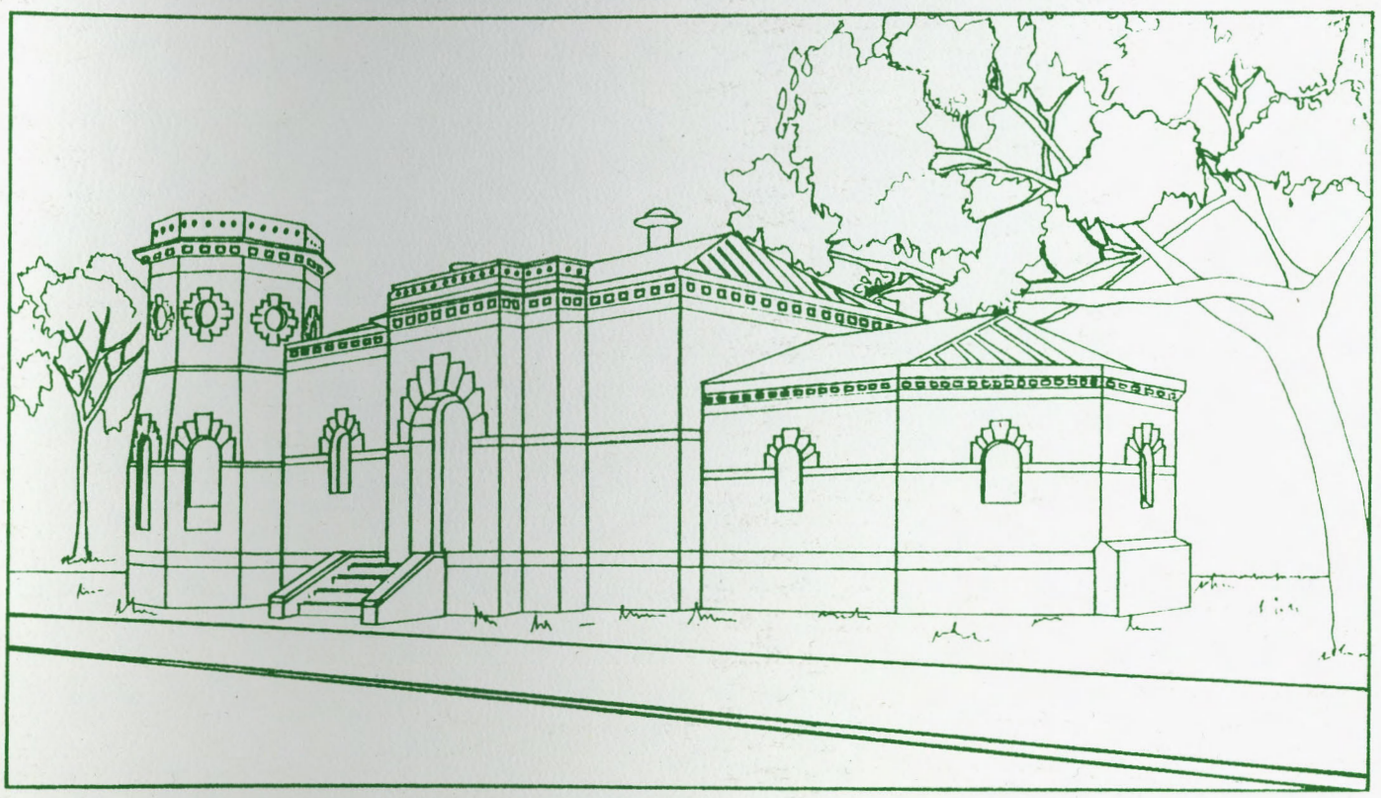
4/21/84

INTERIM REPORT ON PRELIMINARY DESIGN

MODIFICATIONS TO EXISTING GATE HOUSES AND IMPROVEMENTS TO DISTRIBUTION SYSTEM

Borough of Manhattan



March 1984

CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER SUPPLY

Contract No. MED-539

Metcalf & Eddy of New York, Inc.
New York, N.Y.

HAZEN AND SAWYER, P.C.
New York, N.Y.

Metcalf & Eddy of New York, Inc.
Engineers & Planners

A JOINT VENTURE

HAZEN AND SAWYER, P.C.
ENGINEERS

60 EAST 42ND STREET
NEW YORK, NEW YORK 10165
(212) 867-3076

March 15, 1984

Honorable Joseph T. McGough, Jr.
Commissioner
City of New York
Department of Environmental Protection
Municipal Building
New York, N.Y. 10007

Dear Commissioner McGough:

In accordance with Contract No. MED-539 (Comptroller's Capital Budget Registration No. XC04808), Modifications to Existing Gate Houses and Improvements to Distribution System in the Borough of Manhattan, we are pleased to submit revised portions of the text based on the most recent progress. Also included are modifications to some basic details as suggested by personnel in your department. The changes are highlighted on the enclosed pages. We have added an appendix (Appendix E) which contains copies of the review agencies' letters and our responses to these letters.

We are nearing completion of detailed design for Contracts MED-550 and MED-551, so we request your attention to the incorporated changes and early concurrence, so the final design phase may proceed.

Sincerely,

George P. Fulton
Project Director

GPF/geb
Enclosure

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION

MED-539

MODIFICATIONS TO EXISTING GATE HOUSES AND IMPROVEMENTS TO DISTRIBUTION SYSTEM IN THE BOROUGH OF MANHATTAN

DRAFT
INTERIM REPORT ON
PRELIMINARY DESIGN

MARCH 1984

JOINT VENTURE
METCALF & EDDY-HAZEN AND SAWYER

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includes full redundancy of parts. As an example either half of the 84-inch loop could be shut down, or Shaft 10B could substitute for the New Croton Aqueduct. All alternatives which don't use the existing gate house will have less maintenance costs.

