce a variety of goods. These included field caissons, battery wagons with forges and limbers and their tools and equipment, various size gun

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carriages, artillery harness, curry combs, horse brushes, waist and saber belts, canteens, haversacks, meat cans, cartridges, implements for guns, tool chests, patterns for machining and heavy castings for the gun shops, as well as the preparation and issue of paint, the repair of wooden gun carriages, and banding, painting, and boxing seacoast projectiles (Report of the Secretary of War, 1890, p. 141; Report of the Secretary of War, 1891, pp. 123-124; Report of the Secretary of War, 1894, pp. 157-158; Report of the Secretary of War, 1896, p. 136). Workers in the shops were also "occupied in work connected with building the gun factory and with gun construction, projectile making, and repairs and alterations to buildings and fences (Report of the Secretary of War, 1890, p. 141). Carriage and harness work was transferred to Rock Island Arsenal in the late 1890s. As a result, the shops concentrated on the production of armament chests to contain tools and implements for seacoast guns, implement chests for gun carriage tools, chests and sets of tools for portable forges, anvil blocks and anvil-block chests for field use, spare parts for seacoast and rapid-fire guns, telescopic sights for Scott guns, and capping seacoast shot and shell by the turn of the century (Report of the Secretary of War, 1900, pp. 93-95; Report of the Secretary of War, 1901, pp. 137-142). Production continued in the building through World War I.

In the years before World War II, the shops were placed on standby, and the building deteriorated because of a lack of maintenance funds (A History of Watervliet Arsenal, pp. 115-116). In 1941 the building was remodeled for the manufacture of 37 mm guns for use on tanks, antitank vehicles, and airplanes, and the west end of Unit 5 was added in 1942 as a heat treat department (Ibid, pp. 123, 126). Production equipment was removed from the building in 1946, and it was converted to offices for the Veteran's Administration, which remained until 1961 (Ibid, p. 143). As part of the arsenal's move to centralize research and engineering facilities, the building was rehabilitated to house design engineering groups and allied units, and the following year it was designated the Benet Research and Engineering Laboratories (Ibid, pp. 190, 194). Currently, the Benet offices, family housing, recreation facilities, a small foundry, post exchange, dispensary, and other arsenal offices are contained in the building. (For further documentation see HAER No. NY-1A.)

## PART II. ARCHITECTURAL INFORMATION

### A. General Statement:

1. Architectural character: The building consists of a composite of six units, which were built over a period of 100 years and which exhibit different scale and detailing. Units 1 and 2, the most

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architecturally distinctive of the six units, and the original section of Unit 5 are classically detailed. Remaining units are more utilitarian in appearance.

2. Condition of fabric: The building is generally in good condition and is well maintained.

B. Description of Exterior:

1. Over-all dimensions: Unit 1 measures 318' 4" (north) x 54' with a pavilion 54' wide on the east end. Unit 2 is 411' (east) x 65'; a pavilion at the south end of the east elevation is 54' wide by 10' 8" deep and the central pavilion is 54' wide by 21' 7" deep. Unit 3 measures 283' (south) x 51' 10". Unit 4 is 281' long x 46' 6" with a 38' 2" x 25' wing on the south and a 65' 5" x 17' 5" wing on the north. Unit 5 is approximately 266' x 50'. Unit 6 measures 253' 8 1/2" x 50' with a 39' x 24' wing on the north. Together Units 1, 2, and 3 form a U-shaped configuration. Units 4, 5, and 6 are placed perpendicularly to Unit 2 along its west elevation. Units 1, 2, and 3 are two stories with attic; remaining units are one story.
2. Foundations: Units 1, 2, and the east end of Unit 5 have coursed and random coursed ashlar foundations with a dressed ashlar water table. Foundations on Units 3 and 4 are random coursed ashlar. The west end of Unit 5 and Unit 6 have concrete foundations.
3. Walls: Walls of Units 1, 2, 3, 4, 6, and the east end of Unit 5 are red brick laid in 5/1 common bond. The west end of Unit 5 has concrete walls. Brick pilasters with brick and stone capitals rise from the water table to a brick entablature on Units 1, 2, and 5. The walls of the 1863 extension to Unit 3 are also articulated by brick pilasters, and a stone belt course encircles the unit above the first story windows. A sandstone belt course also encircles Unit 4. Brick pilasters rise to corbelled brick courses above openings on Unit 6.
4. Structural system, framing:

