NEW YORK STATE | Office of General Services

DESIGN & CONSTRUCTION GROUP
THE GOVERNOR NELSON A. ROCKEFELLER
EMPIRE STATE PLAZA
ALBANY, NY 12242

ADDENDUM NO. 4 TO PROJECT NO. 47164

CONSTRUCTION AND ELECTRICAL WORK
PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR
CONKLINGVILLE DAM
233 COUNTY ROUTE 8
HADLEY, NEW YORK

August 28, 2026

NOTE: This Addendum forms a part of the Contract Documents. Insert it in the Project Manual. Acknowledge receipt of this Addendum in the space provided on the Bid Form.

BIDDING REQUIREMENTS – COMMON

1. DOCUMENT 001114 ADVERTISEMENT FOR BIDS: The last date for receipt of bids is changed from Wednesday, September 9, 2026, at 2 PM, to **Thursday, September 17, 2026 at 2 PM.**

GENERAL REQUIREMENTS - COMMON

2. SECTION 015000.02 CONSTRUCTION FACILITIES & TEMPORARY CONTROLS: Discard the Section bound in the Project Manual and substitute with the accompanying Section (pages 015000.02 -1 thru 015000.02 – 6) noted "ADDENDUM 4CE."

CONSTRUCTION WORK SPECIFICATIONS

3. SECTION 024116 STRUCTURE DEMOLITION: Discard the Section bound in the Project Manual and substitute with the accompanying Section (pages 024116 – 1 thru 024116 – 7) noted "ADDENDUM 4CE."

4. SECTION 028304 HANDLING OF LEAD CONTAINING MATERIALS: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 028304 -1 thru 028304 – 9) noted "ADDENDUM 4CE".

5. SECTION 031000 CONCRETE FORMING AND ACCESSORIES: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 031000 -1 thru 031000 – 10) noted "ADDENDUM 4CE."

6. SECTION 033000 CAST-IN-PLACE CONCRETE: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 033000 -1 thru 033000 – 21) noted "ADDENDUM 4CE."

7. SECTION 055000 METAL FABRICATIONS: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 055000 -1 thru 055000 – 9) noted "ADDENDUM 4CE."

8. SECTION 055119 METAL GRATING STAIRS AND PLATFORMS: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 055119 -1 thru 055119 – 7) noted "ADDENDUM 4CE."

9. SECTION 310000 EARTHWORK: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 310000 -1 thru 310000 – 20) noted "ADDENDUM 4CE."

10. SECTION 314100 DRILLING GROUT HOLES: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 314100 -1 thru 314100 – 4) noted "ADDENDUM 4CE."

11. SECTION 314200 BATCH, MIX AND INJECT CEMENT GROUT: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 314200 -1 thru 314200 – 10) noted "ADDENDUM 4CE."

12. SECTION 315100 ROCK ANCHORS: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 315100 -1 thru 315100 – 14) noted "ADDENDUM 4CE."

13. SECTION 315200 COFFERDAMS: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 315200 -1 thru 315200 – 3) noted "ADDENDUM 4CE."

14. SECTION 352016.53 HYDRAULIC VERTICAL STOP GATE: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 352016.53 -1 thru 352016.53 – 13) noted "ADDENDUM 4CE."

15. SECTION 400507 HANGERS AND SUPPORTS FOR PROCESS PIPING: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 400507 -1 thru 400507 – 8) noted "ADDENDUM 4CE."

16. SECTION 400524.01 LARGE DIAMETER STEEL PIPE: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 400524.01 -1 thru 400524.01 – 11) noted "ADDENDUM 4CE."

17. SECTION 400561.43 KNIFE GATE VALVES: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 400561.43 -1 thru 400561.43 – 16) noted "ADDENDUM 4CE."

18. SECTION 400561.44 VALVE SUPPORT BEARINGS: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 400561.44 -1 thru 400561.44 – 3) noted "ADDENDUM 4CE."

19. SECTION 400561.46 LARGE PIPE COUPLINGS: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 400561.46 -1 thru 400561.46 – 5) noted "ADDENDUM 4CE."

20. SECTION 412200 HOISTS AND CRANES: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 412200 -1 thru 412200– 8) noted "ADDENDUM 4CE."

ELECTRICAL WORK SPECIFICATION

21. SECTION 263213.16 PROPANE-ENGINE-DRIVEN GENERATOR SETS: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 263213.16 -1 thru 263213.16 – 21) noted "ADDENDUM 4CE."

APPENDIX - COMMON

22. BULKHEAD CELLS PHOTOS: Add the attached Document (pages 1 through 8) to the Project Manual.

23. BULKHEAD PHOTOS: Add the attached Document (pages 1 through 16) to the Project Manual.

24. CONC RESTORATION AS- BUILT PHOTOS 1983 – 1984: Add the attached Document (pages 1 through 99) to the Project Manual.

25. CONC RESTORATION AS-BUILT PHOTOS 1984: Add the attached Document (pages 1 through 64) to the Project Manual.

26. CONKLINGVILLE DAM PROJECT LICENSE ORDER #12252: Add the attached Document (pages 1 through 28) to the Project Manual.

27. LASALLE HYDRAULIC MODEL REPORT - MARCH 1998: Add the attached Document (pages 1 through 43) to the Project Manual.

CONSTRUCTION WORK DRAWINGS

28. Revised Drawings:
    a. Drawing Nos. G-004, G-103, C7-12, C-719, C-725, C-726, C-727, A-702, A-703, M-708, S-709, S-711, S-712, S-713, S-714, S-721, S-728, S-734, S-735, S-735, S-738, S-739, S-740, S-742, S-744, S-766, S-783, and S-785, noted Addendum #4, dated 8/28/2026, accompanies this addendum and supersedes the same numbered previously issued drawings.

ELECTRICAL WORK DRAWINGS

29. Revised Drawings:
    a. Drawing Nos. E-501, E-601, E-611, E-701, E-702, E-720, E-734, E-735, E-737, E-738, and E-739, noted Addendum #4, dated 8/28/2026, accompanies this addendum and supersedes the same numbered previously issued drawings.

END OF ADDENDUM

Brady M. Sherlock, P.E.
Director, Division of Design
Design & Construction

SECTION 015000.02 - CONSTRUCTION FACILITIES & TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide the construction facilities and temporary controls necessary for the Work, unless otherwise indicated.

1. The construction facilities and temporary controls specified to be provided by a particular Contract shall be kept operational by that Contractor for the Work of all related Contracts at all times Work is being performed by a Contractor.
2. The construction facilities and temporary controls specified to be provided by a particular Contractor shall be installed as soon after award of the Contract as necessary to enable the Work of each Contract to proceed on schedule and maintained until completion of the Work of all related contracts unless otherwise directed in writing.
3. Any Contractor who requires additions to the construction facilities and temporary controls specified to be provided by another Contractor, shall provide and maintain them.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Construction Waste Management: Section 017419.

B. Disposal of Asbestos-Containing Materials: Section 028213.

1.3 TEMPORARY LIGHT AND POWER

A. Electrical energy for temporary light and power will not be made available.

B. Electrical Work Contract:

1. Provide portable temporary and backup power source for critical building loads, including but not limited to outlet valve operation (power and controls), security, egress lighting, and seasonal heating.
2. Provide temporary wiring, transfer equipment, disconnecting means, fusing, ground fault protection, and overcurrent protection in conformance with the National Electrical Code.

C. All Contracts:

1. Each contract requiring temporary power for lighting, ventilation, heating, process equipment, and construction equipment shall be required to provide their own backup power source to perform the scope of work.
2. All contracts shall coordinate the location, wiring, switching, and operation of their individual backup power sources and provide the proper signage to alert all groups on site of their intended use with contact information listed for assistance.

3. Additional lighting can be provided in the form of LED fixtures or lamp holders (with LED lamps), but in no case shall the load on any branch circuit or feeder exceed its rated capacity.
4. Install materials for temporary light and power in conformance with the National Electrical Code.
5. Materials for temporary light and power need not be new if they are in satisfactory operating condition.
6. Provide ground-fault protection for personnel (such as portable plug-in type ground-fault circuit-interrupters) on single phase 15 and 20 ampere receptacle outlets which are in use.
7. Receptacle outlets, portable cord connectors, and attachment plugs shall have standard NEMA configurations.
8. As the progress of the work allows, and as approved, completed portions of the permanent wiring and electrical service may be utilized by either contract as a means for powering temporary loads and construction equipment.

1.4 TEMPORARY WATER

A. There is no water available at the site for the Work. Provide temporary water for the Work.

B. Construction Work Contract:

1. Provide and maintain a temporary water system, of such size and capacity as to adequately supply the needs of all contractors during performance of their Work.
2. Provide barrels at locations as required for the Work.

C. All Contracts: Prevent waste of water.

1.5 TEMPORARY TOILETS

A. Construction Work Contract: Provide toilet facilities for Contractor's and subcontractors employees engaged on the Project, including employees of other contractors. Locate toilets where directed and maintain them in a sanitary condition.

NUMBER OF EMPLOYEES	MINIMUM NUMBER OF FACILITIES
20 or less	1 toilet
20 or more	1 toilet and 1 urinal per 40 employees
200 or more	1 toilet and 1 urinal per 50 employees

*Toilet/Urinal Combinations shall count as only one facility.

1. Where water and sewer connections are available, provide water closets, otherwise provide approved chemical or electric toilets.
2. Inside buildings, locate toilet facilities no more than 4 stories or 60 feet above or below, nor more than 500 feet travel on the same level from the work location of any person.
3. Locate toilet facilities no more than 1000 feet from any work location.

    a. Exception: Mobile crews having readily available transportation to nearby toilet facilities.

1.6 PROTECTION OF WORK AND EXISTING PROPERTY

A. Protect installed Work and existing property during performance of the Work.

B. Maintain the building in a watertight condition during performance of the Work.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at wall projections, jambs, sills, and soffit of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, and movement of heavy objects by covering them with durable sheet materials.

F. Protect smoke detectors from airborne dust and debris.

1. At the beginning of each work day, provide protective coverings over smoke detectors in areas where airborne dust and debris will be generated by the Work.
2. At the end of the work day, clean the areas in which the smoke detectors are located by whatever means necessary to assure that airborne dust and debris will not contaminate the smoke detectors, then remove protective coverings.
3. Provide signs, instructions, and alternate methods for reporting a fire during the periods that the smoke detectors are covered.
4. Notify the Director's Representative and have procedures approved.

G. Prohibit traffic or storage upon waterproofed and roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

H. Protect existing trees and plants during performance of the Work unless otherwise indicated. Box trees and plants within the grading limit lines. Do not deposit excavated materials or store building materials around trees or plants. Do not attach guy wires to trees.

I. Prohibit traffic from landscaped areas.

J. Cleaning tools of cementitious and other insoluble materials:

1. Do not wash tools in sinks or other sanitary drainage systems. Protect all drainage systems from debris that can clog or damage piping and fixtures.
2. Take all precautions necessary to prevent cementitious and other insoluble materials from flowing into floor drains.
3. Dispose of excess cementitious and other insoluble debris with the other rubbish.

1.7 BARRIERS AND ENCLOSURES

A. All Contracts: Provide barriers during performance of the Work to:

1. Prevent unauthorized entry to work areas.
2. Allow for State's occupancy of Site.
3. Protect existing facilities and adjacent properties from damage.

4. Protect vehicular and pedestrian traffic.

1.8 TEMPORARY FENCE ENCLOSURE

A. Construction Work Contract:

1. Provide temporary fence not less than 8 feet in height above grade.
2. Fabric: #9 gage galvanized steel, or equal gage aluminum, woven together into 2 inch diamond mesh, with both top and bottom edges having a twisted and barbed finish.
3. Posts, Rails, and Connections: Standard galvanized steel products of an approved manufacturer, of the size and types as required and approved. Provide top and bottom rails between all posts, secured with bolted connections.
4. Gates: Provide access gates for passage of employees and materials, complete with padlock. Fabricate gates with galvanized steel pipe perimeter covered with same fabric specified for fence. Furnish the Director's Representative with 2 keys per gate.
5. Erection: Set posts 4 feet into the ground and not more than 10 feet apart. Install bottom rail not more than 2 inches above existing grade. Pull fabric taut and wire tightly to posts and rails at not more than 2 feet on center.
6. Maintain the temporary fence enclosure throughout the life of the Contract, or until directed to be removed. Replace all items or portions of fence enclosure damaged or destroyed.

1.9 WATER CONTROLS

A. Provide and maintain pumping equipment necessary to keep the work areas free from water. Discharge water into existing storm drainage systems or otherwise disperse as directed.

1.10 FIRE PREVENTION

A. Take precautions necessary to prevent fires.

B. Fuel for cutting and heating torches shall be acetylene or LP-gas only and shall be contained in Underwriters Laboratory or Federal Department of Transportation approved containers.

C. Furnish and maintain a currently inspected 20 pound capacity multi-class A:B:C fire extinguisher in the immediate vicinity where welding tools or torches are in use.

D. Furnish and maintain a currently inspected fire extinguisher of the appropriate class and size whenever the temporary storage of materials changes that areas classification of fire load or life safety.

E. Do not use flammable liquids, other than those specified, within a building without the written approval from the Director's Representative.

F. Tarpaulins shall be flameproof and shall be securely anchored when attached to scaffolding or when used to enclose any portion of a building.

G. If required by the nature of the work and facility regulations, the Contractor shall obtain from the facility and pay all costs associated with "Hot Work Permits" including fire watches to execute the work of its contract. Perform hot work in accordance with the Fire Code of New York State and the Hot Work Program approved for the work. Prior to, during and after performing hot work, inspect the hot work area for compliance with the requirements of the permitted Hot Work Program.

1. Post signage "Caution: Hot Work In Progress - Stay Clear" in conspicuous locations warning others before they enter a hot work area where the area is accessible to persons other than the operator of the hot work equipment.

H. Include facility hot works permit program requirements in the project manual appendix.

1. See applicable facility permits and conditions bound in the Appendix.

1.11 ACCESS ROADS

A. Routes of ingress and egress on the premises to the location of the Work shall be as directed.

B. Keep designated access roads clear of dirt and debris resulting from the Work.

C. Provide means of removing mud from vehicle wheels before entering paved roads.

1.12 PARKING

A. All Contracts:

1. Park vehicles in areas where directed.
2. Keep designated parking areas clear of dirt and debris resulting from the Work.
3. If requested, register vehicles which are to be parked at the Facility with the Facility Safety/Security Department.
4. Remove ignition key from unattended vehicles and lock doors.

B. Construction Work Contract: Remove snow from parking areas allocated to all Contractors.

1.13 RUBBISH REMOVAL

A. Clean up and containerize the rubbish (refuse, debris, waste materials, and removed materials and equipment) resulting from the Work at least once a day and more often if the rubbish interferes with the work of others or presents a hazard. Leave work areas broom clean, except where more stringent cleaning is specified, at the end of each day. Locate containerized rubbish on the Site where directed.

B. Remove rubbish from State property at least once a week and more often if the rubbish presents a hazard. Properly dispose of rubbish.

C. Burning of rubbish will not be permitted.

D. Also comply with the requirements of Section 017419.

1.14 RELOCATION AND REMOVALS

A. Should a change in location of any construction facilities and temporary controls be necessary in order to progress the Work properly, remove and relocate such items as directed.

1. Electrical Work Contract: Frequently relocate/revise the temporary lighting as Contractors progress the Work of their contracts causing changes to the condition of the building (installation or relocation of walls, partitions, ceilings, equipment, etc.). Keep pace with the changes and maintain a minimum of 10 foot candles in each recomposed work area.

B. Remove the construction facilities and temporary controls when they are no longer required. Restore permanent facilities used for or connected to temporary facilities to their original condition or better.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 015000

SECTION 024116 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SCOPE

A. This specification covers all demolition work including all labour, material, equipment and the performance for the demolition, disposal, and modifications of the applicable features and components as detailed in the Contract Drawings and as directed by the Director's Representative.

B. Existing dam and outlet structure components to be removed, as shown within the limits of removal on the Contract Drawings and as directed by the Director's Representative, shall include, but not be limited to, the following:

1. Selective demolition of spillway crest and spillway components.
2. Saw cutting and demolition removals of concrete from spillway crest and spillway downstream face, to accommodate proposed spillway crest and overlay.
3. Demolition and removal of existing bridge structure.
4. Saw cutting and demolition removals of concrete from the outlet structure exterior, control house exterior, tailrace wall, approach wall and channel wall to accommodate proposed overlay/refacing.
5. Removal of existing Dow valves and appurtenances.
6. Demolition and removal of walkway bridge at spillway west end and demolition removals of concrete bridge piers.
7. Removal of existing gantry crane, shaft cover, support beams, and associated equipment.
8. Removal of indicated scaffold stair tower, fixed ladder, railings, grating, and other miscellaneous metals in the outlet structure.
9. Selective demolition of indicated portions of existing concrete in the outlet structure and within the control house interior to accommodate installation of new mechanical equipment, pipe, and crane features.
10. Removals or modifications to ancillary existing features within the demolition work limits.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Construction Facilities and Temporary Controls: Section 015000.

B. Removals, Cutting and Patching: Section 017329.

C. Earthwork: Section 310000.

D. Rock Removal: Section 312316.26.

E. Rock Anchors: Section 315100.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

C. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

D. Waterway: The waters of New York State including but not limited to Great Sacandaga Lake and Stewarts Bridge Reservoir.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided individually in the order in which they are specified and tabbed.

D. Quality Control Submittals:

1. Permits: Submit one copy of each permit.
2. Demolition Plan: Submit a demolition plan for each demolition work area required under Quality Assurance Article for approval by Director's Representative.
3. Disposal Plan: Submit one copy of each disposal plan required Quality Assurance Article for approval by Director's Representative.

E. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property for environmental protection, for dust control. Indicate proposed locations and construction of barriers.

F. Schedule of Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping or re-routing of utility services.

G. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before the Work begins.

1.5 QUALITY ASSURANCE

A. Permits: Before the Work of this Section is started, obtain all permits required by Federal, State, and local jurisdictions for all phases and operations of the Work.

B. Demolition Plan: Before the Work of this Section is started, Contractor shall submit to Director's Representative for review a detailed demolition plan including proposed demolition and material handling and disposal procedures. The plan shall describe the following:
   1. Proposed sequence of operations, considering staged construction and access requirements.
   2. Proposed equipment and methods to be used for each operation.
   3. Proposed measures to protect new and existing structures during work, including but not limited to, the dam, the outlet structure, approach wall and channel wall.
   4. Proposed measures to prevent demolition debris and related sediment from entering the waterways and proposed measures to retrieve debris and control sediment disturbances in waterways.

C. Disposal Plan: Proposed plans for disposal of all demolition materials, excluding excess soil and rock, items to remain or be reused on site, and items to otherwise remain with the Owner. Disposal plan shall specifically address Contractor's plan for the disposal of concrete demolition products. Submit for acceptance by the Director's Representative prior to commencing Work.
   1. The Contractor shall comply with federal, state, and local hauling and disposal regulations. Disposal areas shall be legal and permitted for disposal of the material(s) in question.

D. Pre-Construction Conference: A minimum of 14 days prior to start of Work, a conference will be held by the Director's Representative at the Site for the purpose of reviewing the Contract Documents, and discussing the requirements and procedures for submittals and for the Work. The conference shall be attended by the Contractor and all applicable subcontractors in accordance with the requirements of Section 013119.

1.6 PROJECT CONDITIONS

A. Existing Items to Remain in Place: Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Owner.
   1. Repair or replace items damaged by the actions or negligence of the Contractor as accepted by the Director's Representative.
   2. Coordinate the Work of this Section with all other Work indicated.
   3. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition Work performed under this Contract.
   4. Provide new supports and reinforcement for existing construction weakened by demolition or removal Work.
   5. Repairs, reinforcement, or structural replacements require submittal of an appropriate plan and acceptance by the Director's Representative at least 24 hours prior to commencing such Work and no separate payment will be made.

B. Existing Paint: A lead survey was performed on existing surfaces for the presence of lead-based paints. A list of the surfaces tested, and the results of the survey are in Document 003126. Take precautions as required to prevent the spread of lead containing particles and dust.

C. Recycle demolition debris to the extent possible.

D. Burning is prohibited.

E. The use of explosives is prohibited.

F. An asbestos survey was performed and a list of the materials tested, and the results of the survey are in Document 003126. Handle and remove asbestos containing materials in accordance with all local, state, and federal laws and regulations.

G. Protect existing utilities during the Work of this Section.

H. Verify the location and status of all utilities within the Contract Limit Line (CLL) as outlined in Section 023313.

I. Disconnect the following utilities:
   1. Electric: Comply with National Electric Code and utility regulations.
   2. Telecommunication: Comply with utility regulations.

J. Prior to beginning demolition, verify that all utilities to be demolished have been disconnected.

K. Notify Director's Representative of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

L. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
   1. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

M. Storage or sale of removed items or materials on-site is not permitted, except for those items identified for salvage and subsequent reinstallation.

1.7 SEQUENCING AND SCHEDULING

A. Comply with the sequencing and scheduling requirements noted within the Contract Documents.

B. Complete installation of water control measures and dewater work areas prior to commencing demolition in accordance with the Contract Documents.

PART 2 - PRODUCTS

[NOT USED]

PART 3 - EXECUTION

3.1 GENERAL

A. Perform demolition in a systematic manner; see Contract Drawings for demolition sequence requirements.
   1. Concrete removal: Perform removals with equipment sized to safely perform the work in a controlled manner and protect adjacent existing features to remain.
   2. Provide protective systems to prevent materials from falling into lower work areas and waterway.
   3. Embedded Metals Removal: Cut existing embedded metals flush with limits of concrete or masonry to remain unless otherwise indicated in Contract Documents or directed by the Director's Representative. Perform removals with equipment sized to safely perform the work in a controlled manner and protect adjacent existing features to remain.

B. The existing structures and features to remain shall be protected at all times.

C. Wet down masonry materials during demolition to prevent spread of dust and dirt. Sprinkle debris, and use temporary enclosures as necessary to limit dust to lowest practicable level. Do not use water to extent causing flooding, contaminated runoff, or icing.

D. Do not place demolition equipment on structures where it will create excessive loads on supporting walls, floors, and frames. Promptly remove accumulated debris and materials.

3.2 PREPARATION

A. Remove items scheduled to be salvaged for the Facility, and place in designated storage area.

3.3 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, generally from higher to lower level and as indicated in the Contract Documents. Complete selective demolition operations of supported features before disturbing supporting members.
   2. Demolition equipment shall be limited to the size and energies required to perform removals. Over-demolition shall be repaired by the Contractor to the satisfaction of the Director's Representative at no additional cost to the Owner.

3. Neatly cut along limits of removals, openings, and holes providing edges plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
4. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
5. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and transport to ground by method suitable to avoid free fall, prevent ground impact or dust generation, and prevent materials from entering the waterway.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Director's Representative, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.4 DISPOSAL

A. Remove demolition debris and excess fill from State property as soon as practicable.

B. Remove all substantive materials from underwater work, Contractor shall not abandon debris on lake bottom.

C. All demolition debris shall be handled to prevent damage to existing structures to remain and maintain safety for all workers on site.

D. Do not store, sell, or burn materials on the property.

3.5 SALVAGE SCHEDULE

A. The State will retain ownership of the items listed below. Prior to demolition, remove, prepare and place the items indicated where directed.

1. Aluminum and stainless steel operating platforms, gratings, stairs, ladders, railings and accessories from the valve chamber.

2. Scaffold stair from the valve chamber access shaft.

3. Vandalism protective mesh from the upstream outlet structure windows for reinstallation by Contractor.

4. Security bars from outlet structure windows for reinstallation by Contractor.

5. Control room door and frame for reinstallation by Contractor.

END OF SECTION 024116

ADDENDUM 04 CE

SECTION 028304 - HANDLING OF LEAD CONTAINING MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies the requirements for the detection and prevention of lead dust, paint chips, or debris contamination of lead dust control work areas and areas adjacent to them, protection of workers, post-work cleaning, predisposal testing and appropriate disposal of removed material, as well as preparation and encapsulation of existing lead-based painted surfaces that do not otherwise require abatement. The results of the testing for lead-containing materials are listed in the appendix.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Existing Hazardous Material Information: Document 003126.

B. Summary of the Work: Section 011000.

C. Construction Facilities and Temporary Controls: Section 015000.

D. Removals Cutting and Patching: Section 017329.

E. Protection of Workers Lead-Based Paint: Section 028214

1.3 REFERENCES

A. New York State Department of Environmental Conservation (DEC) 6NYCRR:

1. Part 360 Solid Waste Management Facilities.
2. Part 364 Waste Transporter Permits.
3. Part 370 Hazardous Waste Management System-General.
4. Part 371 Identification and Listing of Hazardous Wastes.
5. Part 372 Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities.
6. Part 373 Hazardous Waste Management Facilities.

B. New York State Department of Transportation (DOT): Follow all regulations of 49CFR Part 100 through 199.

C. Occupational Safety and Health Administration (OSHA): Lead Exposure in Construction: Interim Final Rule 29 CFR 1926.62.

D. U.S. Department of Housing and Urban Development (HUD): Guidelines for evaluation and control of Lead based paint hazards: Title Ten of Housing and Community Act of 1992.

E. U.S. Environmental Protection Agency (EPA): Resource Conservation and Recovery Act (RCRA) Section 3004 Hazardous and Solid Waste Amendments.

F. U.S. Environmental Protection Agency (EPA): Toxicity Characteristics Leaching Procedure EPA Method 1311.

G. U.S. Environmental Protection Agency (EPA): Renovation, Repair, and Painting (RRP) Rule.

H. ASTM International: ASTM E1795 Standard Specification for Non-Reinforced Liquid Coating Encapsulation Products for Leaded Paint in Buildings.

1.4 DEFINITIONS

A. Authorized Personnel: Facility or the Director's Representative, and all other personnel who are authorized officials of any regulating agency, be it State, Local, Federal or Private entity who possess legal authority for enforcement or inspection of the work.

B. Containment: The enclosure within the building which establishes a contaminated area and surrounds the location where lead remediation is taking place and establishes a Lead Control Work Area.

C. Floor Surface Clearance Criteria: Shall be determined and established by an independent testing lab hired by the Director's Representative, conforming to all standards set forth by all authorities having jurisdiction, mentioned in the references, and issue the certification of cleaning. At a minimum no single post work lead wipe sample test values shall have reading levels greater than the levels established by pre-work wipe sampling test values, or greater than 10 micrograms of lead per square foot. Record levels in micrograms of lead per square foot.

D. Fixed Object: Mechanical equipment, electrical equipment, fire detection systems, alarms, and all other fixed equipment, furniture, fixtures or other items which cannot be removed from the work area.

E. HEPA: High Efficiency Particulate Absolute filtration efficiency of 99.97 percent down to 0.3 microns. Filtration provided on specialized vacuums and air filtration devices to trap particles.

F. Lead Based Paint (LBP): Paints or other surface coatings that contain lead equal to or greater than 1.0 milligrams per square centimeter or 0.5 percent of lead by weight.

G. Lead Dust Control Work Area: A cordoned off area with drop clothes or an enclosed area or structure with containment to prevent the spread of lead dust, paint chips, or debris from lead-containing paint disturbance operations.

H. PPE: Personal Protective Equipment.

1.5 ABBREVIATIONS

A. ASTM: American Society for Testing and Materials
1916 Race Street
Philadelphia, PA 19103

B. CFR: Code of Federal Regulations
Government Printing Office
Washington, DC 20402

C. DOT: Department of Transportation
Main Office, 50 Wolf Road
Albany, NY 12232

D. NIOSH: National Institute for Occupational Safety and Health
Building J, N.E. Room 3007
Atlanta, Georgia 30333

E. OSHA: Occupational Safety and Health Administration
200 Constitution Avenue
Washington, DC 20210

F. USEPA: United States Environmental Protection Agency
401 M Street SW
Washington, DC 20460

1.6 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided individually in the order in which they are specified and tabbed.

D. Quality Control Submittals: Submit the entire Lead Abatement submittal package at the same time.

1. Worker' Qualifications: The persons removing lead containing/coated material and their Supervisors shall be personally experienced in this type of work and shall have been employed by a company with a minimum of one year experience in this type of work. Submit a copy of documentation of completion of the EPA lead renovators training program.

a. Name of lead supervisor on site during the work.

2. Detailed Work Plan: Submit one copy of the work plan required under Quality Assurance Article.
3. Waste Transporter Permit: One copy of transporter's current NYS DEC waste transporter permit.

E. Operation and Maintenance Data: Submit air filtration unit operation and maintenance data and manufacturer's catalog sheets for the HEPA filter.

1. Provide an affidavit stating that the HEPA filters to be used for this project are new and unused.

F. Contract Closeout Submittals:

1. Assessment Report compiled by a testing lab certifying that the work area has lead concentrations below the levels specified under the cleaning criteria.
2. Disposal Site Receipts: Copy of waste shipment record and disposal site receipt showing that the lead-containing materials have been properly disposed.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the referenced standards.

B. Pre-Work Conference: Before the Work of this Section is scheduled to commence, a conference will be held by the Director's Representative at the Site with the contractor and the subcontractor (if any) for the purpose of reviewing the Contract Documents, discussing requirements for the Work, and reviewing the Work procedures.

C. Detailed Lead-Containing Material Removal Work Plan: Before the physical Work begins, prepare a detailed lead-containing material removal work plan.

1. The work plan shall include, but not be limited to, the location, size, and details of lead dust control work areas, containment, sequencing of lead containing material handling, work procedures, types of equipment, crew size, and emergency procedures for fire and medical emergencies.

1.8 PROJECT CONDITIONS

A. Shut-down of Air Handling System: Complete the Work of this Section within the time limitation allowed for shutdown of the air handling system serving the work area.

1. The air handling system will not be restarted until approval of the post-work dust-wipe testing following the last cleaning.

B. Cover and seal all fin-tube radiator covers, diffusers, duplex outlets, speakers, smoke and heat detectors, etc. Use temporary plasticized partitions as required.

1. Prevent lead containing dust from entering hard to clean areas within the dust containment area.
2. Items judged to be too difficult to protect may be disconnected, removed and replaced at contractor's option.

C. Remove or encase all movable equipment in the work area with two layers of six mil fire retardant polyethylene sheeting.

D. Cut and alter existing materials as required to perform the work. Limit cutting to the smallest amount necessary. Core drill round holes and saw cut other openings where possible for removal work. Flame cutting, high speed grinding or welding is prohibited on lead painted surfaces.

1.9 HEALTH AND SAFETY

A. Where in the performance of the work, workers, supervisory personnel or sub-contractors may encounter, disturb, or otherwise function in the immediate vicinity of contaminated items and materials, all personnel shall take appropriate continuous measures as necessary to protect all ancillary building occupants from the potential lead exposure.

1. Such measures shall include the procedures and methods described herein and shall be in compliance with all applicable regulations of Federal, State and Local agencies.

1.10 FIRE PROTECTION, EMERGENCY EGRESS AND SECURITY

A. Establish emergency and fire exits from the lead dust control work area containment. Provide first aid kits and two full sets of protective clothing and respirators for use by qualified emergency personnel outside of the work area.

B. Provide a logbook throughout the entire term of the project. All persons who enter the regulated lead dust control work area or containment shall sign the logbook. Document any intrusion or incident in the log book.

1.11 PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

A. Workers must wear protective suits, protective gloves, eye protection and a minimum of half-face respirator with new HEPA filter cartridge for all projects. Respiratory protection shall be in accordance with OSHA regulation 1910.134 and ANSI Z88.2.

B. Workers must be trained per EPA, have medical clearance and must have recently received pulmonary function test (PFT) and respirator fit tested by a trained professional.

1. A personal air sampling program shall be in place as required by OSHA.
2. The use of respirators must also follow a complete respiratory protection program as specified by OSHA.

PART 2 - PRODUCTS

2.1 RESPIRATORS

A. Type: Approved by the Mine Safety and Health Administration (MSHA), Department of Labor, or the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

2.2 VACUUM CLEANERS

A. Type: Vacuums equipped with new HEPA filters.

2.3 PLASTIC SHEETS

A. Type: Minimum 6 mil., clear, fire retardant polyethylene sheets.

B. Floor Protective Layer: Minimum 10 mil., reinforced polyethylene sheets.

2.4 DISPOSAL BAGS

A. Type: Minimum 6 mil thick, clear polyethylene bags with preprinted Caution Label. Properly containerize/drum prior to disposal.

2.5 EQUIPMENT

A. Temporary lighting, heating, hot water heating units, ground fault interrupters, and all other equipment on site shall be UL listed and shall be safe, proper, and sufficient for the purpose intended.

B. All electrical equipment shall be in compliance with the National Electric Code, Article 305 - Temporary Wiring.

2.6 ENCAPSULATION

A. Encapsulation shall:

1. Comply with ASTM E1795.
2. Be specifically manufactured and labeled for lead-based paint encapsulation.
3. Be suitable for the substrate to which it is applied.
4. Be applied at the manufacturer's recommended dry film thickness.
5. Be of the color selected by the Director's Representative.
6. Have a 10-year warranty for the application.

B. Acceptable manufacturers:

1. Fiberlock Technologies.
2. Benjamin Moore Insl-X Lead Block.
3. Sherwin Williams Loxon Lead Encapsulant.
4. Director's Representative's approved equivalent.

PART 3 - EXECUTION

3.1 PRE-WORK WIPE TESTING

A. Testing: The Director's Representative will employ the services of an independent testing laboratory to perform the pre-work testing within the lead dust control work area and the areas adjacent to the lead dust control work area.

1. The testing lab will be New York State Department of Health, Environmental Laboratory Accreditation Program (NYS ELAP).

3.2 EMPLOYEE PROTECTION

A. Comply with all applicable Occupational Safety and Health Administration (OSHA) Requirements.

3.3 LEAD-CONTAINING/COATED MATERIAL HANDLING AND DISPOSAL

A. Handle and dispose of lead-containing materials in accordance with OSHA 1926.62 and the approved lead-containing material work plan. Use procedures and equipment required to limit occupational and environmental exposure to lead when material containing or coated with lead containing paint is handled and disposed of in accordance with referenced standards.

3.4 POST-WORK WIPE TESTING

A. Testing: The Director will employ the services of an independent testing laboratory to perform the post-work testing within the lead dust control work area and the areas adjacent to the lead dust control work area.

1. The testing lab will be New York State Department of Health, Environmental Laboratory Accreditation Program (NYS ELAP).

3.5 MULTIPLE WORK LOCATIONS

A. The first work location encountered shall be utilized to develop a method for an acceptable baseline approach for the lead dust control area, pre work wipe samples, employee protection, work method, post work wipe samples, cleaning criteria and disposal.

1. Once an acceptable method is developed and verified by the independent testing lab employed by the Director, subsequent testing shall not be required.
2. Do not change the methodology of the verified work plan during the course of the entire project.

3.6 CLEANING CRITERIA

A. Cleaning criteria is separated into two categories; areas within the lead dust control work area, and areas adjacent to the lead dust control work area:

1. Surfaces within the Lead Dust Control Work Area: In each area where the lead containing/coated materials have been disturbed, compare the post work wipe sample values with the pre work wipe sample values. If any of the sample values exceed the pre work values, clean again and schedule retesting until the lead levels are equal to or less than the pre work values or less than the HUD guidelines listed below. Any other

surfaces inside the lead dust control work area that are not listed below shall be cleaned to the pre work values:

a. Floors: 10 micrograms of lead per square foot.
b. Window Sills: 100 micrograms of lead per square foot.
c. Window Troughs: 400 micrograms of lead per square foot.
d. Soil: 400 ppm in play areas and 1,200 ppm in bare soil in the remainder of the yard.

2. Areas Adjacent to the Lead Dust Control Work Area: In each area where the work has been performed, compare the post work wipe sample values with the pre work wipe sample values. If any of the sample values exceed the pre work values, the area has been contaminated by the work and cleaning is mandatory.

a. Clean all affected surfaces and schedule retesting. If results still exceed pre work wipe sample values, clean again and schedule retesting until the following criteria is met or until the lead dust values are equal to or lower than the pre-work wipe sample values. Any affected surfaces that are not listed below shall be cleaned to pre-work levels.

1) Floors: 10 micrograms of lead per square foot.
2) Window Sills: 100 micrograms of lead per square foot.
3) Window Troughs: 400 micrograms of lead per square foot.
4) Soil: 400 ppm in play areas and 1,200 ppm in bare soil in the remainder of the yard.

3.7 CERTIFICATION OF CLEANING

A. Schedule visual inspection and dust wipe testing with the Director's Representative at the site, when work area is ready for clearance testing.

B. Director's Representative will employ the services of an independent testing lab to perform clearance testing.

1. Prior to removal of any isolation barrier, the Director's Representative will obtain a written affidavit and a final assessment report from the lab stating that the tests conform to all standards set forth by all authorities having jurisdiction, mentioned in the references.
2. Schedule a walk-through inspection with the Director's Representative and obtain his written approval.

C. The Director's Representative shall have final determination of an acceptable clearance level.

3.8 PRE-DISPOSAL TESTING

A. Prior to disposal, the Director's Representative will employ the services of an independent testing lab to perform clearance testing of the removed materials for toxicity in accordance with EPA Method 1311, Toxicity Characteristic Leaching Procedure (TCLP).

1. Test results indicating a value greater than 5 ppm lead or 5mg/L classifies the removed material as Hazardous Waste.

3.9 DISPOSAL OF LEAD-CONTAINING/COATED MATERIAL AND RELATED DEBRIS

A. Transport and dispose of lead-containing material classified as Hazardous Waste in accordance with the standards referenced in Part 1 of this Section.

B. Transport and dispose of lead-containing material classified as Non- Hazardous Waste in accordance with the standards referenced in Part 1 of this Section.

3.10 RESTORATION

A. Remove temporary decontamination facilities and restore area designated for these facilities to its original condition or better.

B. Where existing construction is damaged or contaminated during the course of performing this project, restore area to its condition or better.

3.11 ENCAPSULATION

A. Surface Preparation:

1. Remove loose, flaking, blistered, or deteriorated paint.
2. Repair substrate defects.
3. Clean surfaces of dust, dirt, oil, and contaminants.
4. Use dust-control methods compliant with lead-safe work practices.

B. Application:

1. Apply encapsulant strictly in accordance with manufacturer's instructions.
2. Achieve minimum film thickness required for warranty and ASTM compliance.
3. Apply additional coats as necessary.
4. Do not apply when temperature or humidity exceed manufacturer limits.

C. Inspection and Acceptance:

1. Verify complete coverage.
2. Repair holidays, voids, scratches, and damaged areas.
3. Provide manufacturer's warranty documentation.
4. Maintain encapsulated surfaces undisturbed until final acceptance.

END OF SECTION 028304

ADDENDUM 04 CE

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Form-facing material for cast-in-place concrete.
   2. Shoring, bracing, and anchoring.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Concrete Reinforcing: Section 032000.

B. Cast-In-Place Concrete: Section 033000.

1.3 REFERENCES

A. Except as shown or specified otherwise, the Work of this Section shall conform to the requirements of Specifications for Structural Concrete for Buildings ACI 301-16 of the American Concrete Institute.

1.4 DEFINITIONS

A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review the following:
      a. Special inspection and testing and inspecting agency procedures for field quality control.
      b. Construction, movement, contraction, and isolation joints
      c. Forms and form-removal limitations.
      d. Shoring and reshoring procedures.
      e. Anchor rod and anchorage device installation tolerances.

1.6 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: Manufacturer's catalog sheets, specifications, and installation/application instructions for each of the following:
   1. Form systems and ties.
   2. Waterstops: Brand and manufacturer's name, and installation instructions.
   3. Form-release agent.

E. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer, registered in New York State, responsible for their preparation, detailing fabrication, assembly, and support of formwork.
   1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
   2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
      a. Location of construction joints is subject to approval of the Director's Representative.
   3. Indicate location of waterstops.
   4. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.

F. Design Calculations: Design calculations signed and sealed by a professional engineer licensed to practice in New York State.

G. Samples:
   1. Provide a mock-up for typical waterstop placements for each waterstop type and for typical waterstop joints.
      a. Do not commence waterstop placement work until mock-up is approved by Director's Representative.
      b. Accepted mock-ups shall be comparison standard for remaining work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
   1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
   2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:
   1. Provide continuous, true, and smooth concrete surfaces.
   2. Furnish in largest practicable sizes to minimize number of joints.
   3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:
      a. Plywood, metal, or other approved panel materials.
      b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
         1) APA HDO (high-density overlay).
         2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
         3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
         4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.

2.3 WATERSTOPS

A. PVC Waterstops:
   1. Sike Style 679, Flat Ribbed Waterstop or equal
   2. Sike Style 581 or 609, Retrofit Waterstop or equal
   3. Sika Style 705, Ribbed Centerbulb Waterstop or equal

B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Mineral Technologies
      b. Henry Company.
      c. JP Specialties, Inc.
      d. Sika Corporation.
      e. Approved Equivalent.

2.4 RELATED MATERIALS

A. Chamfer Strips: Wood, metal, PVC, or rubber; 1 inch chamfer, unless otherwise indicated on the Drawings.

B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

C. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.

PART 3 - EXECUTION

3.1 PREPARATION OF FORM SURFACES

A. Apply form-coating material in accordance with manufacturer’s instructions.

3.2 INSTALLATION OF FORMWORK

A. Comply with ACI 301.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.

C. Limit concrete surface irregularities as follows:
   1. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.

D. Construct forms tight enough to prevent loss of concrete mortar.
   1. Minimize joints.
   2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
   1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
   2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   3. Install accessories for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
   1. Provide and secure units to support screed strips
   2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
   1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
   2. Locate temporary openings in forms at inconspicuous locations.

I. Provide chamfer on all exposed external corners of concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

K. Form openings, keyways, blocking, screeds, and bulkheads required in the Work.
   1. Determine sizes and locations from trades providing such items.
   2. Obtain written approval of Director's Representative prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:
   1. Construct joints true to line with faces perpendicular to surface plane of concrete.
   2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Director's Representative.
   3. Place joints perpendicular to main reinforcement.
   4. Locate joints where indicated on the drawings.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
   1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
   2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.3 INSTALLATION OF WATERSTOPS

A. Flexible Waterstops: Install waterstops in accordance with manufacturer's printed instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.

1. Install in longest lengths practicable.
2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
3. Protect exposed waterstops during progress of the Work.