Under Alternatives III-A, III-B and IV most of the construction is outside the existing gate house structure and much of it can be completed before any interruption of the Croton supply must take place. The fact that much of the construction work is done outside of the existing structure may be considered an advantage or disadvantage. It would be simpler to carry out construction activities but it will probably be more disruptive to the neighborhood.

The Contractor would be required to proceed with the various construction activities with due regard to the adequacy of the City's supply of water. As an example, if a "drought warning" were declared, the Contractor may be prevented from initiating new work activities and be given a certain time to complete the work already underway. This would permit the Croton system to be returned to service if a "drought emergency" were declared. The time involved that the Contractor must work under these conditions would be far shorter for Alternatives III-A, III-B and IV than I-A and I-B. The connection to the new riser shaft into the existing New Croton Aqueduct, making pipe connections and disinfection of the facility would be the only activities affecting the operations of the 135th Street facility under Alternatives III-A, III-B and IV. Most of the construction activities involved in I-A and I-B would involve having the facility out of service.

Estimates were made to compare the hydraulic losses to the service areas served by the 135th Street Gate House facility under each alternative. Losses must be kept to a minimum since Jerome Park Reservoir is only several feet above the hydraulic grade required at the service areas. Because of the details of the design of the various alternatives, the headloss through the piping at the 135th Street facilities varies depending on which area is being served under each alternative. The headlosses vary from 1 to 4 feet between alternatives and various service areas for the design total flow of 173 mgd. These headlosses would not preclude using any of the five alternatives being considered.

A construction cost comparison was made of the five alternatives. These are summarized in Table 5-1. The cost varied from about $8.8 million for either I-A or I-B to over $10.1 million for III-A; with III-B at about $9.4 million. Alternative IV was slightly more at $10.6 million.

We recommend that Alternative IV be constructed for the improvement to the facility at 135th Street. The five alternatives are about equal for most considerations. The simpler construction, shorter downtime required and complete redundancy for Alternative IV are important enough to offset the 20 percent increase in cost over Alternatives I-A or I-B. In addition with the underground facility there would be less maintenance due to H.V.A.C. roof repairs.

113-119th Street Gate House and Aqueduct Improvements

The manifold piping would be installed in Amsterdam Avenue (see Figures No. 5-10 thru 5-12). The 119th and 113th Street Gate Houses would be removed from the distribution system and turned over by the Bureau of Water Supply to the Board of Estimate.

The new manifold vaults in Amsterdam Avenue would be underground installations equipped with suitable piping, valves, drains, appurtenant works, and accesses necessary to operate the system under pressure. The installations will include the following:

a) In Amsterdam Avenue at 119th Street - The two 36-inch mains and one 48-inch are connected by a 72" manifold to a single 60-inch main with suitable valves

and distribution controls as shown in Figure 5-12. The pipe material will either be ductile iron or steel.

b) In Amsterdam Avenue at 113th Street - The six 48-inch mains in Amsterdam Avenue are to be manifolded into a single 72-inch main with control valves and distribution controls as shown in Figure 5-12. The pipe material would be either ductile iron or steel.

c) Between the 113th and 119th Street manifolds and the ends of the straight section of the Old Croton Aqueduct, there would be approximately 200 feet of steel 60-inch water main which would be buried pipeline.

d) Within the Old Croton Aqueduct and between the ends of the 60-inch buried sections, there would be 1350 feet of 60-inch pipe installed as a liner. The Aqueduct will serve as a sleeve pipe. The material for this liner pipe would be selected based upon economics, and the ability to have adjacent sections connected from the inside. (The condition and alignment of the Aqueduct would be determined during the performance of the "Underwater Inspection and Survey" Contract scheduled for the spring of 1983.) Suitable materials appear to be prestressed reinforced concrete cylinder pipe, ductile iron, or steel. Those pipe materials have a history of being used for this purpose and are viable alternatives. Other alternatives do not appear to be viable (polyethylene - short life - low pressure rating).

e) Access manholes would be provided at both ends of the straight section of aqueduct to provide access to the sealed off section of aqueduct.

179th Street Pump Station and New Croton Aqueduct Shaft 26

Two approaches were developed to solve the future problems that would be caused at this facility if the Croton System were operated at a higher grade than at present. This would be expected to be the case when the Jerome Park filter plant is on line.

1. Restoration of the 48-inch blow-off drains.

2. Construction of a structural cap on New Croton Aqueduct Shaft 26.

During construction of the 135th Street Gatehouse Facilities, the Tower Service area would lose its standby during times of power failure. This has been addressed by modifications to the auxiliary pump station.

3. Conversion of two diesel engines to stand-by diesel generators for the main pumps.

4. Replacement of the remaining auxiliary pump with a larger capacity auxiliary pump powered by the existing diesel engine.

Restoration of 48-inch Blow Off Drains

The work involves reconnecting the twin 48-inch blow-off drains by breaking through concrete fill which supports the retaining wall erected during the George Washington Bridge ramp construction. The retaining wall would be underpinned as required and a sleeve pipe jacked or bored as appropriate beneath the existing ramp. This is required to maintain the heavy and continuous flow of traffic in this area as shown in Figure 5-13.