Units 1 and 2: Walls are load bearing brick. Two rows of cast-iron fluted Corinthian columns supporting 12" iron girders run the length of both units (see HAER Photo No. NY-1C-12 and HAER Photo No. NY-1C-14). Metal I-beams set approximately 4' on center are bolted to the girders, and brick arches span the area between the beams. In the attic, two rows of attenuated iron columns with flared bases support iron rafters. The rafters are

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set on metal shoes along the top edge of the brick walls. The larger members are tied together by thin iron rods (HAER Photo No. NY-1C-9).

Unit 3: Two rows of 8" cast-iron columns alternating with 8" x 8" wood columns run the length of the building on the first floor. The columns support 11 1/2" x 11 1/2" wood beams into which the floor joists are notched at 16" centers. The roof is supported by heavy timber trusses (HAER Photo No. NY-1C-8).

Unit 4 and 5: Load bearing brick walls on Unit 4 and the east end of Unit 5. The west end of Unit 5 has a structural steel frame.

Unit 6: Structural steel frame. The roof is supported by metal trusses.

5. Porches, stoops: A one-story, flat-roofed, enclosed glass entrance porch is situated at the central pavilion on the east elevation of Unit 2. The building's brick wall is covered with small tiles. Either shed- or gabled-roofed canopies or metal or frame windbreaks shelter a number of the building's other entrances.
6. Chimneys: Numerous metal ventilators rise from the roofs.
7. Openings:
  - a. Doorways and doors: Typical doors throughout are wood, glass or metal personnel or metal overhead doors. On Unit 1, doors on the south side and the west entrance on the north side are set under round brick arches and large fanlights (HAER Photo No. NY-1C-6).
  - b. Windows:

Units 1 and 2: Typical windows are twelve-over-twelve-light, double-hung wood sash with flat stone lintels and stone lug sills. Numerous windows on the east and north elevations have recently been replaced. Gable ends on Units 1 and 2 contain half-round windows with brick triple-header course surrounds and stone lug sills. Round windows with brick triple-header course surrounds are evenly spaced across the second story on the west elevation of Unit 2.

Unit 3: Typical windows are eight-over-eight-light, double-hung wood sash with brick segmental-arch lintels and stone

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lug sills. The half-round opening in the west gable end is covered on the interior with plywood.

Unit 4: Windows are either eight-over-eight-light or one-over-one-light, double-hung wood sash set in round-arched recesses. The windows have concrete or stone lug sills.

Unit 5: Typical windows in the original section are twelve-over-twelve-light, double-hung wood sash with flat stone lintels and stone lug sills. The round window in the west gable end has been infilled with brick. Large expanses of industrial steel sash line the sides of the 1942 addition.

Unit 6: Windows are industrial steel sash set below corbelled brick courses.

8. Roof:

- a. Shape, covering: With the exception of extensions on the north sides of Units 4 and 6, all units have metal or asphalt shingled (west end of Unit 5) gable roofs. The extensions have flat built-up roofs.
- b. Cornice, eaves: Units 1, 2, and 5 have boxed eaves above corbelled raking and horizontal brick cornices. Remaining units have boxed eaves.

C. Description of Interior:

1. Floor plans:

Unit 1: On the first floor, the east end contains a stairway on the east wall, a narrow hall running east-west with offices opening off the north side, and an elevator and locker room on the south side of the hall. The second floor contains offices and an elevator. A U-shaped hallway provides access to two family quarters at the center of the unit. Stairs at the east end of the hall provide access to two additional quarters, which open off an L-shaped hall on the second floor. A vault and storage rooms are along the south wall opposite the quarters. The west end of both floors contain offices and stairs. The attic consists of a single open space running the length of the unit. The stairway from the second floor enters the attic at the west end. (See supplemental material, floor plan)

Unit 2: Both the first and second floors contain a double-loaded central hallway with offices along the east and west sides. The