3.4 REMOVING AND REUSING FORMS

A. Formwork for parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
   1. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. ACI 301, Section 2.3.2 - Removal of Forms:
   1. Change paragraph 2.3.2.5 to read as follows:
      2.3.2.5 Forms and shoring used to support the weight of concrete in beams, slabs and other structural members shall be removed in accordance with recommendations in paragraph 3.2.5 of "Recommended Practice for Concrete Formwork" (ACI 347-14).
   2. Add the following paragraphs:
      2.3.2.8 All formwork shall be removed after the concrete has sufficiently hardened, except in inaccessible spaces where approved.
   3. Change paragraph 2.3.2.7 to read as follows:
      2.3.2.7 After the ends or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than 1 inch from the formed surfaces of concrete.

C. Clean and repair surfaces of forms to be reused in the Work.
   1. Split, frayed, delaminated, or otherwise damaged form-facing material shall not be used.
   2. Apply new form-release agent.

3.5 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

B. Concrete members subject to additional loads during construction shall be shored in such a manner as will protect the member from damage by the loads.

C. Place shores supporting successive stories directly over those below or so design the shores to transmit the load directly to them.

D. Do not remove shores until the member supported has acquired sufficient strength to safely support its weight and any weight imposed thereon.

E. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Director's Representative will engage a special inspector and a qualified testing agency to perform tests and inspections in accordance with the requirements of BDC 406 Summary of Special Inspections and BDC 406.1 Statement of Special Inspections and as directed by the Code Compliance Manager.

END OF SECTION 031000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M 182 – Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats

B. American Concrete Institute (ACI):

1. ACI 117 – Specification for Tolerances for Concrete Construction and Materials
2. ACI 301 – Specifications for Structural Concrete
3. ACI 302.1R – Guide to Concrete Floor and Slab Construction
4. ACI 305.1 – Specification for Hot Weather Concreting
5. ACI 306.1 – Standard Specification for Cold Weather Concreting
6. ACI 308.1 – External Curing of Cast-in-Place Concrete—Specification
7. ACI 318-19 – Building Code Requirements for Structural Concrete.
8. ACI CPP 610.1 – Certification Policies for Concrete Field Testing Technician - Grade I

C. ASTM International (ASTM):

1. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field
2. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
3. ASTM C42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
4. ASTM C94 – Standard Specification for Ready-Mix Concrete
5. ASTM C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens)
6. ASTM C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete
7. ASTM C595 – Standard Specification for Blended Hydraulic Cements
8. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete
9. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete
10. ASTM C219 – Standard Terminology Relating to Hydraulic and Other Inorganic Cements
11. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
12. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete
13. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete
14. ASTM C567 – Standard Test Method for Determining Density of Structural Lightweight Concrete
15. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
16. ASTM C928 – Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs
17. ASTM C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete (Withdrawn 2022)
18. ASTM C1064 – Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
19. ASTM C1077 – Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
20. ASTM C1293 – Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
21. ASTM C1567 – Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
22. ASTM C1602 – Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
23. ASTM C1778 – Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete
24. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
25. ASTM E1155 – Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers

D. American National Standards Institute / American Institute of Steel Construction (ANSI/AISC)

1. ANSI/AISC 303 – Code of Standard Practice for Structural Steel Buildings and Bridges

E. ICC Evaluation Service (ICC-ES):

1. ICC-ES AC198 – Chemical Admixtures Used in Concrete

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete Subcontractor.

2. Review the following:

   a. Special inspection and testing and inspecting agency procedures for field quality control.
   b. Construction joints, control joints, isolation joints, and joint-filler strips.
   c. Anchor rod and anchorage device installation tolerances.
   d. Cold and hot weather concreting procedures.
   e. Concrete finishes and finishing.
   f. Curing procedures.
   g. Forms and form-removal limitations.
   h. Shoring and reshoring procedures.
   i. Concrete repair procedures.
   j. Concrete protection.
   k. Initial curing and field curing of field test cylinders (ASTM C31)
   l. Protection of field cured field test cylinders.

1.5 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. General: Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

E. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.

5. Silica fume.
6. Performance-based hydraulic cement
7. Aggregates.
8. Admixtures:

    a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

9. Curing materials.

10. Joint fillers.
11. Repair materials.
12. Sealer for exposed demolished surfaces
13. Abrasive nosings for concrete stairs.

F. Submit an Environmental Product Declaration (EPD) from the manufacturer for each concrete mix within this specification section, if available. A statement of the contractor's good faith effort to obtain the EPD shall be provided if not available.

1. Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services*.

G. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Slump limit.
6. Air content.
7. Nominal maximum aggregate size.
8. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.

9. Intended placement method.
10. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

H. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

    a. Location of construction joints is subject to approval of the Director's Representative.

I. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

J. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

K. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Adhesives.
5. Joint-filler strips.
6. Repair materials.
7. Sealer for exposed demolished surfaces
8. Abrasive nosings for concrete stairs.

L. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Aggregates.
5. Admixtures.

M. Research Reports:

1. For concrete admixtures in accordance with ICC-ES AC198.

N. Preconstruction Test Reports: For each mix design.

O. Field quality-control reports.

P. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94 requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

C. Field Quality Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:

a. Admixture dosage rates.
b. Slump.
c. Air content.
d. Seven-day compressive strength.
e. 28-day compressive strength.
f. Permeability.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94 and ACI 301.

1.9 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C595, Type 1L, gray.

    a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
    b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
    c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.

2. Fly Ash: ASTM C618, Class F.
3. Maximum Coarse-Aggregate Size: 1 inch nominal, unless a smaller maximum size is required based on placement thickness or congestion.
4. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

1. Retarding Admixture: ASTM C494, Type B.
2. Water-Reducing and -Retarding Admixture: ASTM C494, Type D.
3. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
4. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494, Type G.
5. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

F. Water and Water Used to Make Ice: ASTM C94, potable.

2.3 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

a. Ambient Temperature Below 50 deg F: Black.
b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
c. Ambient Temperature Above 85 deg F: White.

C. Water: Potable or complying with ASTM C1602.

2.4 SEALER FOR EXPOSED DEMOLISHED SURFACES

1. Polymer modified repair mortar rated for vertical and overhead repair meeting requirements of ASTM C928 R2.
2. Compressive Strength:

a. 2000 psi at 3 hours
b. 4000 psi at 24 hours
c. 6000 psi at 28 days

2.5 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
2. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.

2.6 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used at the bridge abutment plus 30-feet at each side, and exterior horizontal surfaces of the outlet structure.

1. Exposure Class: ACI 318 F2, W2, C2.
2. Minimum Compressive Strength: 5000 psi at 28 days.
3. Maximum w/cm: 0.40.
4. Air Content:

a. Exposure Classes F2: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch or 1-inch nominal maximum aggregate size.

5. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

B. Class B: Normal-weight concrete used in all other areas than Class A concrete.

1. Exposure Class: ACI 318 F2.
2. Minimum Compressive Strength: 4500 psi at 28 days.
3. Maximum w/cm: 0.45.
4. Air Content:

a. Exposure Classes F2: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch or 1-inch nominal maximum aggregate size.

5. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94, and furnish batch ticket information.

2.8 ABRASIVE NOSINGS

A. Cast-Metal Units: Cast iron, with an integral abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Safety Tread Co., Inc.
b. Balco; a CSW Industrials Company.
c. Safe-T-Metal Company, Inc.
d. Approved equivalent.

2. Configuration: Cross-hatched units 4 inches wide without lip.
3.

2.9 GLOBAL WARMING POTENTIAL LIMITS

A. The Global Warming Potential (GWP) of standard ready-mix concrete mixes shall meet the maximum limits outlined in in the table below. GWP of each mix will be verified through the submission of an EPD.

Maximum Global Warming Potential (GWP) Limits

for Low Embodied Carbon Concrete

Specified compressive strength (f'c in PSI)	NYS Buy Clean Concrete GWP Limits (in kilograms of carbon dioxide equivalent per cubic yard - $kgCO_2e/y^3$)	NYS Buy Clean Concrete GWP Limits (in kilograms of carbon dioxide equivalent per cubic meter - $kgCO_2e/m^3$)
0 - 2500	275	360
2501 - 3000	302	395
3001 - 4000	360	471
4001 - 5000	434	568
5001 - 6000	458	599
6001 - 8000	541	707
8000+	N/A	N/A

B. The maximum GWP limits are not applicable to quick cure concrete, concrete designed to cure to its design strength quicker than the standard 28 days.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

B. SURFACE PREPARATION

1. Remove standing water, mud, and debris from foundation surfaces to be covered by concrete.
2. Prepare rock surfaces free from oil, objectionable coatings, and loose, semidetached, and unsound fragments. Immediately before placement of concrete, wash rock surfaces with an air-water jet and dry to a uniform surface-dry condition.
3. Prepare earth foundations free from frost or ice.
4. Thoroughly moisten surfaces of absorptive foundations to be covered with concrete so that moisture will not be drawn from fresh concrete. Keep subgrade moisture uniform without puddles or dry areas.
5. Clean, roughen, and surface dry surfaces to be covered with fresh concrete.

    a. Remove laitance, loose or defective concrete, coatings, sand, curing compound, and other foreign material.
    b. Sandblast, steel shotblast, or high-pressure water jet surfaces, or use other method approved by Director’s Representative.
    c. Wash surface thoroughly, and surface dry immediately before placement of adjoining concrete.

3.3 INSTALLATION OF EMBEDDED ITEMS

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 JOINTS

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Director's Representative.
2. Place joints perpendicular to main reinforcement.

    a. Continue reinforcement across construction joints unless otherwise indicated.
    b. Do not continue reinforcement through sides of strip placements of floors and slabs.

3. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

5. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.

6. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

B. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3. Install dowel bars and support assemblies at joints where indicated on Drawings.
4. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items, is complete and that required inspections are completed.

B. Notify Director's Representative and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Conform to the discharge limitations and requirements of ASTM C94 in the operation of truck mixers and agitators.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Do not allow discharged concrete to freefall more than 4 feet.
5. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

    a. Do not use vibrators to transport concrete inside forms.
    b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
    c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

G. Pumping Concrete

1. When pumping concrete, the lubrication materials within the delivery line shall not be discharged into the forms.
2. The inside diameter of the delivery lines shall be the greater of 5 inches or 3 times the maximum size of the coarse aggregate.

3.6 FINISHING FORMED SURFACES

A. Provide as-cast formed finishes according to ACI 301. Surface Finish SF-3.0 shall be used for all formed spillway surfaces. Surface Finish SF-2.0 shall be used for all other formed surfaces.

1. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

    a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
    b. Remove projections larger than 1/4 inch.
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 Class B.

2. ACI 301 Surface Finish SF-3.0:

    a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
    b. Remove projections larger than 1/8 inch.
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 Class A.

    e. Perform no later than one day after form removal.
    f. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
    g. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.
    h. Maintain required patterns or variances as shown on Drawings or to match mockups.

3.7 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.

C. Trowel Finish: Used at interior surfaces.

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.

5. Finish surfaces to the following tolerances as follows:

    a. True planar surfaces within ¼ inch in 10 feet, as determined by a 10-foot straightedge placed anywhere on the slab in any direction.
    b. No abrupt offsets to contiguous surfaces.

D. Trowel and Fine-Broom Finish: Use at walking surfaces, except for spillway walking surface.

1. Apply a first trowel finish to surfaces indicated on Drawings. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.
2. Coordinate required final finish with Director's Representative before application.
3. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

4. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
5. Coordinate required final finish with Director's Representative before application.

3.8 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 8 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.

    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.
    c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.9 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. If forms remain during curing period, moist cure after loosening forms.
3. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
    d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
    e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

        1) Recoat areas subject to heavy rainfall within three hours after initial application.
        2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:

    a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

        1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

            a) Lap edges and ends of absorptive cover not less than 12-inches.
            b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

        2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

            a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
            b) Cure for not less than seven days.

        3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

            a) Water.

b) Continuous water-fog spray.

4) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
5) Recoat areas subjected to heavy rainfall within three hours after initial application.
6) Maintain continuity of coating, and repair damage during curing period.

7) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
8) Recoat areas subjected to heavy rainfall within three hours after initial application.
9) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.10 TOLERANCES

A. Conform to ACI 117.

3.11 APPLICATION OF LIQUID FLOOR TREATMENTS (Not Used)

3.12 CONCRETE SURFACE REPAIRS

1. Repair and patch defective areas when approved by Director’s Representative.
2. Remove and replace concrete that cannot be repaired and patched to Director’s Representative's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

   a. Limit cut depth to 3/4 inch.
   b. Make edges of cuts perpendicular to concrete surface.
   c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
   d. Fill and compact with patching mortar before bonding agent has dried.
   e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

   a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
   b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Director's Representative.

C. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

    a. Correct low and high areas.
    b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.

    a. Finish repaired areas to blend into adjacent concrete.

5. Correct other low areas scheduled to remain exposed with repair topping.

    a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
    b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

    a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
    b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
    c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
    d. Place, compact, and finish to blend with adjacent finished concrete.
    e. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

    a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
    b. Dampen cleaned concrete surfaces and apply bonding agent.
    c. Place patching mortar before bonding agent has dried.
    d. Compact patching mortar and finish to match adjacent concrete.
    e. Keep patched area continuously moist for at least 72 hours.

D. Perform structural repairs of concrete, subject to Director’s Representative's approval, using epoxy adhesive and patching mortar.

E. Repair materials and installation not specified above may be used, subject to Director’s Representative's approval.

3.13 SEAL EXPOSED DEMOLISTION SURFACES

A. All exposed demolished surfaces shall receive ½ inch minimum polymer modified repair mortar.

B. Follow manufacturer’s recommendations for installation, mixing, application, and curing of the product.

3.14 FIELD QUALITY CONTROL

A. Special Inspections: Director’s Representative will engage a special inspector and a qualified testing agency to perform tests and inspections in accordance with the requirements of BDC 406 Summary of Special Inspections and BDC 406.1 Statement of Special Inspections and as directed by the Code Compliance Manager.

B. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172 shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

    a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143:

    a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    b. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231 pressure method, for normal-weight concrete.

    a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C1064:

    a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

5. Unit Weight: ASTM C567 fresh unit weight of structural lightweight concrete.

a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

6. Compression Test Specimens: ASTM C31:

a. Cast and laboratory cure a minimum of three sets of two 6-inch by 12-inch cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C39.

a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days. Test one set of two specimens at 56 days if 28 strength is not satisfactory. Additional tests may be conducted at Contractor's convenience.

8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Director's Representative but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests:

a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Director's Representative.
b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Director's Representative.

1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.

11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.15 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.

7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

ADDENDUM 04 CE

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Metal ladders.
4. Miscellaneous steel trim.
5. Loose bearing and leveling plates for applications where they are not specified in other Sections.
6. Horizontal cable lifeline system.

B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, to be cast into concrete .

2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 051200 "Structural Steel Framing" for steel framing, supports, and other steel items attached to the structural-steel framing.

1.2 COORDINATION

A. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For the following:

1. Manufactured metal ladders and accessories.
2. Horizontal cable lifeline system.

E. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Metal ladders.
4. Miscellaneous steel trim.
5. Horizontal cable lifeline system.

F. Delegated-Design Submittal: For ladders and Horizontal cable lifeline system, including analysis and design data signed and sealed by the qualified professional engineer in New York State responsible for their preparation.

G. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed and registered in New York State.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1, "Structural Welding Code - Steel."
2. AWS D1.2, "Structural Welding Code - Aluminum."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."
4. For metals other than the ones listed above provide relevant welding qualifications and 5 years minimum relevant experience.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design, Ladders: Engage a qualified professional engineer, licensed and registered in New York State, to design ladders. Ladder design shall include design of a rigid track fall arrest system complying with OSHA 1910.23, 1910.28, 1910.29, and NYS Building Code.

B. Delegated Design, Horizontal Cable Lifeline System: Engage a qualified professional engineer, licensed and registered in New York State, to design horizontal cable lifeline system. Horizontal cable lifeline system shall comply with OSHA 1910.140.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
1. Stainless Steel, General: Provide Type 316L for all exterior applications and where indicated.

B. Structural Steel Plates, Shapes, and Bars: ASTM A36.

C. Wide Flange Structural Steel Shapes: ASTM A992 , Grade 50.

D. Stainless Steel Sheet, Strip, and Plate: ASTM A240 or ASTM A666, Type 304.

E. Stainless Steel Bars and Shapes: ASTM A276, Type 304.

F. Stainless Steel Tubing: ASTM A554, Type 304.

G. Rolled-Steel Floor Plate: ASTM A786, rolled from plate complying with ASTM A36 or ASTM A283, Grade C or D.

H. Rolled-Stainless Steel Floor Plate: ASTM A793.

I. Structural Steel Pipe: ASTM A53, Standard Weight (Schedule 40) unless otherwise indicated.

J. Cast Iron: Either gray iron, ASTM A48, or ductile iron, ASTM A536, unless otherwise indicated.

K. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.

L. Aluminum Extrusions: ASTM B221, Alloy 6063-O.

M. Aluminum-Alloy Rolled Tread Plate: ASTM B632, Alloy 6061-T6.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless steel fasteners for fastening stainless steel.
2. Provide bronze fasteners for fastening bronze.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Grade A325 or A440 as noted, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F1554, Grade 36 or as noted, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded, deformed, or headed type unless otherwise indicated; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components hot-dip galvanized to comply with ASTM A153, unless otherwise indicated.

2. Material for Exterior Locations: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.4 MISCELLANEOUS MATERIALS

A. Steel Primer:

1. Comply with Section 099123 "Interior Painting."

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

D. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete."

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Galvanize miscellaneous framing and supports where indicated.

2.7 METAL LADDERS

A. General:

1. Comply with ANSI A14.3.

B. Steel Ladders:

1. Space siderails 18 inches apart unless otherwise indicated.
2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
3. Rungs: 3/4-inch- diameter, steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Harsco Industrial IKG, a division of Harsco Corporation.
        2) W.S. Molnar Company.
        3) Approved equivalent.

6. Source Limitations: Obtain nonslip surfaces from single source from single manufacturer.
7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
8. Galvanize ladders, including brackets.

2.8 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap or headed stud anchors, as indicated, for embedding in concrete construction.

C. Galvanize miscellaneous steel trim.

D. Prime miscellaneous steel trim with zinc-rich primer, if scheduled for finish coating.

2.9 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize exterior bearing and leveling plates.

C. Prime interior plates with zinc-rich primer.

2.10 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel anchors for embedding in concrete.

2.11 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.12 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
4. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.13 HORIZONTAL CABLE LIFELINE SYSTEM

A. Provide multi-span cable horizontal lifeline pass-through system meeting the performance requirements of this section. Provide system for use with up to 2 users at one time with a maximum capacity of up to 400 pounds per user. Provide all hardware for complete lifeline system including but not limit to: stanchions, stanchion bases, cable, O-rings.

B. Cable: Stainless Steel

C. Stanchions and bases: Stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.

2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installation of Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLATION OF BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLATION OF HORIZONTAL CABLE LIFELINE SYSTEM

A. In accordance with the approved shop drawings and manufacturer’s written instructions.

3.5 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION 055000

SECTION 055119 - METAL GRATING STAIRS AND PLATFORMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Industrial Class stairs with steel-grating treads.
2. Steel railings and guards attached to metal stairs.
3. Steel handrails attached to walls adjacent to metal stairs.
4. Industrial Class steel grating platforms.

1.3 COORDINATION

A. Coordinate installation of anchorages for metal stairs.

1. Deliver such items to Project site in time for installation.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For metal grating stairs and platforms, provide the following:

1. Framing, gratings, and foundations.
2. Grout.

E. Shop Drawings:

1. Include plans, elevations, sections, details, attachment to other work, and welding procedure specifications (WPS).
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.

4. Indicate locations of anchors, weld plates, and blocking for attachment of handrails.

F. Delegated-Design Submittal: For stairs, platforms, platform ladders, railings, guards, and support piers, including analysis data signed and sealed by the qualified professional engineer, licensed in the State of New York, responsible for their preparation.

G. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed and registered in the State of New York.

H. Welding certificates.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

C. If the value of the contract exceeds $100,000 all structural steel, reinforcing steel and other major steel items to be incorporated in the Work of this Contract shall be produced and made in whole or substantial part in the United States, its territories or possessions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.

1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.

a. Repair or replace damaged materials or structures as directed.

B. Store and handle galvanized steel members per the recommendations of the American Galvanized Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, licensed and registered to practice in the State of New York, to design stairs, platforms, platform ladders, railings, and guards, including attachment to building construction.

B. Structural Performance of Stairs: Metal stairs and platforms shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft..
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360.

C. Structural Performance of Railings and Guards: Railings and guards, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

   a. Uniform load of 50 lbf/ft. applied in any direction.
   b. Concentrated load of 200 lbf applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

   a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
   b. Infill load and other loads need not be assumed to act concurrently.

3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

   a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

D. Concrete foundation piers: Shall be sized and located to support the platforms.

1. Minimum depth 5 feet embedment below grade.
2. Minimum diameter 16 inches.
3. Allowable vertical bearing stress 5,000 pounds per square foot.
4. Allowable lateral capacity 1,000 pounds per foot of pier width.

2.2 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36.

C. Rolled-Steel Floor Plate: ASTM A786, rolled from plate complying with ASTM A36 or ASTM A283, Grade C or D.

D. Steel Bars for Grating Treads: ASTM A36 or steel strip, ASTM A1011 or ASTM A1018.

E. Steel Wire Rod for Grating Crossbars: ASTM A510.

F. Steel Pipe for Railings and Guards: ASTM A53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

G. Provide galvanized finish for interior and exterior installations unless otherwise indicated.

2.3 FASTENERS

A. General: Provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5 where built into exterior walls.

1. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

1. Structural Steel Connections: ASTM F3125, Grade A325 Type 1.

C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be galvanized.

D. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

2. Material for Exterior Locations: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.4 MISCELLANEOUS MATERIALS

A. Welding Electrodes: Comply with AWS requirements and welding procedure specification.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with ASTM A780 compatible with paints specified to be used over it.

C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for exterior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, railings, guards, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding or bolting unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs, railings, and guards in shop to greatest extent possible.

1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:

1. Comply with AWS requirements and approved welding procedure specifications.
2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
3. Obtain fusion without undercut or overlap.
4. Remove welding flux immediately.
5. Weld exposed corners and seams continuously unless otherwise indicated.
6. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter.

2.6 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Industrial Class, unless more stringent requirements are indicated.

B. Stair Framing:

1. Fabricate stringers of steel channels.

a. Stringer Size: As required to comply with "Performance Requirements" Article.
b. Provide closures for exposed ends of channel stringers.
c. Finish: Shop primed.

2. Construct platforms and tread supports of steel channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.

   a. Provide closures for exposed ends of channel framing.
   b. Finish: Shop primed.

3. Weld stringers to headers; weld framing members to stringers and headers.
4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Risers: Solid.

D. Toe Plates: Provide toe plates around openings and at edge of open-sided floors and platforms, and at open ends of treads.

1. Material and Finish: Steel plate to match finish of other steel items.

2.7 FABRICATION OF STAIR RAILINGS AND GUARDS

A. Comply with applicable requirements in Section 055213 "Pipe and Tube Railings."

2.8 FINISHES

A. Finish metal stairs after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.
1. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.

1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.

1. Include threaded fasteners for concrete inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

1. Grouted Baseplates: Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces.

a. Clean bottom surface of baseplates.
b. Set steel-stair baseplates on wedges, shims, or leveling nuts.
c. After stairs have been positioned and aligned, tighten anchor bolts.
d. Do not remove wedges or shims, but if protruding, cut off flush with edge of bearing plate before packing with grout.
e. Promptly pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

1) Neatly finish exposed surfaces; protect grout and allow to cure.
2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
3. Comply with requirements for welding in "Fabrication, General" Article.

3.3 INSTALLATION OF RAILINGS AND GUARDS

A. Comply with applicable requirements in Section 055213 “Pipe and Tube Railings.”

3.4 REPAIR

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION 055119

SECTION 263213.16 - PROPANE-ENGINE-DRIVEN GENERATOR SETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Engine.
2. Propane fuel system.
3. Control and monitoring.
4. Generator overcurrent and fault protection.
5. Generator, exciter, and voltage regulator.
6. Outdoor generator-set enclosure.
7. Propane connection pipe and valves.

1.3 DEFINITIONS

A. EPS: Emergency power supply.

B. EPSS: Emergency power supply system.

C. LP: Liquefied petroleum.

D. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 SUBMITTALS

A. Manufacturer’s installation instructions shall be provided along with product data.

B. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

C. Manufacturer warranty details/provisions, timeframes, and costs.

D. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Include thermal damage curve for generator.
3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in cubic feet per hour (cubic meters per hour) at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
6. Include air flow requirements for cooling and combustion air in cfm at 0.8 power factor, with air supply temperature of 95 deg F, 80 deg F, 70 deg F, and 50 deg F. Provide drawings showing requirements and limitations for location of air intake and exhausts.
7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.
8. Load analysis and calculations demonstrating the rating of generator capability.

E. Shop Drawings:

1. Include plans and elevations for engine generator, vaporizer, sound enclosure, and other components specified.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.
5. Provide wiring schematic for generator skid including control wiring of remote E-stop.

F. Qualification Data: For Installer and testing agency.

G. Seismic Qualification Data: Per ASCE/SEI 7-22 SDC B. Submit certificates, for engine generator, accessories, and components, from manufacturer.

H. Submittal Requirements.

1. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails, identify center of gravity and total weight, supplied enclosure**,** and each piece of equipment not integral to the engine generator, and locate and describe mounting and anchorage provisions.
2. Detailed description of equipment anchorage devices on which the certification is based on and their installation requirements.

I. Source Quality-Control Reports: Including, but not limited to, the following:

1. Certified summary of prototype-unit test report.
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
5. Report of exhaust emissions showing compliance with applicable regulations.

6. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

J. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For engine generators to include in emergency, operation, and maintenance manuals.

1. Include the following:

a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
b. Operating instructions laminated and mounted adjacent to generator location.
c. Training plan.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
4. Tools: Each tool listed by part number in operations and maintenance manual.
5. Bidder to provide recommended spares list and pricing for Owners review

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Generac Power Systems, Inc.
2. CAT Generators
3. Kohler
4. Owner approved equal

B. Design calculations were based on Generac modeling software. An alternate manufacturer must be able to provide load calculations showing that their generator is in fact equal. Calculations shall be sent in a submittal for engineering approval. Design thresholds are as follows: Refer to 2.3 Section N and O.

1. 80% Max Running Load

C. Source Limitations: Obtain packaged engine generators and auxiliary components through one source from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Engine generator housing, engine generator, batteries, battery racks, silencers, and sound attenuating equipment, accessories, and components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and IBC Class B.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event
2. Component Importance Factor: 1.5

B. B11 Compliance: Comply with B11.19.

C. NFPA & IEEE Compliance:

1. Comply with NFPA 37.
2. Comply with NFPA 70.
3. Comply with NFPA 110 requirements for Level 2 EPSS.
4. Comply with NFPA 58
5. Comply with IEEE 43
6. Comply with NEMA MG 1
7. Comply with IEEE 115

D. UL Compliance:

1. Comply with UL 2200
2. Comply with UL 1349

E. Engine Exhaust Emissions: Comply with EPA Tier 3 requirements and applicable state and local government requirements.

F. Noise Emission: Provide Level 1 sound attenuation (70-85dB) for maximum noise level at property boundaries due to sound emitted by engine generator including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

G. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: -20 to 140 deg F
2. Relative Humidity: Zero to 95 percent.
3. Altitude: Sea level to 1000 feet

H. Unusual Service Conditions: Engine generator equipment and installation are required to operate under the following conditions:

1. Below -20 deg F

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and use.

C. Power Rating: Standby, 80kW generator and 80 kVA alternator minimum

D. Overload Capacity: 110 percent of service load for 1 hour in 12 consecutive hours.

E. Power Factor: 0.8, lagging.

F. Frequency: 60 Hz.

G. Voltage: 240VAC

H. Phase: Three-phase, four wire, delta.

I. Induction Method: Naturally aspirated or Turbocharged

J. Governor: Adjustable isochronous, with speed sensing.

K. Dry electric vaporizer: Handles high-pressure transition from liquid to gas. Generator mounting frame should be sized to include the vaporizer.

L. Shore Power: 20A/1p circuit breaker feeding 20A, 120VAC duplex GFI receptacle on board generator control station. Power feed sourced from normal power.

M. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

N. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries, with capacity as required to operate as a unit as evidenced by records of prototype testing.
2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

O. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time:

    a. Comply with NFPA 110, Type 60 system requirements.
    b. 60 seconds.

P. Engine Generator Performance for Sensitive Loads:

1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.

a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.

2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
8. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.

    a. Provide permanent magnet excitation for power source to voltage regulator.

10. Start Time:

    a. Comply with NFPA 110, Type 60 system requirements.
    b. 60 seconds.

2.4 GAS ENGINE

A. Fuel: LVP from integral vaporizer

B. Rated Engine Speed: 1800 rpm.

C. Lubrication System: Engine or skid-mounted.

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499 and with NFPA 110 requirements for Level 1 equipment for heater capacity.

E. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

    a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and non-collapsible under vacuum.
    b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

F. Muffler/Silencer:

1. Semi-critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

    a. Minimum sound attenuation of 18 dB at 500 Hz.
    b. Sound level measured at a distance of 25 feet from exhaust discharge after installation is complete shall be **85**dBA or less.

G. Air-Intake Filter: Standard-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

H. Vaporizer heater: 240VAC rated, sized for 110% of engines full-load fuel consumption at -20F ambient. Include pre-heat timer in the generator startup logic.

I. Starting System: 24-V electric, with negative ground.

1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least three times without recharging.
4. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.

5. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
6. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 A minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 20 deg F to 140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 GAS FUEL SYSTEM

A. Gas Train: Comply with NFPA 37.

B. Engine Fuel System:

LP Liquid, Withdrawal System:

1. Skid mounted, industrial grade LP vaporizer, sized for 100% of generator full-load demand.
2. Secondary Gas Regulators: For LP Gas on low pressure side of vaporizer, with atmospheric vents piped to the exterior of enclosure.
    a. Vents must have rain and insect resistant screen and be pointed downwards
    b. Vents must also be located above the highest expected snow fall level for region.
    c. Independent piping of vents for units with multiple regulators.

3. Redundant Fuel-Shutoff Solenoid Valves: NRTL-listed, normally closed, safety shutoff valves, one located on the liquid inlet side and one on the vapor outlet side of vaporizer.

a. Activation of the Emergency Stop shall immediately de-energize and close **all** automated fuel shutoff valves, including the liquid inlet solenoid and the vapor discharge solenoid, effectively isolating the vaporizer skid from the fuel source and the engine

4. Fuel Filters: For LP Gas.
5. Manual Fuel Shutoff Valve: For LP Liquid on high pressure side of vaporizer
6. Piping and Interconnections:

a. High-Pressure Liquid Train: All piping from the skid boundary to the vaporizer inlet shall be stainless steel braided flexible hose listed for use with liquid propane, and a minimum pressure rating of 350psig.
b. Low-Pressure Vapor Train: Piping from the secondary regulator to the engine shall be flexible fuel lines that are UL-listed with a minimum working pressure rating of 125 psig. Flexible lines must be supported with cushioned P-clamps

7. LP liquid flow adjusting valve.
8. Fuel change gas pressure switch.
9. Hydrostatic relief valve installed between both fuel shutoff solenoid valves.

C. Propane Tank

1. Tank walls shall be carbon steel in compliance with propane industry standards. Tank shall be coated with two coats of paint that is rust, temperature and UV resistant, color white.
2. Tank shall have feet for placement on a concrete pad. Tank manufacturer shall supply appropriate anchor bolts and nuts.
3. Tank shall comply with same seismic requirements as the generator.
4. Tank supply line shall be bonded to generator enclosure.
5. Tank volume: 500 gallons or as specified on drawings.
6. Tank shall have a manual shut off valve at tank outlet

D. Propane Connection Piping and Valves

Section includes requirements for piping connecting the tank to the generator.

1. Pipe

a. Pipe diameter to be determined by Contractor based on fuel requirements of selected Generator.
b. Above ground piping from propane tank to generator skid shall be rigid, hard-piped schedule 80 carbon steel or approved equal in compliance with propane industry standards. Pipe to be tested to 50 psi over design pressure.
c. Below grade pipe must be corrosion resistant and rated for direct bury applications. Utilize factory coated steel with cathodic protection and field wrapping. Transition from above to below grade piping must be completed with UV resistant materials and be in compliance with propane industry standards.
d. Above grade pipe must be UV resistant and in compliance with propane industry standards for above grade outdoor installation.

2. Shutoff Valves

a. Shutoff valves shall be threaded brass, ball-type, and rated pipe design pressure and for outdoor installation.
b. Valves must be dielectrically isolated from dissimilar metal pipes such as black iron or galvanized steel, in accordance with propane industry standards.

3. Relief Valves

a. Relief valve shall be brass, rated for pipe design pressure, diameter and outdoor installation, and follow propane industry standards.
b. Relief valve pressure rating shall be determined by Contractor based on selected Generator requirements.
c. Valves must be dielectrically isolated from dissimilar metal pipes such as black iron or galvanized steel, in accordance with propane industry standards.

2.6 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. Manual starting can be initiated when mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates generator-set shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

B. Provide minimum run time control set for 15 minutes with override only by operation of a remote emergency-stop switch.

C. Comply with UL 508A.

D. Configuration:

1. Control and Monitoring Panel: Operating and safety indications, protective devices, basic system controls, engine gages, instrument transformers, generator disconnect switch or circuit breaker, and other indicated components shall be grouped in a combination control and power panel. Control and monitoring section of panel shall be isolated from power sections by steel barriers. Panel shall be powered from the engine generator battery. Panel features shall include the following:

a. Skid Mounted Cabinet Construction: Rigid, self-supporting steel unit complying with NEMA ICS 6.
b. Switchboard Construction: Power bus shall be copper. Bus, bus supports, control wiring, and temperature rise shall comply with UL 891.

2. Digital controller with integrated LCD, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
3. Analog controls with dedicated gages and indicator lights for the instruments and alarms indicated below.
4. Instruments: Located on the control and monitoring panel and viewable during operation.

a. Engine lubricating-oil pressure gage.
b. Engine-coolant temperature gage.
c. DC voltmeter (alternator battery charging).
d. Running-time meter.
e. AC voltmeter, connected to a phase selector switch.
f. AC ammeter, connected to a phase selector switch.
g. AC frequency meter.
h. Generator-voltage adjusting rheostat.
i. Slug switch on vaporizer discharge
j. Vaporizer temperature gage

5. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm indication, including the following:

a. Cranking control equipment.
b. Run-Off-Auto switch.
c. Control switch not in automatic position alarm.
d. Overcrank alarm.
e. Overcrank shutdown device.
f. Low water temperature alarm.
g. High engine temperature prealarm.
h. High engine temperature.
i. High engine temperature shutdown device.
j. Overspeed alarm.
k. Overspeed shutdown device.
l. Vaporizer temperature high/low
m. Vaporizer power failure
n. Low vapor temperature
o. Fuel inlet pressure high/low
p. Solenoid valve status mismatch
q. High liquid propane level
    1) If liquid is detected at the vaporizer discharge, the fuel solenoid valves will immediately close
r. Low fuel main tank.

    1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for the duration required for the indicated EPSS class.

s. Coolant low-level alarm.
t. Coolant low-level shutdown device.
u. Coolant high-temperature prealarm.
v. Coolant high-temperature alarm.
w. Coolant low-temperature alarm.
x. Coolant high-temperature shutdown device.
y. EPS supplying load indicator.
z. Battery high-voltage alarm.
aa. Low cranking voltage alarm.
bb. Battery-charger malfunction alarm.
cc. Battery low-voltage alarm.
dd. Lamp test.

ee. Contacts for local and remote common alarm.
ff. Low-starting air pressure alarm.
gg. Low-starting hydraulic pressure alarm.
hh. Remote manual stop shutdown device.
ii. Air shutdown damper alarm when used.
jj. Air shutdown damper shutdown device when used.
kk. Hours of operation.
ll. Engine generator metering, including voltage, current, Hz, kW, kVA, and power factor.
mm. Generator overcurrent protective device not closed alarm.

E. Connection to Datalink:

1. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication.
2. Provide connections for datalink transmission of indications to remote data terminals via Ethernet.

F. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
2. Coolant low-temperature alarm.
3. High engine temperature prealarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low fuel main tank alarm.
8. Low coolant level alarm.
9. Low cranking voltage alarm.
10. Contacts for local and remote common alarm.
11. Audible-alarm silencing switch.
12. Air shutdown damper when used.
13. Run-Off-Auto switch.
14. Control switch not in automatic position alarm.
15. Low cranking voltage alarm.
16. Generator overcurrent protective device not closed.
17. Propane tank level
18. Vapor discharge temperature
19. Vapor discharge pressure

G. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation. Operation of remote emergency stop shall immediately shut down generator, shunt trip the generator output breaker, de-energize redundant safety fuel shut off valves among other requirements of NFPA 110 and NFPA 37.

H. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.

B. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.

C. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

D. Generator Overcurrent Protective Device:

1. Molded-case circuit breaker, thermal-magnetic type; 100 percent rated; complying with UL 489:

    a. Tripping Characteristic: Designed specifically for generator protection.
    b. Trip Rating: Matched to generator output rating.
    c. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
    d. Mounting: Adjacent to or integrated with control and monitoring panel.

E. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms. Contacts shall be available for load shed functions.
2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

F. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.

1. Indicate ground fault with other engine generator alarm indications.
2. Trip generator protective device on ground fault.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide six or twelve lead alternator as found acceptable to the Director's Representative.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Enclosure: Drip proof.

G. Instrument Transformers: Mounted within generator enclosure.

H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified

1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
2. Maintain voltage within 30 percent on one step, full load.
3. Provide anti-hunt provision to stabilize voltage.
4. Maintain frequency within 10 percent and stabilize at rated frequency within 2 seconds.

I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

K. Subtransient Reactance: 12 percent, maximum.

2.9 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description:

1. Vandal-resistant, sound-attenuating, weatherproof steel housing, wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

    a. Sound Attenuation Level: 20dB.

2. Prefabricated or pre-engineered galvanized-steel-clad, integral structural-steel-framed, walk-in enclosure, erected on concrete foundation.

B. Structural Design and Anchorage: Comply with ASCE/SEI 7 for wind loads up to 100 mph.

C. Fire Protection: Provide smoke detector in enclosure; mounted according to NFPA 72.

D. Hinged Doors: With padlocking provisions.

E. Space Heater: Thermostatically controlled and sized to prevent condensation.

F. Lighting: Provide weather-resistant LED lighting with 50 fc average maintained.

G. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine generator components.

H. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.
3. Ventilation: Provide temperature-controlled exhaust fan interlocked to prevent operation when engine is running.

I. Interior Lights with Switch: Factory-wired, vapor-proof fixtures within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection.

1. AC lighting system and connection point for operation when remote source is available.
2. DC lighting system for operation when remote source and generator are both unavailable.

J. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

2.10 VIBRATION ISOLATION DEVICES

A. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Minimum Deflection: 1 inch

B. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.11 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.12 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with IEEE 115 and with NFPA 110, Level 2 Energy Converters.

B. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Test generator, exciter, and voltage regulator as a unit.
3. Full load run.
4. Maximum power.
5. Voltage regulation.
6. Transient and steady-state governing.
7. Single-step load pickup.
8. Safety shutdown.
9. Provide 14 days' advance notice of tests and opportunity for observation of tests by Director’s Representative.
10. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Director’s Representative or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Director’s Representative no fewer than two working days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Director’s Representative's written permission.

3.3 INSTALLATION

A. Comply with NECA 1 and NECA 404.

B. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.

C. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete equipment bases.
2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
3. Install packaged engine generator with restrained spring isolators having a minimum deflection of 1 inch on a concrete base. Secure enclosure to anchor bolts installed in concrete bases.

D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

E. Exhaust System: Install Schedule 40, black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet.

1. Install isolating thimbles where exhaust piping penetrates combustible surfaces with a minimum of 9-inch clearance from combustibles.

F. Drain Piping: Install condensate drain piping to muffler drain outlet with a shutoff valve, stainless-steel flexible connector, and Schedule 40, black steel pipe, the full size of the drain connection, with welded joints. Provide insulation to protect against freezing.

G. Electrical Wiring: All electrical components within the fuel system boundary shall be rated for hazardous location Class I, Division 2. Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.

C. Connect engine exhaust pipe to engine with flexible connector.

D. Gaseous Fuel Connections:

1. Connect fuel piping to engines with a gate valve and union and flexible connector.
2. Install manual shutoff valve in a remote location to isolate gaseous fuel supply to the generator.
3. Vent gas pressure regulators outside of enclosure at least 18" above ground to avoid potential snow line.

E. Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.

F. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

A. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.6 FIELD QUALITY CONTROL

A. Testing Agency:

1. Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in the first two subparagraphs below as specified in the NETA ATS. Certify compliance with test parameters.

a. Visual and Mechanical Inspection:

1) Compare equipment nameplate data with drawings and specifications.
2) Inspect physical and mechanical condition.
3) Inspect anchorage, alignment, and grounding.
4) Verify the unit is clean.

b. Electrical and Mechanical Tests:

1) Perform insulation-resistance tests in accordance with IEEE 43.

a) Machines 200 hp or less. Test duration shall be one minute. Calculate the dielectric-absorption ratio.

2) Test protective relay devices.
3) Verify phase rotation, phasing, and synchronized operation as required by the application.

4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
5) Perform vibration test for each main bearing cap.
6) Verify correct functioning of the governor and regulator.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

   a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
   b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
   c. Verify acceptance of charge for each element of the battery after discharge.
   d. Verify that measurements are within manufacturer's specifications.

4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg. Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.

7. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
8. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 percent and 100 percent of rated linear load. Verify that harmonic content is within specified limits.
9. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at **four** locations 25 feet from edge of the generator enclosure, and compare measured levels with required values.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Test instruments shall have been calibrated within the last 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.

E. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

I. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

J. Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each power wiring termination and each bus connection while running with maximum load. Remove all access panels so terminations and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

3.8 DEMONSTRATION

A. Engage a Company Service Advisor to train Director’s Representative's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION 263213.16

SECTION 310000 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Site Clearing:

   a. Protecting existing vegetation to remain.
   b. Removing existing vegetation.
   c. Clearing and grubbing.
   d. Stripping and stockpiling topsoil and existing riprap.

2. Excavation:

   a. Excavating areas indicated on the Contract Drawings at the toe of the downstream slope and into the existing gravel access road for relief well installation and corresponding manhole and drainage piping placement.
   b. Excavating areas indicated on the Contact Drawings for installation of standby generator, propane tank, and for construction of their respective foundations.
   c. Excavating areas indicated on the Contract Drawings along the tailrace and Stewarts Bridge Reservoir up to and beyond the existing scour hole.
   d. Excavating areas indicated on the Contract Drawings along concrete channel wall.
   e. Excavating areas indicated on the Contract Drawings for the direct-buried conduits near the standby generator and propane tank area.

3. Fill and Backfill:

   a. Filling and backfilling areas on existing and excavated subgrade indicated on the Contract Drawings at the toe of the downstream slope and into the existing gravel access road for relief well installation and corresponding manhole and drainage piping placement. This includes improvements and rehabilitation to the access road.
   b. Filling and backfilling areas on existing and excavated subgrade indicated on the Contract Drawings for installation of standby generator, propane tank, and for construction of their respective foundations.
   c. Filling and backfilling areas on existing and excavated subgrade indicated on the Contract Drawings along the tailrace and Stewarts Bridge Reservoir up to and beyond the existing scour hole.
   d. Filling and Backfilling areas on existing and excavated subgrade indicated on the Contract Drawings along concrete channel wall.

e. Backfilling areas on excavated subgrade indicated on the Contract Drawings for the direct-buried conduits near the standby generator and propane tank area.

4. Preparation of subgrades.
5. Fill and backfill compaction.
6. Stone fill, light stone fill, and riprap placement.
7. Access road improvements and rehabilitation.
8. Rough and final grading.

B. Related Requirements:

1. Section 310001 – Earthwork Materials.
2. Section 312500 – Erosion and Sedimentation Controls.
3. Section 314100 – Drilling Grout Holes.
4. Section 314200 – Batch, Mix, and Inject Cement Grout.
5. Section 314300 – Piezometers.
6. Section 314400 – Relief Wells.
7. Section 315100 – Rock Anchors.
8. Section 315200 – Cofferdams.
9. Section 329200 – Turf and Grasses
10. Section 330561 – Concrete Manholes.
11. Section 334213 – SICPP Drainage Pipes.
12. Section 400523 – Stainless Steel Drainage Pipes.

1.3 REFERENCE STANDARDS

A. ASTM International (ASTM):

1. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).
2. ASTM D6913 – Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.
3. ASTM D7928 – Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis.
4. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
5. ASTM D3740 – Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
6. ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
7. ASTM D4873 – Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
8. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
9. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

B. Related Requirements:

1. Local utility standards when working in close proximity to utility lines.
2. Occupational Safety and Health Administration: Comply with the applicable requirements of the Code of Federal Regulations Title 29 – Labor, Part 1926 Safety and Health Regulations for Construction (OSHA).

C. New York State Department of Transportation (NYS DOT)

1. NYS DOT 620 - Bank and Channel Protection
2. NYS DOT 703 - Aggregates
3. NYS DOT 733 - Earthwork Materials

1.4 DEFINITIONS

A. Subgrade Surface: Surface upon which fill, backfill, or topsoil material is placed.

B. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsurface, reasonably free of subsurface soils, clay lumps, gravel, weeds, roots, toxic materials, or other non-soil materials.

C. Sand Backfill: Material to be placed in areas indicated on the Contract Drawings for backfill for relief well excavations, backfill for relief well system tailwater discharge outlet protection, backfill for relief well access road improvements, backfill for relief well filter material, backfill for electrical conduits outside the drainage stone area of the standby generator and propane tank area, backfill and fill in the tailrace and Stewarts Bridge Reservoir up to and beyond the scour hole, and clearing and grubbing in non-landscaped areas. Material to be used to satisfy filter criteria with surrounding material, such as underdrain material and stone fill.

D. Underdrain Material: Material to be placed in areas indicated on the Contract Drawings for backfill for relief well excavations, relief well system tailwater discharge outlet protection and in the tailrace and Stewarts Bridge Reservoir up to and beyond the scour hole. Material to be used to satisfy filter criteria with surrounding material, such as sand backfill and stone fill.

E. Stone Fill: Material to be placed in areas indicated on the Contract Drawings in the tailrace and Stewarts Bridge Reservoir up to and beyond the scour hole. Stone Fill to be used to protect against anticipated water velocities in the tailrace and Stewarts Bridge Reservoir.

F. Light Stone Fill: Material to be placed in areas indicated on the Contract Drawings for the relief well system tailwater discharge outlet protection and if needed for backfill for relief well excavations. Light stone fill shall be placed along downstream slope at the toe by the relief wells if there is not enough stockpiled existing riprap material.

G. Drainage Stone: Material to be placed in areas indicated on the Contract Drawings for final grading in the standby generator and propane tank area, backfill for relief well excavations (i.e., below manholes and around drainage pipes), backfill for direct buried gas piping in the drainage stone area at the standby generator and propane tank area, for construction of the stabilized construction entrance, for construction of the concrete wash-out area, for the pumped water filter bag system, around the temporary sump pit detail, and backfill for the relief well and

standby generator and propane tank access roads. For the drainage stone backfill at the relief well excavations, refer to Specification 330561 – Concrete Manholes, Specification 334213 – SICPP Drainage Pipes, and Specification 400523 – Stainless Steel Drainage Pipes. Material to be used to satisfy filter criteria with sand backfill.

H. Riprap: Existing material to be removed from areas indicated on the Contract Drawings and stockpiled for later use in final grading. Riprap is to be used to protect against erosion on the downstream slope at the toe by the relief wells.

I. Geogrid: Geosynthetic material to be used for access road improvements. Geogrid to be placed between the drainage stone and sand backfill within the access road improvement areas according to the Contract Drawings.

J. Separation Geotextile: Geosynthetic material to be used for construction of the stabilized construction entrance (below the drainage stone), sediment filter logs, temporary silt fence, reinforced silt fence, filter bags, underlayment for flow path for pumped water filter bag system, and turbidity curtain, all according to the Contract Drawings.

K. Borrow Soil: Approved soil imported from off-site for use as fill or backfill.

L. Backfill: Soil material or controlled low-strength material used to fill an excavation.

M. Fill: Soil materials used to raise existing grades.

N. Suitable Material (Fill and Backfill for Landscaped Areas): Material generally consisting of mineral soil (inorganic), blasted or broken rock and similar materials of natural or man-made origin, including mixtures thereof. Maximum particle size shall not exceed 2/3 of the specified layer thickness prior to compaction. Topsoil and organic silt may be used as suitable material in landscaped areas provided it is placed as the surface soil. Sand backfill may be used as suitable material in non-landscaped areas for fill and backfill provided it is not placed as the surface soil.

O. Unsuitable Material: Material that are not suitable for intended construction as presented on the Contract Drawings, often because of an excess of moisture or generally poor soil quality as determined by the Director's Representative.

P. Earth Excavation: Removal of all surface and subsurface material not classified as rock, to the lines and dimensions indicated on the Contract Drawings.

Q. Rock: Limestone, sandstone, shale, granite and similar material in solid beds or masses in its original or stratified position which can be removed only by blasting operations, drilling, wedging, or use of pneumatic tools, and boulders with a volume greater than 1.0 cu yd.

R. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Director's Representative. Unauthorized excavation, as well as remedial work directed by Director's Representative, shall be without additional compensation.

S. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

T. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

U. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

V. Landscaped Areas: Areas not covered by structures, walks, roads, paving, or parking.

W. Grading Limit Line (Shown on Drawings): Limits of grading, excavations and filling required for the Work. Unless specifically noted otherwise, the Grading Limit Line and Contract Limit Line shall be considered the same.

1.5 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Director's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 SUBMITTALS

A. Submittals for this Section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Existing Conditions: Submit documentation before earthwork activities begin of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by the Work of this Section.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

E. Qualification Data: For ASTM certified soils testing agency.

F. At the Pre-Construction meeting, submit the proposed start date and detailed construction sequence.

G. At least four weeks before material placement, submit specifications for the proposed compaction equipment including weight (both static and dynamic) and dimension of the pads on the roller drums.

H. Samples: Submit samples as follows at least four weeks before planned material placement. Take the samples in the presence of the Director's Representative and submit to the ASTM certified soils testing agency for gradations, Atterberg limits, and Proctors. These tests shall be performed in accordance with ASTM standards, shall be performed and signed by a certified soils laboratory, and shall be submitted as part of the original submittal. Refer to Section 310001 for Earthwork Materials.

I. Quality Control Submittals at least four weeks before proposed material is to be placed:

1. Backfill and Fill Materials: Provide name and location of source and the NYSDOT Source Number, if applicable. If the material is not being taken from an approved NYSDOT source, the soil laboratory test results for gradation performed by an ASTM certified soils laboratory shall be required.

1.7 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

1.8 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Director's Representative and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Director's Representative or authorities having jurisdiction.

B. Utility Locator Service: Locate underground utilities, in accordance with Section 023313 – Underground Utility Locator Service, before beginning site clearing or earth-moving operations.

C. Do not commence operations until temporary site fencing and erosion and sedimentation control measures are in place.

D. Do not commence earthwork operations until plant-protection measures specified herein are in place.

E. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Do not direct vehicle or equipment exhaust towards protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

H. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. See Section 310001 - Earthwork Materials.

B. Protection-Zone Fencing:

1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.

a. Height: 36 inches .
b. Color: High-visibility orange, nonfading.

2. Chain-Link Protection-Zone Fencing: As specified in Section 015000 - Construction Facilities and Temporary Controls.

C. Protection-Zone Gates: Single swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 24 inches.

D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:

1. Size and Text: As shown on the Contract Drawings.
2. Lettering: 3-inch- high minimum, black characters on white background.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed as required.

C. Protect existing site features, to remain, from damage during construction. Protect standpipe piezometers, weir, structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

1. Restore damaged improvements to their original condition, as acceptable to the Director’s Representative.

D. Protect and maintain erosion and sedimentation controls during earth-moving operations.

E. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide and maintain temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, in accordance with Section 312500 – Erosion and Sedimentation Controls, the Contract Drawings, and requirements of authorities having jurisdiction. If the erosion and sedimentation controls specified by the authorities having jurisdiction are more stringent than those specified in the Contract Documents, contact the Director's Representative.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
2. Inspect, maintain, and repair erosion and sedimentation control measures during construction until permanent vegetation has been established.
3. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 PLANT PROTECTION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain and be protected. Flag each tree trunk at 54 inches above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Trunk Protection: Protect the trunk of each tree to remain as follows:

1. Install 2-by-4-inch wood planks around trunk at maximum 3 inches apart. Minimum three planks per tree. Band together with no less than three steel bands stapled to the planks to hold them securely in place. Wrap orange plastic construction fencing to a minimum of three layers outside slats. Fasten wrap with wire.

    a. Height: 48 inches.

D. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that shall prevent people and animals from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation. Install access gates where indicated.

E. Install protection-zone signage in visibly prominent locations in a manner approved by Director's Representative. Install one sign spaced approximately every 20 feet on protection-zone fencing, but no fewer than four signs with each facing a different direction.

F. Maintain protection zones free of weeds and trash.

G. Maintain protection-zone fencing and signage in good condition as acceptable to Director's Representative and remove when construction operations are complete and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

H. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

1. Small Trees: Provide new trees of same size and species as those being replaced for each tree that measures 6 inches or smaller in caliper size.
2. Large Trees: Provide one new tree(s) of 6-inch caliper size for each tree being replaced that measures more than 6 inches in caliper size.

a. Species: to match existing, unless otherwise directed by Director's Representative.

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities as necessary

B. Interrupting Existing Utilities: Do not interrupt utilities serving occupied facilities unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Director's Representative not less than seven days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without the Director's Representative's written permission.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain.
2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods or air spade for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

B. Backfill depressions caused by clearing and grubbing operations with suitable material unless further excavation or earthwork is indicated.

1. Place backfill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to specified density.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to remove its full extent in a manner to prevent intermingling with underlying soil or other waste materials.

1. Remove subsurface soil and non-soil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsurface soil or other materials. Grade and shape stockpiles at 2 horizontal to 1 vertical (2H:1V) or flatter to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 120 inches.
2. Do not stockpile topsoil within protection zones.
3. Stockpile surplus topsoil to allow for respreading deeper topsoil.
4. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
5. All stockpiles must be located a minimum of 50 feet away from any open excavation within the designated areas presented on the Contract Drawings. If Contractor requires additional stockpiling locations, the additional locations must be provided to and approved by the Director's Representative.

3.7 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials (sand backfill, underdrain material, drainage stone, light stone fill, stone fill, and existing riprap) and excavated suitable materials away from the edge of excavations and without intermixing. Place, grade, and shape stockpiles at 2 horizontal to 1 vertical (2H:1V) or flatter to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of soil stockpiles to 120 inches.
2. Do not stockpile soil material within protection zones.
3. Dispose of surplus soils. Surplus soil is that which exceeds quantity indicated to be stockpiled or reused.
4. All stockpiles must be located a minimum of 50 feet away from any excavation within the designated areas presented on the Contract Drawings. If Contractor requires additional stockpiling locations, the additional locations must be provided to and approved by the Director's Representative.

3.8 SURFACE DEWATERING

A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades. Refer to Section 312500 – Erosion and Sedimentation Controls.

B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

C. Protect subgrades from rain or water accumulation that can cause softening, undermining/undercutting, washout, damage, and other soil changes that would be detrimental to the stability of subgrades.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

3.9 TAILRACE EXCAVATION DEWATERING

A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of water and permit excavation, construction, and final grading to proceed on dry, stable subgrades. Refer to Section 315200 – Cofferdams.

3.10 EXCAVATION

A. Excavation for Relief Well Installation and Corresponding Manhole and Drainage Piping Installation: Work for the relief well excavation shall be performed prior to any other Work along the toe or in the tailrace, exception cofferdam construction, which is required for this Work. Refer to Section 315200 – Cofferdams for dewatering of this area for excavation. This applies for backfill placement at the relief well locations as presented in the sections below. As per the Contract Drawings, the excavation sequence requires only one relief well system to be excavated at a time. In order to progress to excavation at the next relief well system, backfill must be completed at the previous relief well location. Excavate overburden soils in areas indicated on the Contract Drawings at the toe of the downstream slope and into the existing gravel access road for relief well installation and corresponding manhole and drainage piping placement. The excavation shall extend to the lines and grades shown on the Contract Drawings. The excess material shall be disposed of at an approved off-site location.

B. Excavation for Standby Generator and Propane Tank: Excavate overburden soils in areas indicated on the Contract Drawings for installation of standby generator, propane tank, and for construction of their respective foundations. The excavation shall extend to the lines and grades shown on the Contract Drawings. The excess material shall be disposed of at an approved off-site location.

C. Excavation for Tailrace and Stewarts Bridge Reservoir up to and Beyond Scour Hole: Excavate overburden soils in areas indicated on the Contract Drawings in the tailrace and Stewarts Bridge Reservoir up to and beyond the scour hole. Prior to excavating, removal of existing additional stone fill material to the limits presented on the Contact Drawings is required. Excavation to expose the underlying bedrock surface at the existing tailrace channel apron will be required. The excavation shall extend to the lines and grades shown on the Contract Drawings. The excess material shall be disposed of at an approved off-site location. Refer to Section 315200 – Cofferdams for dewatering of this area for excavation.

D. Excavation for Concrete Channel Wall: Excavate overburden soils in areas indicated on the Contract Drawings along the concrete channel wall. The excavation shall extend to the lines and grades shown on the Contract Drawings. The excess material shall be disposed of at an approved off-site location.

E. Excavation for Direct-Buried Conduits Near the Standby Generator and Propane Tank Area: Excavate overburden soils in areas indicated on the Contract Drawings along the proposed alignment for the direct-buried conduits near the standby generator and propane tank area. The excavation shall extend to the lines and grades shown on the Contract Drawings. The excess material shall be disposed of at an approved off-site location.

F. Install and maintain all erosion and sedimentation controls during all earthwork operations as specified in Specifications Section - 312500 (Erosion and Sediment Control) or as directed by local officials. If the erosion and sedimentation controls specified by the local officials are more stringent than those specified on the Contract Drawings, contact the Director's Representative.

G. Maintain sides and slopes of excavations in a safe condition until completion of backfilling. Comply with Code of Federal Regulations Title 29 - Labor, Part 1926 (OSHA).

H. Stockpile excavated materials classified as suitable material in an area approved by the Director's Representative, until required for fill or backfill. Place, grade, and shape stockpiles for proper drainage as approved by the Directors Representative. Post signs to label all stockpiled materials.

I. Notify the Director's Representative upon completion of excavation operations. Do not proceed with the Work until the excavation is inspected and approved. Inspection of the excavation by the Director's Representative shall be made within three working days' notice.

J. Removal of Unsuitable Material Beneath Improvements: Excavate encountered unsuitable materials which extend below required elevations to additional depth as directed by the Director's Representative. Have cross sections taken, under the supervision of an independent Land Surveyor, to determine the quantity of such excavation. Do not backfill this excavation prior to quantity measurement.

K. Excavations at Edges of Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and

redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.

3. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.11 UNAUTHORIZED EXCAVATION

A. Backfill and compact unauthorized excavations as specified for authorized excavation of the same classification, unless otherwise directed by the Director's Representative.

3.12 SOIL PREPARATION

A. Notify Director's Representative when excavations have reached required subgrade and are ready for inspection.

B. Proof-roll subgrade at locations directed by the Director's Representative with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.

C. If Director's Representative determines that unsuitable material is present or that there are soft spots or areas of excessive pumping or rutting, excavate and replace with compacted backfill or fill material as directed.

1. Have cross section taken, under the supervision of an independent land surveyor, to determine volume of additional excavations.

D. Authorized additional excavation and replacement material shall be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Director's Representative, without additional compensation.

3.13 BACKFILL & SOIL FILL

A. Surface Preparation of Fill Areas: Strip topsoil, remaining vegetation, and other deleterious materials prior to placement of fill. Prior to placement of fill, smooth out and compact areas where wheel rutting has occurred due to stripping or earthwork operations.

B. Surface Preparation of Backfill Areas: Strip remaining vegetation and other deleterious materials prior to placement of backfill. Prior to placement of backfill, smooth out and compact areas where wheel rutting has occurred due to stripping or earthwork operations.

C. Excavations: Backfill as promptly as Work permits, but not until completion of the following:

1. Acceptance by the Director's Representative of construction below finish grade.
2. Inspection, testing, approval, and recording locations of underground utilities.
3. Removal of trash and debris.

D. Sand Backfill: Place sand backfill material to the lines and grades shown on the Contract Drawings in layers not more than 6 inches thick in loose depth unless otherwise specified. As part of the scour hole remediation, sand backfill will be placed up to the exposed bedrock surface at the existing tailrace channel apron, as shown on the Contract Drawings. Before compaction, moisten or aerate each layer as necessary to facilitate compaction to the required density. Do not place fill or backfill material on surfaces that are muddy, frozen, or covered with ice. Use equipment appropriate for spreading the sand backfill in a uniform layer across the lift.

1. For fill and backfill areas, the layer thickness may be modified by the Director's Representative, at the Contractor's written request, if in the Director's Representative's judgment, the equipment used is capable of compacting the sand backfill in a greater layer thickness. This request shall include the type and specifications of compaction equipment intended for use.
2. For scour hole fill placement, a minimum of 1.0 foot of sand backfill shall be placed. The minimum layer thickness provided is proposed, the Director's Representative shall evaluate conditions during construction to see if an increase in the layer thickness is warranted. The minimum 1.0 foot layer thickness is based on placement in the dry (dewatered) condition. If material is to be placed in the wet (watered) condition, the minimum thickness would increase by 50 percent to 1.5 feet. Confirm condition of material placement with Director's Representative prior to material placement.

E. Underdrain Material: Place underdrain material to the lines and grades shown on the Contract Drawings in layers not more than 6 inches thick in loose depth unless otherwise specified. As part of the scour hole remediation, underdrain material will be placed up to the exposed bedrock surface at the existing tailrace channel apron, as shown on the Contract Drawings. Do not place fill or backfill material on surfaces that are muddy, frozen, or covered with ice. Use equipment appropriate for spreading the underdrain material in a uniform layer across the lift.

1. For fill and backfill areas, the layer thickness may be modified by the Director's Representative, at the Contractor's written request, if in the Director's Representative's judgment, the equipment used is capable of compacting the underdrain material in a greater layer thickness. This request shall include the type and specifications of compaction equipment intended for use.
2. For scour hole fill placement, a minimum of 1.5 feet of underdrain material shall be placed. The minimum layer thickness provided is proposed, the Director's Representative shall evaluate conditions during construction to see if an increase in the layer thickness is warranted. The minimum 1.5 foot layer thickness is based on placement in the dry (dewatered) condition. If material is to be placed in the wet (watered) condition, the minimum thickness would increase by 50 percent to 2.25 feet. Confirm condition of material placement with Director's Representative prior to material placement.
3. For backfill of relief well excavations, a minimum of 1.5 feet of underdrain material shall be placed. The underdrain material shall be placed above the sand backfill along the final slope as indicated on the Contract Drawings.

F. Drainage Stone: Place drainage stone to the lines and grades shown on the Contract Drawings in layers not more than 6 inches thick in loose depth unless otherwise specified. Do not place fill

or backfill material on surfaces that are muddy, frozen, or covered with ice. Use equipment appropriate for spreading the drainage stone in a uniform layer across the lift.

1. For fill and backfill areas, the layer thickness may be modified by the Director's Representative, at the Contractor's written request, if in the Director's Representative's judgment, the equipment used is capable of compacting the drainage stone in a greater layer thickness. This request shall include the type and specifications of compaction equipment intended for use.

G. Stone Fill: Place stone fill (25% Light Stone Fill and 75% 1-Ton Stone Fill as described in Section 310001 – Earthwork Materials) to the lines and grades shown on the Contract Drawings. As part of the scour hole remediation, stone fill will be placed up to the exposed bedrock surface at the existing tailrace channel apron, as shown on the Contract Drawings. The stone fill shall be placed in a manner that minimizes voids. The placed stone fill shall be a well graded mass of variable size stones with no areas of uniform size material. Rearrange individual stones, if necessary, by hand or with mechanical equipment to obtain the specified results.

1. For scour hole fill placement, a minimum of 4.5 feet of stone fill shall be placed. The minimum layer thickness provided is proposed, the Director's Representative shall evaluate conditions during construction to see if an increase in the layer thickness is warranted. The minimum 4.5 foot layer thickness is based on placement in the dry (dewatered) condition. If material is to be placed in the wet (watered) condition, the minimum thickness would increase by 50 percent to 6.75 feet. Confirm condition of material placement with Director's Representative prior to material placement.

H. Light Stone Fill: Place light stone fill to the lines and grades shown on the Contract Drawings. The light stone fill shall be placed in a manner that minimizes voids. The placed light stone fill shall be a well graded mass of variable size stones with no areas of uniform size material. Rearrange individual stones, if necessary, by hand or with mechanical equipment to obtain the specified results.

I. Riprap: Place riprap to the lines and grades shown on the Contract Drawings. The riprap shall be placed in a manner that minimizes voids. The placed riprap shall be a well graded mass of variable size stones with no areas of uniform size material. Rearrange individual stones, if necessary, by hand or with mechanical equipment to obtain the specified results.

J. Landscaped Areas: Place Suitable Material when required to complete fill or backfill areas up to subgrade surface elevation. Do not use material containing particles over four inches in diameter within the top 12 inches of suitable material.

K. Backfilling Excavation Resulting From Removal of Unsuitable Material:

1. Up to Subgrade Surface Elevation: Place suitable material or appropriate fill material when backfill is needed unless otherwise specified by the Directors Representative.

3.14 SOIL MOISTURE CONTROL

A. Where fill or backfill must be moisture conditioned before compaction, uniformly apply water to the surface and to each layer of fill or backfill to within 3 percent of optimum moisture content.

B. Prevent ponding or other free water on surface during and after compaction operations.

C. Remove and replace, or scarify and air dry, soil that is too wet to permit compaction to specified density. Soil that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing, until moisture content is reduced to a value which shall permit compaction to the percentage of maximum density specified.

D. When the existing ground surface to be compacted has a density less than that specified for the particular area classification, break up and pulverize, and moisture condition to facilitate compaction to the required percentage of maximum density.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Compact each lift of sand backfill to 95 percent of the maximum dry density, as measured in the standard proctor test and within 3 percent plus or minus of optimum moisture content (ASTM D 698). Each lift of sand backfill shall be tested for its in-place dry density and moisture content using a nuclear density gauge at a rate of two tests per lift (ASTM D 6938). Each test result shall meet or exceed the minimum requirements. Compaction testing requirements for the sand backfill within the deepest portion of the scour hole will be reviewed when the scour hole has been exposed and dewatering conditions have been evaluated by the Director's Representative.

B. Compact each lift using the approved compaction equipment with an equal number of passes over the entire lift. Each lift shall be compacted sufficiently to destroy any soil clumps or clods and knead the soil together producing a uniform, homogenous mass free of all defects, cracks, and fissures.

C. Sand backfill placed within 5 feet of structures shall be compacted with hand compaction equipment until it is firm and stable as determined by the Director's Representative.

D. If a compacted layer fails to meet the specified percentage of maximum density, the layer shall be recompacted and retested. If compaction cannot be achieved the material/layer shall be removed and replaced. No additional material may be placed over a compacted layer until the specified density is achieved.

E. Place all underdrain material and drainage stone using appropriate equipment to the specified lift thickness. Each lift shall be raked smooth and compacted through several passes of a walk behind vibratory roller and approved by the Director's Representative. Compaction testing is **not** required.

3.16 STONE FILL, LIGHT STONE FILL, AND RIPRAP PLACEMENT

A. Do not place stone fill, light stone fill, or riprap over frozen or spongy subgrade surfaces.

B. Place the required soil backfills and fills, as necessary, to achieve the required filter criteria prior to placing stone fill, light stone fill, or riprap at depth indicated on Drawings.

C. Place stone fill, light stone fill, or riprap into position at thickness as indicated on Drawings.

D. End Dumped: End dump stone fill, light stone fill, and riprap to conform to the lines, grades and thicknesses indicated. End dumped stone fill, light stone fill, and riprap shall be a well graded mass of variable size stones that meet the required gradation composition with no areas of uniform size material. Rearrange individual stones, if necessary, by hand or with mechanical equipment to obtain the specified results.

E. Hand Placed: Hand place stone fill, light stone fill, and riprap. Align stones to obtain a close fit and to minimize voids. Fill spaces between stones with spalls of suitable size.

3.17 PLACEMENT OF GEOSYNTHETICS

A. Geogrid: Place between the 12 inch thick (minimum) layer of drainage stone and the 12 inch thick (minimum) layer of sand backfill for the relief well access road improvements as shown on the Contract Drawings. If more than one roll width is required, rolls should overlap a minimum of 6 inches.

B. Separation Geotextile: Geosynthetic material to be used for construction of the stabilized construction entrance (below the drainage stone), sediment filter logs, temporary silt fence, reinforced silt fence, filter bags, underlayment for flow path for pumped water filter bag system, and turbidity curtain according to the Contract Drawings. If more than one roll width is required, rolls should overlap a minimum of 6 inches.

3.18 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Rough Grading:

1. Exterior Grading: Trim and grade area within the Grading Limit Line and excavations outside the limit line, required by this Contract, to a level of 4 inches below the finish grades indicated unless otherwise specified herein or where greater depths are indicated. Provide smooth uniform transition to adjacent areas.

    a. Slope cut and fill in transition areas, outside of the grading limit line, to meet corresponding levels of existing grades at a slope of 1 vertical to 2 horizontal (2H:1V), unless otherwise indicated.
    b. Landscaped Areas: Provide uniform subgrade surface within 1 inch of required level to receive topsoil thickness specified. Compact fill as specified to within 3 inches of subgrade surface. Remove objectionable material detrimental to proper compaction or to placing full depth of topsoil. If the top 3 inches of subgrade has become compacted before placement of topsoil, harrow or otherwise loosen rough graded surface to receive topsoil to a depth of three inches immediately prior to placing topsoil.

C. Finish Grading:

1. Uniformly grade rough graded areas within limits of the Grading Limit Line to finish grade elevations indicated. Remove tree/vegetation protection fence from areas that shall receive permanent seeding and/or planting to complete finish grading. Immediately re-install the fencing to protect these areas from compaction.
2. Grade and compact to smooth finished surface within tolerances specified, and to uniform levels or slopes between points where finish elevations are indicated or between such points and existing finished grade.
3. Grade areas adjacent to structures so as to drain away from structures and to prevent ponding.
4. Finish surfaces free from irregular surface changes, and as follows:

    a. Seeded or Plan Areas: Finish areas to receive topsoil within 1 inch above or below the required subgrade surface elevation.

5. Spread topsoil directly upon prepared subgrade surface to a depth measuring 6 inches after natural settlement of the topsoil has occurred in areas to be seeded or to receive sod. Perform topsoil spreading operations only during dry weather. Place to greater depth when necessary to adjust grades to required elevations.

    a. Approved existing topsoil within the Grading Limit Line may be used. Provide additional topsoil from outside sources as required.
    b. The type of seeding depends on the acceptable dates.

6. Finish topsoil surface free of depressions that would trap water, free of stones over 1 inch in any dimension, and free of debris or other objectionable material. Finished surfaces shall conform to the contour lines and elevations indicated on the drawings or as directed by the Director's Representative.

7. All newly topsoiled, seeded, and mulched areas shall have tree/vegetation protective fences installed immediately after mulching and continuously maintained throughout construction. This is to protect from compaction which will keep seed from germinating.

3.19 MAINTENANCE AND RESTORATION

A. Restore grades to indicated levels where settlement or damage due to performance of the Work has occurred. Correct conditions contributing to settlement. Remove and replace improperly placed or poorly compacted fill materials.

B. Restore pavements, walks, lawns, and other exterior surfaces damaged during performance of the Work to match the appearance and performance of existing corresponding surfaces as closely as possible.

C. Topsoil and seed or sod damaged lawn areas outside of the work area and new lawn inside the work area. Water as required until physical completion of the Work.

D. Assess the access road conditions following completion of all construction work at the site. Repair any areas of the access road that are deemed unacceptable at the discretion of the Director's Representative.

3.20 FIELD QUALITY CONTROL

A. Special Inspections: Director's Representative shall engage a qualified Special Inspector to perform the following special inspections:

1. Determine prior to placement of fill and backfill that site has been prepared in compliance with requirements.
2. Determine that fill and backfill material classification and maximum lift thickness comply with requirements.
3. Determine, during placement and compaction, that in-place density of compacted fill and backfill complies with requirements.

B. Testing Agency: Director's Representative shall engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Coordinate with and allow testing agency to inspect and test subgrades and each fill or backfill layer; provide testing agency minimum three working days advanced notice prior to all phases of filling and backfilling operations. Proceed with subsequent earthwork activities only after test results for previously completed work comply with requirements.

D. Testing agency shall test compaction of sand backfill in place according to ASTM D698. Tests shall be performed at the following locations and frequencies:

1. Relief Well Installation and Corresponding Manhole and Drainage Piping Placement: Compaction testing shall be performed as directed by the Director's Representative to ascertain the compacted density of the fill and backfill materials. Compaction testing shall be performed on each lift of sand backfill as specified (minimum two tests per lift) and on other fill and backfill as determined by the Director's Representative. If a compacted layer fails to meet the specified percentage of maximum density, the layer shall be recompacted and shall be retested. No additional material may be placed over a compacted layer until the specified density is achieved.
2. Tailrace and Stewarts Bridge Reservoir up to and Beyond Scour Hole: Compaction testing shall be performed as directed by the Director's Representative to ascertain the compacted density of the fill and backfill materials. Compaction testing shall be performed on each lift of sand backfill as specified (minimum two tests per lift) and on other fill and backfill as determined by the Director's Representative. If a compacted layer fails to meet the specified percentage of maximum density, the layer shall be recompacted and shall be retested. No additional material may be placed over a compacted layer until the specified density is achieved.
3. Concrete Channel Wall: Compaction testing shall be performed as directed by the Director's Representative to ascertain the compacted density of the fill and backfill materials. Compaction testing shall be performed on each lift of sand backfill as specified (minimum two tests per lift) and on other fill and backfill as determined by the Director's Representative. If a compacted layer fails to meet the specified percentage of maximum density, the layer shall be recompacted and shall be retested. No additional material may be placed over a compacted layer until the specified density is achieved.
4. Direct-Buried Conduits at Standby Generator and Propane Tank Area: Compaction testing shall be performed as directed by the Director's Representative to ascertain the compacted density of backfill materials. Compaction testing shall be performed on each lift of sand backfill as specified (minimum two tests per lift) and on other fill and backfill as determined by the Director's Representative. If a compacted layer fails to meet the

specified percentage of maximum density, the layer shall be recompacted and shall be retested. No additional material may be placed over a compacted layer until the specified density is achieved.

3.21 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Director's Representative; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove from Director's property and dispose of excess and unsuitable materials, including materials resulting from clearing, grubbing and removal of existing improvements; soil; trash; and debris. A proper disposal location must be provided and approved by the Director's Representative.

END OF SECTION 310000

ADDENDUM 04 CE

SECTION 314100 – DRILLING GROUT HOLES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish drilling equipment capable of drilling holes for the grouting work, as shown in the plans and specifications.

B. The Contractor will be required to contain all spoils including soils and water from the drilling process. The drilling shall not allow for the direct discharge of construction water to water bodies. Temporary sediment control devices may be required in combination with the overall site controls for sufficient protection.

C. A pre-construction meeting scheduled by the Director's Representative will be held prior to the start of drilling. The Director's Representative, Prime Contractor, and the Specialty contractors, such as the drilling and grouting contractor, if different than the Prime Contractor, shall also attend. Attendance is mandatory. The preconstruction meeting will be conducted to clarify the construction requirements for the work, to coordinate construction schedule and activities and to identify contractual relationships and delineation of responsibilities among the Prime Contractor and various Subcontractors.

D. Sequence of Work: Decommission open well piezometers B1 through B5 before drilling for the grout curtain.

1.2 RELATED WORK

A. Section 00 31 32 - Geotechnical Data

B. Section 31 42 00 - Batch Mix and Inject Cement Grout

C. Section 31 43 00 – Piezometers

1.3 REFERENCES

A. Geotechnical Data collected for the project as provided in the following:

1. Engineering Data Report - Conklingville Dam Spillway Foundation Remediation and Concrete Repair Project, Prepared by Schnabel Engineering, April 2019.

1.4 REFERENCE STANDARDS

A. United States Bureau of Reclamation:

1. USBR 7310 – Constant Head Hydraulic Conductivity Tests in Single Drill Hole.

B. Related Requirements:

1. Geotechnical Data collected for the project as provided in the following:

a. Engineering Data Report - Conklingville Dam Spillway Foundation Remediation and Concrete Repair Project, Prepared by Schnabel Engineering, April 2019.

1.5 SUBMITTALS

A. Before the planned start date, submit the following information, in writing to the Director's Representative for review:

1. Three projects within the past ten years on which the Contractor has successfully completed drilling of similar type and capacity required for this project. A brief description of each project with the owner's name and current phone number shall be included. Submit information to the Director's Representative a minimum of 30 calendar days prior to start of work. Begin work only after receiving the Director's Representative approval.
2. Submit proof of three projects within the past ten years on which the foreman for this work has supervised drilling grout holes of similar type and purpose required for this project. Submit proof of prior experience with the subcontractor approval process.
3. A description of the proposed method of drilling the grout holes, including equipment set-up, drill operation, circulation fluid, drill hole size, bit type, means of equipment and personnel access to the drilling site, and any work platforms needed to perform the work.
4. A plan of drilling order of the bore holes, flushing of the bore holes, and methodology to prevent grout intrusion from adjacent grout injection into open bore holes.

B. A Drilling Preparation Plan (DPP) shall be submitted by the Contractor for ultimate submittal to Federal Energy Regulatory Commission (FERC). The DPP shall be in a format and provide information readily accepted by FERC to obtain approval to commence drilling.

C. During and following drilling, submit the following data to the Director's Representative for review within 7 calendar days after completion of the work:

1. Drilling logs for each hole drilled that include the following data:
   a. Hole number/location
   b. Dates, start and end times of drilling
   c. Surface elevation of the hole, drilled depth, and bottom of hole elevation
   d. Description of drilling equipment
   e. Rate of advance with depth
   f. Notation of any obstructions encountered or unusual events occurring during drilling
   g. Depth of drilling fluid loss, if any, (and return of circulation if applicable)
   h. Description of strata or cuttings correlated with drilling depth
   i. Water depths
   j. Other data as required by the Director's Representative

PART 2 - EXECUTIONDRILLING GROUT HOLES

A. **Accuracy of Drilling:** The drilling method used shall be accurate to 6 inches on the surface hole locations and deviate less than 2 percent over the hole length to ensure that existing utilities, existing standpipe piezometers, and other site features are not damaged by the drilling process.

B. **Grout Holes:** Grout holes (primary, secondary, and tertiary) shall be drilled using the rotary core drilling method with water circulation fluid. The drill holes shall be nominally 3 inch diameter unless otherwise approved. Holes shall be thoroughly cleaned of all dust, rock chips, grease or other material which may affect water testing or grouting work. Compatible drill casing shall be provided and used if required to advance holes through unstable material and remain in the hole to be used in the grouting operations to suit the Contractor's Work Plan. The Contractor may propose alternate methods to stabilize unstable ground such as down-stage grouting. The casing shall be advanced simultaneously with the drill bit unless otherwise approved. During the grouting work the casing shall be extracted in 5-foot increments in accordance with the Contractor's Work Plan. Therefore, 5-foot casing lengths shall be required unless otherwise approved by the Director's Representative.

C. Water shall be used to return drill cuttings to the surface.

D. Drilling operations will be observed by a Director's Representative as required in the approved Quality Control and Inspection Program (QCIP) and DPP. Any holes advanced by diamond-bit rock coring will be observed full time by a Director's Representative. Facilitate extraction of the core and placement of the core into a core box intended for this express purpose (provided by the Contractor) in the presence of the Director's Representative.

E. If operations cause subsidence or physical damage, immediately cease operations and repair the damage. Revise operations to prevent reoccurrence of such damage. Any costs incurred due to this subsidence or physical damage shall be at no additional cost to the Director. All grout holes shall be progressed at the orientation as seen in the Contract Drawings to the tolerances noted herein.

2.2 DRILLING SEQUENCE

A. Grout Line 1 (downstream), Grout Line 2 (upstream) shall be drilled in a sequence that suits the Contractor's Work Plan. The Contractor may, at their convenience and in accordance with their Work Plan, drill holes in multiple locations at the same time provided that all other requirements of these specifications are met.

B. Primary (P or P*), secondary (S or S*), and tertiary (T) grout hole locations are shown on the Contract Drawings. Drilling shall start with primary holes to be followed by secondaries and then tertiary holes. The drilling of secondary holes shall not start before grouting has been completed, to the Director's Representative's satisfaction, at adjacent primary hole locations (within 5 feet, any direction). Similarly, drilling of tertiary holes shall not be allowed unless grouting in adjacent primary and secondary holes (within 5 feet, any direction) has been completed. The need for additional tertiary (T*) holes shall be determined by the Director's Representative based upon results of water testing after completion of primary, secondary, and required tertiary grout holes. Additional tertiary holes shall be drilled in the hole locations provided on the Contract Drawings. The spacing of holes shall be as shown on the plans, or as ordered by the Director's Representative.

C. P and S grout holes indicate primary and secondary grout holes drilled at an inclination of 3 vertical to 1 horizontal (3V:1H), respectively. P* and S* grout holes indicate primary and secondary grout holes with an inclination different than 3V:1H. T and T* indicate tertiary grout holes drilled vertically.

D. Upon completion of drilling and prior to grouting, the drill hole shall be rinsed with clean water until the return water is clear and free of sediments.

E. Grout holes shall be maintained open until they are grouted. A drill hole that collapses prior to filling with grout, shall be reopened, replaced, or abandoned, as ordered by the Director's Representative. A drilled hole that fills with grout due to grouting another hole shall be washed out prior to the grout hardening, redrilled or replaced with another hole, at the Contractor's expense, as ordered by the Director's Representative. Demonstrate in the drilling and grouting plan submittals that drilling ahead and leaving bore holes open can be successfully completed without fouling of the open holes by adjacent work.

2.3 DISTANCE AND TIME RESTRICTIONS

A. New grout holes shall not be drilled or washed closer than 5 feet to a hole being actively grouted. Drilling grout holes within 5 feet of a previously grouted hole will not be permitted until at least 8 hours after the completion of grouting in that hole.

END OF SECTION 314100

SECTION 314200 – BATCH, MIX AND INJECT CEMENT GROUT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This work shall consist of furnishing all equipment, labor and materials for injecting Portland cement grout mixes into bedrock and concrete as shown on the plans or at any locations ordered by the Director's Representative, through drilled holes using a packer, as well as backfilling grout holes to grade where necessary.

B. The work defined in this section is specialty construction requiring a Contractor who is highly knowledgeable and experienced in cement grouting.

C. The Contractor will be required to contain all spoils including soils and water from hole flushing and water testing. The grouting operations shall not allow for the direct discharge of construction water into the reservoir. Temporary sediment control devices may be required in combination with the overall site controls for sufficient protection in a manner that suits the Contractor's Work Plan.

D. A pre-construction meeting scheduled by the Director's Representative will be held prior to the start of grouting. This may be performed in conjunction with the pre-construction meeting prior to starting drilling operations. The Director's Representative and the Prime Contractor are required to attend. Specialty contractors, such as the grouting contractor, if different than the Prime Contractor, shall also attend. Attendance is mandatory. The preconstruction meeting will be conducted to clarify the construction requirements for the work, to coordinate the construction schedule and activities and to identify contractual relationships and delineation of responsibilities among the Prime Contractor and various Subcontractors.