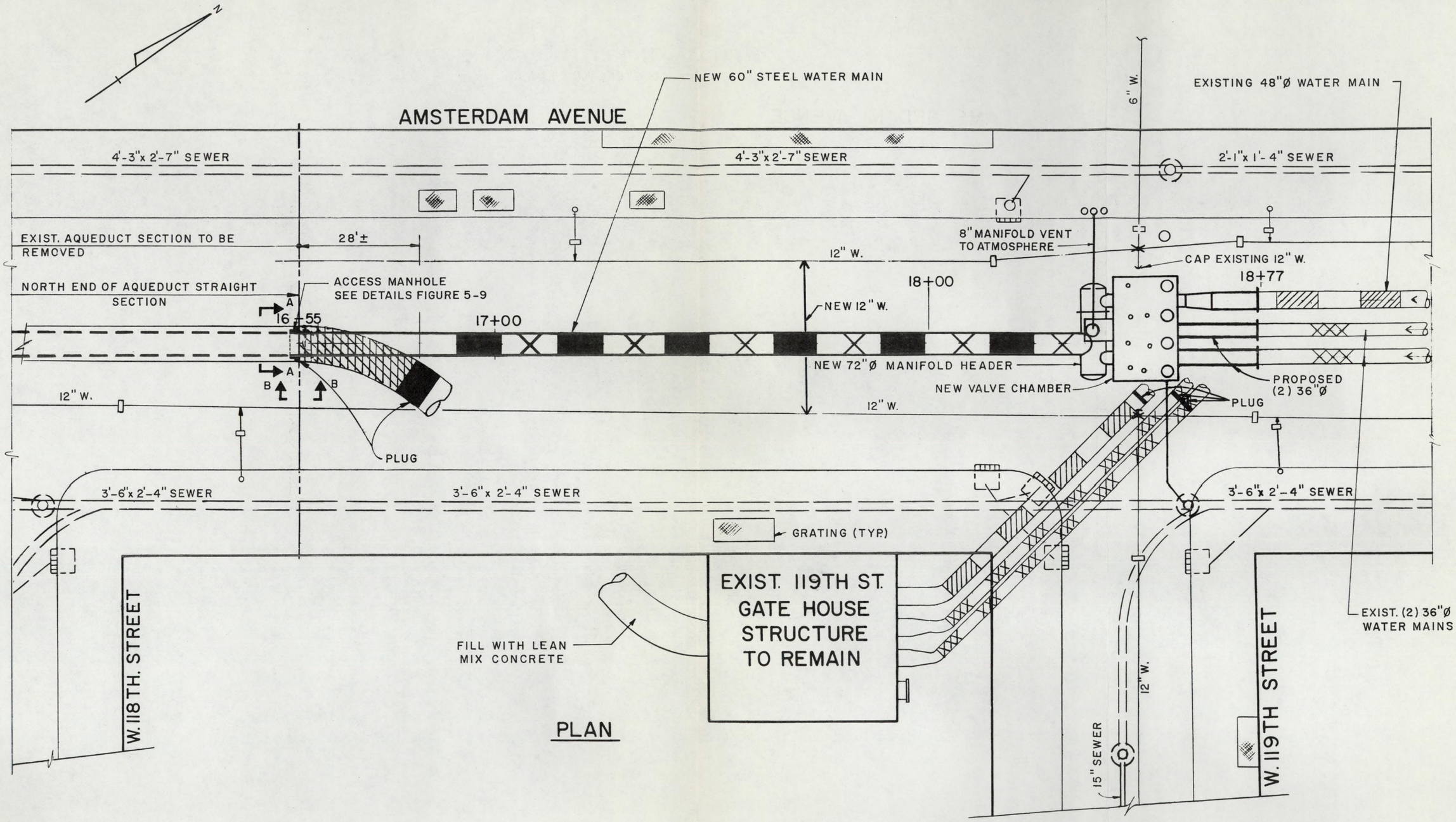
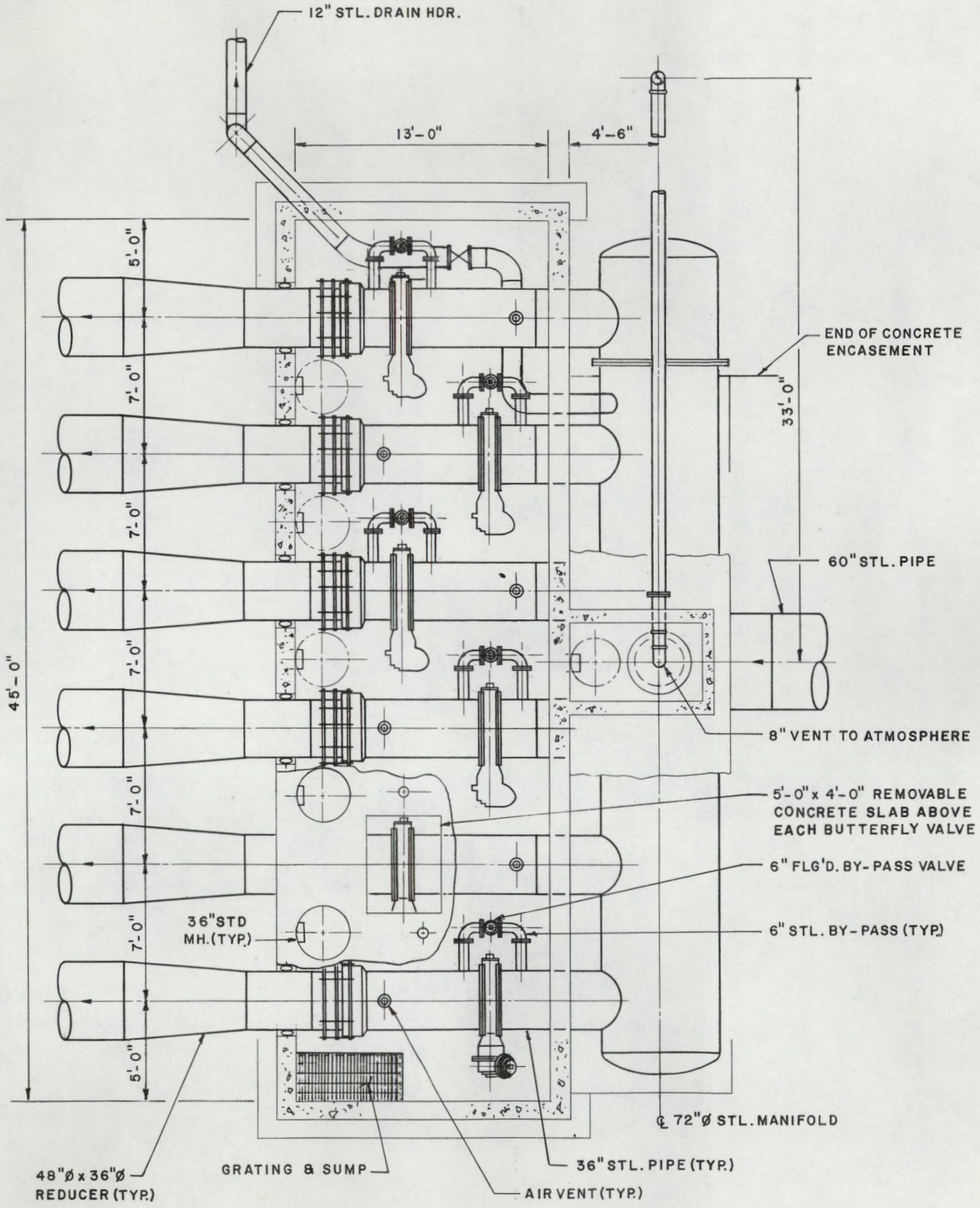
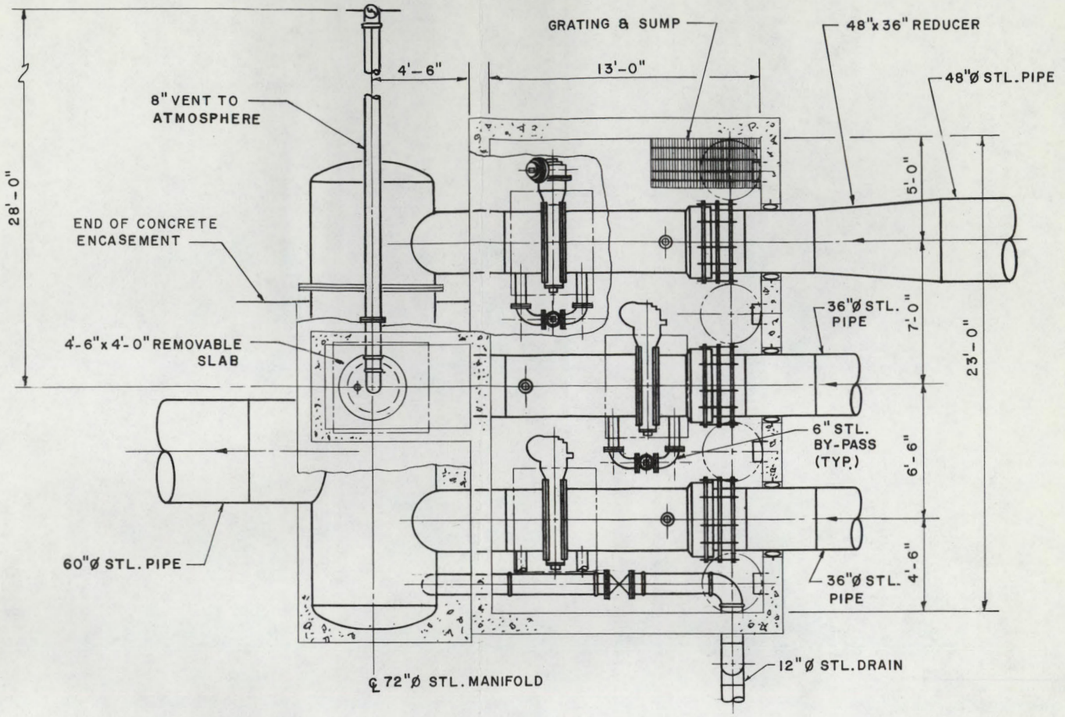