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main stairway for the unit is in the northeast corner of the central pavilion. The attic consists of an open room entered from Unit 1 on the north and intersected by the central pavilion on the east and a separate room at the south end. (See supplemental material, floor plan)

Unit 3: Offices open off the sides of a double-loaded hallway which runs approximately two-thirds the length of the unit on both floors. The west ends of both floors contain a large room with smaller office spaces. Stairways are located near the center of the unit. The attic contains two rooms, the largest of which is on the west. (See supplemental material, floor plan)

Unit 4: A central double-loaded hall provides access to offices and hospital facilities. The post exchange is in the south extension, and the north extension contains restrooms reached by an L-shaped hallway off the central hall. (See supplemental material, floor plan)

Unit 5: The original section has two interconnecting rooms on the east. The third room of the original plan has been divided into three smaller rooms. The 1942 addition, largely used as a foundry, has two larger production rooms containing furnaces and autoclaves on the east and west ends separated by two smaller rooms. An office occupies the northwest corner of the unit. (See supplemental material, floor plan)

Unit 6: The unit contains three rooms, one of which occupies the west half and houses an exercise facility. Smaller rooms are partitioned off along the south side. The north extension has two rooms and a narrow hall on the south. (See supplemental material, floor plan)

2. Stairways: The straight-run stairs on the east wall of Unit 1 have a wood newel, thin wood balusters, and plain wood rail. Attic stairs have plain wood rails and wood treads and risers. Remaining stairways are modern metal and concrete stairs with plain wood rails.
3. Flooring: Floors in Units 1, 2, 3, 4, and 6 are linoleum. The attics in Units 1, 2, and 3 have board flooring. The floor in the west room of Unit 5 is end grain wood blocks; remaining floors in the unit are concrete.
4. Wall and ceiling finish: Exterior and interior load bearing walls are brick. Office partition walls are dry wall, wood paneling, or removable metal and glass. Typical ceilings are acoustical tile.

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5. Openings:

- a. Doorways and doors: Typical doors are modern wood, metal, or glass personnel. Doors between sections of the attics in Units 1, 2, and 3 are heavy sliding metal fire doors.
- b. Windows: Windows in Units 1, 2, 3, 4, and the original section of Unit 5 are set in plain wood frames. Windows in the 1942 addition to Unit 5 and Unit 6 are set in metal frames.

6. Decorative features and trim: Cast-iron fluted Corinthian columns in the west end of Unit 1 and in Unit 2 are partially visible. Columns in the storage area adjacent to the family quarters on the first floor of Unit 1 are fully visible.

7. Mechanical equipment:

- a. Heating, air conditioning: The building is centrally heated and air conditioned.
- b. Lighting: Lighting is provided by incandescent or fluorescent ceiling fixtures.
- c. Plumbing: Plumbing fixtures are modern.

D. Site:

Located adjacent to the arsenal's main entrance, the building faces east onto the boundary fence, Broadway, Interstate 787, and the Hudson River. Dalliba Avenue and an open green space lie north of the building, and Westervelt Avenue, a paved parking lot, and the cast-iron storehouse (Building 38, HAER No. NY-1) are to the south. On the west are Gibson Street, another paved parking lot, and the arsenal's Officers' Club (Building 41, HAER No. NY-1G).

PART III. SOURCES OF INFORMATION

A. Architectural Drawings:

Plan and south (Unit 3), east (Unit 2), and north (Unit 1) elevations drawn in 1866 shortly after construction of Units 1, 2, and 5. Watervliet Arsenal Museum. (HAER Photo No. NY-1C-10)

Section of carpenter shop and storehouse, showing north wall of carpenter shop (Unit 2) on the left and the south wall of the

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storehouse (Unit 1) on the right. Dated September 22, 1898.  
Watervliet Arsenal Engineering Division. (HAER Photo No. NY-1C-18)

Plan of cellar under present wood shop. Undated. Watervliet Arsenal  
Engineering Division. (HAER Photo No. NY-1C-17)

Transverse section of storehouse (Unit 1) showing cast-iron columns  
on the first and second floors. Undated. Watervliet Arsenal  
Engineering Division. (HAER Photo No. NY-1C-16)

Steam heating plant for the shops below the canal, first and second  
floor plans. Undated. Watervliet Arsenal Engineering Division.  
(HAER Photo No. NY-1C-19 and HAER Photo No. NY-1C-20)

Plans for construction of Unit 6. 1941. 6 sheets, includes  
elevations, foundation, truss details, and structural steel.  
Watervliet Arsenal Engineering Division.