E. Read Results of Lugeon Testing by Schnabel Engineering (April 2019) which documents very high (>100 lugeon; with some results above 500 lugeons) test results at this site. See Section 1.3 References. Be prepared to both properly inject grout and control placement of grout under these, and similar conditions.

1.2 RELATED WORK

A. Section 00 31 32 - Geotechnical Data

B. Section 31 41 00 - Drilling Grout Holes

C. Section 31 43 00 - Piezometers

1.3 REFERENCE STANDARDS

A. ASTM International:

1. ASTM C940 – Standard Test Method of Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory
2. ASTM C942 – Standard Test Method for Compressive Strength of Grouts for Preplaced-Aggregate Concrete in the Laboratory
3. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
4. ASTM C33 – Standard Specification for Concrete Aggregates
5. ASTM C595 – Standard Specification for Blended Hydraulic Cements
6. ASTM 4380 – Standard Test Method for Determining Density of Construction Slurries
7. ASTM 6910 – Standard Test Method for Marsh Funnel Viscosity of Construction Slurries

B. United States Bureau of Reclamation (USBR):

1. USBR Design Standards No. 13 Embankment Dams Manual
2. USBR 7310 – Constant Head Hydraulic Conductivity Tests in Single Drill Hole.

C. Related Requirements:

1. Geotechnical Data collected for the project as provided in the following:
   a. Borings Logs – Engineering Data Report - Conklingville Dam Spillway Foundation Remediation and Concrete Repair Project, Prepared by Schnabel Engineering, April 2019.

1.4 SUBMITTALS

A. Before the planned start date, submit the following information, in writing to the Director's Representative for review:

1. Three projects within the past ten years on which the Contractor has successfully completed cement grouting of similar type and purpose required for this project. A brief description of each project with the owner's name and current phone number shall be included. Submit information to the Director's Representative a minimum of 30 calendar days prior to start of work. Begin work only after receiving the Director's Representative approval.
2. Submit proof of three projects within the past ten years on which the foreman for this work has supervised cement grouting of similar type and capacity required for this project. Submit proof of prior experience with the Subcontractor approval process.
3. A grouting plan, including:
   a. Equipment and sizes to be used for grouting, water test procedures, grouting procedures, proposed access locations, any work platforms needed to perform the work, and dimensions and materials and testing procedures.
   b. Information for materials that will be used in the grouting.
   c. Grout designs with admixtures.
   d. A plan for the daily disposal of wasted and unused grout.
   e. A diagram of the equipment arrangement (see Section 2.1G for additional information).
   f. Order of grouting holes.
   g. Grout Injection Procedure: Shall include the following:
      1) Proposed maximum injection pressures.

2) Proposed minimum and maximum injection rates.
3) Proposed stage lengths.
4) Proposed methods to monitor existing structure displacement during grout injection.
5) Proposed methods to manage artesian groundwater pressures during drilling and grouting work.

h. All other information indicating typical grouting procedures from hole preparation to completion of grouting.

B. During and following construction, submit the following data to the Director's Representative for review within 7 calendar days after completion of the work in each hole:

1. Results of the water pressure testing, where performed, using a form which identifies the location, date, time, personnel, equipment, volume of water, pressure and a log of time versus water loss.
2. Provide a form which tracks grout quantity per hole location including depth of groundwater table before grouting, location and depths of holes; times of starting and stopping grouting operations; details of stage length and grout mixes used; quantity of grout injected together with injection pressure attained for each stage; and types of cement grout used to backfill holes.
3. 7-day and 28-day compressive strength test results for each grouting event and at least once per day in accordance with ASTM C942 for grout cubes or ASTM C39 for grout cylinders.

PART 2 - PRODUCTS

2.1 GROUTING EQUIPMENT

A. **General:** The arrangement of the grouting equipment shall be such as to provide a continuous circulation of grout throughout the system. Grouting equipment shall be arranged to allow recirculation back to the grout tank to control the grout pressure. Maximum grouting pressures to be used in each hole shall be as shown in Table 2-1 or otherwise specified by the Director's Representative. The pressure shall be measured by a gauge at the top of the grout hole and the depth shall be measured from the ground surface to the center of the grouted interval.

Table 2-1 - Allowable Grouting Pressures

Center Depth (ft)	Maximum Pressure (psi)	Correction to Gauge Readings
< 5 ft	5 psi (Note 1)	Subtract 0.75 psi/ft of gauge height above the ground and other line losses.
> 5 ft	1.0 psi/ft (Note 1)	

Table 2-1 Notes:
1. The minimum gauge pressure shall be 3 pounds per square inch (psi) (gauge pressure) for gauge heights less than 3 feet above the ground.

1. The equipment shall be adequate to furnish a continuous supply of grout to the locations and at the pressures indicated in the Contract Documents. Equipment which, in actual operation, proves inadequate to satisfactorily complete the work shall be removed from the job site and replaced with equipment satisfactory to the Director's Representative.

B. **Mixer:** The grout mixer shall be a high speed, high shear mixer, capable of continuous mixing of the contents at a minimum operating speed of 1,500 revolutions per minute (RPM). The methods used shall ensure the components are thoroughly mixed and allow for altering the consistency of the grout. A colloidal mixer is an example of approved equipment for mixing the grout.

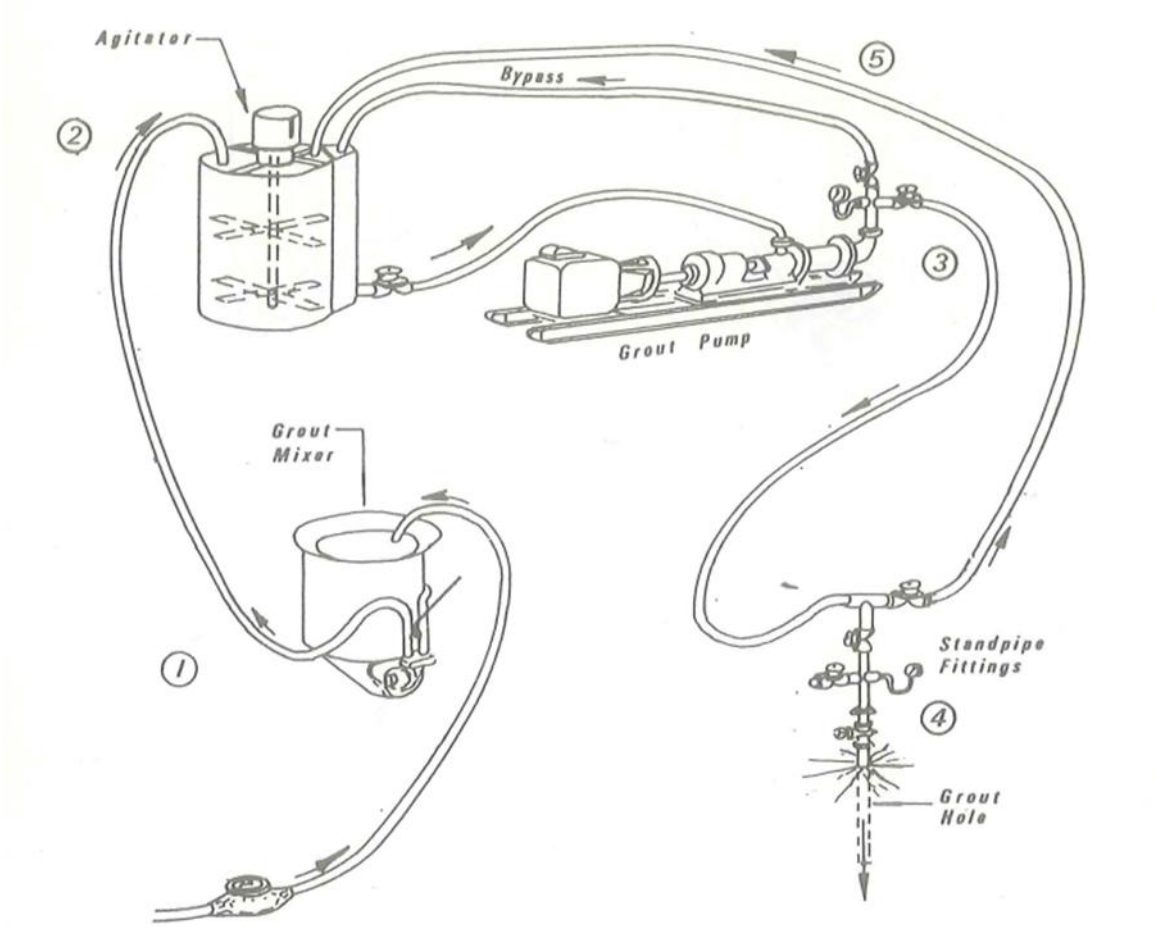
C. **Grout Pump:** Pumping of grout shall be limited to a maximum length of 100 feet from the grout plant to the connection at the grout hole. A standby grout pump shall be included in the equipment available at the site.

D. **Pressure Gauges:** The gauge(s) shall be a minimum of 3 inches in diameter, of a suitable operating range such that low pressures (3 psi range) can be monitored accurately and in full working order. Provide at least one spare gauge to prevent delays to the work. Gauges in metric units may be used for the Contractor's convenience provided that accurate conversion to Society of Automotive Engineers (SAE) standards can be conducted. A real time grout injection monitoring system is strongly preferred.

E. **Grout Delivery:** The delivery system shall include a recirculation line and a means of controlling the injection pressure located at the hole are to be provided as shown below.

F. **Water Flushing:** Standby water flushing equipment shall be maintained by the Contractor. The standby water flushing equipment shall utilize a different power source than the grouting equipment, have sufficient capacity to flush out any partially grouted holes if necessary, due to blockage or breakdown of grouting equipment, and shall be capable of developing at least 300 psi. It is acceptable to use the standby grout pump (or water test equipment, if it meets these requirements) as flushing equipment if the standby grout pump meets these requirements.

G. **Equipment Arrangement:** Shall be similar to Figure 2-1 below and meet the requirements of this specification. The Contractor is free to modify the arrangement shown to suit their Work Plan provided that the essential equipment elements, including gauges, and the return lines are provided. Submit the equipment arrangement (see Section 1.4A.3).



(Source: Houlsby, *Construction and Design of Cement Grouting)*

Figure 2-1 – Typical Gear Layout

2.2 GROUTING MATERIALS

A. **Portland Cement:** Shall conform to ASTM C595, Type 1L and provided in bags. Microfine or other grouting specific cement can be considered if required by the grout mixes and should be submitted in the Grouting Plan. Chemical grouts will not be allowed.

B. **Water:** Shall be portable water and free from deleterious materials.

C. **Sand:** Used for Grouting shall conform to ASTM C33 for concrete aggregates, be well rounded, and of a gradation that suits the Contractor's equipment.

D. **Bentonite:** Shall be a suitable commercially processed powdered bentonite, free-flowing when mixed with water and containing not less than 85 percent montmorillonite, generally used for industrial purposes. Submit bentonite product mill certificates for review by the Director's Representative.

E. **Chemical Admixtures:** A thixotropic stabilizer suitable for use with cement grout consisting of a water-soluble polymer may be used to reduce washout of the grout to suit the Director's work

plan. All chemical admixtures are subject to review by the Director's Representative prior to use and must be used in accordance with the Manufacturer's requirements.

F. **Cement Grout Mix:** The initial grout mix will be developed by the Contractor and the Director's Representative based on the results of the water testing (see Section 3.2). It shall consist of cement and water and admixtures to reduce washout and as recommended by the Contractor and as approved by the Director's Representative.

1. The High Viscosity Grout Mix provided in Table 3-1 shall have an unconfined compressive strength of 3,500 psi at 28 days.
2. The mix will be adjusted as appropriate during the work based on consultation between the Contractor and the Director's Representative to produce the best grouting result.
3. Sand may be added to the grout in proportions up to a 1:1 sand/cement ratio (by volume) if approved by the Director's Representative in situations where a single grouting port or stage has taken in excess of 15 bags of cement at minimal injection pressure.
4. Admixtures may be added to the grout subject to the approval of the Director's Representative.

PART 3 - EXECUTION

3.1 PRIOR TO GROUTING

A. Prior to beginning grouting each grout hole in rock, the grout hole shall be cleaned by flushing with water to remove drill cuttings and soil and rock particles that may have become lodged in the sides of the hole.

B. For the purposes of this specification, Grout Line 1 is on the downstream side of the structure and Grout Line 2 is on the upstream side of the structure, refer to the Contract Drawings. Contractor may grout Grout Lines 1 and 2 in either order to suit their Work Plan. Any open holes that are filled with grout from grouting another hole shall be flushed free of grout prior to the grout hardening, or a replacement hole shall be drilled at no cost to the Director if the hole cannot be washed clean.

C. Perform bore hole water testing prior to grouting as indicated in Section 3.2.

3.2 BORE HOLE WATER TESTING PRIOR TO GROUTING

A. Water shall be injected into the bore hole through a packer system at intervals of depth, or stages, which match the grouting stages. Water tests shall be conducted in accordance with USBR 7310 and as described in the Contractor's submittal for grouting.

B. Bore hole water testing shall occur at every third primary or secondary bore hole location as indicated on the Contract Drawings prior to grouting, or as required by the Director's Representative. Bore hole water testing shall occur at tertiary bore holes or additional primary or secondary bore hole locations as determined by the performance of the grouting operations at the direction of the Director's Representative.

3.3 GROUTING PROCEDURES

A. **Grouting Sequence:** For the purpose of grouting sequence, holes shall be identified as primary (P or P*), secondary (S or S*), and tertiary (T). P grout holes indicate Secondary holes shall be spaced between primaries as indicated on the Contract Drawings. Secondary holes shall be drilled and grouted a minimum of 8 hours after the grouting of adjacent primary holes. Required tertiary holes shall be spaced between primaries and secondaries as indicated on the Contract Drawings. Tertiary holes shall be drilled and grouted a minimum of 8 hours after the grouting of adjacent secondary holes. Additional tertiary (T*) holes if directed by the Director's Representative shall also be drilled and grouted at least 8 hours after grouting of adjacent required tertiary holes are completed.

B. **Grouting Method:**

1. Grouting shall be carried out using the up-stage grouting method (bottom to top). The grouting procedures described herein may be varied in the field by the Director's Representative based on conditions observed during the work. Up-stage grouting is defined as a complete cycle of grouting of any portion of a hole in ascending stages.
2. After each hole has been drilled, washed and, if required, bore hole water tested, it shall be grouted in up-stages with stage lengths and grout mixes at the pressures specified and provided in the approved grouting submittal or otherwise as directed by the Director's Representative.
3. Primary, Secondary, and Required Tertiary Holes: It is expected that primary, secondary, and required tertiary holes will be grouted in 10-foot stages (maximum). This will be accomplished by setting a packer 10 feet above the bottom of the hole. After grouting the lowest section, raise the packer 10 feet and grout the next interval. Continue this process to the top of the hole; it is acceptable to use shorter intervals to suit the site conditions.
4. Additional Tertiary Holes: It is possible that one or more locations will have unacceptably high leakage rates. Grout efficiency testing (see Section 3.4) will be performed at the locations shown on the Contract Drawings to evaluate the effectiveness of the primary, secondary, and required tertiary grouting program. Additional tertiary holes will be completed, if necessary, based on the results of the grout efficiency testing (see Section 3.4) and the grouting program in the high leakage areas. These holes will be grouted in 10-foot stages from the bottom of the hole to the top and will be completed adjacently upstream and downstream of failed areas at locations shown on the Contract Drawings.
5. The depth and inclination of the grout holes may vary from that shown on the Contract Drawings based on the results of the grouting program at the direction of the Director's Representative.

C. **Grouting:**

1. The maximum grout pressure shall not exceed the pressures in Table 2-1 unless directed otherwise.
2. Unless otherwise specified, the grout injection shall proceed in a continuous manner until termination criteria for each stage is reached. Prepare three grout mixes suitable for the intended purposes indicated in Table 3-1 for initial approval in the grouting submittal. A history of projects and performance of the grout mixes should be provided for validation of suitability. Mixes consistent with those submitted shall be used for the duration of the project unless otherwise discussed with and approved by the Director's Representative. It is acknowledged that some minor adjustments to achieve the desired performance may be

required. Suggestions provided by the Director's Representative should be considered guidelines only. It is the Contractor's responsibility to provide stable grout mixes suitable for the design intent.

Table 3-1 - Grout Mixes

Grout Mix By Application	Grout Take Prior to Thickening Grout Mix	Typical Usage for Mix Type (Notes 1 and 2)
Low Viscosity (Initial) Grout Mix at each stage	5 cubic yards is pumped into a single 10 foot grout stage	Lower viscosity mix to start each stage to penetrate partially open to open natural fractures in the rock mass. Penetration into pore of rock matrix is not required.
Moderate Viscosity Grout Mix	3 cubic yards is pumped into a single 10 foot grout stage	Moderate viscosity mix to all for grout to penetrate partially open natural fractures in the rock mass and limit travel to achieve termination criteria.
High Viscosity Grout Mix	2 cubic yards is pumped into a single 10 foot grout stage	High viscosity mix to choke off wide defects with "unlimited" travel to achieve termination criteria (Note 3).

Table 3-1 Notes:

1. Modify grout mixes (as required) based on field observations, and as approved by the Director's Representative.
2. The mix shall be balanced and stable as defined by the USBR Design Standards No. 13 Embankment Dams Manual and designed to perform the indicated function.
3. Terminate grouting in current stage if Grout Take Threshold is reached, see Section 3.3.D.

D. Grout Stage Termination Criteria:

1. Pressure Threshold: The maximum pressure is reached. The initial maximum grouting pressures shall assume 1 psi per foot of depth (measured from the surface to the point of injection), plus losses and additional pressure as needed to overcome any artesian water pressure. Grouting may continue if pressures are reached below the appropriate maximum limit.
2. Rate Threshold: Grout shall be injected until the subsurface material accepts less than 1 gallon of grout per 5 minutes of injection time at the maximum allowable pressure and chosen grout consistency.

3. Volume Threshold: See Table 3-1, if the volume threshold for the High Viscosity Mix is met, grouting shall be stopped and allowed to set up for 12 hours, prior to redrilling the hole to this depth and continued grouting up to the top grout depth. If artesian pressures are present, a packer system should be set at the top of the interval to control pressure and seal the bore hole from flow while the grout is allowed to set.
4. Loss of Grout to the Ground Surface or Waterbody Threshold: Grout shall be stopped immediately, and the Director's Representative shall evaluate conditions before grouting resumes if grout is observed at the ground surface or water surfaces.
5. Heave Threshold: Heave or displacement is observed near the point of injection in excess of ½ inch. Provide methods for monitoring heave or displacement during grout injection.
6. Other Threshold: As directed by the Director's Representative.

The Director's Representative shall be notified and termination criteria reviewed before the grouting equipment is removed from the bore hole. Upon reaching one of the above refusal criteria (excluding the volume threshold), and obtaining concurrence with the Director's Representative, the packer shall be lifted to the top of the next stage, and the process repeated over the limits shown in the Contract Drawings. If artesian pressures are present, control pressures while packer systems are moved to the next grouting interval.

E. **Special Attention:**

1. The ambient temperature within the holes at the time of grouting shall be above 40 degrees F (5 C) and less than 105 degrees F (40 C).
2. Maintain the grout temperature between 40 and 85 degrees F.

F. **Leakage of Packer:** Leakage of packer shall be monitored at all times. In the event of grout leakage, grouting shall be suspended while the packer is reseated. If on the resumption of grouting it is found that refusal occurs immediately, (indicating that the grout in the hole has clogged either the grout hole or the previously used grout passageways), then that stage shall be flushed with clean water and regrouted. No extra payment shall be made for flushing and regrouting.

3.4 GROUT EFFICIENCY TESTING

A. Following grouting for primary, secondary, and required tertiary holes, water testing shall be performed at grout efficiency test locations indicated on the Contract Drawings or as required by the Director's Representative to verify efficiency of the grouting program. Water shall be injected into the bore hole through a packer system at intervals of depth, or stages, which match the grouting stages. Water tests shall be conducted in accordance with USBR 7310 and as described in the Contractor's submittal for grouting. A passing water test shall be considered as 7 lugeons or less. A failing water test shall constitute the need for additional tertiary holes as described in Section 3.3.B.4. Grout efficiency test locations with failed water tests shall be grouted in 10-foot stages (maximum). This will be accomplished by setting a packer 10 feet above the bottom of the hole. After grouting the lowest section, raise the packer 10 feet and grout the next interval. Continue this process to the top of the hole; it is acceptable to use shorter intervals to suit the site conditions.

3.5 CONTRACTOR QUALITY CONTROL

A. A Quality Control Inspection Program (QCIP) has been prepared for this project. The Contractor's quality control personnel shall work cooperatively with the Director's Representative during grouting to ensure the QCIP program requirements are met. The data and measurements detailed in this specification shall be communicated to the Director's Representative during grouting as requested to allow for real-time evaluation of the grouting process and results.

B. The Contractor will perform testing on fluid grout properties both to check the consistency of the mix compared to approved mix design properties, and to achieve desired placement and performance for the project.

C. Fluid Grout Testing shall consist of, the following at a minimum, once per hole per mix, and additionally where grout take/performance is not providing the anticipated performance, or upon the request of the Director's Representative:

1. Grout mix used, including materials, admixtures, and equipment used.
2. Water/Cement Ratio: Respective water/cement ratios by weight, as mixed.
3. Density: Respective densities per ASTM 4380.
4. Viscosity: Respective marsh funnel times per ASTM 6910.
5. Bleed: Respective bleed results per ASTM C940.

D. Collect and save samples of grout placed at the direction of the Director's Representative. The samples are for the purpose of demonstrating set time and consistency of the grout.

E. Record the measurements and data detailed in this specification and provide to the Director's Representative upon completion of work. The proposed Quality Control testing by the Contractor shall be clearly defined, including type, procedure, and frequency (at a minimum) in the grouting submittal.

3.6 PROTECTION OF WORK AND CLEAN UP

A. Take precautions as may be necessary to prevent damage to the existing structure or elements of on-going construction. Provide necessary equipment to properly dispose of wastewater, grout, and other chemicals from grouting operations. Upon completion of grouting operations, clean up all waste resulting from grouting operations, including but not limited to trash, unused grout, and drill cuttings. Final surfaces shall match existing grades and prevent both a tripping hazard and long-term water collection at the top of the completed grout hole. Provide the method used to restore the upper portion of the bore hole to meet these requirements in the grouting submittal.

END OF SECTION 314200

SECTION 315100 – ROCK ANCHORS

PART 1 - GENERAL

1.1 SCOPE

A. This work shall consist of furnishing, drilling, installing, and testing prestressed grouted rock anchors and accessories at the locations and in the patterns shown on the Contract Drawings or as ordered.

B. The work defined in this section is specialty construction requiring a Contractor who is highly knowledgeable and experienced in the installation of rock anchors.

C. The Contractor will be required to contain all spoils including soils and water from the anchor installation process. Under no circumstances are spoils from the installation allowed to enter the river. The installation shall not cause erosion or allow for the direct discharge of construction water. Temporary sediment control devices may be required in combination with the overall site controls for sufficient protection.

D. A pre-construction meeting scheduled by the Director's Representative will be held prior to the start of construction. The Director's Representative, Prime Contractor, and Surveyor shall attend. All of the specialty contractors, such as the rock anchor contractor if different than the Prime Contractor, shall also attend. Attendance is mandatory. The preconstruction meeting will be conducted to clarify the construction requirements for the work, to coordinate construction schedule and activities and to identify contractual relationships and delineation of responsibilities among the Prime Contractor and various Subcontractors.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Allowances: Section 012100

B. Concrete Forming and Accessories: Section 031000

C. Concrete Reinforcing: Section 032000

D. Cast-In-Place Concrete: Section 033000

E. Batch Mix and Inject Cement Grout: Section 314200

1.3 REFERENCES

A. Geotechnical Data collected for the project as provided in the Bidding Requirements, Document 003132.

B. New York State Department of Transportation (NYSDOT) Standard Specifications, latest edition.

C. Post-Tensioning Institute Recommendations for Prestressed Rock and Soil Anchors, current edition.

1.4 DEFINITIONS

A. Rock Anchors: A small diameter, steel bar with bonded and unbonded lengths capable of being prestressed.

B. Alignment Load (AL): A minimum initial load (5 percent DL maximum) applied to the rock anchor during testing to keep the testing equipment correctly positioned.

C. Anchorage: The portion of the rock anchors, including anchor and bearing plates, nuts, and wedges that is used to prestress and transfer loads from the structure to the rock anchor.

D. Anchor Grout: Grout that fills the space between the anchor and the anchor hole with an approved water to cement ratio and strength, and grout that fills the space between casing and casing hole as indicated on the plans.

E. Bond Length: The portion of the rock anchor which is bonded to rock and transfers the tensile force from the rock anchor to rock.

F. Casing Pipe: Steel tube introduced during the drilling process in overburden soil to temporarily stabilize the drill hole.

G. Centralizers: A device to support and position the rock anchor in the casing or drill hole so that a minimum grout cover is provided.

H. Couplers: A device which allows lengths of steel bar to be connected.

I. Creep Rate: The magnitude of total movement measured during a load hold per log cycle of time.

J. Design Load (DL): The maximum unfactored load expected to be applied to the rock anchor during its service life.

K. Designated Monitoring Anchor: A rock anchor that is configured to be lift-off tested after initial installation and for future monitoring.

L. Packer: An expandable device used to positively seal a section of a drill hole and through which water or grout is injected under pressure.

M. Performance Load Test: Cyclic incremental loading of a production rock anchor to 1.33 DL with creep test, recording the total movement at each increment.

N. Proof Load Test: Incremental loading of a production rock anchor to 1.33 DL with creep test, recording the total movement at each increment.

O. Sheath: The portion of the rock anchor which encases the unbonded length only.

P. Stressing Length (Free Length): That portion of the rock anchor which is not bonded to grout.

Q. Unbonded Length: The portion of the rock anchor which is not bonded to grout through provision of the sheath.

1.5 SUBMITTALS

A. Submit proof of the following to the Director's Representative for approval:

1. Submit proof of five projects within five years on which the Contractor has successfully installed rock anchors of similar type and capacity required for this project. A brief description of each project with the owner's name and current phone number shall be included.
2. Submit proof of five projects within five years on which the foreman for this work having supervised the installation of rock anchors of similar type and capacity required for this project. Submit proof of prior experience with the subcontractor approval process.

B. Before the planned start date, submit the following information, in writing to the Director's Representative for review:

1. A rock anchor installation plan, that includes the Contractor's qualifications, description of drilling operations including selected equipment and sizes, the assembly of the anchor with its accessories, water pressure test procedures, grouting procedures, the method of anchor installation, proposed access plan, dimensions, materials and testing procedures, and numbering or identification of each rock anchor. Indicate sequence and schedule relative to the foundation grouting specified in Section 31 42 00.
2. Design calculations, stamped by a Professional Engineer licensed and authorized to practice in New York State, which determine the bearing plate design.
3. Shop drawings of the anchor and corrosion protection including:

    a. Type and size of bar
    b. Centralizers and their location
    c. Couplers and their location
    d. Stressing length corrosion protection
    e. Bond length corrosion protection
    f. Casing pipe dimensions and locations
    g. Smooth sheathing
    h. Rock anchors head assembly including nuts, wedges, washers, plates, covers and trumpet
    i. Anchorage corrosion protection system (including corrosion inhibitor compound)
    j. Grout design with admixtures

4. Manufacturer's certificates of compliance for the following: Rock anchors threadbar, complete rock anchors head assembly including nuts, wedges, washers, plates, covers and trumpet, smooth sheathing, centralizers, corrosion inhibitor compound, and grout design with admixtures.

C. During and following construction, submit the following data to the Director's Representative for review:

1. Provide results of the water pressure testing using a form which identifies the location, date, time, personnel, equipment, volume of water, pressure and a log of time versus water loss.
2. Provide a form which tracks grout quantity per anchor location for each time a drill hole is grouted. In addition, present total grout usage as a percentage of theoretical.
3. Provide performance and proof load test results and associated equipment calibration certifications. Test results should be presented using a form which identifies the location, date, time, personnel, equipment, and a log and graph of load versus displacement. In addition, results of the creep test shall also be presented.
4. As-built drawings showing the locations of the anchors, total rock anchor lengths, stressing lengths and bond lengths.
5. Anchor installation notes (hole progression, caving, clean-out).
6. Grouting records indicating the cement type, quantity injected and grout pressures.
7. 7-day and 28-day compressive strength test results for each grouting event and at least once per day in accordance with ASTM C 942 for grout cubes or ASTM C39 for grout cylinders.

1.6 PROJECT CONDITIONS

A. Furnish all labor, materials, tools and equipment and perform all operations necessary for drilling, cleaning, water testing, grouting, installation, and load testing (performance and proof testing) of the rock anchors.

B. An allowance for all instances of pre-grouting, re-drilling, and re-testing rock anchor holes which fail the water pressure test outlined in Article 3.2G of this Section is included in the contract. The cost for all instances of pre-grouting, re-drilling, and re-testing of rock anchor holes that fail the water pressure test will be paid for out of the allowance. All other work of this section will be paid at the contract bid price.

PART 2 - PRODUCTS

2.1 ROCK ANCHOR BARS

A. Shall be straight shaft, deformed, solid, continuous threadbar, double corrosion protected, new, and undamaged. If anchor length (in excess of 50 feet) prevents the use of a continuous threadbar, a coupler may be used.

B. Shall be ASTM A722 Grade 150 steel and shall be provided with the minimum diameters as shown on the Contract Drawings.

2.2 ANCHORAGE ASSEMBLY, COUPLERS, AND CENTRALIZERS

A. The anchorage assembly and couplers shall be capable of developing a minimum of 100 percent of the guaranteed minimum ultimate tensile strength of the anchor bars.

B. Bearing Plates

1. Plates shall be fabricated from new ASTM A572 Grade 50 steel and shall have a minimum size as shown on the approved shop drawings. All anchorages shall be configured for lift-off testing.

C. Beveled Washers, Flat Washers and Wedges: Beveled washers, hardened flat washers, and wedges for the anchorage shall be designed to preclude premature failure of the pre-stressing steel due to notch or pinching effects.

D. Heavy 2H Hex Nuts: Heavy 2H hex nuts shall be constructed for threaded engagement with the outer end of the anchor bar. The nut should be heavy duty type with round head, conforming to or exceeding the ultimate strength of the anchor bar.

E. Couplers: Couplers may be required and shall be constructed for threaded engagement with the anchor bars. The coupler must be capable or conforming to or exceeding the ultimate strength of the bar.

F. Centralizers: Centralizers are required and shall be fabricated from Schedule 40 PVC, or other material not detrimental to the anchor bars (wood shall not be used) and shall be capable of being securely attached to the bar. The centralizers shall be sized to maintain the bars within the center of the casing or drill hole, while allowing grout to flow freely around the bar and along the drill hole.

G. Coupler Protection: The coupler and any exposed bar section next to it shall be covered with a corrosion proof compound or wax impregnated cloth tape. The coupler area shall be covered by a smooth plastic sheathing complying with the requirements set forth in Article 2.3, overlapping the adjacent sheathed bar by at least 1 inch. The two joints shall be sealed each by a coated heat shrink sleeve of at least 6 inches in length, or approved equal. The corrosion proof compound shall completely fill the space inside the cover sheathing.

H. Trumpets shall be fabricated from Schedule 40 steel pipe and be completely welded to the bearing plate. The trumpet shall have an inside diameter equal to or larger than the hole in the bearing plate and shall be long enough to accommodate movements of the structure during loading and testing. The length of the trumpet shall be 10-inches and the space between the rock anchors and the trumpet shall be filled with a corrosion proof compound and provide a seal to retain grease within the trumpet between the trumpet and the stressing length corrosion protection. A description of the seal shall be submitted to the Director's Representative for approval.

2.3 SHEATHING

A. Sheathing used over the anchors bar in the unbonded (free stressing) zone shall be made of material with the following properties: resistant to chemical attack from aggressive environments, grout or corrosion inhibiting compounds; resistant to aging by ultra-violet light; non-detrimental to the rock anchor bars and capable of withstanding abrasion, impact and bending during handling and installation. The minimum wall thickness for the sheathing shall be 0.060 inches for polyethylene or polypropylene, 0.040 inches for PVC tubing and 0.20 inches for steel tubing or pipe. The sheathing shall permit the unobstructed elongation of the unbonded length during stressing.

B. If couplers are required within the unbonded zone, the sheathing must be sized to allow for unobstructed movement of the coupling.

2.4 GREASE

A. Corrosion inhibiting grease shall conform to the requirements of the Post Tensioning Institute's "Specifications for Unbonded Single Stranded Tendons", Section 3.2.5.

2.5 CEMENT GROUT

Cement Grout shall meet the following requirements:

A. Grout shall be non-shrink neat cement with a maximum water to cement ratio of 0.45 by weight.

B. Water for mixing grout shall be potable.

C. Grout strength accelerators shall not be used. Admixtures, which control bleed and retard set may be used. Admixtures shall be mixed and placed in accordance with the manufacturer's recommendations.

D. Grout mixing shall be performed with a high-shear colloidal mixer.

E. The cement grout mix shall provide a minimum compressive strength of 5000 pounds per square inch (psi) at the time of anchor testing.

F. Appropriate measures shall be taken to preclude freezing of the grout prior to its reaching design strength.

G. Cement shall conform to ASTM C595, Type IL Portland cement.

H. 7-day and 28-day compressive strength tests shall be performed for each grouting event and at least once per day in accordance with ASTM C 942 for grout cubes or ASTM C39 for grout cylinders.

2.6 DESIGNATED MONITORING ANCHOR ENCLOSURE

A. Construct the enclosure for the designated monitoring anchors as indicated on the Contract Drawings.

PART 3 - EXECUTION

3.1 DESIGN LOAD, TOLERANCE AND CONSTRUCTION CRITERIA

A. Design Load. The design load for the rock anchors for this project shall be as shown on the Contract Drawings unless otherwise directed by the Director's Representative.

B. The hole diameter shall be in accordance with the Contract Drawings and manufacturer's recommendations.

C. The bonded length and associated hole diameter shall be large enough to provide a capacity of at least 1.33 times the design load or as directed by the Director's Representative.

D. The unbonded (free stressing) length shall be as shown on the Contract Drawings or as directed by the Director's Representative.

E. Centralizers shall be spaced as shown on the Contract Drawings.

F. Prior to drilling, confirm the design location with the Director's Representative as indicated on the Contract Drawings. The deviation of the drilled hole location shall be no more than 2 inches in any direction from the design location.

G. The deviation of the drilled hole entry angle from the specified inclination and direction shall be no more than 1 degrees.

H. Rock anchors shall be installed after the foundation grouting has been completed as specified in Section 31 42 00 in the vicinity of the anchor. Do not install anchors within 100 feet of incomplete foundation grouting, as measured along the alignment of the foundation grouting, unless otherwise approved by the Director's Representative.

3.2 ROCK ANCHORS DRILLING

A. Locate appropriate-sized drilling equipment to suit drilling operations.

B. Drill holes for the rock anchors using core drilling, rotary drilling, auger drilling, or percussion drilling. Install casing as required to maintain a clean and open hole. Utilize a drill bit with a diameter not smaller than the specified hole diameter minus 1/8 inch.

C. The drill hole diameter shall conform to the requirements of this special provision. The drill hole shall extend 12 inches below the design depth of the rock anchors bar.

D. Care shall be taken to ensure an accurate and straight hole.

E. Drilled holes shall be cleaned of all drill cuttings, dust, grease, sludge and debris before the rock anchor bar is inserted into the hole.

F. Soil and rock spoils shall be sufficiently dried and removed from the site, including water used during the entire anchor installation process. No spoils or drilling water are allowed to enter the river.

G. Perform a water pressure test by filling the bonded zone in rock with water and subjecting it to a nominal pressure of 5 pounds per square inch in excess of the hydrostatic head as measured at the top of the hole. Use of a packer to isolate the bonded zone is allowed. Record the leakage rate from the hole, over a 10-minute period and report the results immediately to the Director's Representative. If the leakage rate from the hole over a 10-minute period exceeds 2.75 gallons of water, the hole shall be pre-grouted, re-drilled, and re-tested in accordance with the requirements herein, otherwise proceed to rock anchor installation. Should the subsequent water pressure test fail, the entire process shall be repeated until results are attained which are within leakage allowances. All costs for pre-grouting, re-drilling, and re-testing of anchor holes failing the water

pressure test will be negotiated with the Director's Representative in accordance with Section 012100.

H. If necessitated by Article 3.2G, pre-grout holes in general compliance with Section 3.04 below after completing the drilling to the depths shown on the Contract Drawings. The cost for all instances of pre-grouting will be paid for out of the contract allowance in Section 012100.

I. If necessitated by Article 3.2G, re-drill holes to the specified length and diameter a minimum of 18 to 36 hours after placement of the pre-grout, such that the pre-grout has reached a strength to preclude washout when re-drilling, and prior to the grout reaching a strength that exceeds the strength of the surrounding medium. The drilled holes shall be cleaned of all drill cuttings, sludge and debris before the rock anchors bar is inserted into the hole. The cost for all instances of re-drilling holes will be paid for out of the contract allowance in Section 012100.

J. If necessitated by Article 3.2G, re-test the hole, using the procedure described in Section 3.2G. If the subsequent water pressure test does not meet the requirements, the entire process should be repeated until satisfactory water pressure test results are achieved. The cost for all instances of re-testing holes will be paid for out of the contract allowance in Section 012100.

3.3 ROCK ANCHOR INSTALLATION

A. The bottom of the rock anchor bar shall be positioned 12 inches above the bottom of the drilled hole.

B. The threaded outer end of the rock anchor bar shall extend sufficiently to accept the proof test and lift off equipment. The anchorage nut shall be tightened using an approved post tensioning hydraulic jack, which permits tightening of the nut during tensioning.

C. All equipment used for placing shall be such that it will not damage the rock anchors or their accessories.

D. The anchor shall be centered in the trumpet so that there is no contact between the two. The corrosion protection surrounding the stressing length of the tendon shall extend up beyond the bottom seal of the trumpet but shall not contact the bearing plate or anchor head during stressing and testing.

E. The bearing plate shall be installed perpendicular to the anchor, within a ±3° tolerance and centered, without bending or kinking of the anchor.

F. The anchor head shall be protected from corrosion during the interim between anchor installation and final corrosion protection installation by installing a temporary cap and filling the trumpet and anchor head with corrosion-inhibiting grease. Any detrimental corrosion shall be caused for rejection.

G. After installation, testing and acceptance of each anchor, the trumpet and annulus around the trumpet shall be filled with corrosion inhibiting grease and the permanent corrosion protection of the anchorage shall be installed. Unless otherwise indicated, place a water-tight steel cap, filled with corrosion inhibiting grease over the anchor head and encase the anchor head in concrete as shown on the Contract Plans.

3.4 GROUT INSTALLATION

A. Provide equipment capable of continuously grouting an individual anchor in less than 1 hour. Unless otherwise specified, the grout injection shall proceed in a continuous manner until refusal is reached. Grouting equipment shall be arranged to allow recirculation back to the grout tank to control the grout pressure. Maximum grouting pressures to be used in each hole shall be 5 psi or as shown on the plans or otherwise specified by the Director's Representative. The pressure shall be measured by a gauge at the top of the grout hole. If artesian conditions are encountered, grout pressures may have to be higher and maintained on the hole until the grout has set. Refusal is defined as a grout take of less than one batch in ten minutes at maximum grouting pressure.

B. Grouting of the annular space around the rock anchors shall be injected at a pressure, which is sufficient to overcome hydrostatic head. The pressure which is used shall be approved by the Director's Representative. Dewatering or pre-grouting may be required for proper grouting of the rock anchors in groundwater or poor soil conditions. The annular space between the anchor and the drilled hole up to the level of the trumpet and between the anchor and encapsulation shall be filled with grout. In order to prevent air voids in the grouting operation, the hole shall be filled with grout progressively from bottom to top. Grouting of the stressing length shall be done at low pressure. The trumpet shall not bear on the top of the stressing length grout column during testing, to ensure that load applied to the anchor during testing is not transferred to the anchorage via the grout column.

C. All grout pipes, tubes and fittings shall be clean and free from dirt particles, grease, hardened grout, or other contamination before grouting is commenced for any anchor. All surplus water and diluted grout shall be flushed or blown from all lines before commencing injections. The grout line shall be attached to the grout injection tube with suitable fittings such that leakage is entirely prevented.

D. The anchor bond length shall be grouted by injecting grout at the lowest point in the anchor borehole.

E. A grout sample shall be obtained on each day and at each anchor that is installed and tested for compressive strength at 7 and 28 days of age. Each test sample shall consist of a three-cube set that may be tested for compressive strength at the specified age, unless otherwise specified by the Director's Representative.

F. Mix all grout with a colloidal type mixer capable of continuous mixing and producing grout free of lumps. The grout pump shall be equipped with a grout pressure gage capable of measuring the highest working pressures attained plus 50 psi.

G. In no event, shall the Contractor stop pumping grout or modify the grout mix unless directed to do so by the Director's Representative.

H. Grout that cannot be placed, for any reason, within two (2) hours after mixing shall be discarded as wasted grout.

I. Flush out partially grouted holes whenever grouting is interrupted for two hours or more. If the Contractor fails to flush out a partially grouted hole, the Director's Representative may direct the Contractor to abandon and backfill the hole and drill and grout another hole, and no payment will be made for the abandoned hole, drilling or the grout.

J. Special Attention:

1. The structures, embankment, or waterway adjacent to grouting operations shall be continuously observed during all grouting operations. Grouting operations shall cease and the Director's Representative shall be notified immediately if there is any evidence of grout entering the waterway. Should grout enter the waterway through holes in structure walls, these holes shall be repaired as shown on the contract plans or as directed by the Director's Representative prior to resuming grouting.
2. The ambient air temperature within the holes and of the grout at the time of grouting shall be above 40 ºF.
3. Leakage of the packer shall be monitored at all times by circulating water above the packer during grouting. In the event of grout leakage, grouting shall be suspended while the packer is reseated. If on the resumption of grouting it is found that refusal occurs immediately, (indicating that the grout in the hole has clogged either the grout hole or the previously used grout passageways), then that stage shall be flushed with clean water and re-grouted. No extra payment shall be made for flushing and re-grouting.