FIG. 5-10 119TH STREET
GATE HOUSE AREA



PLAN
AT EL. 109.10



PLAN
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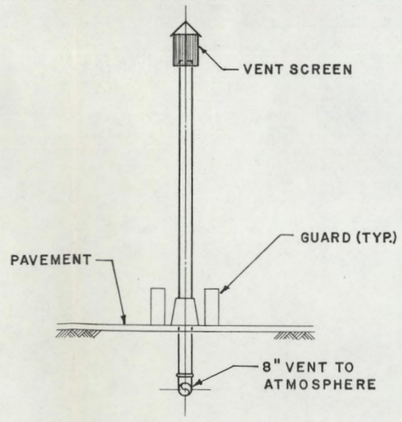
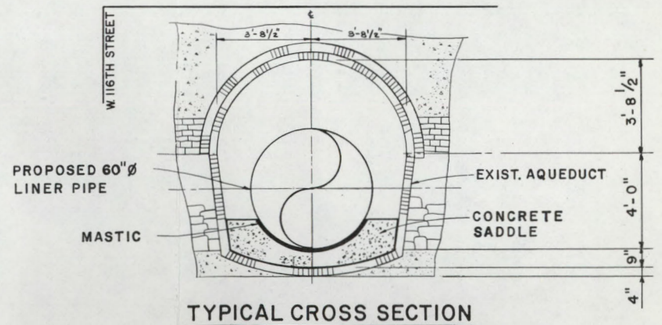


FIGURE B



TYPICAL CROSS SECTION
EXISTING INTERCONNECTING
AQUEDUCT WITH 60" Ø LINER PIPE

FIG. 5-12 NEW 119TH & 113TH STREET PIPE MANIFOLD CHAMBERS AND SLIP-LINED OLD CROTON AQUEDUCT

Miscellaneous Water Mains. Chapter 4 describes the need for a number of new water mains to adequately supply the Croton service areas while the Croton system is shut down. The following water mains would be required for the three shaft modifications. Table 4-1 gives more detail regarding specific location.