Addition to Building 40-Unit 5. 1942. 6 sheets, includes plans,  
elevations, sections, and roof truss. Watervliet Arsenal Engineering  
Division.

Conversion of Unit 1 to family quarters. 1960. 14 sheets, includes  
plan, cross section, plumbing, electrical, and kitchen and bathroom  
details. Watervliet Arsenal Engineering Division.

B. Early Views:

Construction photograph showing cast-iron columns in what is probably  
the second floor of Unit 1. Taken in 1865. Watervliet Arsenal  
Museum. (HAER Photo No. NY-1C-13)

Construction photograph showing cast-iron columns and beams in what  
is probably the second floor of Unit 2. Taken in 1865. Watervliet  
Arsenal Museum. (HAER Photo No. NY-1C-14)

Construction photograph showing cast-iron truss system in what is  
probably Unit 2. Taken in 1865. Watervliet Arsenal Museum. (HAER  
Photo No. NY-1C-11)

East (Unit 1) and north (Unit 2) elevations. Taken in 1865 when the  
building was under construction. Watervliet Arsenal Museum. (HAER  
Photo No. NY-1C-15)

West and south elevations of Boiler House (Unit 5) before the stack  
was removed and the Unit was enlarged in 1942. Undated. Watervliet  
Arsenal Museum. (HAER Photo No. NY-1-C-15)

C. Bibliography:

1. Primary and unpublished sources:

Colonel W. A. Thornton, Commander, to General C. D. Ramsay, Chief of Ordnance, November 30, 1863. Entry 1015, Letters Received by Construction Division 1863-1870, Record Group 156, Records of the Office of the Chief of Ordnance. Navy and Old Army Branch, National Archives, Washington, D.C. Documents enlargement of machine shop (Unit 3) and briefly describes the smith shop (Unit 4).

Stephenson, F. J. "Historical Sketch of Watervliet Arsenal." Watervliet, New York: Watervliet Arsenal, July 1, 1910. Entry 30025-D, Subentry 227, Record Group 156, Records of the Office of the Chief of Ordnance. Navy and Old Army Branch, National Archives, Washington, D.C. Notes construction of shop on the site of Unit 4 in 1828.

2. Secondary and published sources:

Annual Report of the Secretary of War for the Year 1893. Vol. 3, Ordnance. Washington, D.C.: Government Printing Office, 1893. Notes that electric power from the seacoast gun shop was used when the canal was closed.

Annual Report of the Secretary of War for the Year 1894. Vol. 3, Ordnance. Washington, D.C.: Government Printing Office, 1895. Lists items manufactured in the shops.

Annual Report of the Secretary of War for the Year 1896. Vol. 3, Ordnance. Washington, D.C.: Government Printing Office, 1897. Lists items manufactured in the shops.

Annual Report of the War Department for the Fiscal Year Ended June 30, 1897, Report of the Chief of Ordnance. Washington, D.C.: Government Printing Office, 1897. Lists items manufactured in the shops.

Annual Report of the War Department for the Fiscal Year Ended June 30, 1899, Report of the Chief of Ordnance. Washington, D.C.: Government Printing Office, 1899. Lists items manufactured in the shops.

Annual Report of the War Department for the Fiscal Year Ended June 30, 1900, Report of the Chief of Ordnance. Washington, D.C.: Government Printing Office, 1900. Lists items manufactured in the shops.

WATERVLIET ARSENAL  
BROADWAY SHOPS  
(Building 40, Benet Research and  
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Annual Report of the War Department for the Fiscal Year Ended June 30, 1901, Report of the Chief of Ordnance. Washington, D.C.: Government Printing Office, 1902. Lists items manufactured in the shops.

Building Technology, Inc. Historic Properties Report Watervliet Arsenal, Watervliet, New York and Rotterdam Family Housing Area, Rotterdam, New York. January 1985. The report and inventory cards for the arsenal are filed as field records in the Prints and Photographs Division, Library of Congress under HAER No. NY-1A.