K. Records: Accurate records of all grouting shall be kept by the Contractor and furnished to the Director's Representative at the end of each shift. The records shall include the following for all hole grouting in progress, and other data as the Director's Representative may require:

1. Location and depths of holes;
2. Times of starting and stopping grouting operations, details of stage length and grout mixes used, quantity of grout injected together with injection pressure attained for each ten (10) minute interval throughout the grouting period until refusal is achieved or the mix or grout is changed;
3. Types of cement grout used to backfill holes.

3.5 PERFORMANCE TESTS, ACCEPTANCE CRITERIA AND LOCK OFF PROCEDURES

A. At a minimum the first anchor installed at each of the four specified anchoring locations indicated in the rock anchor schedule on the Contract Drawings (spillway, ice chute, rock slope, stop gates) shall be performance tested in accordance with the requirements of this specification. Testing of the rock anchors shall not be performed until the rock anchors grout has attained at least 100 percent of the minimum required compressive strength. Rock anchors which do not meet the performance test criteria contained herein shall be rejected and replacement rock anchors shall be installed.

B. The testing equipment shall be capable of stressing the rock anchors to the maximum specified test load within the rated capacity. The pump shall be capable of applying each load increment in less than 60 seconds. The equipment shall permit the rock anchors to be stressed in increments so that the load can be raised or lowered in accordance with the test specifications, and allow the anchor to be lift-off tested to confirm the lock-off load. Stressing equipment shall have been calibrated within an accuracy of + or - 2% within 60 days prior to use. The calibration certificate and graph shall be available on site at all times. The calibration shall be traceable to the National Institute of Standards and Technology (NIST). The production gauge shall have graduations not larger than 100 psi. One certified dial gauge, traceable to the National Institute of Standards and Technology (NIST), shall be used which permit the measurement of total movement at every load increment to be read to the nearest 0.001 inch. The dial gauge shall have sufficient travel to record

the total rock anchors movement at the maximum test load without the need to reset at an interim point.

C. Testing Equipment Setup. Prior to setting the dial gauge, the alignment load shall be accurately placed on the rock anchors. The alignment load shall be ten percent of the design load (AL). The dial gauge shall bear on the pulling head of the jack and the stems shall be in alignment with the rock anchors direction. The dial gauge shall be supported on an independent fixed frame, such as a tripod, which will not move as a result of stressing or other construction activities during the test.

D. Testing Schedule. Performance tests shall be performed by cyclically and incrementally loading the rock anchors to 133 percent of the design load (DL). The rock anchors movement at each load shall be measured and recorded by the Contractor. All testing should be observed by the Director's Representative. At load increments other than the maximum test load, the load shall be held long enough to obtain a stable reading. Incremental loading for performance tests shall be in accordance with the following schedule:

LOAD SCHEDULE
AL
0.25DL
AL
0.25DL
0.50DL
AL
0.25DL
0.50DL
0.75DL
AL
0.25DL
0.50DL
0.75DL
1.00DL
AL
0.25DL
0.50DL
0.75DL
1.00DL
1.20 DL
AL
0.25DL
0.50DL
0.75DL
1.00DL
1.20 DL
1.33DL
AL
Lock-off
Lift- off Reading

E. All load increments shall be maintained within 5 percent of the intended load. Depending on performance, either 10 minute or 60 minute creep tests shall be performed at the maximum test load (1.33 DL). The creep period shall start as soon as the maximum test load is applied and rock anchors movement shall be measured and recorded at 1, 2, 3, 4, 5, 6, and 10 minutes. Where the rock anchors movement between 1 and 10 minutes exceeds 0.040 inches, the maximum test load shall be maintained an additional 50 minutes and movements shall be recorded at 20, 30, 40, 50, and 60 minutes.

F. Performance Test Acceptance Criteria. Performance tests shall be considered acceptable when all of the following criteria is met.

1. A total creep movement of less than 0.04 inches is observed between the 1 and 10 minute readings or a total creep movement of less than 0.08 inches is observed between the 6 and 60 minute readings.
2. The creep rate is constant or decreasing throughout the creep test load hold period.
3. The total movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the rock anchors unbonded length.
4. A pullout failure does not occur at the maximum test load. Pullout failure is defined as the condition at which attempts to increase the test load simply result in continued pullout movement of the rock anchors. The pullout failure load shall be recorded as part of the test data.

G. Lock Off Procedures:

1. Lift-Off Readings. Lift-off readings shall be taken and recorded directly after testing on all anchors. The load required to relieve the load from the anchor head shall be measured and recorded. If the lift-off load is not within 5% of the lock-off load the anchorage shall be reset and another lift-off reading taken.
2. Lift-Off Tests. Lift-off tests shall be performed on rock anchors only. Unless otherwise indicated, locations for lift-off tests shall be selected randomly by the Director's Representative prior to the commencement of any anchor testing. For each anchor subjected to a lift-off test, leave an adequate length of tendon protruding over the anchorage to permit jacking.
    a. Lift-off tests shall be performed at least 24 hours but no more than 7 days after the anchor has been set to lock-off load. The results of all lift-off tests shall be recorded.
    b. If the lift-off load is not within 10% of the lock-off load, the anchorage shall be reset and another lift-off test performed according to the requirements in this specification.

H. Any rock anchors failing to meet the required criteria, shall be replaced at no additional charge to the Owner. A replacement rock anchor and location will be designated by the Director's Representative.

3.6 PROOF TESTS, ACCEPTANCE CRITERIA AND LOCK OFF PROCEDURES

A. Each production rock anchors including the test anchor, which has not been performance tested, shall be proof tested in accordance with the requirements of this specification. Testing of the rock anchors shall not be performed until the rock anchors grout has attained at least 100 percent of

the minimum required compressive strength. Rock anchors which do not meet the proof test criteria contained herein shall be rejected and a replacement rock anchor shall be installed.

B. The testing equipment shall be capable of stressing the rock anchors to the maximum specified test load within the rated capacity. The pump shall be capable of applying each load increment in less than 60 seconds. The equipment shall permit the rock anchors to be stressed in increments so that the load can be raised or lowered in accordance with the test specifications, and allow the anchor to be lift-off tested to confirm the lock-off load. Stressing equipment shall have been calibrated within an accuracy of + or - 2% within 60 days prior to use. The calibration certificate and graph shall be available on site at all times. The calibration shall be traceable to the National Institute of Standards and Technology (NIST). The production gage shall have graduations not larger than 100 psi. One certified dial gage, traceable to the National Institute of Standards and Technology (NIST), shall be used which permit the measurement of total movement at every load increment to be read to the nearest 0.001 inch. The dial gage shall have sufficient travel to record the total rock anchors movement at the maximum test load without the need to reset at an interim point.

C. Testing Equipment Setup. Prior to setting the dial gage, the alignment load shall be accurately placed on the rock anchors. The alignment load shall be determined by the Director's Representative as a percentage of the design load. The dial gage shall bear on the pulling head of the jack and the stems shall be in alignment with the rock anchors direction. The dial gage shall be supported on an independent fixed frame, such as a tripod, which will not move as a result of stressing or other construction activities during the test.

D. Testing Schedule. Proof tests shall be performed by incrementally loading the rock anchors to 133 percent of the design load (DL). The rock anchors movement at each load shall be measured and recorded by the Contractor. All testing should be observed by the Director's Representative. At load increments other than the maximum test load, the load shall be held long enough to obtain a stable reading. Incremental loading for proof tests shall be in accordance with the following schedule:

AL
0.25DL
0.50DL
0.75DL
1.00DL
1.20 DL
1.33DL
AL
Lock-off
Lift- off Reading

E. All load increments shall be maintained within 5 percent of the intended load. Depending on performance, either 10 minute or 60 minute creep tests shall be performed at the maximum test load (1.33 DL). The creep period shall start as soon as the maximum test load is applied and rock anchors movement shall be measured and recorded at 1, 2, 3, 4, 5, 6, and 10 minutes. Where the rock anchors movement between 1 and 10 minutes exceeds 0.040 inches, the maximum test load shall be maintained an additional 50 minutes and movements shall be recorded at 20, 30, 40, 50, and 60 minutes.

F. Proof Test Acceptance Criteria. Proof tests shall be considered acceptable when all of the following criteria is met.

1. A total creep movement of less than 0.04 inches is observed between the 1 and 10 minute readings or a total creep movement of less than 0.08 inches is observed between the 6 and 60 minute readings.
2. The creep rate is constant or decreasing throughout the creep test load hold period.
3. The total movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the rock anchors unbonded length.
4. A pullout failure does not occur at the maximum test load. Pullout failure is defined as the condition at which attempts to increase the test load simply result in continued pullout movement of the rock anchors. The pullout failure load shall be recorded as part of the test data.

G. Lock Off Procedures:

1. Lift-Off Readings. Lift-off readings shall be taken and recorded directly after testing on all anchors. The load required to relieve the load from the anchor head shall be measured and recorded. If the lift-off load is not within 5% of the lock-off load the anchorage shall be reset and another lift-off reading taken.
2. Lift-Off Tests. Lift-off tests shall be performed on rock anchors only. Unless otherwise indicated, locations for lift-off tests shall be selected randomly by the Director's Representative prior to the commencement of any anchor testing. For each anchor subjected to a lift-off test, leave an adequate length of tendon protruding over the anchorage to permit jacking.
    a. Lift-off tests shall be performed at least 24 hours but no more than 7 days after the anchor has been set to lock-off load. The results of all lift-off tests shall be recorded.
    b. If the lift-off load is not within 10% of the lock-off load, the anchorage shall be reset and another lift-off test performed according to the requirements in this specification.

H. Any rock anchors failing to meet the required criteria, shall be replaced at no additional charge to the Owner. A replacement rock anchor and location will be designated by the Director's Representative. Anchors which do not meet the total movement criteria shall not be permitted to carry any load.

END OF SECTION 315100

SECTION 315200 - COFFERDAMS

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 310000.

B. Erosion and Sedimentation Controls: Section 312500

1.2 SUBMITTALS

A. Water Control Plan and Access Plan, including:

1. Construction schedule outlining control targets for upstream and downstream water levels.
2. Sequencing and durations of construction activities in relation to the target water levels.
3. Water control and dewatering means and methods, including all cofferdams, bulkheads, water diversion structures and sediment and erosion control measures.
4. Egress plans to indicate how weather will be forecast and how equipment, materials and personnel will be removed from affected areas.
5. How forecasted and actual precipitations within the watershed will be monitored to minimize impact to work areas.
6. Sequencing of all in-water work, including cofferdam installation and removal, must comply with the water quality restrictions.
7. A seepage control plan to indicate how seepage through the cofferdams will be collected and how erosion and sediment control features will be incorporated into the work.
8. If contractor-designed bulkheads are used at the intake, submit details similar to requirements of Article 1.2-B herein.
9. Coordinate plans for tailrace dewatering with the Outlet Conduit Liner Grout Installation Plan in accordance with Specification Section 036000 and the Low-Level Outlet Pipe Liner Work Plan in accordance with Specification Section 400524.01.

B. Cofferdam design: for each cofferdam, bulkhead, and water diversion structure, submit the design, including computations and methods and details of installation, to the Director's Representative for review, prior to cofferdam construction. The Submittal shall also include shop drawings and diagrams, with all pertinent data, showing the cofferdams proposed for use as at the project site. Computations and Shop Drawings for contractor furnished cofferdams shall be signed and sealed by a Professional Engineer licensed and registered to practice in New York State. All systems submitted shall be designed for static water pressure plus stream pressure, and any other anticipated loads, as appropriate.

1. Include arrangement drawings indicating the sequence of construction, and measurements and alignment checks to be conducted as construction progresses.
2. Include anchor bolt and base plate plans, erection drawings, and detail drawings for all members.
3. Indicate shop and field welds by standard American Welding Society (AWS) welding symbols in accordance with AWS A2.4.

4. Shop drawings shall be checked by the detailer before submission. Failure to submit checked shop drawings will be cause for their disapproval without review.
5. Changes initiated by the detailer or fabricator to previously reviewed shop drawings shall be resubmitted.
6. When shop drawings are marked "Approved as Noted", promptly resubmit copies of corrected shop drawings for formal approval and record.

C. Pre-installation surveys:

1. Submit to the Director's Representative for review and approval, a survey of the waterway bottom grades prior to the installation of the cofferdams.

D. Post-removal survey:

1. Submit to the Director's Representative for review and approval, a survey of the waterway bottom grades after the removal of the cofferdams to confirm that all cofferdam materials have been removed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cofferdams may be constructed of earth, earth-filled bags, sheet piling or any other materials which the Contractor may elect to use, as approved by the Director's Representative, and which will allow the Work to be installed with the cofferdams in an un-watered condition.

B. Pumping equipment and bracing shall be of adequate quality and capacity and shall be so arranged as to permit their proper functioning in connection with the above Work.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION SURVEYS

A. Perform, and submit to the Director's Representative for review and approval, a survey of the waterway bottom grades prior to the installation of the cofferdams.

3.2 INSTALLATION

A. Construct, maintain, and remove cofferdams and pumping equipment at the locations and to the alignment noted on the drawings. Size and provide pumping equipment to suit the work area to remain dewatered. Dewatering equipment and bracing shall be located to permit construction of the cofferdams in accordance with the plans.

B. Erosion and sediment control devices must be in place prior to placement or removal of earth materials for the cofferdam. The Contractor is responsible to monitor and ensure that sediment from placement or removal of cofferdam does not present a discernable difference in water color

or quality past the sediment control device(s). If water quality changes past the sediment control device(s), the Contractor must stop cofferdam placement or removal, alert the Director's Representative and repair the device or present a new measure to control sediment, approved by the Director's Representative, prior to restarting cofferdam work.

C. Construct cofferdams so as to keep the excavations free from water, ice, or snow and to permit excavation to be carried to the depth required by the drawings or ordered by the Director's Representative. Any and all damage caused by the failure of a cofferdam from any cause whatsoever, shall be the responsibility of the Contractor. It shall be their responsibility also to protect any and all stream banks from erosion by reason of restriction of the channel caused by the erection of cofferdams. All material which erodes from the banks during the time that the cofferdams are in place shall be removed as required and replaced by the Contractor at their own expense.

D. All equipment, obstacles, and other hazards which may endanger traffic of any kind, shall be outlined at night with adequate lighting.

3.3 REMOVAL

A. Remove all cofferdam materials from the waterway. All erosion and sediment control measures shall remain in place until cofferdams have been removed and final waterway and bank grades have been restored and approved by the Director's Representative. Remove materials from Director's property and dispose of materials. A proper disposal location must be provided and approved by the Director's Representative.

3.4 POST-REMOVAL SURVEY

A. Perform, and submit to the Director's Representative for review and approval, a survey of the waterway bottom grades after the installation of the cofferdams to confirm that all cofferdam materials have been removed from the waterway.

END OF SECTION 315200

SECTION 352016.53- HYDRAULIC VERTICAL STOP GATE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: This document specifies the minimum technical requirements for design, fabrication, testing, supply and installation of a Vertical Lift Stop Gate (gate) at Conklingville Dam.

1. Components are specified by performance. The final work must, in all respects, meet the required standards for design, performance, durability, and operation.
2. The design and arrangement of the work should be such that installation, repair, replacement, general maintenance and operation of the work may be undertaken with the minimum of time, effort and expense.
3. Supply all labor, materials, machinery, equipment, tools and perform all work necessary for the design, supply, transportation, handling, fabrication, testing, installation, and commissioning of the following:

    a. Conklingville Dam.

        1) One (1) vertical stop gate.
        2) Three (3) sets of gate guides, sill beams and lintels.
        3) All components required for lifting the gate, lowering it into the guides, and disengagement from crane.
        4) Installation and commissioning of the gate and guides.

1.2 RELATED REQUIREMENTS

A. Section 05 50 00 – Metal Fabrications

1.3 REFERENCE STANDARDS

A. US ARMY CORPS OF ENGINEERS (USACE)

1. EM 1110-2-2107 – Vertical Lift Gates
2. EM 1110-2-2104 – Strength Design for Reinforced Concrete Hydraulic Structures

B. UNIFIED FACILITIES GUIDE SPECIFICATIONS

1. UFGS 05 50 14 – Structural Metal Fabrications
2. UFGS 05 50 15 – Civil Works Fabrications

C. AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

1. ASCE 7-22 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures

D. AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

1. ASME B1.1 – Unified Inch Screw Threads
2. ASME B18.2.6 – Fasteners for Use in Structural Applications
3. ASME B30.20 – Below-the-Hook Lifting Devices

E. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) AND AMERICAN WELDING SOCIETY (AWS)

1. AASHTO/AWS D1.5 – Bridge Welding Code

F. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

1. ANSI/ABMA Standard 11 - Load Ratings and Fatigue Life for Roller Bearings

G. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

1. OSHA - Laws and Regulations

H. THE ASSOCIATION FOR MATERIALS PROTECTION AND PEFORMANCE (AMPP)

1. AMPP standards

I. INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

1. ISO Standard 724 – ISO general-purpose metric screw threads Basic dimensions

1.4 OPERATING REQUIREMENTS

A. The gate shall be designed to provide reliable operations for a minimum required service life of 50 years with expected maintenance as described below.

B. During the required service life of the gate and embedded components, it is expected that the following major maintenance items will be required:

1. Surface Restoration (every 30 years).

a. Sandblasting, painting, resurfacing, etc.

2. Replacement of gate seals (every 30 years).

C. The gate must operate under variable head conditions. Refer to the table below for Static and Static & Surge head values. Surge loading is based on a 15-second gate closure time. The design will be based on the following conditions:

Maximum Design Headwater Level	EL 772.12 ft
Design Tailwater Level	EL 698.112 ft

Sill Beam Level	EL 698.12 ft
Static Head (Unseating)	74 ft
Static & Surge Head (Unseating)	81.4 ft

D. The specified dimensions and features for the gate are as follows:

GATE ASSEMBLIES	
Number of Gates	1
Type	Fixed-roller vertical lift
Clear width of opening	7 ft – 5 in
Height of Gate	8 ft – 4 ¾" entire top to bottom
Skin plate location	Upstream
Seal location	Upstream
Vertical seal type	Center Bulb Seal
Lintel Seal	Center Bulb Seal
Bottom seal type	Molded rubber
Number of lifting points	2
GATE GUIDE EMBEDDED PARTS	
Number of main guides	3 sets
Seal Path	Stainless Steel
Roller or Bearing Path	Stainless Steel

E. Sufficient weight shall be provided for the gate to close readily under conditions of maximum head. The lowering force shall exceed the resistance to lowering based on static friction coefficients by a minimum of 15%.

1.5 ACCESSIBILITY

A. The design shall accommodate variations in the as-built conditions for the steel structures and the supporting concrete substructures.

B. The gate will be removed and stored for extended periods of time when it is not required for maintenance activities.

1.6 DESIGN REQUIREMENTS

A. Basic Design Data.

1. The gate and all associated equipment shall be designed for the following basic loads and conditions. The design shall meet the requirements of USACE EM 1110-2-2107.
2. The following minimum friction coefficients shall be used in calculations of friction loads acting on the gates and associated equipment. Higher friction coefficients shall be used as appropriate for the selected type of bearing and bearing configuration.

Contact Materials	**Static Friction**	**Moving Friction**

Antifriction Bearings	0.02	0.01
Rubber seals on steel	1.5	0.8
Rubber seals with fluoro-carbon on steel	0.25	0.12
Brass on steel	0.5	0.25
Steel on steel (unlubricated)	0.5	0.25

3. The rolling resistance developed through bearing contact between the moving main gate rollers and the roller path shall be accounted for. Rolling resistance factor shall not be less than 0.03 in. based on radius.

B. Design Loads.

1. The gate and ancillaries shall be designed for the most unfavorable possible combination of the following loads to provide reliable operation. The loads and load combinations shall be in accordance with USACE EM 1110-2-2107. Additional loading circumstances, including ASCE 7 requirements, shall be considered if deemed appropriate for the design.

C. Roller Design.

1. Rollers shall be designed in accordance with applicable requirements of USACE, ASME and other specified standards.
2. Rollers shall be provided with antifriction bearings. The load acting on the bearing(s) shall consider radial as well as the 90-degree axial load. Manufacturer: SKF or Director's Representative approved equivalent. The bearing shall be restrained axially by using retaining rings (per ASME B18.27.1, Rockwell C 44 hardness) on the shaft and in the wheel bore at both sides of the bearing races. Ring design temperature range shall be -20 to 100 degrees F. Water resistant grease shall be used for bearings and radial outboard lip seals shall be provided to prevent ingress of water and contaminants.

3. The maximum shear and compressive stresses in the rollers and roller paths shall not exceed the following for extreme loading conditions:

   a. Shear stress in lbs. per square inch (psi) shall not exceed 90,000 psi.
   b. Compressive stress in lbs. per square inch (psi) shall not exceed 1000 times the minimum BHN of the softer material or 247,000 psi whichever is lower.

4. The roller path hardness shall be at least 30 BHN greater than that of the gate roller. The hardness depth shall be considered if applicable to the design.
5. The roller axle shall be designed in accordance with applicable requirements of USACE, ASME and other specified standards. The design of crown rollers and their supports shall take into consideration the rated radial load acting on the roller along with axial loads resulting from gate deflection or misalignment during gate operation.

D. Gate Guide Design.

1. The main vertical guide members shall be designed as continuous beams on elastic foundations. The loads on the concrete shall be assumed to be proportionally distributed between the top and bottom flanges of the support beam depending on the relative stiffness of the constituent subcomponents.

2. Rock anchors shall be provided to resist lateral loads from the guides. Unfactored anchor loads shall be as follows:

   a. Design Load: 234 kips
   b. Lock-off Load: 273 kips
   c. Testing Load: 312 kips

3. The roller path thickness shall be not less than 10 times the depth of maximum shear, or 1 inch. The roller path shall be fully heat-treated to the hardness required. The required hardness shall be at least 30 BHN greater than the main gate rollers as described in the previous section. The roller paths shall be at least 0.5 in. wider on each side than the width of the contact ellipse between the roller and the roller path calculated for the maximum load condition.
4. Potential structural impacts on the gates, guides, rollers, and seals due to misalignment of the roller path shall be considered and accounted for in the design.
5. The vertical guide members, sill beams and anchor rods shall be designed to withstand the maximum differential head of water seepage between the secondary concrete and existing concrete, if applicable.
6. The design of the guides shall address the issue of grout leakage during the final grouting process. Embedded parts such as guides, sill beams and anchor rods shall be designed to withstand forces induced by fluid concrete pressure.

E. Fracture Critical Members (FCM)

1. Identify and designate all non-redundant tension members or components of members whose failure would result in structural failure of the gate as FCM.
2. All members identified as FCM shall be fabricated and welded in accordance with the latest version of AASHTO/AWS D1.5M/D1.5.
3. Submit a Fracture Control Plan (FCP) for approval outlining welding procedures, qualifications, certifications, inspection protocols, and other requirements that conform to AASHTO/AWS D1.5M/D1.5 Bridge Welding Code, Clause 12 – Fracture Control Plan for Non-Redundant Members prior to beginning fabrication.

F. Lifting Components

1. Design and provide all components required for lifting the gates for transport, staging, installation, removal, or storage.
2. Lifting components shall accommodate installation of the gate and provide means to disconnect gate from the crane once installation is complete.
3. Design drawings shall clearly identify all lifting components, with corresponding usage procedures detailed in the Operation & Maintenance (O&M) manual.

G. Deflection Limits.

1. All structures and equipment shall be designed such that deflections under imposed specified loads will not impair their structural integrity, operation, or performance. This includes the performance of the gates and seals.
2. Gate Deflection.

a. The deflection limits of the principal gate beams under normal loading conditions shall not exceed 1/800 of the gate span. This does not include localized deflection of the skinplate.

1.7 SUBMITTALS

A. Design drawings, detailed component drawings (including fabrication and machining), engineering calculations, and design reports shall be Signed and Sealed by a Professional Engineer licensed in the State of New York.

B. Mechanical/Structural Design Submittals:

1. Provide detailed calculation reports for the following mechanical and structural components:

a. Gate structural and mechanical calculation report.
b. Gate guide structural and mechanical calculation report, to include distribution of hydraulic loading to the rock anchors.

2. Operation and Maintenance manuals.
3. Inspection, testing, and commissioning procedures.
4. Shop test reports.
5. Fracture Control Plan (FCP)

C. Mechanical/Structural Drawings:

1. General arrangement drawings for all major components.
2. Plan, elevation, and section drawings for all structures.
3. Detailed component drawings (including fabrication and machining) for all fabricated components.
4. Assembly drawings.
5. Detailed design and fabrication drawings for all special tool and lifting components.

PART 2 - PRODUCTS

2.1 SPARE PARTS

A. A list of recommended spare parts, individually priced, shall be provided. The Director's Representative may purchase any or all of the spare parts at the prices quoted.

B. Delivery of the spare parts shall be made with the shipment to site of the gate equipment. All spare parts shall be interchangeable with, and of the same materials and workmanship as the corresponding parts.

C. All spare parts shall be, wherever possible, stock items readily available in America. Spare parts for field testing and acceptance trials shall be provided at no additional cost to Director's Representative.

2.2 MATERIALS AND WORKMANSHIP

A. General.

1. All materials shall be new and shall comply with the requirements of UFGS 05 50 15. If alternative materials are proposed, the proposed material substitution shall be proven equivalent to or better than the original specified material. The materials and workmanship shall be free from defects.
2. The materials specified herein shall be used as minimum requirements.
3. The design, fabrication, heat treatment, inspection and certification shall comply with the applicable requirements of the ASTM, ASME and other specified standards.
4. No patching, plugging, shimming or other such means to overcome defects, discrepancies or errors shall be employed without the submission of a non-conformance report. Failure to comply with this requirement shall constitute grounds for rejection of the item in question.
5. Similar parts shall be made to gauge where possible, to ensure that such parts are interchangeable one with the other.
6. Screws, bolts, studs, nuts, and other fasteners shall be in accordance with ASME Standard B1.1 or ASME B18.2.6M. Pipe, flanges and fittings shall conform to ANSI Standards.
7. All parts shall have, at a minimum, the weights in accordance with their drawing dimensions. Upon completion of shop fabrication and machining, a complete list of finished weights of all major components shall be provided.
8. All material used in the design of Fracture Critical Members shall be ASTM A709 and shall meet the requirements of AASHTO/AWS D1.5.

B. Gate Axles.

1. Axles shall be corrosion resistant steel (tempered), ASTM A564-630/H900.

C. Rubber Seals.

1. The rubber seal compound shall be one of the following: natural rubber/polyisoprene or neoprene and shall have no reclaimed polymers. The rubber compound shall include reinforcing carbon black, zinc oxide, accelerators, antioxidants, vulcanizing agents, and plasticizers. The rubber seal profile shall be properly cured into a homogeneous form and kept free of oils, grease, or other materials which would deteriorate the rubber. The vertical seals for the gate shall have a Polytetrafluoroethylene (PTFE) film vulcanized and bonded to the sealing surface. The film shall be 1/16 in. thick Huntington Abrasion Resistant Fluorocarbon Film No. 4508 or equal. Physical characteristics of the seals shall meet the following minimum requirements:

Material Specifications for Stop Gate Seals		
Physical Test	**Test Value**	**Specifications**
Tensile Strength	2900 psi (20 MPa) (min)	ASTM D412
Elongation at Rapture	450% (min)	ASTM D412
Durometer Hardness, Shore Type A	60 to 70	ASTM D2240
Water Absorption	5% by weight (max)	ASTM D471
Compression Set	30% (max)	ASTM D395 Method B

Tensile Strength After Accelerated Aging (48 hours in oxygen at 69.98°F (21.1°C))	80% (min)	ASTM D572, D573

2. All corners shall be pre-molded and have a suitable radius on the inside edge. All joints, both shop and field, shall be located a reasonable distance from the corners. All shop joints shall be vulcanized. Field joints shall be kept to a minimum of two (2) splices and shall be vulcanized during assembly. Field joints shall be held with double fasteners on each side of the joint.

D. Roller Paths.

1. The vertical roller paths shall be a single piece of stainless steel.
2. The roller path shall be constructed with full penetration welds. Field welding is not acceptable.

E. Welding.

1. All welding shall comply with the requirements of UFGS-05 50 14.
2. Welding of Fracture Critical Members shall comply with the requirements of AASHTO/AWS D1.5.

2.3 GATE ASSEMBLY

A. Each gate section shall be comprised of a number of horizontal beams connected to vertical end members designed to transfer the horizontal loads to the main rollers and then to the roller paths on the gate guides. The skin plates shall be designed as an integral part of the main horizontal beams and the whole assembly stiffened with vertical diaphragms and other secondary members. The bottom of the gate shall be designed to minimize uplift forces. Operating loads shall consider both flowing and no-flow conditions.

B. Internal drain holes shall be provided at all gate levels and bottom of gate to drain all horizontal surfaces. A minimum of four (4) 4 in. diameter drainage holes shall be provided in the web of each horizontal beam and the bottom plate to ensure the drainage. The drainage holes shall be ground smooth and/or chamfered around the edges in such a way to avoid the possibility of pooling of water. If the beam web is divided by stiffeners, then there shall be at least one drain per section.

C. The gate shall be of welded construction.

D. The gate shall be designed for ease of maintenance. USACE EM 1110-2-2107 Chapter 7 shall be used as a guideline for designing for operation and maintenance.

E. The roller axle supports shall be accurately line-bored and machine faced to maintain proper location, alignment and tolerances. The bottom face of the upstream skin plate shall be machined for bearing on the sill beam. The seal faces for the vertical seals and bottom seal shall be machined. The gate side guide rollers and/or side bumpers shall be aligned to the center of gravity of the gate.

F. Gate Seals.

1. The vertical and lintel seals for the gate shall be Polytetrafluoroethylene (PTFE) sheathed center bulb seals retained on the gate by corrosion resistant clamp bars and bearing on machined corrosion resistant seal plates welded to the embedded guides.
2. The bottom seal shall be of rubber construction mounted on machined bars on the upstream face of the gate and held in position with corrosion resistant clamping bars. Fasteners shall be corrosion resistant.

G. Gate Rollers.

1. Main Rollers.

a. The main rollers shall be simply supported on axles mounted in housings in the vertical end members of the gate. The rollers shall be equipped with anti-friction bearings.
b. The main rollers shall have crowned treads. The axles shall have a machined eccentricity to facilitate adjustment of roller alignment.
c. The roller and axle assemblies shall be accurately machined, finished and positioned in accordance with the requirements of the bearings selected to achieve the operation and alignment tolerances.

2. Bearings for Rollers.

a. The roller bearings are to be of the antifriction type. Bearings shall be standard, off-the-shelf components to ensure readily available replacements. All press fits and running clearances shall be in accordance with the recommendations of the bearing manufacturer.

H. Side Bumpers.

1. The gates shall be equipped with bumpers on each side. The bumpers shall be manufactured from high-density plastic (UHMWPE) for reduced friction. Upstream bumpers shall be installed as required to prevent upstream travel of the gate during operation and damage to the flared guides during installation.

2.4 EMBEDDED PARTS

A. The bottom of the gate guides and the sill beams will be embedded in secondary concrete.

B. Components embedded in secondary concrete shall be designed and fabricated to support concrete at a determined pour rate.

C. The roller path, vertical seal path, and sill beam seal face shall all be comprised of machined stainless steel. The material hardness of the roller paths shall be greater than the rollers by at least 30 BHN.

D. Construction of Main Vertical Guide Members and Sill Beams:

1. General.

a. The roller paths and seal surfaces on the vertical members, lintel beams, and sill beams shall be accurately machined to satisfy installation tolerances. Final machining of the guides shall be performed after all fabrication has been completed and after all components have been stress relieved.
b. The connections between the sealing faces on the sill beams and vertical members shall be arranged so that these faces are square and so that the joints may be seal welded and ground square. These components shall be designed for field-adjustability.
c. All connections between sill beams to the guides, lintel beams to the guides and any other joints requiring proper alignment, shall be bolted connections with machined flanged mating faces. All joints exposed to the water passage shall be seal-welded.
d. All welded joints shall be ground flush for joints in the main water passage and on rolling, sliding, and contact surfaces.
e. The sealing faces on the sill beams, vertical members, and lintel beam shall be continuous without holes or gaps. The seal paths and seating strips shall be seal-welded along their entire length on all sides.

2. Vertical Guides.

a. The main vertical gate guides may be of a multiple assembly fabrication type with an upstream seal and downstream roller path.
b. The main vertical roller path shall be of single piece construction. The main vertical roller path and seal face guides shall be stress relieved after fabrication and before machining.
c. The vertical guides shall have flared/tapered openings to facilitate installation of the gate. Flared portion shall not extend below the sealing surfaces of the gate.
d. The gates shall be fully guided over the entire height of the guides and sufficiently constrained to eliminate damage to seals or any other components, jamming, and excessive movement.

3. Sill Beams.

a. The upper surface of the sill beams shall be stainless steel and shall be flush with the finished concrete surface.
b. The sill beam design shall incorporate adjustment devices in the vertical and lateral directions to ensure proper alignment of the sill beam within the gate slot.
c. The sill beams shall be installed in secondary concrete.

4. Anchor Rods into Existing Concrete.

a. Design and provide grouted anchor rods to secure the secondary concrete to the existing concrete and to level embedded components.
b. Provide adhesive anchor rods to secure the lintel beam to the existing concrete.

PART 3 - EXECUTION

3.1 PROTECTIVE COATINGS

A. The paint system for the gate and guides shall be suitable for high velocity water flow.

B. To the extent possible, painting of the gate and guides shall be done in the shop.

C. Prior to painting, all rough welds and sharp steel edges shall be ground smooth, and all weld splatter removed.

D. After completion of fabrication and prior to assembly, all exposed steel surfaces shall be cleaned in accordance with SSPC-SP10 “near white blast” cleaning. All surfaces which are to be painted shall be coated as follows:

1. Primer Coat: TNEMEC Series 394 PerimePrime at 2.5-3.5 mils dry film thickness or Director’s Representative approved equivalent. Color shall be beige.
2. Intermediate Coats: Two (2) coats of TNEMEC Series 22 Epoxoline at 12-15 mils dry film thickness (each coat) or Director’s Representative approved equivalent. Color shall be white.
3. Finish Coat: TNEMEC Series 1095 Endura-Shield at 2-5 mils dry film thickness or Director’s Representative approved equivalent. Color to be selected by Director’s Representative.

E. All painting shall be done in strict accordance with paint manufacturer’s standard instructions.

F. Field touch up shall be compatible with shop applied paint and shall be in accordance with manufacturer’s instructions.

3.2 OPERATION AND MAINTENANCE MANUALS (O&M)

A. An Operation and Maintenance manual shall be prepared and submitted for review, which shall detail the methods and procedures to perform all installation, operational, and maintenance activities for all equipment. All drawings shall be included in the manuals. Information data sheets shall be included in detailing all equipment and consumables. Must include anticipated lifecycle information and a replacement schedule.

3.3 INSTALLATION

A. Site installation.

1. Furnish all tools, material, supervision, labor, site transportation of equipment in the area of installation, site transportation of tools, personnel and other construction and installation facilities, and all other items required and necessary for the installation, erection, alignment, commissioning, site testing and placing the gate equipment into successful operation.
2. Where field welding is permitted, the ground clamp shall be attached to the work piece and shall be located near the weld location to prevent the transfer of an electric current through the associated electrical components or steelwork.
3. After installation, remove debris and clean all exposed surfaces.
4. Off-the-shelf equipment installation specifications from the manufacturer disagree with those listed above, the more stringent of the two shall be utilized unless otherwise directed. The discrepancies shall be proposed to the Director’s Representative for review.
5. Provide special tools and devices required for the installation and maintenance in addition to the tools normally necessary for site erection. The special tools and devices shall remain

the property of the Director's Representative for use in subsequent maintenance or dismantling.

6. Prepare and submit proposed site installation and testing instructions and field commissioning procedures to the Director's Representative for approval. The procedure shall include record sheets on which the various checks and tests shall be recorded.
7. Installation of Equipment:

a. Secondary Concreting and Grouting

1) Secondary concreting for gate guide embedment's shall meet the requirements of EM 1110-2-2104.
2) Grouting shall be installed in accordance with the manufacturer's requirements.
3) Concreting and grouting procedure, complete with testing requirements for Quality Control, shall be submitted for review.

b. Gate Embedded Parts

1) Submit for review the detailed procedures for aligning the guide and sill beam, specifying the tools, instrumentation, and required accuracy tolerances.
2) Prior to the commencement of work on each set of guides or other components embedded in secondary concrete, the components shall be inspected and a written report detailing all items that may cause interference or problems during subsequent installation shall be submitted. Before installation of embedded parts at the site, all loose scale and foreign material shall be removed from the surfaces that will be in contact with concrete. The final alignment of embedded parts after secondary concreting shall be within the following tolerances:

MAIN GUIDE ROLLER PATHS	
Vertical alignment (over the full height)	+/- 0.04 in.
Straight edge check	0.006 in. in 6 ft length
Gauge distance across water passage surfaces	+/- 0.12 in.
Upstream/downstream offset between pairs of roller paths	+/- 0.12 in.
VERTICAL SEAL PATHS	
Vertical alignment (over the full height)	+/- 0.04 in.
Straight edge check	0.006 in. in 6 ft length
Gauge distance across water passage	+/- 0.12 in.
SILL BEAM	
Horizontal alignment (over the full length)	+/- 0.01 in.
Straight edge check	0.006 in. in 6 ft length
GUIDE RAILS	
Vertical alignment (over the full height)	+/- 0.12 in.
Gauge distance across opening	+/- 0.2 in.

3) The sealing surface tolerances shall be such that leakage after final commissioning is minimized.

4) Two vertical basic reference planes shall be established for alignment of the parts in each water passage. One plane shall be at right angles to the water passage and parallel to the vertical bearing and sealing path surfaces; and the other plane shall be parallel to the centerline of the water passage. Tolerances for alignment specified above shall be related to measurements made from either one or both reference planes.

5) The vertical guide members shall be installed so that they are square with the reference plane to avoid warped and skewed seal and bearing path surfaces. The sill beams shall be erected and adjusted using the anchors rods embedded in concrete and the adjustment devices for the lateral directions. The junction of the sealing surfaces at the sill beam and the vertical seal paths shall be square. Provide braces at a minimum of 5 ft centers to maintain the relative position and alignment of the roller path and sealing faces during secondary concreting.

c. Prior to and after the embedment of the parts, perform all necessary alignment checks to ensure specified tolerances are achieved. Submit alignment reports along with calibration certificates for all equipment and tools used. Apply seal-welds to all field joints and grind the welds smooth. Ensure any surface deviations are gradual, without abrupt steps.

1) After site testing, the gate shall be stored in an area designated by the Director's Representative.

B. Site Pre-Commissioning Tests

1. Perform all site tests of individual machinery components and completed units to demonstrate that the assembled work meets the requirements.
2. The tests shall prove work to be in satisfactory working order. Any defects which become evident during the tests shall be immediately corrected and the tests continued until the work is proven to be in satisfactory working order and accepted.
3. All equipment not included in the supply but necessary for carrying out the tests shall be provided.
4. Below-the-hook lifting devices shall be load tested per the requirements of ASME, B30.20.

C. Tests in the Dry

1. Upon completion of all adjustments and verification of satisfactory working order, a minimum of three complete operations shall be performed on each gate throughout the full range of travel above water level. Roller-to-roller path and gate-to-guide path clearances shall be checked and documented for each gate.

D. Tests in the Wet

1. The maximum acceptable leakage rate through the gate shall be 0.1 gpm/foot length of seal. Leakage tests procedures shall be developed and submitted for review and approval.

END OF SECTION 352016.53

SECTION 400507 - HANGERS AND SUPPORTS FOR PROCESS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports.
2. Hanger rods.
3. Structural attachments.
4. Pipe guides.
5. Formed-steel channel.

B. Related Requirements:

1. Section 031000 - Concrete Forming and Accessories: Execution requirements for placement of inserts or sleeves in concrete forms specified by this Section.
2. Section 033000 - Cast-in-Place Concrete: Execution requirements for placement of concrete housekeeping pads specified by this Section.
3. Section 400523 - Stainless Steel Process Pipe and Tubing: Execution requirements for placement of hangers and supports as specified by this Section.
4. Section 400531 - Thermoplastic Process Pipe: Execution requirements for placement of hangers and supports as specified by this Section.
5. Section 400551 - Common Requirements for Process Valves: Common product requirements for valves for placement by this Section.

1.2 REFERENCE STANDARDS

A. American Welding Society:

1. AWS D1.1 - Structural Welding Code - Steel.

B. ASME International:

1. ASME B31.1 - Power Piping.
2. ASME B31.9 - Building Services Piping.

C. ASTM International:

1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings.
3. ASTM A181 - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.
4. ASTM A576 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacturer, Selection, Application, and Installation.

1.3 COORDINATION

A. Coordinate Work of this Section with piping and equipment connections specified in other Sections.

1.4 SUBMITTALS

A. Manufacturer’s installation instructions shall be provided along with product data.

B. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

C. Product Data: Submit manufacturer information, including load capacity.

D. Shop Drawings: Indicate system layout with location, including critical dimensions, sizes, hanger and support locations, and details of trapeze hangers, anchors, and guides.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Welder Certificates: Certify welders and welding procedures employed on Work, verifying AWS qualification within previous 12 months.

G. Delegated Design Submittals:

1. Submit signed and sealed Shop Drawings with design calculations and assumptions for load carrying capacity of trapeze, multiple pipe, and riser support hangers.
2. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers.

H. Manufacturer Instructions: Submit special procedures and assembly of components.

I. Qualifications Statements:

1. Submit qualifications for manufacturer, fabricator, installer, and licensed professional.
2. Submit manufacturer's approval of installer.

1.5 QUALITY ASSURANCE

A. Perform Work according to AWS D1.1 for welding hanger and support attachments to building structure.

B. Perform Work according to New York State Office of General Services (OGS) standards.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years' experience.

B. Fabricator: Company specializing in fabricating products specified in this Section with minimum three years' experience.

C. Contractor: Company specializing in performing Work of this Section with minimum three years' experience.

D. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of New York.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store materials according to manufacturer instructions.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.8 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. Furnish materials according to New York State Office of General Services (OGS) standards.

B. Description:

1. Comply with ASME B31.1.
2. Provide means of vertical adjustment after erection.
3. Pipe Sizes 1/2 to 1-1/2 Inches:

a. Material: Steel; ASTM A36.
b. Configuration: Split ring.
c. Swivel: Adjustable.