Location	Size (inches)	Length (feet)
Shaft 10	48	2010
135th Street	30	1720
	20	1485
	12	2720
Shaft 12	36	75
(106th, 111th Streets)	30	30
	20	30
Shaft 20	36	925
Delancey Street	30	50
	20	15

Contract 4. Modification of Gate Houses at 135th, 119th and 113th Streets, and lining of the Old Croton Aqueduct Section between 119th and 113th Street. Modification to 179th St. Pump Station, and Capping New Croton Aqueduct Shaft 26.

135th Street Gate House. The existing facility at 135th Street would be replaced by an underground chamber in the street and the gate house structure could be turned over to the Board of Estimate if it is no longer needed by the Bureau of Water Supply. Work activities would be as follows:

a. Temporarily transfer the source of water for the Croton service areas to Catskill/Delaware supply

b. Provide electrical standby for 179th Street Pump Station

c. Dewater New Croton Aqueduct

d. Construct Alternative IV facility at 135th Street

e. Construct structural cap on New Croton Aqueduct Shaft 26 and replace pump in 179th St. Pump Station.

119th Street and 113th Street Gate Houses. At 119th Street, the two 36-inch and one 48-inch water mains would be replaced with new ductile iron water mains from the point of curvature north of 119th Street to the new 119th Street pipe manifold. The mains would pass through a valve chamber which would be equipped with an 8-inch blow-off connection, as well as 36-inch and 48-inch valves with bypasses. The chamber would be equipped with removable slabs.

Adjacent to the valve chamber would be a buried 72-inch diameter manifold equipped with a blow-off and air release. The manifold would be connected to a 60-inch buried steel water main. This would be buried for 100 feet and connected to a new liner inside the Old Croton Aqueduct.

119th and 113th Street Gate Houses

Existing Conditions

The 119th Street Gate House and the 113th Street Gate House are located along Amsterdam Avenue. The Gate Houses serve as open chamber transition sections for Croton water conduits in Amsterdam Avenue as the water is transported from the 135th Street Gate House to the Chelsea service area (see Figure B-3). Water flows under pressure from the 135th Street Gate House to the 119th Street Gate House through two 36-inch and one 48-inch cast iron water mains. At 119th Street it changes to open channel flow through an aqueduct. The aqueduct is needed because the ground level along Amsterdam Avenue between 113th Street and 119th Street is higher than the available Croton system hydraulic grade.

The horseshoe shaped U brick lined aqueduct is 7'-8" high x 6'-0" wide, 1,600 ft. long and slopes at a constant rate of 0.4% from 119th Street to 113th Street. The aqueduct was constructed between 1838 and 1842. Approximately 1,000 feet of the aqueduct was tunneled and blasted through rock, while 400 ft. adjacent to the 113th Street Gate House and 200 ft. adjacent to the 119th Street Gate House was built using cut and cover methods.

The aqueduct terminates at the 113th Street Gate House where six 48-inch diameter cast iron water mains leave the Gate House and continue down Amsterdam Avenue to the Chelsea service area.

119th Street Gate House

Architectural

The single story 119th Street Gate House was erected in 1893 on the south-east corner of 119th Street and Amsterdam Avenue across the street from Columbia University. The building is 42 ft. long x 36 ft. (See Figure B-4).

The area is enclosed on two sides, north and west, by a wrought iron fence. The building's west wall is adjacent to Amsterdam Avenue sidewalk while the east and south property lines are located adjacent to apartment house building walls.

The operating floor at elevation 126.6 ft. is 8 feet above the sidewalk on 119th Street. The main entrance to the building is on 119th Street. The walls are 18-inch thick and 14 ft. high of granite block. A steeply sloping pointed slate roof with a 3 ft. high stone parapet wall covers the entire operating floor level.

An open water chamber occupies approximately 2/3 of the operating floor area. The remaining 1/3 of interior floor covers four pipe chambers connected to the water chamber. Access openings, 2'-6" x 1'-8", are provided in the floor to the individual chambers. The Gate House's superstructure was erected upon a substructure of thick granite block walls. The water chamber bottom floor elevation is approximately 111.6 feet.

The Gatehouse building is structurally sound with its architectural features being minimal and functional. Exterior details include a metal clad double door with an arched glass transom at the main entrance, arched window openings in the walls which are sealed closed with masonry block and an exterior wrought iron fence and entrance gate.

There are no operating utilities in the building.

Mechanical Equipment

Mechanical equipment consists of eight hand operated cast iron sluice gates approximately 2 ft. x 5 ft. The gates shut off the cast iron pipes entering the building. The gates are not used for control purposes. Four cast iron sluice gates 5 ft. x 4 ft. are installed below grade in the building north wall with 8 feet of cover to connect the individual pipe chambers with the 48-inch diameter cast iron water mains in the street.

113th Street Gate House

Architectural

The single story 113th Street Gate House was erected in 1875 and is on the southwest corner of 113th Street and Amsterdam Avenue (see Figure B-5). The building is approximately 50 ft. x 50 ft.

Amsterdam Avenue is relatively flat for this section of roadway, elevation approximately 121 ft. The building is enclosed on two sides, north and east, by a wrought iron fence. The building west wall is adjacent to an 8 ft. wide common alleyway between the Gate House and a New York City fire house. The south end of the building is abutted by a landscaped garden area that is shared with a high rise senior citizen home. The main access to the building is through the garden.

The 18-inch thick, 16 ft. high limestone block walls give the building a massive appearance. A steeply sloping pointed slate roof covers the entire operating floor level.

An open surface bell shaped water chamber occupies approximately 2/3 of the operating floor area which is at elevation 124.8. The remaining 1/3 of interior operating floor space is for an operating floor slab covering six individual pipe chambers connected to the wet chamber. Access openings 2'-6" x 1'-8" are provided in the floor to each of the 8 pipe chambers.