A History of Watervliet Arsenal, 1813 to Modernization 1982. Watervliet, New York: U.S. Army, Watervliet Arsenal, n.d. Notes problems with using the Erie Canal as a source of power.

Kyle, Francis K. A History of Watervliet Arsenal. Watervliet, New York: Watervliet Arsenal, 1920. Quotes contemporary correspondence and Ordnance Department annual reports relating to construction and production in the shops. Copy available in the Watervliet Arsenal Museum.

Message from the President of the United States to the Two Houses of Congress at the Commencement of the First Session of the 30th Congress. (Washington, D.C.: Wendell and Van Benthsen, 1847), p. 694. Documents construction of finishing shop (Unit 3).

U.S. Congress. House. Report of the Secretary of War. Vol. 1677, 1875. Contains a map of the arsenal identifying uses of the shops.

\_\_\_\_\_. Report of the Secretary of War. Vol. 2836, 1890. Lists items manufactured in the shops.

\_\_\_\_\_. Report of the Secretary of War. Vol. 3083, 1892. Lists items manufactured in the shops.

D. Likely Sources Not Yet Investigated:

Records of the Office of the Chief of Ordnance, Record Group 156, and Records of the Office of the Chief of Engineers, Record Group 77, Navy and Old Army Branch, National Archives, Washington, D.C. should be further investigated.

E. Supplemental Material:

First and Second Floor Plans, Benet Laboratories, Building No. 40.

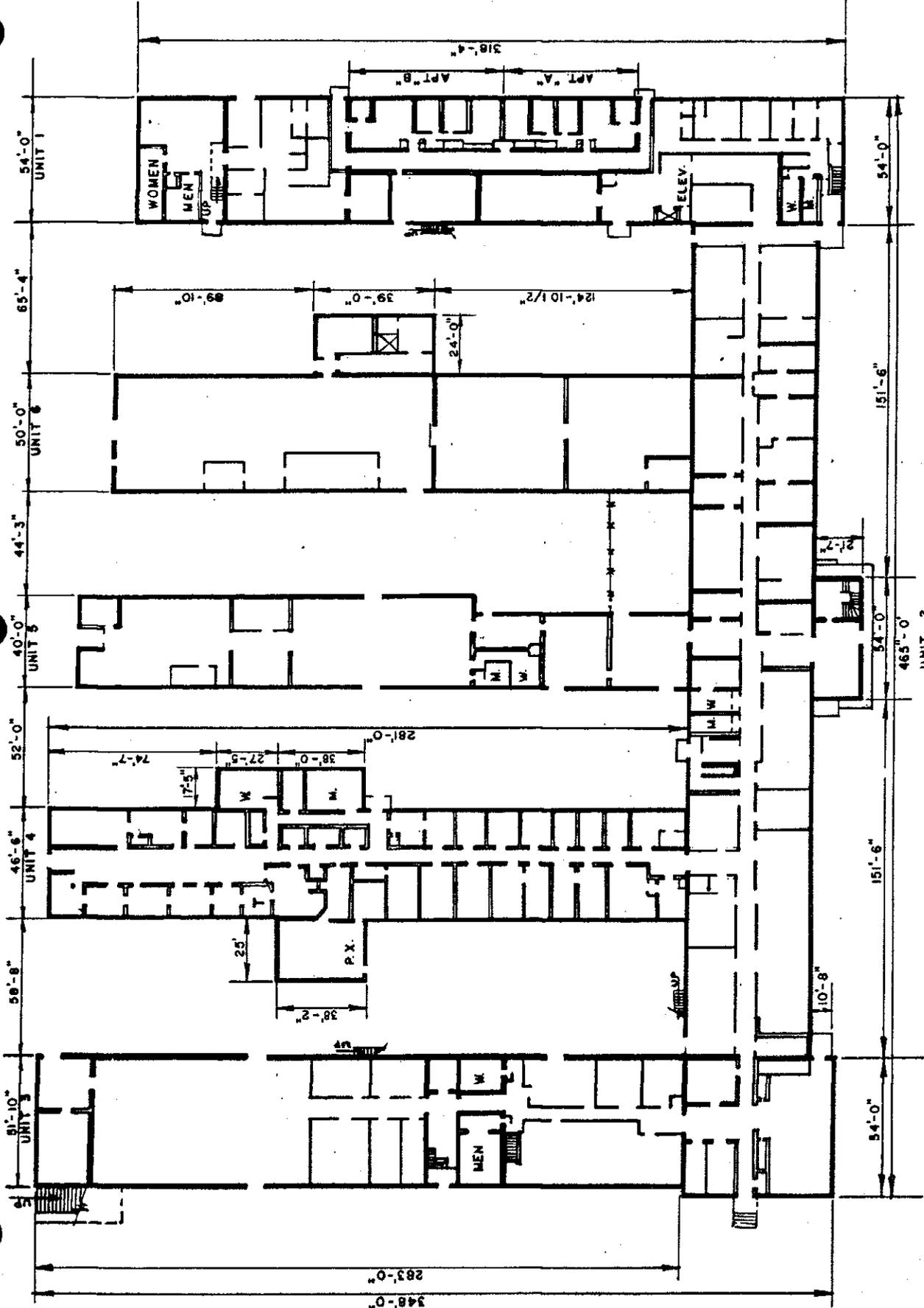
WATERVLIET ARSENAL  
BROADWAY SHOPS  
(Building 40, Benet Research and  
Engineering Laboratories)  
HAER No. NY-1C (Page 17)