4. Pipe Sizes 2 Inches and Larger:

a. Material: Steel; ASTM A36.
b. Configuration: Clevis.
c. Swivel: Adjustable.

5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Wall Support for Pipe Sizes 3 Inches and Smaller: Cast-iron J-hook.
7. Wall Support for Pipe Sizes 4 Inches and Larger: Welded steel bracket.
8. Vertical Support: Riser clamp.
9. Floor Supports: Cast-iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.

C. Performance and Design Criteria:

1. Pipe Hangers:

a. Design for pipe movement without disengagement of supported pipe.
b. Allow for expansion and contraction of piping while eliminating undue stress on piping appurtenances and equipment.
c. Provide linkage to permit lateral or axial movement where anticipated.
d. If horizontal pipe movement is greater than 1/2 inch , or if hanger rod deflection from the vertical is greater than 4 degrees from cold to hot position of pipe, offset hanger rod and structural attachment to maintain rod vertical in hot position.

2. Heat Transmission: Design supports, hangers, anchors, and guides to prevent excessive heat from being transmitted to building structure, equipment, or piping appurtenances.
3. Riser Supports: Support risers on each floor with riser clamps and lugs, independent of connected horizontal piping.
4. Point Loads:

a. Support plastic piping containing meters, valves, appurtenances, and other point loads on both sides.
b. Avoid point loads on plastic piping by providing extra-wide pipe saddles or galvanized-steel shields.

5. Noise Reduction: Wrap copper tubes located within buildings in a 2-inch- wide strip of rubber at each pipe support, bracket, clip, and hanger.

2.2 HANGER RODS

A. Material: Steel; ASTM A576.

B. End Connections: Threaded both ends.

C. Size: Comply with ASME B31.1.

2.3 STRUCTURAL ATTACHMENTS

A. Concrete Inserts:

1. Case: Malleable iron with galvanized steel shell and expander plug.
2. Connection: Threaded, with lateral adjustment.
3. Size: To suit threaded hanger rods.

B. Mounting Brackets: Welded steel; ASTM A36.

C. Beam Clamps:

1. Comply with MSS SP-58.
2. Material: Steel; ASTM A36.
3. Size: Suitable for load to be supported.
4. Anchoring: Locknuts and set screws.
5. Furnish reversible top flange.

D. Riser Clamps:

1. Material: Steel; ASTM A36.
2. Support of Copper Tubing: Furnish copper-plated clamp.

E. Offset Clamps:

1. Configuration: Double leg, two pieces.

2.4 PIPE GUIDES

A. Intermediate Guides:

1. Pipes 6 Inches and Smaller: Pipe clamp with oversize pipe sleeve.
2. Pipes 8 Inches and Larger: U-bolts with double nuts.

B. Alignment Guides:

1. Pipes 8 Inches and Smaller:

a. Material: Galvanized steel.
b. Type: Sleeve.

2. Pipes 10 Inches and Larger:

a. Material: Galvanized steel.
b. Type: Roller.

2.5 FORMED-STEEL CHANNEL

A. Description:

1. Material: Galvanized steel.
2. Thickness: 12 gage.
3. Mounting Holes: 1-1/2 inches o.c.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field dimensions as indicated on Drawings.

3.2 INSTALLATION

A. Obtain permission from Director's Representative before using powder-actuated anchors.

B. Obtain permission from Director's Representative before drilling or cutting structural members.

C. Inserts:

1. Placement:

    a. Concrete forms.
    b. Reinforced concrete slabs and sides of reinforced concrete beams.

2. Piping 4 Inches and Larger: Provide hooked rod to concrete reinforcement section.
3. Concrete Slabs Forming Finished Ceiling: Locate inserts flush with slab surface.

D. Pipe Hangers and Supports:

1. Comply with ASME B31.1.
2. Support horizontal piping as indicated on Shop Drawings.
3. Install hangers with minimum 1/2-inch space between finished covering and adjacent Work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Minimum Vertical Adjustment: 1-1/2 inches.
6. Supports:

    a. Independently of equipment.
    b. Horizontal Cast-Iron Piping: Adjacent to each hub, with maximum 5-foot spacing between hangers.
    c. Vertical Piping:

        1) Cast-Iron Piping: At each floor at hub.
        2) Other Piping: At every floor.

    d. Riser Piping: Independent of connected horizontal piping.

7. Piping in Parallel at Same Elevation: Provide multiple pipe or trapeze hangers.
8. Provide neoprene packing between hanger or support and piping.

9. Clamps and Brackets:

    a. Provide welded steel brackets if piping is to be run adjacent to building walls or columns.
    b. Use beam clamps if piping is to be suspended from building steel.
    c. Insulated Piping: Provide two bolted clamps designed to accommodate insulated piping.
    d. Use offset clamps if pipes are indicated as offset from wall surfaces.

E. Equipment Bases and Supports:

1. Housekeeping Pads:

    a. Material: Concrete, as specified in Section 033000 - Cast-in-Place Concrete.
    b. Minimum Thickness: 3-1/2 inches.
    c. Plan Area: Extend 6 inches beyond supported equipment.

2. Supports:

    a. Material: Steel members.
    b. Brace and fasten with flanges bolted to structure.
    c. Anchor Bolts and Accessories: Use templates furnished with equipment.

F. Finishes:

1. Coat with two coats of water resistant epoxy paint, color to be determined by Director's Representative.

3.3 ATTACHMENTS

A. Pipe Hanger Spacing:

1. Pipe Material: PVC.

    a. Maximum Hanger Spacing: 4 feet.
    b. Hanger Rod Diameter: 3/8 inch min.

2. Pipe Material: Steel.

    a. Size: 3 inches and smaller.
    b. Maximum Hanger Spacing: 12 feet.
    c. Hanger Rod Diameter: 1/2 inch min.

3. Pipe Material: Steel.

    a. Size: 4 inches and larger.
    b. Maximum Hanger Spacing: 12 feet.
    c. Hanger Rod Diameter: 5/8 inch min.

END OF SECTION 400507

SECTION 400524.01 - LARGE DIAMETER STEEL PIPE

PART 1 – GENERAL

1.1 WORK INCLUDED

A. The Work covered by this Section consists of furnishing all equipment and material and performing all labor for the fabrication and delivery to site of large diameter (20" and above) steel pipe as shown on the drawings, including pipe, bends, elbows, tees, flanges, bolts, and tapered sections, complete with protective coatings and associated appurtenances. The Work includes furnishing the materials, equipment, labor and quality control program, preparation of shop drawings, installation drawings, fabrication, shop testing, applying shop coating material, and delivery to site.

B. Contractor shall fabricate the pipe sections and appurtenances so as to minimize field welding and facilitate installation. In this regard, it is intended that the pipes be shipped as complete "cans" requiring only circumferential welding at site. Contractor shall be responsible for obtaining all required permits for transportation and all transportation costs.

1.2 APPLICABLE STANDARDS

A. Pertinent provisions of the current issue of the following listed codes and standards shall apply to the Work of this Section, except as they may be modified on the Drawings or as specified herein, and are hereby made a part of this Specification to the extent required.

1. American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code

   a. Section II - Materials Specifications Part A - Ferrous
   b. Section VIII - Pressure Vessels
   c. Section IX - Welding and Brazing Qualifications

2. American Society for Testing and Materials (ASTM), Specifications for:

A6	General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use
A20	General Requirements for Steel Plates for Pressure Vessels
A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
A153	Standard Specification for Zinc Coating
A240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
A307	Standard Specification for Carbon Steel Bolts, Studs and Threaded Rod
A516	Pressure Vessel Plates, Carbon Steel, for moderate and lower temperature service
A563	Standard Specification for Carbon and Alloy Steel Nuts
A572	High-Strength Low Alloy Columbium-Vanadium Steels of Structural

Quality
D5162 Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates
D7901 Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals

3. American Institute of Steel Construction (AISC) "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings"
4. American Water Works Association (AWWA) C200 Standard for Steel Water Pipe 6 Inch and Larger
5. American Water Works Association (AWWA) C206 Field Welding of Steel Water Pipe
6. American Water Works Association (AWWA) C207 Standard for Steel Pipe Flanges for Waterworks Service – Sizes 4 in. through 144 in.
7. American Water Works Association (AWWA) M11 Steel Pipe – A Guide for Design and Installation
8. American Welding Society (AWS)
9. American Society of Civil Engineers (ASCE) “Steel Penstocks”, ASCE Manuals and Reports on Engineering Practice No. 79

1.3 SUBMITTALS

A. Contractor submittals shall be in accordance with Section 01 33 00 of the Specifications.

B. Low-level Outlet Pipe Liner Work Plan:

1. A plan for installation of the 90-inch diameter steel pipe liner downstream of the knife gate valves, including:

   a. Details of the means and methods of access to the tailrace and existing outlet pipe for liner installation.
   b. Details of the means and methods of handling the liner pipe for installation.
   c. Coordinate the plan with the Water Control Plan and Access Plan in accordance with Specification Section 315200 and the Outlet Conduit Liner Grout Installation Plan in accordance with Specification Section 036000.

PART 2 PRODUCTS

2.1 MATERIALS

A. General:

1. Unless otherwise authorized in writing by the Director’s Representative, only materials conforming to the requirement of this Specification and the Drawings shall be incorporated in the Work.
2. Reference to specifications or test methods of the ASTM or other authority shall be to the specification or test method in effect on the date of the Contract, unless otherwise

specified.

3. Materials specified by reference to specifications or test methods of the ASTM or other authority shall be tested in accordance therewith.
4. In case of revisions to ASTM or other authority documents, after the date of Contract, rendering available material as manufactured not compatible with the controlling document, the Contractor shall list the differences between the revision at contract date and later revisions and submit to the Director's Representative for approval.

B. Steel:

1. ASTM A516 Grade 70 shall be used for rolled and welded steel plates in the fabrication of the large (90") pipe and adapters.

2. ASTM A53 shall be used for the low level outlet air vent pipe and siphon vent pipe.
3. Plates shall be supplied in the normalized condition and shall be produced to fine grain practice. All specified mill tests shall be performed on each plate used.
4. In addition to normal mill tests, Charpy V-notch impact tests shall be performed on each plate as-rolled in accordance with ASTM A20 and A370. The average minimum impact strength of each set of three specimens, tested at -40°F, shall be 13 ft lb, and no individual test result at -40°F shall be less than 10 ft lb.

C. Schedule

1. Low level outlet air vent pipe and siphon vent pipe shall be STD schedule.

D. Flanges:

1. Pipe flanges shall be sized and fabricated in accordance with AWWA C207 using ASTM A307 Grade B bolts, ASTM A563 heavy hex nuts and washers. Bolts, nuts and washers shall be galvanized in accordance with ASTM A153. Tolerances for flanges including facing and surface roughness shall be in accordance with AWWA C207. Flange gaskets shall be provided per Section 40 05 61.45 to mate with the 90" knife gate valves.
2. The flange of the existing upstream pipe where the old Dow valve was mounted shall be machined, if required, to meet the requirements of AWWA C207. The flange shall be machined for a flat gasket (see 40 05 61.45). Gaskets for 20 and 24" valves and flanges shall be provided per Section 40 05 64. The angularity of the flange shall be within 1 degree as required by AWWA C207.

E. Drain Assemblies:

1. One drain assembly per 90" reducer shall be provided as shown on the drawings. Contractor shall supply the complete assembly from the pipe to its cap. The drains shall be orientated as shown on the drawings.

F. Structural Steel:

1. Structural steel shapes and plates, other than those used in the penstock fabrication, shall conform to ASTM A572, Grade 50.

G. Couplings:

1. Large diameter couplings shall be in accordance with Section 40 05 61.46.
2. Stainless steel cladding shall conform to ASTM A240, Type 304L.

H. Pipe Interior Coating System:

1. The paint system shall be suitable for high velocity water flow.
2. Primer: TNEMEC Series 394 PerimePrime.
3. Intermediate and top coats: TNEMEC Series 22 Epoxoline. Finish color shall be white.

I. Pipe Exterior Coating System:

1. Primer: TNEMEC Series 394 PerimePrime.
2. Intermediate and top coats: TNEMEC Series V69 Hi-Build Epoxoline II. Color to be used approved by Director's Representative.

J. Other Materials:

1. Materials not specified shall be subject to the review and acceptance by Director's Representative.

PART 3 EXECUTION

3.1 FABRICATION PROCEDURES

A. General:

1. The pipe and accessories shall be fabricated in accordance with the applicable provisions of Section VIII, Division 1, of the ASME Boiler and Pressure Codes or AWWA C200 Standards for Steel Water Pipe.
2. The minimum pipe thickness, design pressures, fittings, bend details, and other pipe appurtenances shall be as shown on the drawings. All dimensions and details not shown on the Drawings shall be subject to review and acceptance by the Director's Representative.

B. Bending:

1. Plates shall be bent to the required radii in the direction in which they were rolled. The grain of the plates shall run in the circumferential direction.

C. Joints:

1. Joints shall be welded as specified herein and plates and shell sections shall be arranged so that, where possible, all longitudinal joints are staggered at 30° above and below the horizontal axis. Circumferential welds shall be located away from stiffener/anchor rings and face of any concrete encasement by at least 12 inches. The location of all joints shall be subject to acceptance by Director's Representative.
2. All welds shall be complete penetration unless indicated otherwise.
3. The length of pipe to be fabricated in the shop shall be a maximum, limited only by

transportation restrictions, such that the number of welds for completion at Site is a minimum. Field assembly drawings shall identify all field joint requirements.

4. Welding of stainless steel cladding shall be in accordance with AWS D1.6 Structural Welding Code – Stainless Steel.

D. Bends and Tapers:

1. Pipe bend sections shall be delivered with marks indicating the true top of the section at each end to facilitate installation.
2. The bends and taper parts of the pipe shall be formed by cutting the plates at an angle to form properly-fitted miter joints to produce the required degree of curvature. Mitered segments shall have a deflection angle between adjacent segments no greater than 7½ degrees. Miter joints shall, inasmuch as is practical, be fully welded before delivery, leaving only circumferential joints to be field welded. The ends of the bends shall be fully prepared for field welding and match marked with the adjacent pipe sections.

E. Access Holes:

1. Access holes, with plugs, shall be provided in the lower segment of sections of pipe to be concrete encased as shown on the drawings, for concreting or grouting any voids which may occur between the pipe and the concrete. The access holes shall not intersect any welds.

3.2 QUALITY CONTROL

A. General:

1. The Contractor shall be responsible for preparing an Inspection and Quality Control Program. This program shall be an integral part of the fabrication and shall be submitted for review and acceptance by the Director's Representative. A minimum quality control program shall be in accordance with ANSI Z1.8 and shall include but not be limited to:

   a. Identification of all materials used in the fabrication of the conduit and appurtenant structures.
   b. Free access for the Director's Representative to such parts of all plants as are concerned with the supply or manufacture of materials for the conduit.
   c. Documentation of all tests required for Quality Control.
   d. Qualification of the welding procedures before they are used in the fabrication.
   e. Qualification of welders and welding operation before using the welders in production work.
   f. Documentation of Charpy V Notch Impact Tests as specified in ASTM A370 and A673.

B. Inspection and Testing:

1. General: All materials, equipment, and processes shall be subject to inspection and testing as specified in the General Conditions and in accordance with the approved Inspection and Quality Control Program. All shop operation, tests, and records of tests shall be subject to Inspection by the Director's Representative. Materials shall not be incorporated in the final product until all tests, analyses and inspections shall have been

completed, or certified copies of report of results of test analyses shall have been accepted. All records shall be the property of the Director's Representative.

2. Visual Inspection: All component parts shall be inspected for dimensional compliance to determine conformance to detail drawings and established tolerances. Any structure which is of unique and/or complex design shall be check assembled prior to shipment. Mating parts shall be match marked. Edges of plates prepared for welding shall be visually examined for signs of laminations, shearing cracks, and other imperfections before and after forming. Pieces showing signs of laminations (cracks of visible seams) shall be ultrasonically examined to determine extent. If laminations extend more than 3 inches then the plate shall either be rejected or have the defective section removed, subject to acceptance by Director's Representative.
3. Nondestructive Testing: All personnel performing nondestructive testing shall be qualified in accordance with the American Society for Nondestructive Testing's Recommended Practice No. SNT-TC-1A, Supplement A, B, C, D, and E.

C. Fabrication Tolerances:

1. All fits and tolerances of fabricated parts shall conform to NBS Standard PS15, except as required by these Specifications. The tolerances shall be as follows:

   a. Out of Roundness: All out of roundness shall be in the form of smooth ovals and be no more than 1% of nominal diameter per ASCE Manual 79 Section 11.3.4.1.
   b. Alignment: Shell shall not deviate more than 1/8 inch in 10 ft.
   c. Circumference: The difference between the nominal outside circumference and the actual circumference shall be no more than ¾ inch per ASCE Manual 79 Section 11.4.3.
   d. The ends of each adjacent pipe section shall be matched up to one another in the place of manufacture to ensure a satisfactory fit so that they may be erected in their final positions without difficulty and with the required degree of accuracy. The tolerances of the conduit edges at field splice locations must accommodate the field butt welds as detailed on the drawing. After matching up each section, it shall be carefully match marked with appropriate reference marks on each end to ensure correct register and handling when the sections are erected. The sections shall be numbered consecutively from the downstream to the upstream ends.

3.3 WELDING

A. General:

1. All welding of the pipe shall be in accordance with the requirements of Section VIII Division 1 – Part UW, and Section IX of the ASME Boiler and Pressure Vessel Code.
2. All joints in the pipe shall be butt-welded with complete penetration double V- groove welds (ASME Type No. 1), where practical. Joints in the pipe that are accessible from only the inside of the pipe during erection shall be butt welded with single V-groove welds (ASME Type No. 2). Tack welds shall not be included in the groove weld.
3. The surfaces of plates to be welded shall be cleaned of all scale, rust, oil, paraffin, grease, paint, moisture, or any other potential contaminant for a distance of not less than 3 inches from the welding edge.
4. After deposition, each bead of weld shall be cleaned with a descaling hammer and wire

brush to remove all slag and scale, and shall be ground, if necessary, to prepare for the proper deposition of the next bead of weld metal. All welds found defective shall be rewelded and inspected again at the expense of Contractor.

5. All welded joints shall be dressed to produce a smooth uniform surface and be free of flux and scale to allow non-destructive examination, where applicable.
6. All welded joints on the inside of the pipes shall be made with a reinforcement not exceeding 5/32 inch.
7. Storage and rebaking of electrodes shall be in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section II, Part C.
8. All temporary lugs and devices welded to the outside of the steel shell shall be carefully removed by Contractor and the welds dressed smooth and flush with the surrounding metal. Care shall be exercised in removing such attachments to prevent cutting, tearing, or gouging into the steel pipe.
9. The welding and fabricating procedure shall be such that residual stresses are kept to a minimum and distortion is avoided.
10. Adequate ventilation and illumination shall be provided for welding on the pipe interior.
11. Weather Conditions:
12. No welding shall be done when the surfaces of the parts to be welded are wet; nor during periods of high winds unless the welder or welding operator and work are properly protected.
13. No welding shall be done when the temperature of the base metal is below 50°F. The parts to be welded shall be preheated before welding when the ambient temperature is below 50°F.
14. Welding Electrodes:
15. Welding electrodes shall be the low hydrogen type, and as specified by AWS Standard D1.1-90 for the particular metal being welded. The weld metal shall be at least equivalent in strength to the parent metal. If required, stainless steel electrodes shall be used for welding stainless steel.

B. Welding Procedures:

1. All welding procedure specifications and procedure qualification records shall be submitted to Director's Representative for information 7 days prior to commencing any welding.
2. When either or both welding plates exceed 1-inch thickness, continuous areas of plates within 3 inches of each side of the welding operation shall be preheated to not less than 150°F and maintained at a substantially uniform temperature, as measured by temperature measuring crayons or other approved means. In the event that weld repairs are necessary, the area adjacent to the repairs shall be similarly preheated prior to and during rewelding of the affected area. For temporary tack welding on plates where either or both is 1 inch or thicker, the preheat requirements may be reduced to 105°F minimum, using dry, low-hydrogen electrodes and dry plate. Thermal stress relieving of welds will not be required.
3. Welding procedure qualification tests shall be made or shall have been made in accordance with Section IX of the ASME Boiler and Pressure Vessel Code. The tests shall cover all sizes and types of joints processes and positions used on the steel pipe. Test plate thickness shall not be less than the plate thickness used in the pipe. Tests shall include tensile, bend, and Charpy V-notch impact tests. Charpy tests shall include:
4. One set of three impact tests with the load applied across the weld and the weld and the notch in the weld metal; and
5. One set of three impact tests with the notch in the adjacent heat-affected zone of the

parent metal.

6. The above tests shall be performed in accordance with ASTM A370.
7. Charpy impact requirements shall be in accordance with ASME Section VIII, Division 1.

C. Qualifications of Welders:

1. All welders and welding operators assigned to the Work, shall have passed, within the preceding 12 months, the qualification test for welders and welding operators in accordance with Section IX of the ASME Boiler and Pressure Vessel Code. Written qualification records shall be made available for each welder and welding operator.
2. All welds shall be stamp marked identifying the welder. If, in the opinion of Contractor's welding inspector, the work of any welder or welding operator at any time appears unsatisfactory, he shall be required to pass the appropriate requalification test. All costs of qualification and requalification tests shall be borne by Contractor.

D. Weld Quality and Inspection:

1. Contractor's welding inspector shall be certified and shall, at all times, have access to all places where equipment or materials are being field fabricated or prepared for use in this Contract. Such inspection and witnessing will be conducted by inspector in a manner which will minimize interference with the operation of installation.
2. Any defects or deficiencies shall be remedied by Contractor to the satisfaction of inspector.
3. A record shall be maintained by Contractor of the location of all defects or deficiencies and the corrective measures taken to effect repairs.

E. Nondestructive Testing:

1. Perform nondestructive testing in conformance with the applicable code or standard of the testing being used. In addition, Contractor shall perform, at no additional cost to Director's Representative, any nondestructive testing and inspection requested by Engineer on any material or weldments in which defects are suspected.
2. Since the design assumes a joint efficiency of 100%, all circumferential and longitudinal welds require 100% ultrasonic or radiographic testing.
3. Radiographic examination of welds for pressure-containing parts, including the standards of acceptability, shall be in accordance with paragraphs UW-51 and UW-52 of the ASME Code, Section VIII, Division 1. Standards and evaluation of spot radiography shall also conform to these requirements.
4. Ultrasonic examination of welds for pressure-containing parts, including the standards of acceptability, shall be in accordance with Appendix 12 to the ASME Code, Section VIII, Division 1.
5. All nondestructive testing shall be done by Contractor at no additional cost to Owner.
6. Pipe shall be checked for visual defects, such as weld spatter or undercut, and such defects shall be removed or repaired.
7. Welding of stainless steel cladding shall receive 100% visual examination.

3.4 PROTECTIVE COATINGS

A. General:

1. Certification, Sampling and Testing of Materials: The Contractor shall furnish a manufacturer's certificate of compliance for each coating material prior to its use in the Work. The certificate shall include material identification, quantity, batch number, date of manufacture, and certified test results covering all requirements of specifications under which the material is being furnished.
2. All coating work shall be performed by skilled and experienced persons, working under the supervision of capable supervisors who shall be experienced in application of the specific types of coating work being performed. Materials shall be applied in accordance with the manufacturer's specifications and instructions, and materials shall be thinned only for proper workability in compliance with the manufacturer's specifications. Material shall be evenly applied free from runs, holidays, pinholes, and sags.
3. The outside of the low-level outlet pipe liner that will be embedded in and in contact with grout and greater than 3 inches from an exposed surface shall not be finish coated.

B. Preparation of Surfaces:

1. Prior to application of protective coatings, irregularities of metal surfaces, such as sharp corners, rough welds, pits, gouges, and projections shall be ground smooth. Weld spatter and flux shall be removed prior to grinding.
2. Surfaces to be painted shall be clean, dry, and free of dirt, dust, and any other substance that might interfere with the functioning of the coating system. All surfaces to be coated shall be in proper condition to accept and ensure the proper adhesion and functioning of the particular coating specified.
3. The abrasive material for blast cleaning shall be of such particle size, shape, hardness and gradation as to effectively clean the metal without excessive pitting, yet leave a roughened surface suitable for the tenacious adhesion of subsequent coatings.
4. As soon after cleaning and before the formation of any type of corrosion or accumulation of dust or dirt, the cleaned metal surfaces shall be coated.

C. Application of Coatings:

1. The coatings shall be applied in accordance with the Manufacturer's recommendations, with the following additional requirements:

    a. The Contractor shall include in his inspection and quality control assurance program a procedure for recording painting data and parameters having a bearing in the quality of the final product.
    b. Each coat shall set to a smooth surface, uniform in thickness without runs, sags, or streaks and free of pinholes and flaws.
    c. Steel surfaces at field welds shall not be treated, coated or painted for a distance of 3 inches from the edges to be welded. After welding and testing, these areas shall be painted as noted below.

D. Pipe Interior Coating System:

1. SSPC-SP10 blast to near white.
2. Shop apply one coat of primer (2.5-3.5mils dry film thickness).
3. At site after field welding, use SP10 blast for welded areas and to touch up damaged areas. Coat the welded areas and damaged areas with same primer.
4. Apply intermediate and top coats (12-15mils dry film thickness each).
5. Total finished dry film thickness shall be 25-30mils.

E. Pipe Exterior Coating System:

1. SSPC SP10 blast to near white.
2. Shop apply one coat of primer (2.5-3.5mils dry film thickness).
3. At site after welding, use SP10 blast for welded areas and to touch up damaged areas. Coat the welded areas and damaged areas with same primer.
4. Apply intermediate and top coats (4-6mils dry film thickness each).
5. Total finished dry film thickness shall be 10-15mils.

F. Inspection:

1. The Contractor shall conduct film thickness measurements and electrical inspection of the coatings with Contractor furnished equipment per ASTM D7091, and shall recoat as necessary to build up a coating system of the specified integrity and thickness.
2. Coating thickness specified in mils shall be measured with a dry film thickness gage, Elcometer, manufactured by Gardner Laboratories, Inc.; G. E. Model B, as manufactured by General Electric Co.; or equal. Discontinuities and voids in the coating shall be determined with an electrical holiday detector. Coating shall be checked for voids and discontinuities per ASTM D5162 with a high voltage detector such as Tinkor and Rasor Model AWP or equal.

3.5 LOW-LEVEL OUTLET PIPE LINER INSTALLATION

A. Handling:

1. Verify alignment and clearance within the existing outlet conduit.
2. Handle the liner in such a manner as to avoid excessive deformation and damage to the liner and protective coating.
3. Unless otherwise approved by the Director's Representative, install the liner in one piece so as to minimize the duration of installation and dewatering of the tailrace.

3.6 PACKAGING AND DELIVERY

A. General:

1. Unless otherwise specified, each delivery shall be composed of all parts necessary to assemble a complete structure and each shipping invoice shall be accompanied by a bill of materials with all parts individually identified, including structure, type and number.
2. The Contractor shall obtain all necessary permits and licenses required for shipping of the pipe sections.

B. Packaging:

1. Labeling tags shall be moisture proof and shall be securely attached in readily visible locations to all materials. Marking inks and paints shall be waterproof and non-fading. All labeling shall be applied over a bright iridescent colored background in 1 inch minimum height black letters. Each member shall be clearly labeled as to piece number, weight, and length. The special fittings and bends shall have the centerline of the crown and invert designated on the interior of the pipe.

2. All hardware necessary to complete the installation of an individual piece shall be securely packaged in a single container. The container shall be clearly labeled with the piece type, number and a listing of the types (by Mark No.) and quantities of parts contained therein. Care shall be taken when lading, blocking and strapping or taping such containers down for transport to ensure that damage shall be prevented.

END OF SECTION 400524.01

SECTION 400561.43 - KNIFE GATE VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Knife gate valves - including all connections in accordance with the contract documents and as directed by the Director's Representative.

B. Related Sections:

1. 01 33 00 - Submittals
2. 05 12 00 - Structural Steel Framing
3. 09 91 23 – Interior Painting
4. 40 05 06 - Couplings, Adapters, and Specials for Process Piping
5. 40 05 24.01 - Large Diameter Steel Pipe
6. 40 05 61.45 – Valve Gaskets

1.2 SCOPE OF WORK

A. Provide all labor, materials, equipment, and incidentals required to furnish and install a fabricated steel knife gate valve system for isolation and/or throttling service as shown on the Contract Drawings and specified herein.

B. The Knife Gate system shall be provided by a single manufacturer (DeZurik, Orbinox, Pratt, or Director's Representative approved Equal). The manufacturer shall provide proof that at least one of their valves of this size range has been in service for the last 5 years or so. The valve system includes 3 x 90-inch Bonneted Knife Gate valves (to include valves, torque unit, hydraulic cylinder, and other accessories per specification), hydraulic power unit, power modules, and interconnections; and related controls and accessories as shown on the Contract Drawings or specified herein, and as required for a complete and functioning system.

C. The Knife Gate valve system manufacturer shall be solely responsible for the procurement, and integration, and shall provide any necessary technical knowledge during the installation by the Contractor of all Knife Gate valve system components including, but not limited to, Knife Gate valves and hydraulic power units. Hydraulic piping shall be by the Contractor as recommended by the Manufacturer.

D. The Contractor shall be responsible for the Knife Gate valve manufacturer's coordination among all the original equipment manufacturers for all system components, as required for a complete and functioning system.

E. Hydraulic piping shall be furnished, installed, and tested per Section 40 05 23 by the Contractor.

F. Manufacturer shall have had 5 substantially similar Knife Gate system installations (Valve, Cylinder, Hydraulic Power Units) in the last 5 years.

1.3 REFERENCE STANDARDS

A. Where reference is made in this Section to one of the following standards, only the applicable requirements of the revision in effect at the time of the bid opening shall apply.

B. AMERICAN CONCRETE INSTITUTE (ACI)
1. ACI 318 – Building Code Requirements for Structural Concrete

C. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISI)
1. AISI 360 – Specification for Structural Steel Buildings

D. AMERICAN SOCIETY OF MECHANICAL ENGINEERS/AMERICAN NATIONAL STANDARDS INSTITUTE (ASME/ANSI)

1. ASME/ANSI B16.10 – Face-to-Face and End-to-End Dimensions of Valves
2. ASME/ANSI B16.5 – Pipe Flanges and Flanged Fittings
3. ASME/ANSI B16.47 – Large Diameter Steel Flanges: NPS 26 through NPS 60 Metric/Inch Standard
4. ASME PCC-1 – Guidelines for Pressure Boundary Bolted Flange Joint Assembly

E. ASTM INTERNATIONAL (ASTM)

1. ASTM A36/A36M – Standard Specification for Carbon Structural Steel
2. ASTM A53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
3. ASTM A193/A193M – Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High-Pressure Service and Other Special Purpose Applications
4. ASTM A240/A240M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
5. ASTM A276/A276M – Standard Specification for Stainless Steel Bars and Shapes
6. ASTM A312/A312M – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
7. ASTM B271/B271M – Standard Specification for Copper-Base Alloy Centrifugal Castings
8. ASTM A570 - Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled
9. ASTM F593-17 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
10. ASTM F1941 – Standard Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric

F. AMERICAN WELDING SOCIETY (AWS)

1. AWS A5.13:2010 – Specification for Surfacing Electrodes for Shielded Metal Arc Welding
2. AWS D1.1/D1.1M – Structural Welding Code - Steel
3. AWS D1.6/D1.6M – Structural Welding Code - Stainless Steel

G. AMERICAN WATER WORKS ASSOCIATION (AWWA)

1. AWWA C207-18 – Steel Pipe Flanges for Waterworks Service—Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm)
2. AWWA C520-19 – Knife Gate Valves, Sizes 2 in. (50 mm) through 96 in. (2,400 mm)

3. AWWA C541-16 – Hydraulic and Pneumatic Cylinder and Vane-Type Actuators for Valves and Slide Gates
4. AWWA C542-16 – Electric Motor Actuators for Valves and Slide Gates

H. MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTING INDUSTRY (MSS)

1. MSS SP 6 – Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings
2. MSS SP 81 – Stainless Steel, or Stainless-Steel-Lined, Bonnetless Knife Gate Valves With Flanged Ends
3. MSS SP 135 – High-Pressure Knife Gate Valves
4. MSS SP 151 – Pressure Testing of Knife Gate Valves

I. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum)

J. UNITED STATES ARMY CORPS OF ENGINEERS (USACE)
1. USACE EM 1110-2-2104 – Strength Design for Reinforced Concrete Hydraulic Structures

1.4 SUBMITTALS

A. Submit the following for approval prior to commencing fabrication in accordance with Section 01 33 00 Submittal Procedures.

1. Drawings showing assembly details, materials of construction, bills of material, dimensions and both shipping and installed weight.
2. Individual control schematics and wiring diagrams for the HPU with all external interfaces identified.
3. A Process and Instrumentation Diagram (P&ID) for the hydraulic tubing and ancillaries between the HPU, its accumulators, and the valves.
4. Drawings detailing the accumulator mounting frame and connections to the wall that will support it.

B. Submit a valve commissioning procedure prior to shipping.

C. Submit the following for approval prior to shipping the valves in accordance with Section 01 33 00 Submittal Procedures.

1. Certified hydrostatic shop test report.
2. Certified operational shop test report for valves and actuators.
3. Certified factory acceptance test for the HPU and controls.
4. Certificate of Compliance certifying that the valves have been fabricated in accordance with applicable specifications and standards.
5. Valve Manufacturer’s installation instructions.
6. Operating and maintenance instructions assembled in a manual prepared specifically for this project, including all required catalog cuts, drawings, equipment lists, descriptions, installation, and other information required to instruct operating and maintenance personnel unfamiliar with the valves and appurtenances.

D. Submit the following after installation of the valves in accordance with Section 01 33 00 Submittal Procedures.

1. Field test report affirming that the valves were successfully installed and functionally tested in the presence of the valve Manufacturer in accordance with its installation instructions and that operator training was provided.

1.5 QUALITY ASSURANCE

A. Qualifications

1. Valves shall be the products of well-established, reputable and qualified firms who have a minimum of 10 years of experience in the design and manufacture of fabricated steel knife gate valves and hydraulic power units. Manufacturer must have at least 5 installations of substantially similar throttling Knife Gate valves, one being at least 78" in diameter in the last 5 years.
2. The valves shall be designed, fabricated, tested, and installed in accordance with accepted industry practices and methods and shall comply with this Section where applicable.
3. Valves and HPU shall be factory inspected by Director's Representative personnel.

B. Certifications

1. The valve manufacturer shall furnish a certificate that affirms compliance with the applicable standards referred to herein. MTRS shall be provided for Director's Representative review.

C. Provide a qualified and factory-trained service representative of the valve and HPU Manufacturer to provide the services specified below. Person-day requirements listed are exclusive of travel time and do not relieve the Contractor of the obligation to place the equipment in operation as specified.

1. Installation observation: Observe setting, leveling, alignment, and field erection of the valve.

   a. 1 person-days.

2. Functional testing observation: Observe calibration and functional testing of the valve and HPU.

   a. 1 person-days.

3. Valve and HPU Manufacturer training: Provide classroom and field operation and maintenance instruction including all materials, slides, videos, handouts, and preparation to lead and teach classroom sessions. Training required to be provided by other manufacturers, such as the valve actuator Manufacturer, shall be arranged separately by the Contractor.

   a. 1 person-days.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Care shall be taken in handling to avoid damage to the valves, actuators, appurtenances and finishes.

B. Prior to shipping, valve ports shall be suitably covered to avoid entry of foreign material.

C. The valve, bonnet and hydraulic actuator shall be shipped separately. The HPU shall be shipped as a unit.

D. Valve stems shall be coated with a protective coating which shall be maintained until the valve is placed into service.

1.7 SPARE PARTS

A. The following spare parts shall be supplied and included in the Contractor's base bid.

1. One complete filter element change
2. One coil for each solenoid valve
3. Spare relief valve of each type
4. Spare load holding valve of each type
5. 5 fuses of each type

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. General.

1. The valve design shall be verified using SolidWorks or a similar finite-element stress analysis program to demonstrate the integrity and proper functionality of the valve at the design pressure with the body and flanges unconstrained.
2. The valve shall meet the applicable requirements of MSS SP-81, MSS SP-135, or AWWA C520.
3. The valve shall be designed with a relief groove to allow the gate to push solid particles aside to prevent material packing in the seat area. If required, groove flush ports shall be provided and fabricated from the same material as the wetted parts.
4. Valves shall have a fabricated pressure retaining bonnet that fully encloses the gate. The bonnet shall be rated at the same pressure as the valve body and shall not include an internal gate packing, gland, or gate wiper. A packing gland shall be located at the top of the bonnet to provide a tight seal around the stem. The packing shall be replaceable without disassembling the valve or removing the valve from the pipeline. Valve designed for dead-end-of-line service.
5. The valve stem shall have an integral back-seating ring to allow repacking under pressure. The back-seating ring sealing surface shall be designed to mate with the bottom of the packing gland.
6. The valve shall be designed so that all required lubrication can be performed with the valve installed.

7. Metal-seated valves shall be full-port design with the clear port ID equal to or greater than the pipe ID.
8. Provide gate guides for valves where the valve stem is not installed in the vertical position. Gate guides shall fully support the gate and allow it to seat as required.
9. The pressure class of valve flanges shall be equal to or greater than the pressure rating of the valve.

B. Knife Gate Valves shall be 90" and designed for throttling service in raw water service.

1. Valves shall be designed for a maximum operating head of 80 feet.
2. Valve basic dimensions shall be in accordance with contract drawings, including valve feet and width of components.
3. Valve body, bonnet and hydraulic actuator shall have threaded holes or other means to attach Crosby lifting eyes, each with a safety factor of 5 based on load they must support for handling purposes.
4. The gate shall be square, fully guided over the full stroke, beveled leading edge, to facilitate throttling as required.
5. Valves shall be uni-directional.
6. Flanges shall be raised face to meet AWWA C 207 2D Class 150.
7. Valve orientation shall be vertical with a hydraulic cylinder.
8. Flange gaskets shall be manufactured per Section 40 05 61.45.

C. Materials of construction

1. Body ASTM A570 CS
2. Flanges ASTM A570 CS
3. Bonnet ASTM A570 CS. Ribs shall be fully welded.
4. Wetted Parts ASTM A240 316 SS
5. Gate ASTM A240 316 SS
6. Stem 17-4 SS
7. Backseat Ring ASTM A240 316 SS
8. Seat Nitronic 60
9. Packing PTFE
10. Packing Gland ASTM A240 316 SS
11. Yoke A312 SS pipe.
12. Fasteners F593 SS.

D. Coatings

1. All exterior surfaces, except for machined and bronze surfaces, shall be painted.
2. Protect all machined surfaces and tapped holes during sandblasting, and mask for painting.
3. Sandblast per SSPC SP-6 "Commercial Blast Cleaning" immediately prior to priming.
4. Before priming/painting, provide surfaces dry and free of dust, oil, grease and other foreign material.
5. Paint with two coats:
   a. Sherwin Williams Macropoxy 646, 5-10 mils DFT (self-priming) or Directors approved system.
   b. Maintain temperature and humidity levels within coating systems requirements.
6. Color: SW4086 Safety Blue.

2.2 FABRICATION

A. Flange faces shall be machined and grooved with a spiral serrated finish.
B. Flange bolt holes shall be:

1. Threaded.

C. Gate surface finish shall be:

1. 32 micro-inch RMS.

D. Provide valve with brass or Type 316 stainless steel nameplate attached with Type 316 stainless steel rivets. Nameplates shall have stamped letters and shall include serial number, pressure rating, and other essential information.
E. For stainless steel bolting, except where Nitronic 60 or bronze nuts are provided, use graphite-free anti-seize compound to prevent galling.
F. Uni-directional valves shall be marked to indicate the seat side of the valve.

2.3 HYDRAULIC CYLINDER ACTUATORS AND POWER UNITS

A. Hydraulic Cylinder Actuators and Hydraulic Power Unit

1. Each Knife Gate valve will be operated by a single hydraulic cylinder actuator mounted on the valve. The Hydraulic Power Unit (HPU) shall operate all three valves/cylinders on an individual basis. The HPU and its individual hydraulic circuit components shall be furnished by the manufacturer as a self-contained skid-mounted assembly. The HPU skid shall have a foot print no more than 4’ 8” wide by 6’ 0” inches long. The height from the bottom of the HPU to the top of the accumulators, which will be mounted above the HPU, shall not exceed 10’ – 2” (see drawing SK-703). Electrical connections shall be made to power and control terminal boxes provided by Contractor that is easily accessible.

a. The hydraulic cylinder actuators shall be linear, double-acting, single-rod hydraulic cylinders.
b. The cylinders, HPU and all components shall be designed to operate in an unclassified area.
c. The actuator, hydraulic piping, clamps, anchors, and hardware are to be type 316 L SS.
d. Provide (1) HPU for (3) Knife Gate Valves. Each valve shall have its own hydraulic cylinder actuator.
e. Provide Local Control Panels and Local Control Stations as shown on the Contract Drawings. Local station shall have pump run hour indication. Panel shall have internal heater to prevent condensation and enclosure shall be rated NEMA 4X.
f. Provide a Human Machine Interface (HMI) for installation up in the valve control house. The HMI shall have the following features, at a minimum:

1) Valve position in percent open.
2) Pump motor condition (on/off).
3) Valve chamber temperature.

g. Provide for local and remote indication of valve position (percent open).