The substructure and superstructure are similar to the 119th Street Gate House and are in the same condition.

Mechanical Equipment

Mechanical equipment consists of twelve hand operated, cast iron gates which serve the same function as the sluice gates at 119th Street Gate House.

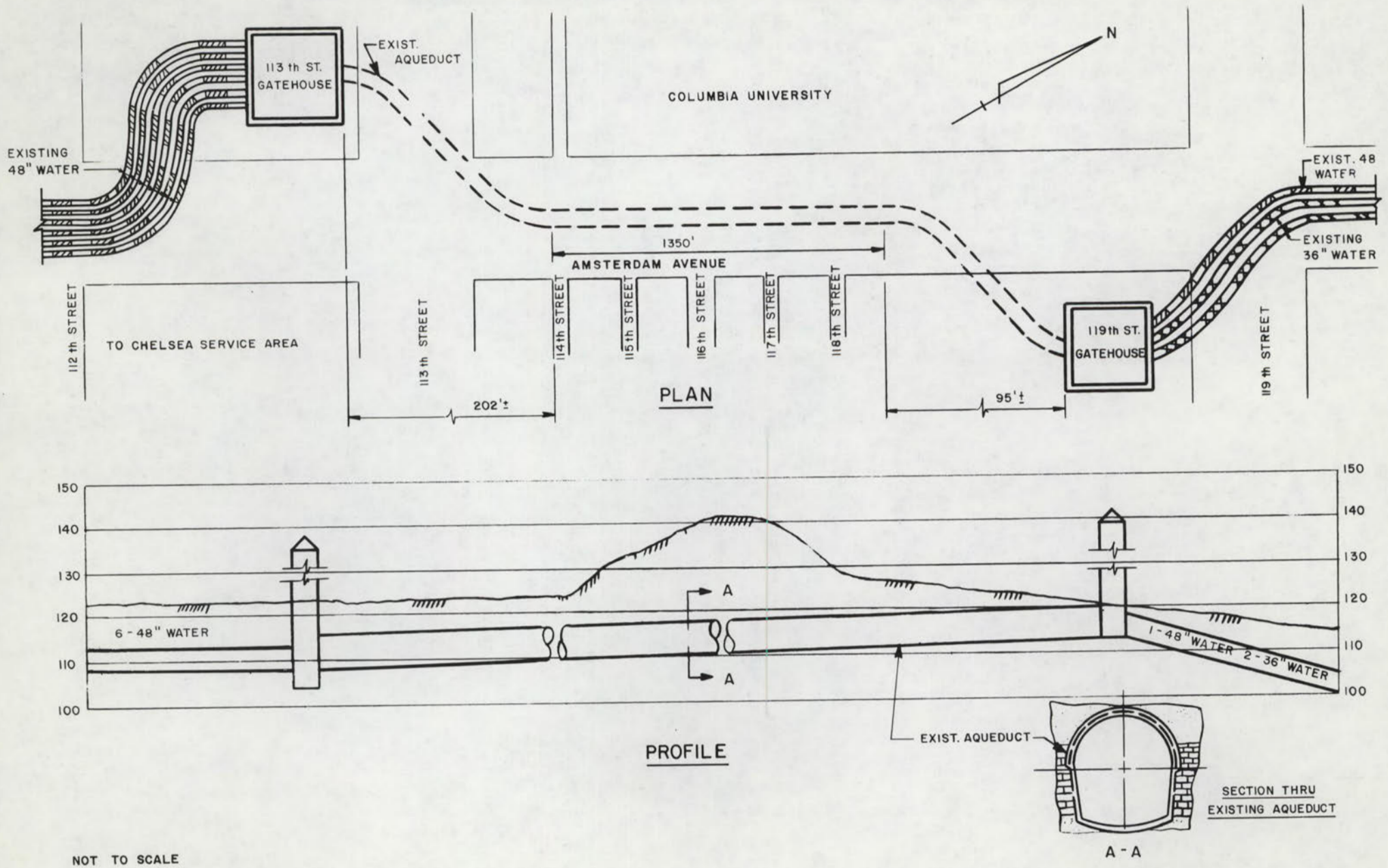
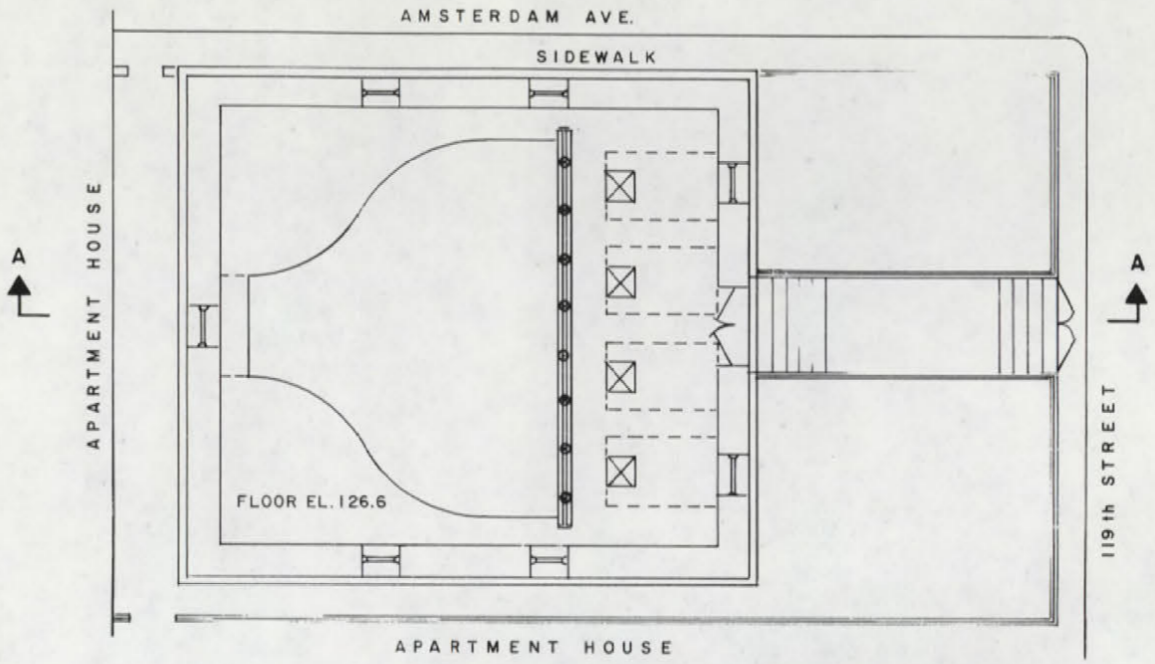
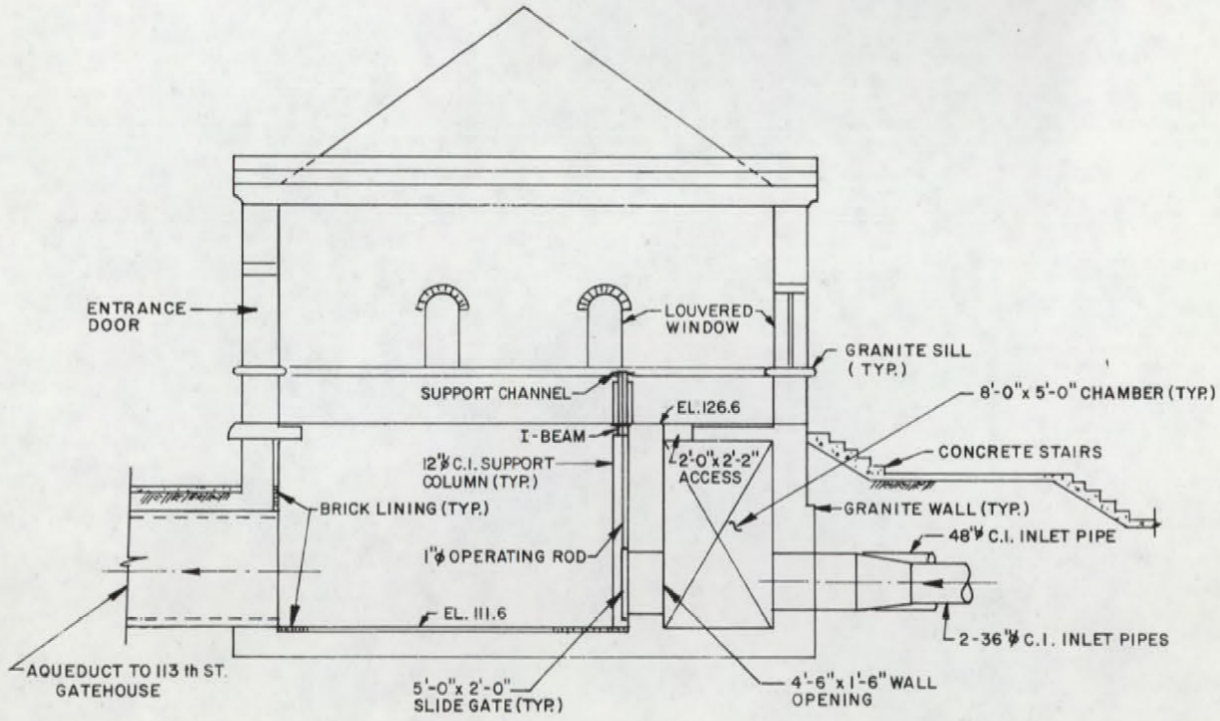