No date. 2 sheets. Watervliet Arsenal Engineering Division.

Prepared by: Barbara E. Hightower  
Historian  
MacDonald and Mack Partnership  
February 1985

PART IV. PROJECT INFORMATION

This project was part of a program initiated through a memorandum of agreement between the National Park Service and the U.S. Department of the Army. Stanley H. Fried, Chief, Real Estate Branch of Headquarters DARCOM, and Dr. Robert J. Kapsch, Chief of the Historic American Buildings Survey/Historic American Engineering Record, were program directors. Sally Kress Tompkins of HABS/HAER was program manager, and Robie S. Lange of HABS/HAER was project manager. Under the direction of William A. Brenner, Building Technology Incorporated, Silver Spring, Maryland, acted as primary contractor, and MacDonald and Mack Partnership, Minneapolis, was a major subcontractor. The project included a survey of historic properties at Watervliet Arsenal, as well as preparation of an historic properties report and HABS/HAER documentation for 17 buildings. The survey, report, and documentation were completed by Barbara E. Hightower, historian, Minneapolis. The photographs were taken by Robert A. Ryan and J Ceronie of Dennett, Muessig, Ryan, and Associates, Ltd., Iowa City, Iowa. Drawings were produced by Gary M. Louris, Minneapolis.



**WATERVLIET ARSENAL**  
WATERVLIET, N.Y.

Drawn by: J.R. GANEMILAE. App'd by: [Signature] Date: [Blank]

Revisions: [Blank]

**FIRST FLOOR PLAN**  
**BENET LABORATORIES**  
**BUILDING NO. 40**

Scale: NO SCALE Date: [Blank]