1) Open and Close Time Periods: Hydraulic cylinder actuators and HPU shall be designed to open and close the Knife Gate valve at a rate of 16 inches per minute. Hydraulic cylinder actuators and HPU shall be designed to operate the valves through three consecutive opening and closing cycles during every 90-minute period, at specified ambient temperature conditions under full differential pressure.
2) The operating hydraulic circuit pressure at the point of connection between the manufacturer's integrated power module and the field hydraulic piping shall not exceed 2000 psi.
3) The hydraulic cylinder actuator and power module shall be designed to use a petroleum free, biodegradable synthetic hydraulic fluid meeting the MIL-H-5606 specifications for low-temperature hydraulic fluids. Fluid shall be Phillips 66 Syndustrial or Director's Representative approved biodegradable fluid.
4) The Hydraulic cylinder actuators and HPU shall be sized to provide 125 percent of the maximum required force under design operating head conditions for the Knife Gate valve using the minimum pressure available from the system without exceeding the nameplate horsepower rating of the pump. The HPU and cylinder shall be rated for a minimum of 3000 psi. The accumulator shall be sized for one open and close cycle for one valve. The actuator manufacturer shall submit Shop Drawings and design calculations stamped by a Professional Engineer, registered in the state of New York, certifying that each hydraulic actuator has been properly designed for maximum pressure and thrust. The piston rod shall be Type 17-4PH stainless steel, hard chrome plated 1 mil thick minimum. Wiper retainer and bolts shall be Type 316 stainless steel. Bushing, rod bushing, and rod wiper shall be metallic bronze or Type 316 stainless steel. Each hydraulic actuator shall be provided with proximity switches to stop the pump motor at the end of travel and indicate fully open and fully closed positions.
5) The piston rod shall be rifle drilled to the required dimensions to accept a linear transducer according to Subpart 2.03 C.2.b which shall transmit an analog signal to the local controller as well as for remote indication, indicating the position of the gate.
6) The hydraulic cylinder actuator shall be designed to be submersible.
7) Isolation ball valves shall be provided at each actuator with an isolation ball valve that connects both cylinder ports together. This allows for isolating the cylinder while connecting the plumbing into a loop circuit, aiding in bleeding and replenishing the fluid circuit.
8) Lifting hooks shall be provided to facilitate the handling of hydraulic cylinder actuators in either a vertical or horizontal position. Lifting hooks, baseplates and companion flanges shall be surface machined for 2-1/2 inches on the outer outside diameter area and sides of the baseplate. All hardware, including bolts, washers, and elastic stop nuts shall be Type 316 stainless steel. If elastic stop nuts are not provided, double nutting shall be provided.
9) All mounting brackets, structural supports and other accessories necessary for the complete installation of each hydraulic cylinder actuator, local control station, and enclosure shall be supplied by the Knife Gate valve system manufacturer.
10) Hydraulic Actuator Mounting: All fasteners and hardware shall be stainless steel ASTM A276, Type 316, and ASTM A320, B8 or B8F.

11) Means shall be provided to allow safe manual hand-pumped operation of the Knife Gate valve in the event of loss of electrical power. All hand pump components shall be Type 316 stainless steel. A means shall also be provided to manually operate the valve via an electric drill or in a similar fashion.
12) Pressure switches shall be provided to start the pump and stop the pump. Lead/lag operation of the pumps shall be provided.
13) The design of the cylinder, HPU and components shall be based on a maximum design pressure of 3,000 psi.

B. Construction

1. Pump and Motor

a. The HPU shall have two hydraulic pumps, with one as a standby (operate in lead/lag mode).
b. The pumps and motors shall be of the type most suitable for the application, taking into account maximum flow rate, pressure range, available power, and duty cycle.
c. The pumps and motors shall be sized to deliver fluid to operate the hydraulic actuators as specified at the design speed and pressure.
d. The pumps shall start in a no-load state.
e. The motors shall be manufactured and installed for use in conditions specified in this section. Electric motors shall be cast iron construction, premium efficiency, TEFC, 3 phase-60Hz-230 volt, and meet MG-1, MG-13 and NEMA 4X enclosure requirements, including a 1.15 service factor.
f. A Variable Frequency Drive (VFD) shall be included with this system. The input voltage to the VFD shall be single phase 60 Hz 230 volt. The VFD shall be WEG or Director's Representative approved equal.
g. Electric motors shall be equipped with winding heaters to prevent condensation of internal components.
h. Check valves shall be provided in the hydraulic circuits to hold the hydraulic actuator in place once movement is stopped by either the hand pumps or the electric pumps.
i. Adjustable pressure control valves shall be provided to limit the pressure in the hydraulic lines. Valves shall be selected such that the load will not drift from its supported position due to excessive internal leakage through the pressure control valves.

C. Portable Operator

1. Provide one (1) 120V single phase portable hydraulic pump to be used at the Power Module. The portable operator shall be equipped with hydraulic hoses with quick disconnect fittings. The power module shall be provided with quick disconnect connections with isolation valves, direction valves, and fittings for the portable hydraulic pump for opening and closing of the gate upon failure of all systems. Connections shall be installed above the floodplain. An adequately sized hydraulic fluid reservoir to open the gate shall be provided with the portable operator.

D. Hydraulic Fluid

1. The system shall be designed to use a premium grade; petroleum free-based synthetic hydraulic fluid with a minimum flash point of 300 deg F. Design temperatures shall be 40 to 115 deg F. The oil shall contain oxidation and rust inhibitor and shall have excellent resistance to foaming with ready release of entrapped air. The hydraulic fluid shall provide a high level of wear protection for high-pressure, high-output hydraulic pumps and shall provide freedom from deposit formation. Where required, the hydraulic fluid shall be petroleum free, readily biodegradable, zinc and ash free, AW hydraulic fluid. It must carry approvals of major hydraulic manufactures. Typically, these types of oils shall be Synthetic PAO's.
2. The hydraulic fluid shall be specifically suited for use in conjunction with all components furnished as part of the Hydraulic Power Units in accordance with the recommendations of the manufacturer of the various equipment components.
3. The hydraulic fluid shall be as specified by the Hydraulic Power Unit manufacturer. The manufacturer shall submit a statement in writing that wetted parts of the hydraulic system are suitable for extended operation with the hydraulic fluid.
4. The Contractor shall furnish all hydraulic fluid required to fill all of the hydraulic power systems, distribution piping, accumulators, cylinders, etc. complete. The hydraulic power systems shall be filled with hydraulic fluid after the installation, connection, cleaning, and testing of all system equipment including all piping, hoses, valves, and connections associated with the system.

E. Hydraulic Piping

1. All Piping, fittings, and valves for supply and return distribution between the hydraulic power units, accumulators, and valve control panels shall be:

   a. Minimum of 1".
   b. 316 SS seamless, bright annealed, cleaned, and capped. Piping shall be carefully installed using instrument-grade fittings; a minimal amount of flushing shall be required. All bends should be swept not hard.
   c. All SS pipe shall be pickled and passivated, cleaned, and capped.
   d. Filed plumbing shall be flushed prior to connecting the HPU and actuator. Flushing requirements per ISO 18-17-14.
   e. Piping shall conform to ANSI/ASME B 31.1 - Power Piping.
   f. Piping shall have a minimum factor of safety of six based on the maximum working pressure to burst.
   g. Piping shall be designed for a maximum test pressure (1.5 times operating pressure) at the maximum design temperature of the process medium.
   h. Piping components and fittings and tubing integral to the power unit and accumulator rack shall be Type 316 Stainless steel tube connections and SAE O-Ring port connections, butt welded or socket welded.
   i. Piping shall be provided with appropriate connection joints and or fittings to connect the distribution supply and return piping to the HPU skid.

F. Accumulator Rack

1. An accumulator rack shall be designed by the Contractor to support the accumulator vessels off of the wall above the HPU. The design shall detail all members, welds and fasteners required to attach the accumulator vessels to the rack and the wall.

2. The accumulators shall be no longer than 7’ – 6” and no wider than 4’- 9”. See height restrictions in Section 2.2.A.1.
3. Contractor shall determine type, number and embedment length of anchor bolts required to anchor the rack to the outlet structure wall.
4. Structural assessment and design of the accumulator rack shall comply with the following requirements:

    a. Codes and Standards

        1) ACI 318-19, Building Code Requirements for Structural Concrete
        2) USACE EM 1110-2-2104, Strength Design for Reinforced Concrete Hydraulic Structures, 2016
        3) AWS D1.1, Structural Welding Code
        4) AISI Specification for Structural Steel Buildings, dated August 1, 2022

5. Loads and Load Cases

    a. Loads and load cases shall follow the requirements of ACI 318-19 and USACE EM 1110-2-2104, supplemented by the minimum seismic criteria below:

        1) Minimum lateral seismic coefficient: 0.15g
        2) Minimum vertical seismic coefficient: 0.042g

6. The rack shall be painted in accordance with Section 099123, color to be determined by Director’s Representative.

G. Controls

1. Skid Mounted Local Control Station

    a. Each HPU shall be provided with its own Local Control Station (LCS), mounted to the manufacturer’s skid-mounted assembly to be installed on or adjacent to the HPU. The LCS shall control all valves.
    b. Each skid-mounted LCS shall be NEMA 4X, and of a material suitable for the environment.
    c. Each skid-mounted LCS shall include the following front panel-mounted indicators and controls for each valve:

        1) Local-Remote and LCS Selector (allows for control from either LCS) Switches
        2) LCD gate position indicator accurate to the nearest tenth of an inch
        3) Open, Close, Stop, Reset, and E-Stop push buttons
        4) In-Remote, Opened, Closed, Power On, Gate Fault, PLC Fault, Low Oil, Low-Low-Oil, Pump 1 Fault, Pump 2 Fault, Pump 1 Run, Pump 2 Run, In-Local lights.

    d. The control system shall include a Programmable Logic Controller (PLC) and Human Machine Interface (HMI) for control of the HPU and data recording.

H. Visual Devices

1. Oil reservoir site glass.
2. Pressure gauges – pump inlet and output pressure.
3. Temperature gauges – pump inlet and output.
4. Oil level gauge and level switches (low and high).

I. Electrical Controls

1. The electrical controls shall be in accordance with the Contract Drawings.
2. Power supply to the LCS shall be a single-point connection according to the Contract Drawings. Any additional transformation and distribution of power internal to the manufacturer's provided equipment shall be part of the manufacturer's scope of supply.
3. A panel-mounted disconnect switch shall be provided. The door of the enclosure shall be mechanically interlocked with the disconnect switch such that the door cannot be opened with the switch in the ON position without using a tool-operated defeater.
4. Each motor circuit shall be protected with a properly sized, adjustable, magnetically-tripped, three-pole motor circuit protector and a NEMA rated motor starter with a manual reset thermal overload relay.
5. All control transformers in motor starters shall only be used to power components relative to the motor control and not any auxiliary devices such as instruments and actuators.
6. All indicating lights, push buttons and other devices shall be according to New York State Office of General (OGS) standards.
7. Each door-mounted device shall have its own lamicoid plastic legend plate custom engraved by the actuator manufacturer.
8. A means shall be provided to test all indicating lights according to OGS standards.
9. In the event of a power module component failure or general fault alarm, the power module shall shut off.

J. Wiring and Terminal Blocks

1. Control wire shall be THHN with a 90 degree C rating. All connectors and terminal blocks shall have the same rating.

K. Control Circuits

1. All controls shall be hard-wired relay logic between the manufacturer's electrical/controls and equipment.
2. Dry contacts shall be provided according to the contract drawings.
3. Manufacturer shall provide a minimum of four (4) spare dry contacts.

L. Valve Controls

1. Provide controls as shown on the Contract Drawings.
2. Position Indication:

    a. Continuous Knife Gate valve position indication shall be provided via an explosion-proof actuator-mounted linear position sensing transducer and shall be displayed at a panel meter on the Local Control Stations. The position transducer shall provide a 4-20mA analog output signal. Transducer shall be protected from water damage. The power module shall still be able to operate the hydraulic cylinder actuators when the position transducer fails.

3. Limit Travel Indication:

   a. Limit travel indication shall be provided by means of two switches integrally mounted to each hydraulic cylinder actuator.
   b. Adjustable time delays shall be provided from the moment limit of travel is sensed to permit the pump and valves to remain energized to ensure full travel of the valve to its mechanical limit, either fully seated in the closed position or fully opened.

M. Hydraulic Circuit Pressure Sensors Switches and Gauges

1. Pressure switches and gauges shall be incorporated to monitor and display the system pressure.
2. Sensors for low oil and low-low reservoir fluid level, system oil low and high pressures, and hydraulic oil leaks shall be provided.
3. Switches for low oil, low-low and high hydraulic reservoir fluid levels, and low and high accumulator gas pressure shall be provided.
4. An oil Temperature switch shall be provided. The switch shall be mounted on the reservoir with the temperature probe inserted into a bulb well to allow servicing without draining the reservoir of oil.

N. Oil Reservoir Miscellaneous

1. Reservoir shall have an internal oil heater.
2. Valve position
3. Oil temperature sensor
4. Dual oil filter clogged alarm

O. Input/Output (IO) - Miscellaneous

1. Open/close switch
2. Valve position
3. Oil temperature sensor
4. Dual oil filter clogged alarm

2.4 SOURCE QUALITY CONTROL / SHOP TESTS

A. Witness Shop Test

1. All valves, hydraulic cylinders, and hydraulic power units shall be witness shop tested in accordance with AWWA C522. They shall be tested together in the valve system manufacturing facility.
2. A detailed shop test procedure shall be submitted for Director's Representative approval.
3. Testing of the hydraulic cylinder actuators and HPU's modules shall be witnessed by the Director's Representative at the Director's Representative discretion. Submersible hydraulic cylinder actuators shall be tested with 10 psi of air for one hour to ensure positive sealing.
4. The control systems shall be tested by the manufacturer and witnessed by the Director's Representative for which pressure, duty, rating, capacity, and function are specified.

5. Testing on the hydraulic cylinder actuators shall be performed with test loads that simulate the corresponding proposed valves. Testing shall be performed with the hydraulic actuator in the same alignment as will be installed in the field.
6. Testing shall include but shall not be limited to:

    a. Operation under rated and design load
    b. Verification of pressure switch settings
    c. Verification of relief valve settings
    d. Verification of pump and motor operation and performance
    e. Verification speed of travel and positioning of the actuator
    f. Check for hydraulic fluid leaks
    g. Check line pressure at various points including the pump output and downstream of the pressure switches
    h. Check actuator response to the controller

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that piping system is ready for valve installation.

3.2 INSTALLATION

A. General: Install Knife Gate valve system in accordance with the manufacturer's recommendations and approved Shop Drawings and as required herein.

1. Install Knife Gate Valves as shown by the Contract Drawings.
2. Field piping shall be in accordance with Section 40 05 24.01 – Large Diameter Steel Pipe.
3. 10-micron filters with safety bypass check valves and pressure gages shall be provided for the feed and return hydraulic fluid lines.
4. The Contractor shall be responsible for furnishing and installing all distribution supply and return hydraulic oil piping, isolation valves, fittings, and appurtenances required to connect each power module to its respective hydraulic actuator. Install physical protection to the hydraulic piping between the HPU and actuators, and in other areas where the hydraulic oil piping is exposed and can be damaged.
5. The Contractor shall furnish all hydraulic oil required to fill the hydraulic system and its piping for the initial cleaning, testing, and overall system startup and all subsequent refilling/replacement required to make the system complete and operational through the duration of the Contract’s warranty period.

B. Hydraulic lines shall be flushed as follows:

1. All piping, including Hydraulic Power Unit (HPU) skid mounted and distribution piping (off skid piping), shall be cleaned with a high velocity flush as specified herein. The cleaning procedure shall free any debris attached to the interior pipe wall and then suspend the debris in the flowing stream for removal by filtration. All contaminants shall be removed to a cleanliness level which will provide satisfactory operation of the HPU.
2. Contractor shall evaluate the system and its physical layout to determine the technique or combination of techniques best suited to complete the high-velocity flush.

3. Contamination removal shall be performed manually and removal of contaminants shall be at the oil reservoir or other enlarged volumes of the system.
4. Flushing Procedure:

   a. Contractor shall submit a flushing plan for review by the Director's Representative. Flushing plan shall meet the requirements as specified herein.
   b. Flushing oil shall match that of the oil to be used for normal operation.
   c. Circulation of oil through the oil system shall be at a flow rate at least twice the normal operating flow rate, or with a minimum 4,000 Reynolds Number, whichever requires a greater flow rate.
   d. Flushing flow rate shall be achieved by any of the following methods:

      1) A dedicated, additional pump not associated with the HPU skid may be installed and sized for double flow through the entire system. All mechanical and electrical connections for the pump shall be the responsibility of the Contractor.
      2) Utilize the furnished pump on the HPU skid. The system shall be segregated to achieve double flow and the pump shall not surpass its allowable operating range.

   e. Flushing oil shall be heated to a range of 160°F to 180°F and shall be maintained throughout the piping circuit. External low watt density electrical heaters may be connected to the system and or insulation and heat tracing wire. Heating component material(s) shall be compatible with the flushing product.
   f. Flushing oil shall be filtered and filtration shall be achieved by any of the following methods:

      1) Utilize the job supplied full flow filters. Elements shall be replaced at the completion of the flush.
      2) Utilize additional temporary full flow filters with finer elements.

   g. Flushing oil shall be sampled in accordance with ISO 21018.
   h. Vibration of the piping shall be performed during the flush at amplitudes greater than anticipated during normal operation, but within its mechanical limitation.

C. System Cleanliness:

1. Acceptable contamination level shall be provided by the HPU manufacturer, in three digit scale format per ISO 4406 cleanliness code, prior to initiating the flushing procedure.
2. System cleanliness shall be determined by Particle Counting. Particles within the flushing oil shall be measured per ASTM D2390 to determine the contamination level. Samples for particle counting shall be taken at the extreme end of the system being flushed.
3. Field-installed plumbing shall be flushed clean to a minimum ISO level of 18/17/14, or to the oil cleanliness requirement recommended by the hydraulic manufacturer of the component with the lowest tolerance to contamination.
4. Only continuous-run cables are permitted between the LCSs and the actuator; no splices will be permitted. The cable shall be long enough to provide at least five feet of additional cable in each LCS. To mitigate induced voltages from power cables to lower voltage control cables, power, and control cables shall be run separately in separate conduits.

D. Field Testing And Quality Assurance

1. Manufacturer's Field Services: Furnish the services of a qualified representative of each of the various manufacturers as required herein.

   a. The representative shall inspect the installation of equipment, field test the equipment, make any necessary adjustments, field calibrate the equipment upon completion of the installation of each actuator and gate, and place it in initial operation. In addition, the representative shall instruct the Director's Representative operating personnel in the operation, calibration, troubleshooting, and maintenance of the equipment.
   b. Reports: Submit a report from the manufacturer of each visit to the site. Reports shall provide complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction, and all other pertinent information.

E. Tests

1. After installation of the Knife Gate valve systems and all appurtenances, subject the units to a field running test under actual operating conditions as required herein and in the Contract Documents.

   a. Test Knife Gate valves, hydraulic power units, and hydraulic cylinder actuators in accordance with the approved testing plan, including the following. The field tests shall be witnessed by the Director's Representative.
   b. Have each actuator open and close the valve through the full range of travel at least three times each:
      1) In the dry.
      2) In the wet with reservoir level available at the time of testing.
      3) Should the reservoir level at time of testing be less than EL 768 (NAVD88), subsequent testing shall be performed when the reservoir level next reaches EL 768 (NAVD88) or at another lower reservoir level determined by the Director's Representative.
   c. Automatic switch to standby pump operation following duty pump failure.
   d. The field tests shall demonstrate that all equipment, controls, and monitoring operate as specified and within the allowable leakage rates. Allowable leakage rate is 5 ml/minute/inch of nominal diameter under rated pressure per AWWA C520.
   e. Field test all valves and the HPU from each of its respective local control panels and master control panel. Field test the manual overrides to demonstrate that they can seat and unseat each gate.

A. END OF SECTION 400561.43

ADDENDUM 04 CE

SECTION 400561.44 - VALVE SUPPORT BEARINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Knife gate valve pot bearings - including all connections in accordance with the contract documents and as directed by the Director's Representative.

B. Related Sections:

1. 01 33 00 - Submittals
2. 40 05 61.43 - Knife Gate Valves

1.2 SCOPE OF WORK

A. Provide all labor, materials, equipment, and incidentals required to furnish and install High-Load Multi-Rotational (HLMR) pot bearings for support of knife gate valves as shown on the Contract Drawings and specified herein.

1.3 SUBMITTALS

A. Submit the following for approval prior to commencing fabrication in accordance with Section 01 33 00 Submittals.

1. Drawings showing assembly details, materials of construction, bills of material, and dimensions.

1.4 QUALITY ASSURANCE

A. Qualifications

1. The bearings shall be designed, fabricated, tested, and installed in accordance with accepted industry practices and methods and shall comply with this Section where applicable.

2. Bearings shall be produced by a firm regularly engaged in the design and manufacture of bearings, of the type specified, and with a minimum of 10 years experience producing such bearings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Care shall be taken in handling to avoid damage to the bearing components and finishes.

PART 2 PRODUCTS

2.1 DESIGN

A. General.

1. The bearing shall conform to Con-Serv's CON-SLIDE Pot Bearing (CPB) or Director's Representative approved equivalent.

2. Per knife valve assembly, one free moving pot bearing and one outside guided pot bearing are required.

3. The free moving pot bearing shall be Con Serv's CON-SLIDE CPB-75FM or approved equivalent and shall have the following properties:
   a. Minimum vertical capacity of 75 kip.
   b. Shall be able to accommodate 1" movement in all directions.

4. The outside guided pot bearing shall be Con Serv's CON-SLIDE CPB-75G30 or approved equivalent and shall have the following properties:
   a. Minimum vertical capacity of 75 kip.
   b. Minimum lateral capacity of 30% of vertical load (22.5 kip).
   c. Shall be able to accommodate 1" movement in the un-restrained direction.

B. Materials of construction

1. The body of bearings shall be of steel construction, type A588 (yield strength = 50,000 psi) or equivalent.

2. Slide surfaces shall be Polytetrafluoroethylene (PTFE) on stainless steel plating. The thickness of the PTFE shall be a minimum of 3/16". The stainless steel shall be 16 gauge. The coefficient of friction shall be 0.03.
3. AASHTO-grade neoprene bearing pads shall be provided. Maximum pressure on the pad shall be 3500 psi.

2.2 FABRICATION

A. The upper PTFE element shall be larger than the lower element to accommodate the anticipated movement.

B. Backup plates shall be ½" larger all around to allow for seal welding.

C. The elements shall be flat, clean and prepared for installation in the structure. Slots and holes, if required, shall be fabricated in the bearing manufacturer's plant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that bearings are ready for installation.

3.2 INSTALLATION

A. General:

1. Remove vinyl masking from stainless steel surfaces before final placement.
2. Installation of bearings follow manufacturer's written instructions.

END OF SECTION 400561.44

SECTION 400561.46 – LARGE PIPE COUPLINGS

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Section 40 05 24.01- Large Diameter Steel Pipe

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of these specifications, all work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following documents to the extent that the requirements therein are not in conflict with the provisions of this Section.

B. Commercial Standards:

ANSI/ASTM E165	Liquid Penetrant Inspection, Methods for
ANSI/AWS D1.1	Structural Welding Code - Steel
ANSI/AWWA C200	Steel Water Pipe 6 Inches and Larger
ANSI/AWWA C210	Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
ANSI/AWWA C213	Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
ANSI/AWWA C227	Bolted, Split-Sleeve-Type Restrained and Non-Restrained Couplings for Plain-End Pipe
ASTM F1476	Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications
ASTM D2000	Classification System for Rubber Products in Automotive Applications
AWWA M11	Steel Water Pipe - A Guide for Design and Installation

1.3 SUMMARY

A. The Contractor shall furnish and install bolted, split sleeve mechanical couplings, complete in place, all in accordance with the requirements of the Contract Documents and Drawings. The couplings selected shall be designed for the type, size, and working pressure of the piping system with which they are to be used.

1.4 SUBMITTALS

A. Certifications: the CONTRACTOR shall furnish a certified affidavit of compliance for all couplings furnished under this Section of the Specifications, as specified and applicable in ANSI/AWWA C210, C213, and C227, respectively, and the following supplemental requirements:

1. Physical and chemical properties of all steel.
2. Hydrostatic test reports (if required).

1.5 QUALITY ASSURANCE

A. Inspection: All couplings shall be subject to inspection at the place of manufacture in accordance with the provisions of ANSI/AWWA C210, C213, and C227, respectively, as supplemented by the requirements herein. The Contractor shall notify the Director's Representative in writing of the manufacturing starting date not less than 3 calendar days prior to the start of manufacture.

B. During the manufacture of the couplings, the Director's Representative shall be given access to all areas where manufacturing is in process and shall be permitted to make all inspections necessary to confirm compliance with these Specifications.

C. Testing Requirements: One coupling of each diameter and pressure class shall be shop hydro tested per ASTM F1476 and certified to a pressure of at least 150% of the specified working pressure.

PART 2 - PRODUCTS

2.1 GENERAL

A. Couplings are to be bolted, split-sleeve type and consist of four basic components: one or more housing segment(s), gasket assembly, bolts and nuts, and restraint rings, if required for joint restraint.

B. Approved Manufacturer: Couplings shall be split-sleeve as manufactured by Victaulic Company or Director's Representative approved equivalent, as follows:

Style Number	Coupling/Pipe Material	Split Sleeve Coupling Type
232	Carbon Steel	Restrained Flexible Coupling

2.2 COUPLING DESIGN

A. Couplings shall be designed to perform under the most critical combination of internal pressure and external loads as determined by the design procedures per AWWA M11 and the provisions of these specifications.

B. Coupling shall be designed to allow movement on one end of the coupling only. That is, it shall be fixed on one end and allowed to slide on the other.

C. Coupling Thickness for Internal Pressure: The thickness of the coupling body shall meet or exceed the design requirements specified in AWWA M11 Manual.

2.3 COUPLING HOUSING

A. Material: Coupling shall be manufactured from ASTM A36 for carbon steel couplings.

B. Description: The coupling shall be of the split-sleeve type with a single or double arch cross section which closes around pipe ends that are smooth for expansion or contraction requirements or pipe ends with steel restraint rings affixed for pipe end restraint requirements.

C. As the coupling closes, it confines the elastomeric gasket beneath the arches of the sleeve to create the radial seal. The axial seal is affected at the sealing plates as the bolts pull the coupling snug around the pipe. Depending on the coupling style, Victaulic split-sleeve couplings may permit angular pipe deflection, flexibility, contraction and expansion as specified in the manufacture's latest literature.

2.4 O-RING / GASKET

A. Material: Elastomers shall have properties as designated by ASTM D2000.

B. Description: The sealing members are comprised of single gasket or two O-Rings and an elastomer-sealing pad bonded to the sealing plate. Internal pressure is not required to affect the seal.

C. Service:

1. Air: O-Ring / Gasket supplied shall be EPDM for temperatures of -30°F up to +230°F or Silicone for temperature of -30°F up to 350°F; conforming to ASTM D2000.
2. Water: O-Ring / Gasket supplied may be Isoprene or EPDM conforming to ASTM D2000 for water and sewerage service within the temperature range of -40°F to +160°F.

2.5 STUDS AND NUTS

A. Material: Carbon steel studs shall be zinc plated and conform to ASTM A193 Grade B7. Carbon steel nuts shall be zinc plated and conform to ASTM A194 Grade 2H. Stainless steel studs shall conform to ASTM F593 Class 2 Grade B8M. Stainless steel nuts shall conform to ASTM F594 Grade 8M, 316.

B. Installation: The coupling shall be assembled with provided studs and nuts at the closure plates, tightened to assure snug coupling contact with the pipe. Follow the manufacturer's written instructions regarding installation and tightening of nuts.

2.6 RESTRAINT RINGS

A. Material: Restraint rings shall be furnished with the couplings when required. Carbon steel restraint rings shall conform to ASTM A108 grade 1018.

B. Application: Series 231 couplings allow for thermal expansion and contraction at the pipe joint. Two restraint ring(s) affixed to the end of one pipe keeps the coupling in the proper location. Follow the manufacturer's instructions for weld size and restraint ring location(s).

2.7 EPOXY COATINGS (WHERE SPECIFIED)

A. Fusion Bonded Epoxy Coatings: Except as otherwise provided herein, the fusion bonded epoxy coating shall be applied to the inside and outside of the coupling in conformance with ANSI/AWWA C213.

B. Liquid Epoxy Coatings: Except as otherwise provided herein, the liquid epoxy coating shall consist of an epoxy primer and a liquid epoxy finish system applied in conformance with ANSI/AWWA C210. Both primer and finish shall be spray applied to the inside and outside of the coupling is accordance with the manufacturer's recommendations.

2.8 SUPPLEMENTAL EXTERIOR COATING

A. Supplemental Exterior Coating of Buried Couplings: Couplings installed underground shall receive additional protection against corrosion.

2.9 INSULATING SLEEVE (WHERE SPECIFIED)

A. Insulating Sleeve: When specified, insulating sleeves shall be supplied to provide for electrical isolation between the two pipe ends. One sleeve shall be provided for each pipe end. The sleeve width shall be equal to ½ the coupling body width plus 1 inch. Thickness shall be 3/16" inch. Each sleeve shall have a lip that extends down between the pipe ends that is ⅜ inch thick by 1" inch deep, fully bonded to the sleeve. The insulating sleeve material shall be an EPDM elastomer (other elastomers are available) suitable for potable water service.

PART 3 - EXECUTION

3.1 INSTALLATION OF COUPLINGS

A. The Contractor shall inspect each coupling to ensure that there are no damaged portions of the coupling. Particular attention should be paid to the sealing pad/sealing plate area.

B. Before installation of the couplings, each coupling shall be thoroughly cleaned of any foreign substance, which may have collected thereon and shall be kept clean at all times thereafter.

C. In no case shall the deflection in the joint between pipe ends exceed the maximum deflection recommended by the MANUFACTURER. No joint shall be misfit any amount that will be

detrimental to the strength and water tightness of the finished joint. The couplings shall be assembled and installed in conformity with the recommendation and instruction of the MANUFACTURER.

D. Wrenches used shall be of a type and size recommended by the MANUFACTURER. Nuts shall be tightened so as to secure uniform gasket compression between the coupling and the body of the pipe with all nuts tightened approximately the same amount. Final tightening shall be by hand (no air impact wrenches) and is complete when the coupling is in uniform contact around the circumference of the pipe.

E. The coupling Manufacturer's factory-trained representative shall provide on-site training for the Contractor's field personnel in the use of installation tools and installation of couplings. The representative shall periodically visit the job site to ensure best practices in coupling installation are being followed. (A distributor's representative is not considered qualified to conduct the training.)

3.2 TESTING

A. There shall be no visible leakage allowed at any pipe joints that utilize couplings. Any visible leaks at coupled pipe joints shall be repaired to the satisfaction of the Director's Representative.

END OF SECTION 400561.46

SECTION 412200 - HOISTS AND CRANES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Section 055000 – Metal Fabrications

1.2 REFERENCES

A. AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings

B. ASME HST-4M, Performance Standard for Overhead Electric Wire Rope Hoists

C. AWS D1.1, Code for Welding in Building Construction

D. Hoist Manufacturer's Institute Standard Specification for Electric Wire Rope Hoists

E. ANSI/NFPA 70 National Electric Code, Article 610, Cranes and Hoists

F. OSHA 29 CFR 1910.179, Overhead and Gantry Cranes

G. CMAA Specification 70, Specifications for Top Running Bridge & Gantry Type Multiple Girder Electric Overhead Traveling Cranes

H. ANSI/ASME B30.16, Safety Standard – Overhead Hoits (Underhung)

I. National Electrical Manufacturers Association (NEMA)

1.3 SYSTEM DESCRIPTION

A. Hoist and Crane System: The system specified consists of an overhead crane, with trolley mounted wire rope hoist, supported by a runway framework and the building structure, and meeting the requirements of the referenced specifications, standards, rules and codes.

B. In addition, a transfer cart as described herein and shown on contract drawings shall be designed, fabricated and installed to facilitate movement of valves and material from the valve chamber access shaft to the overhead crane and vice versa.

C. A jib crane as described herein shall be designed, fabricated and installed per contract drawings.

1.4 DESIGN REQUIREMENTS

A. The overhead crane and all associated equipment shall be designed for the specified basic loads and conditions. The design shall meet the requirements of CMAA Specification 70.

B. System Capacity: Will lift and move components weighing up to 15 tons within the valve house.

C. Crane, carrier, and hoist equipment shall be designed for Class A service.

D. Crane shall be motor propelled, double girder.

E. Bridge travel shall be variable speed using a stepless Variable Frequency Drive (VFD) with a maximum speed of 65 feet per minute.

F. Trolley travel shall be variable speed using a stepless VFD with a maximum speed of 50 feet per minute

G. Suspend hoist from a motor driven trolley. Hoist shall have two lifting speeds, 12.0/2.0 feet per minute.

H. Control hoist, trolley, and crane with a pushbutton control pendant suspended 4'-0" above floor.

I. Spacing between rails shall be as indicated on the Contract Drawings.

J. Overall length of runway shall be as indicated on the Contract Drawings.

K. Runway elevation as indicated on the Contract Drawings.

L. Deflection Limits:

1. All crane structures and equipment shall be designed such that deflections under imposed specified loads will not impair their structural integrity, operation, or performance.
2. The deflection limits of the crane shall meet the limits specified in CMAA Specification 70. Crane function shall be considered in the deflection and stricter deflection criteria may be necessary to ensure adequate long-term operation.

1.5 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Waiver of Submittals: The "Waiver of Certain Submittal Requirements" in Section 013300 does not apply to this Section.

E. Submittals Package: Submit the shop drawings, product data, and quality control submittals specified below at the same time as a package.

F. Shop Drawings:

1. Show the construction details of the hoist and crane system and the crane support structure.
2. Show the electric wiring and control system (both power and control).
3. Show installation details.

G. Product Data:

1. Catalog sheets, specifications, and installation instructions.
2. Bill of materials.
3. Name, address, and telephone number of nearest fully equipped service organization.

H. Quality Control Submittals:

1. Design data, including safety factor of materials.
2. Test report of hoist and crane system, include load test.
3. Certificate required under Quality Assurance.

I. Contract Closeout Submittals:

1. Operation and maintenance data.
2. Test reports of the completed hoist and crane system.
3. List of spare parts provided.

PART 2 - PRODUCTS

2.1 HOIST AND CRANE SYSTEMS

A. General

1. All components of the hoist and crane system shall be the responsibility of a single supplier.
2. The manufacturer shall have a minimum of 10 years' experience in the design and manufacture of this type of crane.
3. The hoist and crane system shall be rated for jogging service.

B. Hoist: Electric wire rope hoist as manufactured by Simmers, Konecranes, American Monorail, Spanmaster, or Robbins & Myers with all parts and accessories necessary to install on bridge crane and meeting the following requirements:

1. Minimum lifting capacity of 15 tons.
2. Trolleys: Trolley assemblies shall be articulating type. Attach load bars to yokes in such manner as to assume that all wheels are in contact with the operating flange at all times.

    a. Yokes shall be ductile castings and fixture machined.

3. Festoon system on the bridge for trolley movement for power and control cable.
4. Friction clutch assembly on hoist to prevent overloading.
5. Dual braking system.
6. Upper and lower limit switches.

7. Hook with safety latch. Hook shall be mounted to swivel on thrust bearing.
8. An early break contact for early VFD shutdown shall be included in the hoist control system.

C. Crane: Top running, motor driven, double girder crane as manufactured by Simmers, Konecranes, American Monorail, Robbins & Myers, or Spanmaster with track, suspension system and all parts necessary to meet the following requirements:

1. Rating of Service "Class A" as specified in CMAA-70.
2. Vertical impact load shall be 1/2 percent of the rated load for each fpm hoisting speed of the carrier.
3. Track and Fittings:

    a. Track size based on the load positioned on the track system to produce the most severe conditions of stress and deflection.
    b. Track sections shall be installed with bolted type splice plates to provide flush and level connections at the operating tread of the track. The maximum gap between the adjacent ends of the load carrying flange not to exceed 1/16 inch.
    c. Accomplish rigid track support by bolting the runway track to the supporting structure.
    d. Track Suspension: All necessary clamps, hanger rods, bolts, and other fittings from which the track system is suspended shall be provided as a part of the overhead track system. Track hanger supports shall be spaced as shown on the Drawings.
    e. Minimum crane stop to centerline of hook distance shall be 4' – 6 1/2" on both ends of the crane runway.
    f. Minimum transverse distance from centerline of hook to centerline of rail shall be (see Drawing S-740):

        1) Upstream: 2' – 5 ¾"
        2) Downstream: 3' – 10 ¾"

4. Electrification:

    a. A festoon system shall be installed to transmit power from the crane disconnect switch mounted on the valve house wall to the crane as it moves laterally on the runway.
    b. Conductors shall be complete with mounting clips, end caps, splices with covers, and power feeds.
    c. All controls shall be housed in a single stainless steel NEMA 4X panel with an internal heater with thermostat.
    d. An disconnecting means with an overcurrent protective device with a shall be provided and wired into the incoming power circuit.
    e. All motors equipped with magnetic contactors operated with ON-OFF push button station pendant suspended 4'-0" above the floor, from the hoist trolley unit.
    f. The pendant shall have a NEMA 4X housing, 2-step buttons, with a momentary switch on/off buttons, E-stop and lighted pushbuttons.
    g. Crane operation: 240 volt, 3 phase, 60 hertz.
    h. Control circuits: Maximum 120 volts.

5. End Trucks: End trucks consisting of structural steel weldments bolted directly to the crane bridge member forming a rigid and square connection.

    a. Safety lugs shall limit drop of end truck to not more than one inch in event of wheel yoke, axle or load bar failures. Place safety lugs on both sides of the rail so that if failure occurs the rail is centrally loaded about the vertical axis.

6. Brakes:

    a. Hoisting Brakes: In accordance with Hoist Manufacturers Institute specifications and ANSI B30.16 Safety Standards for Overhead Hoists (Underhung).
    b. Brakes supplied for carrier and crane travel shall conform with ANSI B30.11 Safety Standards.

7. Rail:

    a. The crane manufacturer shall provide rails as shown on drawings with holddown bolts/clips in accordance with ASTM A759. There shall be rail pads between the underside of the rail and the beam it sits on.
    b. Rail shall be ASCE 60 lb., 4-1/4" tall.
    c. Rail end stops shall be designed by crane manufacturer and shall be made by Railroad Tools and Solutions or Director's Representative approved equivalent.

8. Miscellaneous:

    a. Paint: Crane manufacturer's standard paint system. Color shall be selected by the Director from the manufacturer's standard color selection.
    b. Letter the crane rated capacity on the bridge rail, hook and on the control box.
    c. Electrical Equipment: Comply with the provisions of ANSI/NFPA 70 National Electrical Code, Article 610, for wiring and equipment.
    d. Crane manufacturer shall provide all special parts and equipment required for equipment installation.
    e. Crane manufacturer shall provide one complete set of wrenches, special tools, or devices required for dismantling and assembling.
    f. Welding shall comply with the requirements of Section 05 50 00.

2.2 TRANSFER CART

A. Crane manufacturer shall provide transfer cart and related rail system as shown on the project drawings. The transfer car will transfer components from crane pick horizontally to the access shaft.

B. Contractor to design and detail the cart and submit calculations for same. Calculations shall be reviewed and stamped by a Professional Engineer licensed in New York State.

C. Embed the transfer cart rails so the top is flush with the concrete walking surface, to prevent a tripping hazard. Minimize the horizontal gap between the rail and concrete on each side of the rail.

D. Transfer cart and rails are subject to the same material and installation specifications as those specified for equivalent crane components.

E. The transfer cart shall have the same capacity as the crane.

F. The transfer cart shall be pulled by a removable winch and wire rope that can be attached and anchored on either side of the cart.

G. The transfer cart shall have pulling points on each end of the car to facilitate pulling it in either direction. In addition, the car shall have pick points at each corner of the cart to facilitate lifting the car as well as providing vertical rigging points for securing loads.

H. The cart wheels shall have antifriction bearings, seals and wheels made in accordance with CMAA-70. There shall be a provision to grease the bearings. Contractor to recommend type of grease.

I. The cart manufacturer shall provide rails as shown on drawings with holddown bolts/clips and rail pads in accordance with ASTM A759.

J. Rails shall be 60 pound, 4-1/4" tall.

2.3 JIB CRANE

A. Contractor shall provide and install a jib crane with electric hoist as indicated by the plans. The jib crane and hoist shall be supplied by Kone Crane, or Director's Representative approved equal.

B. The jib crane load rating shall be 1 ton.

C. The jib crane shall be suitable for outdoor use in a moist, humid environment. It shall be designed to withstand and operate in ice, snow, and rain, and temperatures between -10 and 150 degrees Fahrenheit. Hoist enclosure shall be IP65 completely sealed body for outdoor application.

D. The jib crane shall be 12'-3 ¾" from its center of rotation to the hoist side of the end stop.

E. The jib crane hoist shall be pendant controlled.

1. Pushbutton pendant shall be rated IP65.
2. Buttons shall be lit internally.
3. 2-button, momentary contacts.
4. Strain relief wire.
5. 110V control voltage.
6. Dual speed..

F. Jib crane hoist: 240 volt, 3 phase, 60 hertz.

G. The jib crane shall have a multi-layer system featuring a zinc-rich primer for corrosion resistance, followed by an epoxy intermediate coat and a polyurethane topcoat for UV and wear resistance for outdoor use. Color: safety yellow.

H. Hoist 60 foot lift minimum from hoist hook to bottom of access shaft.

I. Include power leads to be connected to new disconnect switch provided by Contractor.

J. Hoist hook:

1. Forged carbon steel
2. Heavy duty latch
3. Rotation required

K. Hoist bearings shall be sealed with lifetime lubricant.

L. The hoist shall have a chain drive to move it across the jib boom. Chain shall be stainless steel and be at least 1 foot minimum above the jib crane deck.

M. Hoist motor:

1. Totally enclosed fan-cooled (TEFC)
2. Shall include overload and overvoltage protection.
3. Service factor: 1.0 with 30 minute rating minimum

N. Hoist clutch shall be slip clutch to limit overload.

1. Gantry crane hoist chain or wire rope shall be corrosion resistant.

O. Hoist lower speed setting shall be maximum 2 feet per minute.

PART 3 - EXECUTION

3.1 MATERIALS

A. All materials shall be new and shall comply with the requirements of Section 05 50 00. Should the Fabricator propose an alternative material, it is the responsibility of the Fabricator to prove that the proposed material substitution is equivalent to or better than the original specified material. The Materials and workmanship shall be free from defects.

B. The design, fabrication, heat treatment, inspection and certification shall comply with the applicable requirements of the ASTM, ASME and other specified standards.

3.2 INSTALLATION

A. Install the Work in this Section in accordance with the manufacturer's printed instructions, shop drawings, and directions of the crane Company Field Advisor.