FIG. B-3 OLD CROTON AQUEDUCT PLAN & PROFILE



UPPER PLAN



SECTION A-A

FIG. B-4 119TH STREET GATE HOUSE

Insertion Pits - Pits for installing the polyethylene pipe shall be sized and shaped so as to permit insertion as shown on the Contract Drawings. Special care shall be exercised to assure that there are no sharp, hard protrusions which could score or otherwise damage the pipe.

Insertion of Polyethylene Liner Pipe - The liner pipe shall be connected to a "pulling head" and pulled through the sleeve pipe. A roller guidance system shall be employed in the insertion pit and above ground to eliminate possible damage during the insertion process.

Connection of Polyethylene Pipe - After long sections of polyethylene pipe have been pulled into position, there shall be two controls limiting subsequent connections. First, sufficient time must be allowed (48 hours) to permit stresses induced during pulling to be relieved. Second, the final connection in position shall be made at or below 45°F to reduce the expansion-contraction stresses to their practical minimum.

CONTRACT 3

Modification of Shafts 20, 12, 10, Construction of Water Mains on 135th St., Delancey St., and Miscellaneous Short Sections

Shafts - Match existing using the following materials:

- Steel pipe for handrails: stainless steel pipe conforming to ASTM 120 for seamless pipe
- Steel gratings; conforming to ASTM A 570, Grade D
- Nuts and bolts: stainless steel conforming to ASTM A-193
- All steel except stainless or Corten to be galvanized after fabrication

CONTRACT 4

Modification of Gate Houses at 135th St., 119th St., 113th St., and the lining of the Old Croton Aqueduct Section between 119th St.and 113th St.

Architecture -

Substructure - (Below Elevation 132.00 feet)

Existing granite and brick substructure to remain in its present conditions; wall leaks to be repaired and waterproofing provided.

Existing stairs, railings and platforms replaced with aluminum stairs and platforms and stainless steel railing.

Superstructure

Exterior

Existing granite superstructure steam cleaned; tuck pointed as required; sealant provided at coping and parapet masonry joints.

Existing circular louvers in tower replaced with black anodized aluminum louvers.