UNIT 1  
UNIT 2  
UNIT 3  
UNIT 4  
UNIT 5



NET FLOOR AREA  
138,969  
Square feet

FLOOR CAPACITY  
1000 LBS.  
Per square foot

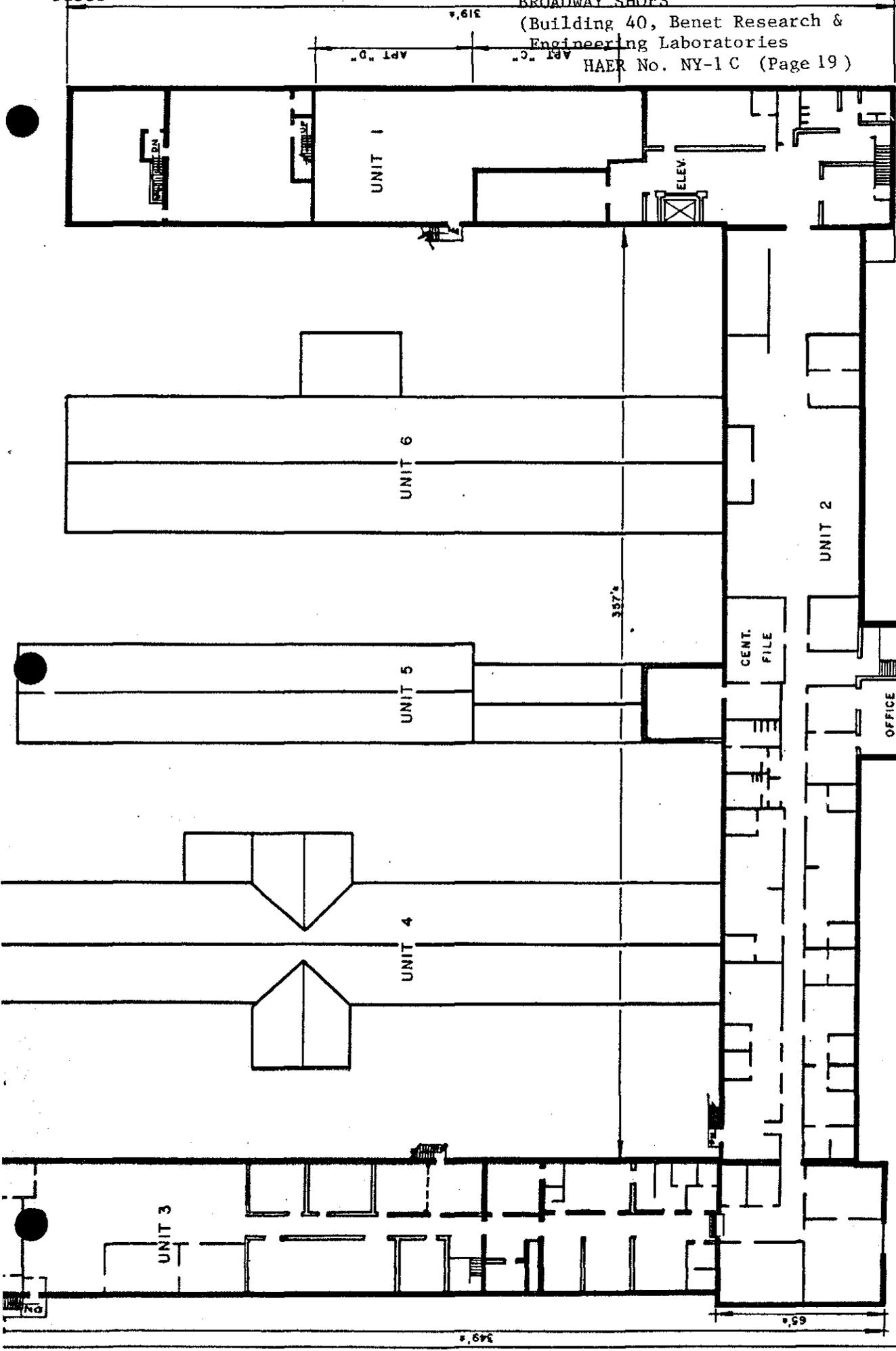
BROADWAY

FENCE

E. Supplemental Material  
Floor Plan

WATERVLIET ARSENAL  
BROADWAY SHOPS

(Building 40, Benet Research &  
Engineering Laboratories  
HAER No. NY-1 C (Page 19))



**WATERVLIET ARSENAL**  
WATERVLIET, N.Y.

Drawn by: J.R. GANGEMI, A.E. App'd by: *[Signature]*  
Revisions: \_\_\_\_\_ Date: \_\_\_\_\_

**SECOND FLOOR**  
**BENET LABORATORIES**  
**BUILDING NO. 40**

Scale: 1" = 50'-0" Date: \_\_\_\_\_

NET FLOOR AREA  
Square feet

FLOOR CAPACITY  
54 LBS  
Per square foot

E. Supplemental Material  
Floor Plan

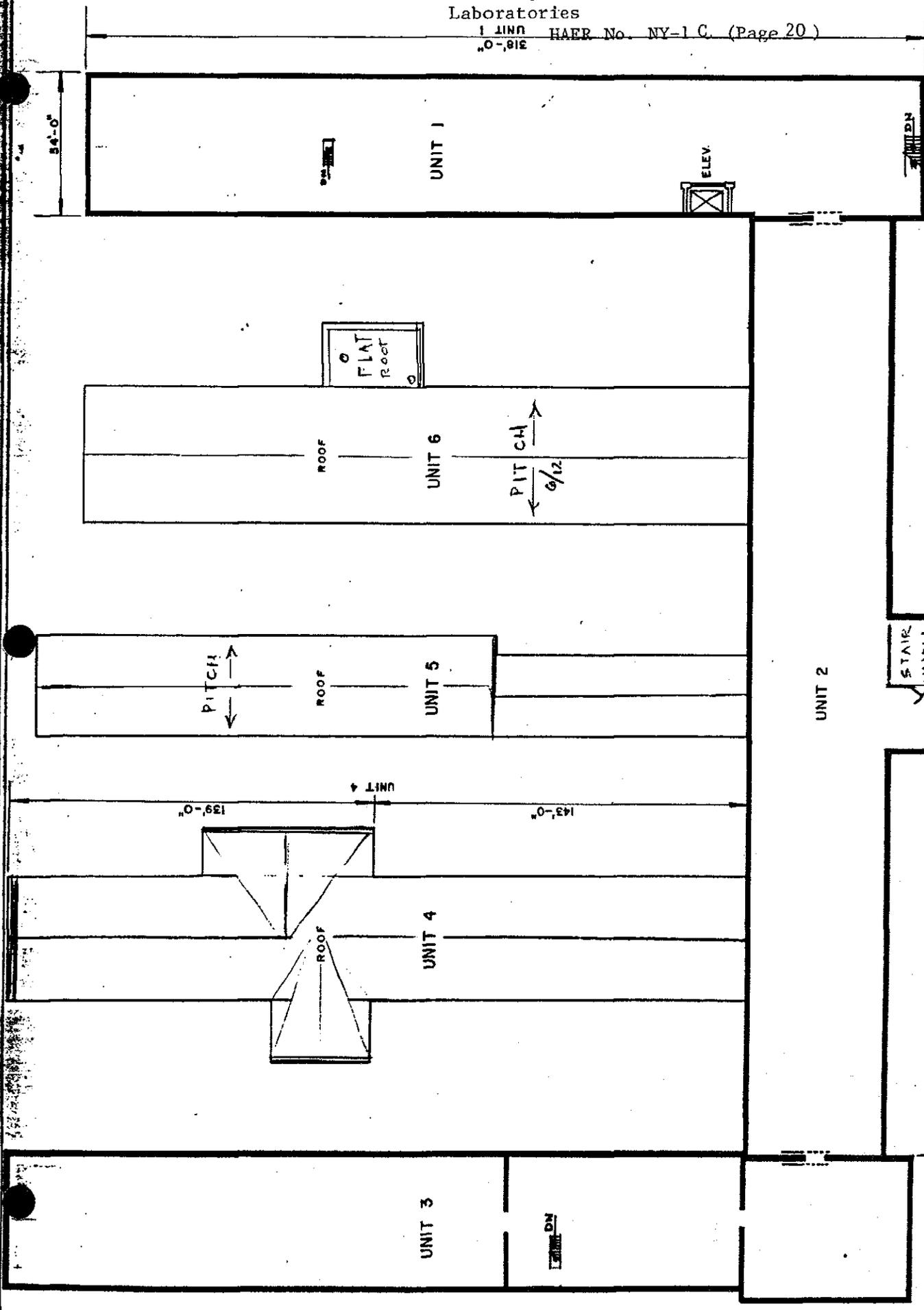
WATERVLIET ARSENAL  
BROADWAY SHOPS  
(Building 40, Benet Research & Engineering  
Laboratories

HAER No. NY-1 C. (Page 20)

WATERVLIET ARSENAL  
WATERVLIET, N.Y.

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Revisions: \_\_\_\_\_ Date: \_\_\_\_\_

THIRD FLOOR  
BENET LABORATORIES  
BUILDING NO. 40



ATTIC PLAN

NET FLOOR AREA  
Square feet  
FLOOR CAPACITY  
54 LBS  
Per square foot