Existing doors and frames restored, cleaned and painted black; stained glass semi-circular transoms above doors to be restored.

Existing external downspouts removed from granite infill at original wall openings and holes plugged with matching granite and mortar.

Existing ornamental railing cleaned to bare metal and repainted black.

Existing metal roofing replaced with terne coated stainless steel standing seam roofing.

Existing tower roof to be replaced with a new concrete slab and built-up roofing; roof hatch replaced with an aluminum hatch.

Interior - (Above Elevation 132.00 feet)

Existing brick joints tuck pointed as required and all interior masonry wall surfaces cleaned.

Existing roof trusses and purlins scraped, cleaned and painted; roof sheathing replaced with new sheathing.

Existing circular stair in tower cleaned to bare metal and repainted.

Existing cast iron floor plates at Elevation 132.00 replaced with metal grating.

Site Improvements

Suitable landscaping.

Eight foot high-chain link fence and gate to replace existing fence.

Special Considerations

Restoration of structure as described above to meet the requirements of the Landmarks Preservation Commission.

Substructural Design -

Excavation - The Contractor will excavate and dispose of all unsuitable material for the purpose of building structures, conduits, pipelines and other structures.

Backfill - Backfill would be placed to the elevations or grades indicated on final drawings. All backfilling would be done with approved sound material. Backfill would be solidly compacted by mechanical tamping as work progresses.

Concrete

a. Concrete will conform with Bureau of Water Supply requirements.

b. Concrete would be Class 40.

c. Air entrained concrete would be used for concrete surfaces exposed to weather. The maximum air content would be six percent.

Steel Reinforcement - Steel reinforcement will conform with Bureau of Water Supply requirements and with ASTM Designation A615 Grade 60.

Wire mesh reinforcement will conform to ASTM A185 "Welded Steel Wire Fabric for Concrete Reinforcement".

Expansion Joints - Expansion joints in walls and slabs would be provided as required.

Construction Joints - A construction joint pattern and alternate pouring sequence would be established to minimize shrinkage cracks.

Expansion Joint Sealer - Exposed joints would be filled and sealed.

Structural Steel

- American Institute of Steel Construction "Specification for Design Fabrication and Erection of Structural Steel for Buildings"
- American Welding Society "Code for Welding in Building Construction" AWSD 1.0
- Materials
  - Structural Steel - ASTM A36
  - Steel Plates - ASTM 283
  - Welds - E70 Electrode
  - Bolts - ASTM A325 High Strength Bolts

Anchor Bolts - ASTM 307 Bar Stock

Rivet Steel - ASTM A502 Grade 1

All brackets, hangers, anchor bolts, flat bars, hardware and other steel work would be galvanized "hot dipped" after fabrication.

Miscellaneous Metals

- Steel pipe for handrails: stainless steel pipe conforming to ASTM 120 for seamless pipe or aluminum.
- Aluminum gratings: conforming to ASTM B 221.
- Nuts and bolts: stainless steel conforming to ASTM A 193.
- Steel except stainless or Corten to be galvanized after fabrication.

Concrete and Reinforcement

- American Concrete Institute (ACI) "Building Code Requirements for Reinforcing Concrete" ACI 318-77.

- Materials:

  . Cement - ASTM Serial Designation C-150 and C-190. Type I for general construction.

  . Fine and coarse aggregate graded in accordance with ASTM Serial Designation C-33.

  . Water/cement ratio not to exceed 6.25 gallons per bag of cement.

  . Concrete proportion by volume one part cement, two parts fine aggregate and four parts coarse aggregate.

  . Reinforcement - ASTM Serial Designation A615 Grade 60.

Water Stops

Extruded polyvinyl chloride waterstops would be installed in all expansion joints and construction joints in structures designed to hold liquids or below grade.

Dustproofing

All cement finished floors and concrete floors, except those covered by other finishes, will receive a dustproof treatment in conformity with the requirements of General Specification 15A of Standard Specifications for DEP, Bureau of Water Pollution Control.

Couplings

a. Victaulic couplings style 77 would be used on interior piping to provide easy disconnection at critical access points.

b. Sleeves would be used on exterior piping to connect new to existing piping.

Access Manholes

Bolted 24-inch steel access manholes would be provided on all riser piping and Old Croton Aqueduct 60-inch liner pipe.

Instrumentation

Venturi meters would be equal to B.I.F. Model 181. They would be sized to operate with a minimum of 120 inches of differential at maximum flow. Headloss through the tube would be between 6 and 9% of head differential. Telemetering connections for the future Jerome Park Treatment Plant would be provided. No bypass piping is to be provided around Venturi meters.

Venturi pressure sensing piping would be placed inside a sleeve pipe to reach a central reading and recording location. Telemetering connections to the future Jerome Park Treatment Plant would be located at the central point. No bypass piping is to be provided around Venturi meters. Signals would be transmitted by telemetering from the manifold chamber or 135th St. Gate House.

Dehumidification

Dehumidification equipment is to be provided in all piping areas and vaults.

Ventilation

Positive ventilation when area is occupied to be provided in all piping areas.

Electrical Design

Electrical 120V, lighting and back-up emergency lighting is to be provided in all piping areas.

Heating

Electrical wall heaters are to be located at critical locations.

Plumbing

Drainage Piping - Overflows will drain to sewer. Uncoated extra heavy cast iron soil pipe and fittings, or (above ground only) standard weight galvanized steel pipe with treated cast iron drainage pattern fittings of galvanized threaded standard weight malleable iron vent fittings.

Domestic Water Piping - Standard weight copper pipe conforming to ASTM B-42 with standard weight threaded bronze fittings or standard weight red brass pipe conforming to ASTM B 43 with standard weight threaded bronze fittings.

Insulation - Fiberglass insulation on all cold water, process water, and hot water piping.