3.3 QUALITY ASSURANCE

A. Company Field Advisor: Secure the services of a Company Field Advisor for a minimum of 10 hours for the following:

1. Render advice regarding installation of the hoist and crane system.
2. Witness final system test and then certify with an affidavit that the hoist and crane system is installed in accordance with the contract requirements and is operating properly.

3.4 COMMISSIONING

A. A load test shall be completed after the crane is installed per CMAA 70. Load shall be up to 125% of rated capacity.

B. Perform a full range motion test:

1. Hoist travel.
2. Bridge travel.
3. Hoist hook raise/lower.

END OF SECTION 412200
































MILWAUKEE VALVE COMPANY, INC.


MILWAUKEE VALVE COMPANY, INC.








DEWALT






DEWALT
DEWALT

As-Built Photos

Conklingville

April 27, 83 - Jan 10, 1984

DAM side OF upper outlet
Channel WALL.

1st. Day OF Chipping.

top of picture

1-12

START of Chipping on dam side
OF upper outlet Channel WALL.

[redacted]

1-12

APR. 27 - 83 EL. 770.65

Saw cut 1" deep - 3" below
Flash board Pipes.

1-12

APR. 27 - 83 EL. 770.65

Chipping on Spillway. First day.

1-12

Apr 27-83 EL. 790.60

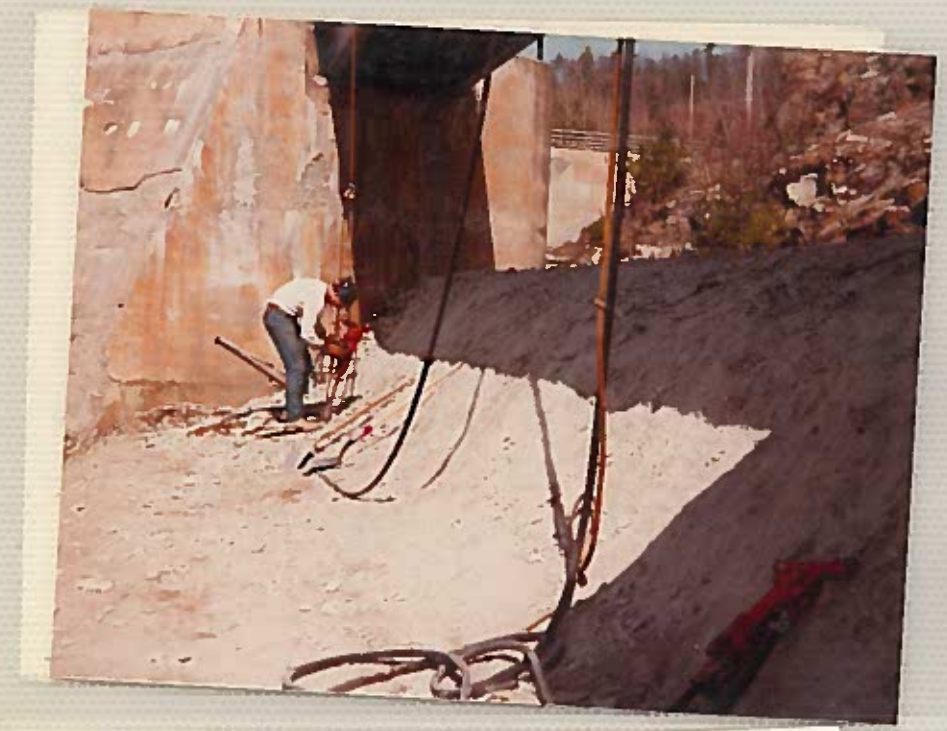
Spillway chipping under walkway.

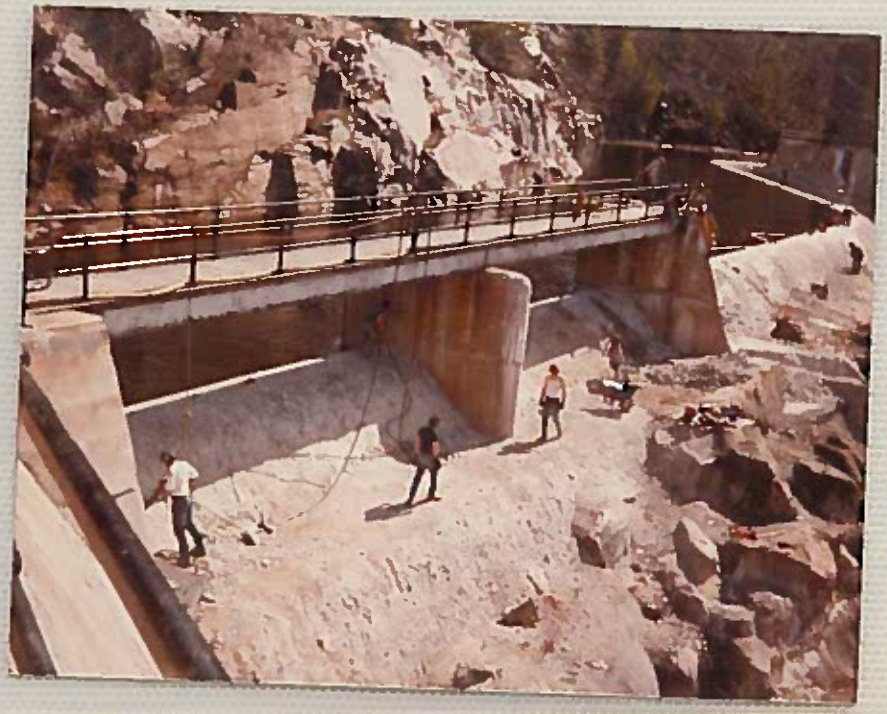
1-12

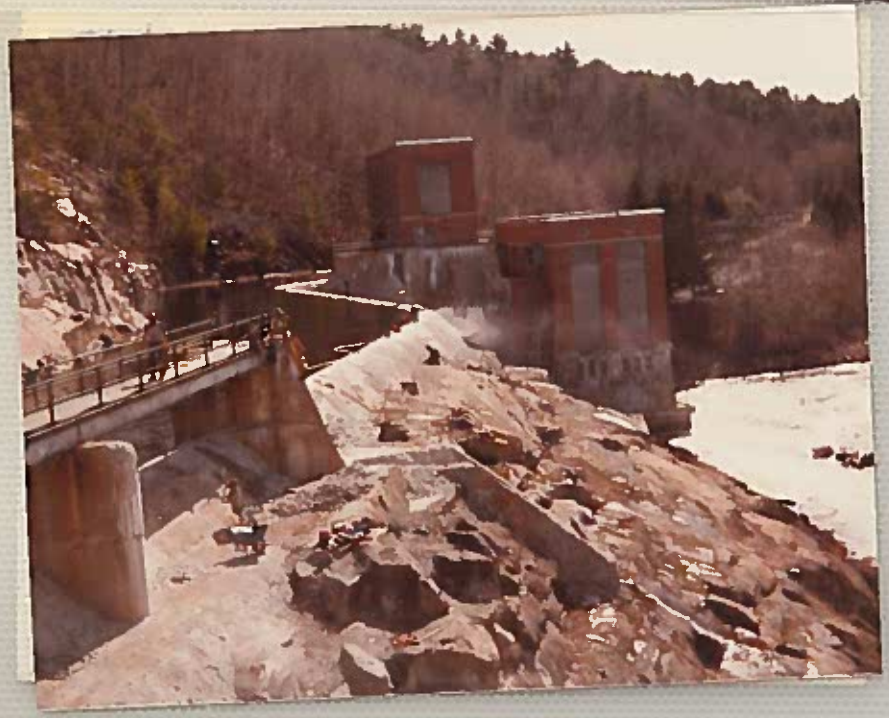














Chipping under walkway at beginning of Spillway.

1-12

Spillway Chipping under walkway.

1-12

APR. 27 - 83 EL. 770.65

Upper Spillway Chipping.

1-12

APR. 27 - 83 EL. 770.65

START of Chipping where end of walkway meets Spillway.

1-12

HILTI COMPANY

5/8" HILTI Adhesive Anchor

PERFORMANCE TEST.

FOR MC PAC CORP.

1-12

Chipping Center Section of Spillway

1-35

APR. 28-83

Chipping Center Section of Spillway

1-35

APR. 28-83

Chipping Center Section of Spillway

1-35













Apr 25 - 63

Chipping Center Section to Spillway

1-35



Looking down down-stream
side of Spillway near E.J. west.

1-35

Chipping Spillway near
Powee house (E.J. West)

Apr. 28-83

1-35

Apr. 28-83 EL. 770.68

Spillway near E.J. West
Center Line Cut - Chipping to
follow -

1-35

Apr. 28-83 EL. 770.68

Drift wood & debris in Fore
bay by Powee House - (E.J. West)

1-35

Chipping and Clean-up on Spillway.
Debris going into Ice-Chute

EL. 770.68

1-35

Before Flood

Apr. 28-83

EL. 770.68

Cleaning debris on Spillway - dumped into Log Chute.

Before Flood 1-35

Apr. 28-83

EL. 770.68

Chipping and Clean-up on Spillway.
Debris going in Log-Chute.

Before Flood 1-35

Tamping and Packing debris in Log Chute

Before Flood 1-35

















Section of Spillway next TO E.J. We

BEFORE Chipping And Cleaning.

1-35

Apr. 28-83

Apr. 28
Last pictures before high water, starting May 1.
Pictures that follow began May 5

Clean-up work started.

1-35

Apr. 28. 83

chipped Spillway under walk way after clean-up.

1-35

Blowing dust from chipped Section - Center of Spill way

1-35

WORK during high WATER-

4-35-

SAWING AND Chipping AT bottom OF STAIRS to Bridge. Upper outlet Channel - DAM Side-

4-35-

MAY 5-83

Chipping on upper outlet CHANNEL WALL- DAM Side.

4-35-

MAY 5-83

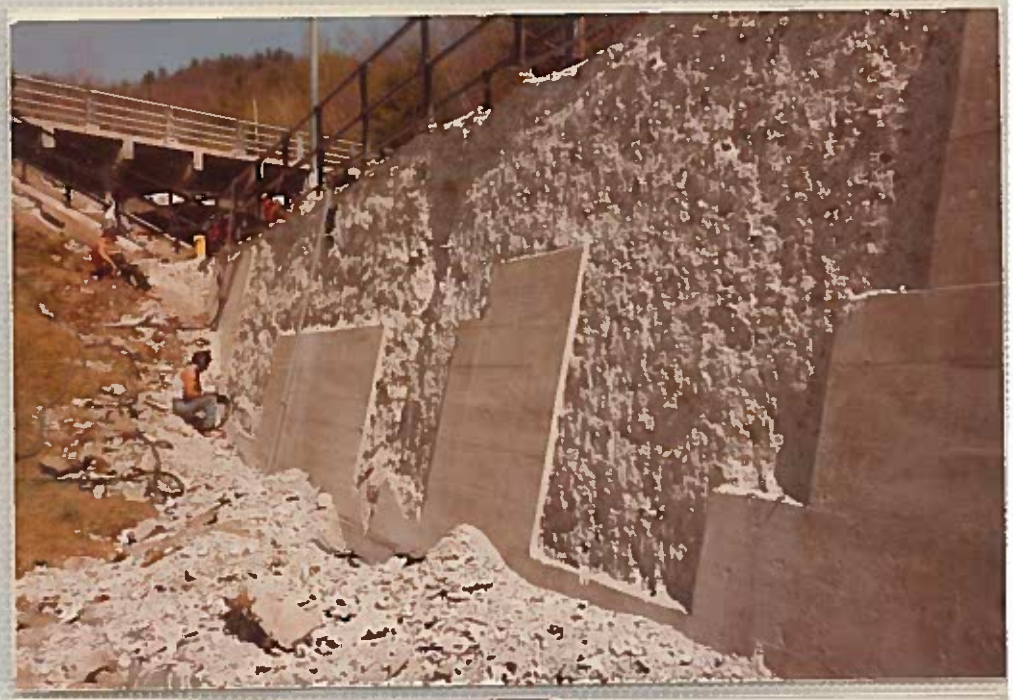
SAWING AND Chipping on Upper outlet CHANNEL. DAM Side

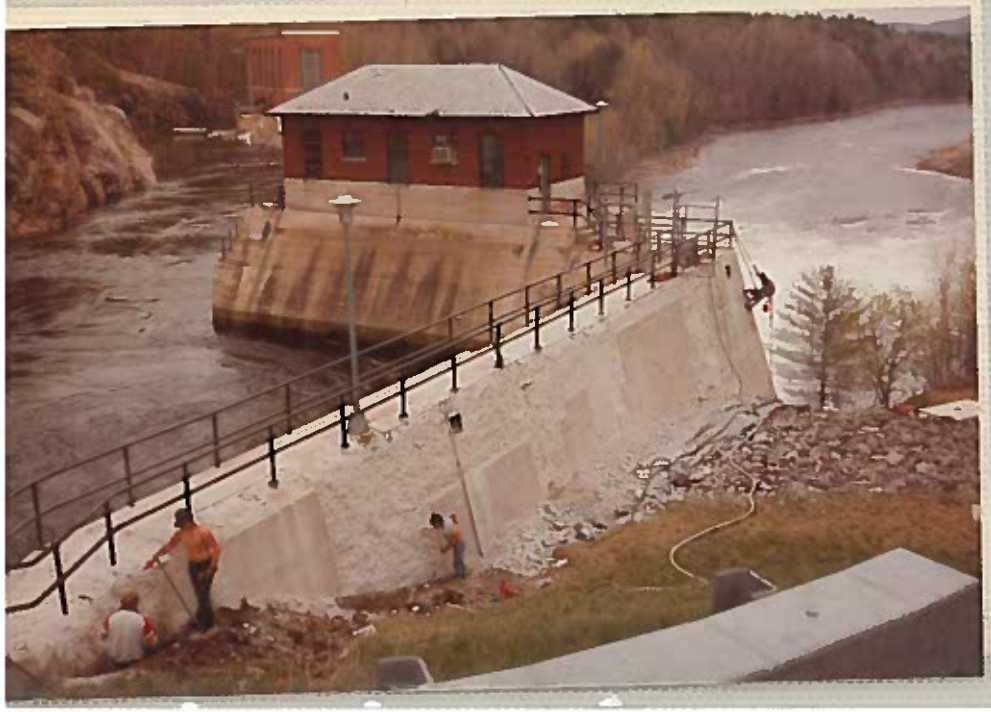
4-35-

SAWING AND Chipping on upper outlet CHANNEL - DAM Side.

4-35-

















MAY 5 83

WORK ON STAIRS FROM BRIDGE TO CONTROL HOUSE

4-35

MAY 5 83

WORK ON STAIRS FROM BRIDGE TO CONTROL HOUSE.

4-35

MAY 5 83

Chipping on stairs and walkway between control house and bridge

4-35

MAY 5 83

Chipping on vertical wall above valve galley - upper outlet channel wall - DAM side.

4-35

5-12-83

START OF WORK ON SPILLWAY SINCE HIGH WATER.

Chipping near E.J. West, Note planks to hold back debris

5-35

5-12-83

START OF WORK ON SPILLWAY SINCE HIGH WATER

Chipper near E.J. West. Note planks to catch old chipped concrete.

60 lb. HAMMER

5-35

5-12-83

Chipping Spillway, Showing saw cut. Near E.J. West

5-35

5-12-83

Chipping on Spillway

45 lb. HAMMER

5-35

Chipper near E.J. West

Note Anchors for original Lag bolts to hold forms

5-35

MAY 12-83

Chipper near E.J. West

Showing Anchors for Lag bolts that held original forms.

MAY 12-83

12 MAY 83

Inspector Anderson looking over Job near E.J. West.

5-35

Planks to catch chipped old Cement.

John Anderson in blue Jacket

5-35

Repaired Mechanical Safety ground cable (copper) that comes from E.J. West to frame work in transformer room of control house.

Cut by accident by power hammer.

5-35

Repaired mechanical safety ground cable (copper) that comes from E.J. West to frame work in transformer room of control house.

Cut by accident by power hammer.

5-35

5-13-83

Above outlet structure (Dow Valves) going down to drill holes to mount braces for walkway for chipping operation.

5-35

5-13-83

Above outlet structure (Dow Valves)

Drilling holes for braces for catwalk for chipping.

















MAY 17-83

Chipping inside Corner by E.J. west.

6-35

MAY 17-83

outside Corner by ice chute.
Near E.J. west
18 to 24 inches being
chipped off.

6-35

MAY 17-83

Near E.J. west -
chipping and cleaning

6-35

MAY 17-83

chipping on most spawled
concrete by ice chute near E.J. west
18 to 24 inches being taken
off

6-35

MAY 17 83

Looking towards E.J. West
Chipping here finished - to be cleaned
up and debris taken away

6-35

MAY 17 83

NEAR Center of Spillway -
Chipping Finished - to be Cleaned
and old Concrete TAKEN AWAY.

6-35

MAY 17 83

Chipped and Cleaned section
NEAR Center of Spillway.

6-35

MAY 17 83

Chipping NEAR TRANSFORMER
Room.

6-35

5-19-83

AL PARIS building RAMP to transport debris FROM spillway to Low end of Dam where trucks can get TO-

6-35















MAY 20 - 83

Conduit from Junction box at end of walkway, going under walkway to transformer Room.

NO longer in use.

6-35

MAY 17 - 83

AL Paris building Ramp to transport debris (via wheel barrow) from spillway to Low end of Dam where trucks can get to —

6-35

MAY 20 83

Break in Conduit caused by Jack hammer. this shorted out, cutting Power to transformer Room and Control House.

Power OFF for 13 days. MAY 20 TO June 2

4800 volts.

6-35

MAY 20 - 83

Chipping started on Corner by Ice Chute and E.J. West

2-3 Feet deep

11-35

MAY 20 - 83

Chipping STARTED on CORNER
by ICE Chute AND E.J. WEST

2 - 3 FT. deep

7-35

MAY 24-83

Chipping CORNER by ice Chute
AND E. J. WEST.

2 - 3 FT. deep

7-35

MAY 24-83

Chipping CORNER by ICE Chute
AND E. J. WEST.

2 - 3 FT. deep

7-35

MAY 20-83

Chipping AND Cleaning
CORNER by ICE Chute

2 - 3 FT. deep

7-35















MAY 24 63

Chipping Canoe by ice

Chute and E.J. west

2-3 FT deep

7-35

MAY 24-83

Corner of ice chute

7-35

MAY 24-83

Ice Chute

7-35

MAY 24-83

Chipping in ice chute

7-35

MAY 25-83

Ice Chute

7-35

June 2 - 83

Chipping Above Valve outlet channel.

7-35

Chipping Above Valve outlet channel.

7-35

6-3-83

Debris Pile From Chipping under Control House - over Valves

8-35

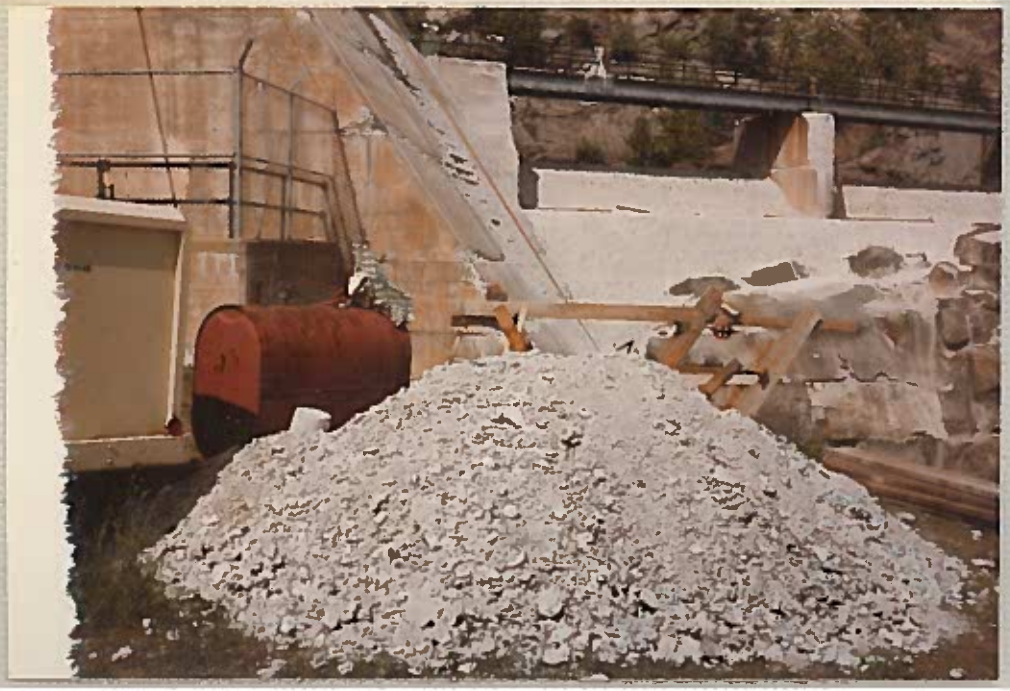
Clearing debris from Chipping Above outlet channel.

7-35

June 2-83

















6-2-83

8-35

Grooves from 2 of 17 construction joints on Spillway

6-2-83

New electrical entrance for control house, replacing destroyed 4800 volt wire in conduit in spillway

7-35

6-3-83

8-35

Catching chipped cement from going in channel

6-3-83

New electrical entrance for control house, replacing destroyed 4800 volt cable in conduit in spillway

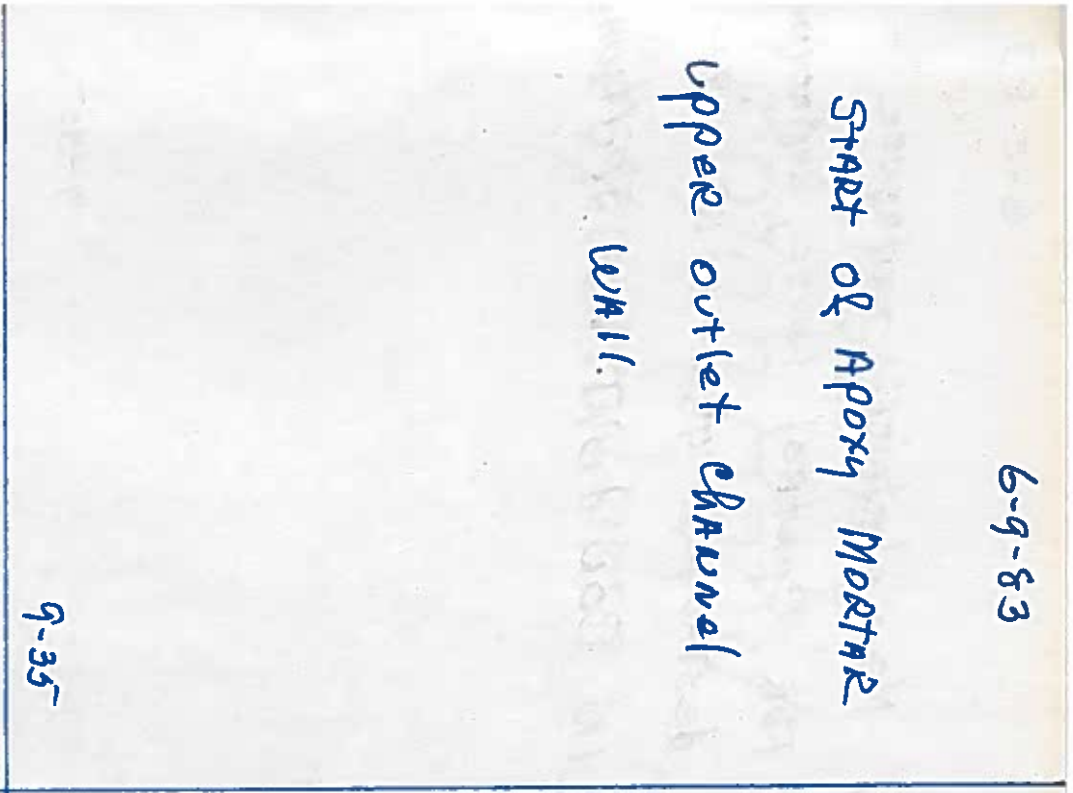
8-35

6-9-83

START of Apoxy MORTAR

upper outlet CHANNEL WALL. DAM Side

8-35~



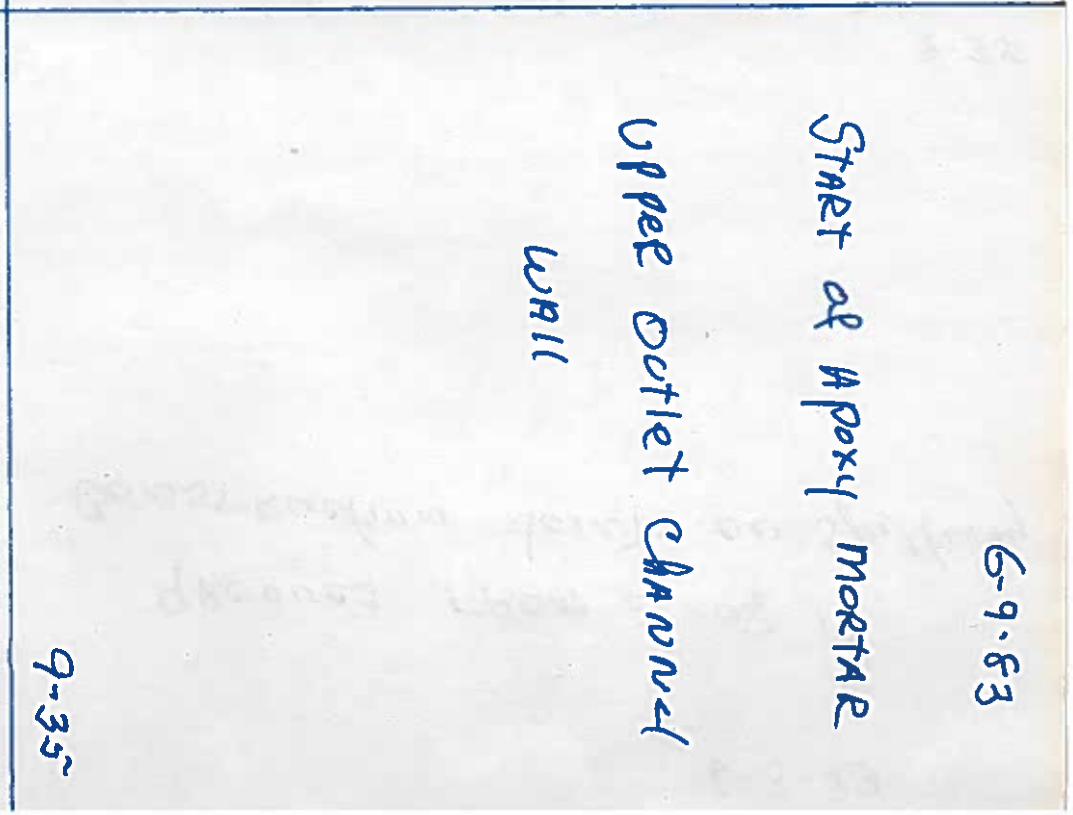
6-9-83

START of Apoxy MORTAR

upper outlet CHANNEL WALL

DAM Side,

9-35~



















6-9-83

WORK ON WINGWALL AT END of VALve outlet CHANNel

9-35

6-16-83

PAINTed CONST. JOINT. TO be FORMed & POURed - upper outlet CHANNel WALL - DAM SIde

9-35

6-9-83

WORK ON VALve outlet CHANNel

9-35

6-10-83

FORM IN log Chute TO be Filled with CONCRete

9-35

IN PLACE "HILTI" ANCHORS

UNDER WALKWAY.

9-35

DRILLING & PLACING "HILTI"

ANCHORS UNDER WALKWAY.

9-35~

BORING FOR HILTI

ANCHORS ON SPILLWAY

6-22-83

BORING FOR HILTI

ANCHORS ON SPILLWAY

10-35~

6-22-83





7-1-83

Tested and Rejected portions
of newly applied Apoxy
MORTAR -
upper outlet channel wall
Dam Side 10-35











Applying FIRST Apoxy MORTAR-

upper outlet CHANNEL WALL-

DAM Side

10-35-

Applying FIRST Apoxy MORTAR-

upper outlet CHANNEL WALL-

DAM Side

10.35-

7-1- F3

Tested And Rejected Portions

of newly Applied Apoxy MORTAR-

upper outlet CHANNEL WALL - DAM Side

10-35-

7-1-83

Tested And Rejected PORTIONS

of Newly Applied Apoxy MORTAR.

upper outlet CHANNEL WALL - DAM Side

10-35-

7-5-83

Test Boring Under Rejected Portion of Newly Applied Apoxy Mortar.

Upper outlet Channel Wall - Dam Side

10-35

MAY 6-83

Approach Channel - Inlet Wall From dam Side

4.-35

7-6-83

Test bore holes - Dam side - upper outlet Channel WALL.

13-35

8-2-83

Samples From Test Core borings.

13-35

Aug-2-63

Chipped steps leading up to bridge.



Aug-2-63

Chipped wall in approach channel



Aug 2 - 83

Divers inspecting ice Chute

13-35

Final Chipping on Stairs.

13-35

July 6-83

Aug 2-83

Divers inspecting ice chute

Final Chipping - Approach Channel

Aug 2-83

First mesh on Spillway

13-35

Aug 2-83

Apoxy MORTAR WORK ON Spillway

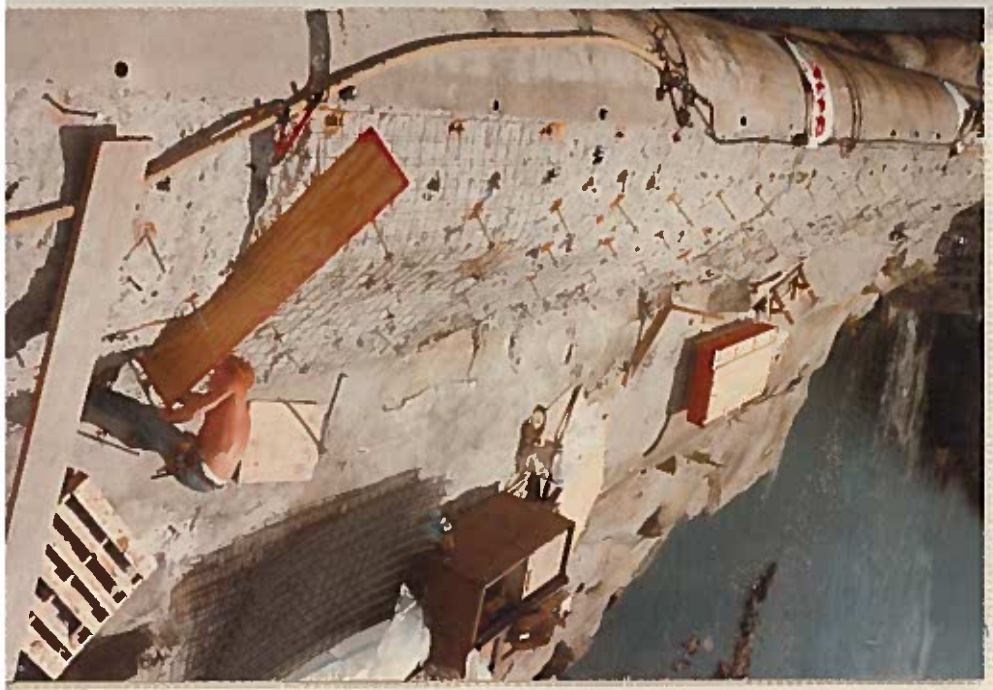
13-35

Aug 2-83

First mesh on Spillway

Aug-2-83

Apoxy MORTAR WORK ON Spillway

















8-16-83

Forming Bay #3 - with Mesh + "Hilti" Anchors

14-35

8-16-83

Bay #1 "Hilti" Anchors And Mesh in Place

14-35

Bay #3 From Cat. Walk

8-16-83

14-35

8-16-83

Bay #1 Detailed Close-up Showing Metal Strip - to be Removed After the Pour - to make A Locking Joint with next Pour

14-35

Aug. 16-83

Section of finished
Apoxy Mortar work
on Spillway

14-35

Aug. 16-83

Channel entrance -
Final Chipping.

14-35

Aug. 16-83

Section of finished
Apoxy MORTAR work
on Spillway

14-35

Aug. 16-83

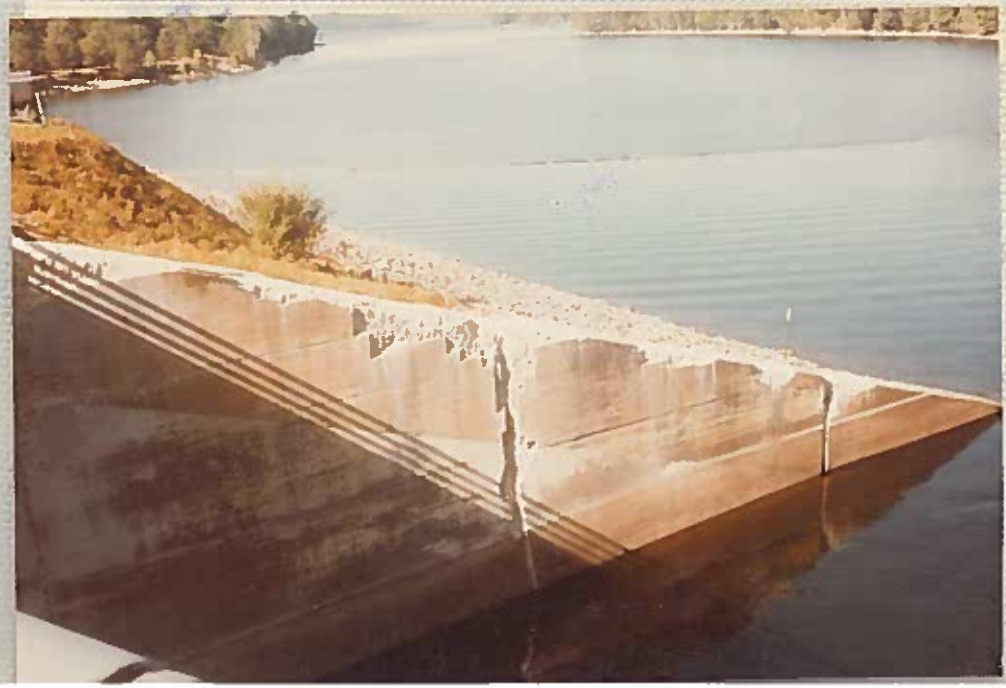
Construction Joint on Spillway
to be Reenforced And Poured -
Joining Apoxy MORTAR -

14-35

















Bottom of BAY #1

Close-up of "HILTI" ANCHORS, ANGLE IRONS, AND "She" bolts, TO hold FORMS in PLACE

14-35

BAY #1. 1st TO be finished.

Close-up of "HILTI" ANCHORS, ANGLE IRON, AND "She" bolts, TO hold Ply-wood FORMS in PLACE

14-35

8-24-83

BAY #1 NEAR Completion.

15-35

8-24-83

PLACING NUTS ON "HILTI" ANCHORS - NEXT, WIRE MESH - THEN "CONES" that Plywood Rests on, Held in PLACE by WING NUTS ON "She" bolts, All AT PROPER heighth.

15-35

8-24-83

BAY #1

Showing Mesh, being held in PLACE by NUTS AND WASHERS - "HILTI" ANCHORS AND CONES.

Plywood goes on next, "She" bolts screws in CONES, wing nuts holds Plywood FORMS.

15-35

8-24-83

DETAIL of "HILTI" ANCHORS, NUTS AND WASHERS holding Mesh; "CONE" SCREWS ON ANCHOR - "She" bolts screws in CONE -

Wing NUTS on "She" bolts holds Plywood FORMS OR "WHALERS"

15-35

8-24-83

DETAIL of ANCHORS AND CONES.

READY FOR Plywood FORMS, Held in PLACE by "She" bolts AND wing nuts.

15-35

8-24-83

under plywood FORMS, Showing "HILTI" ANCHORS AND CONES, AND NUTS AND WASHERS holding mesh in PLACE.

Outside of Plywood FORMS ARE "She" bolts AND Wing nuts.

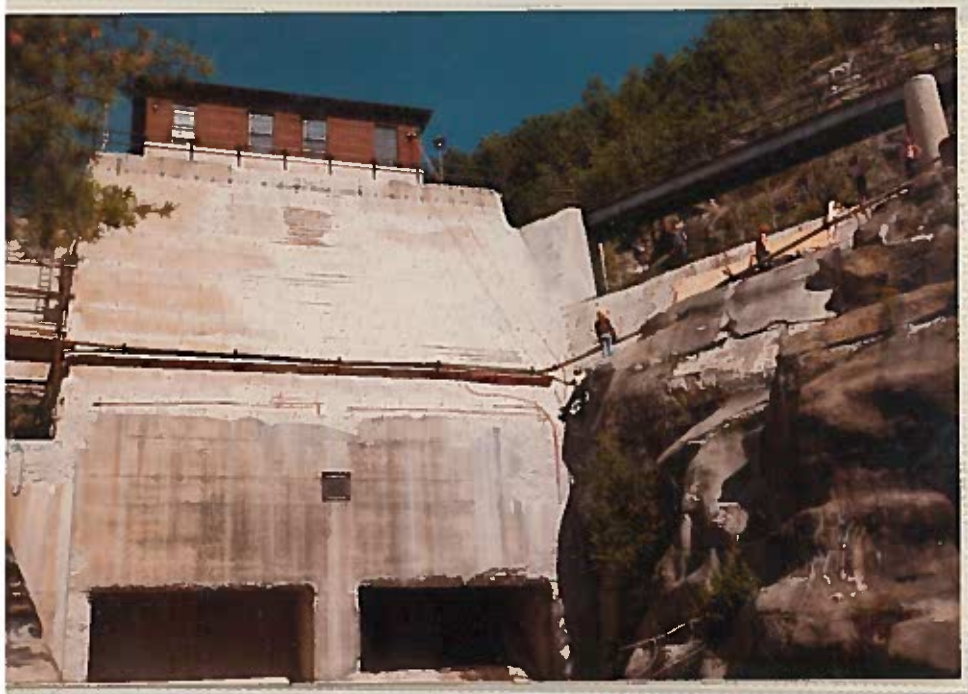
15-35

















8-25-83

5" Pipe - Concrete to be Pumped THRU - (Before being RAISED)

Aug. 25-83

15-30

8-25-83

5" Pipe - Concrete to be Pumped THRU — (Before being RAISED)

Aug. 25-83

15-35

8-26-83

Route of 5" Concrete pipe AFTER being RAISED to Keep Cement AND Stone FROM SEPARATING.

8-26-83

15-35

8-26-83

Route of 5" Concrete Pipe AFTER being RAISED to help Keep Cement AND Stone FROM SEPARATING-

8-26-83

15-30

SMALL CRACK IN APOXY MORTAR
(between pans)

Middle Pier UNDER WALKWAY

15-35

OVERALL View Showing

FORMS # 1 - 3 - 5

15-35

Aug 31 83

Set-up For Cement
Mixer And Cement Pump

Aug 31-83

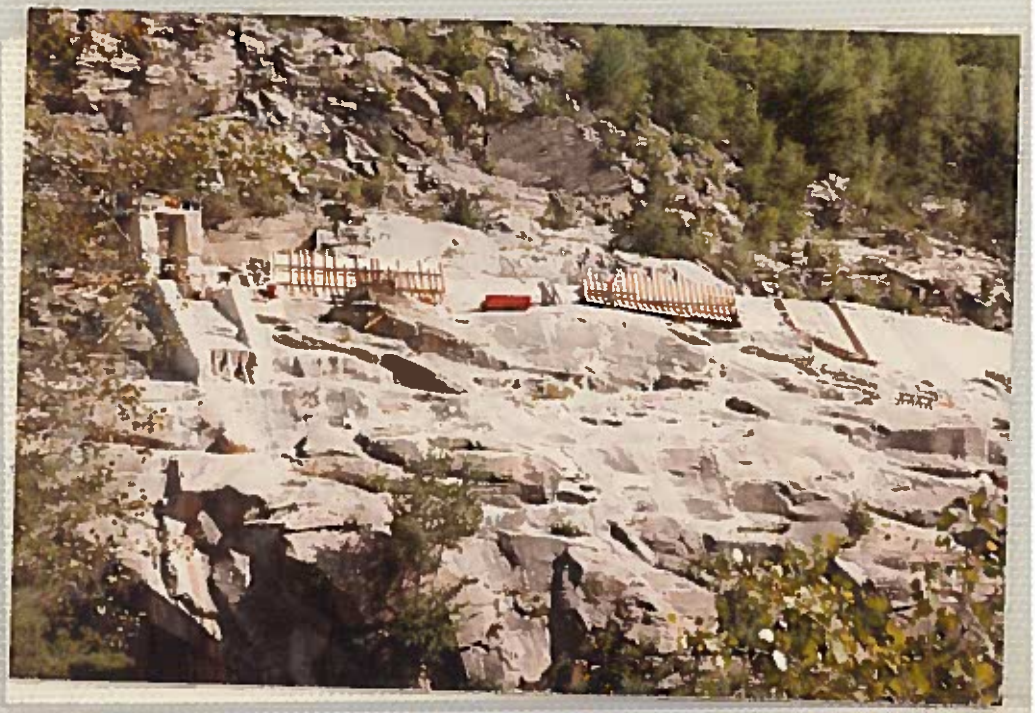
Aug-31-83

FIRST MIX-
Beginning OF Cement work

All must be tested -
Slump AND AIR

16-35








CONCRETE MO
INGERSOLL-RAND









Aug 31 83

16-35

First mix -
First mix -
To be Tested

Aug-31-83

First mix

Slump Testing

Aug 31 83

17-35

First mix
Air Test

Aug 31 83

First mix

Preparing for Air
Test

Aug 31 83

GROUT (SLURRY - wet Cement)
o go THRU 5" Pipe TO
;BRICATE. FOLLOWED BY
ONCRETE

17-35

Aug 31 83

PROPER MIX GOING
INTO PUMP - FINAL
POUR —
BAY 5 - 3 - 1

17-35

17-35

Aug 31 83

CONCRETE VIBRATOR IN BOTTOM
OF FORM #5
SLURRY SEEPING FROM BOTTOM
OF FORM.

17-35

FORM #5
1 st POUR.





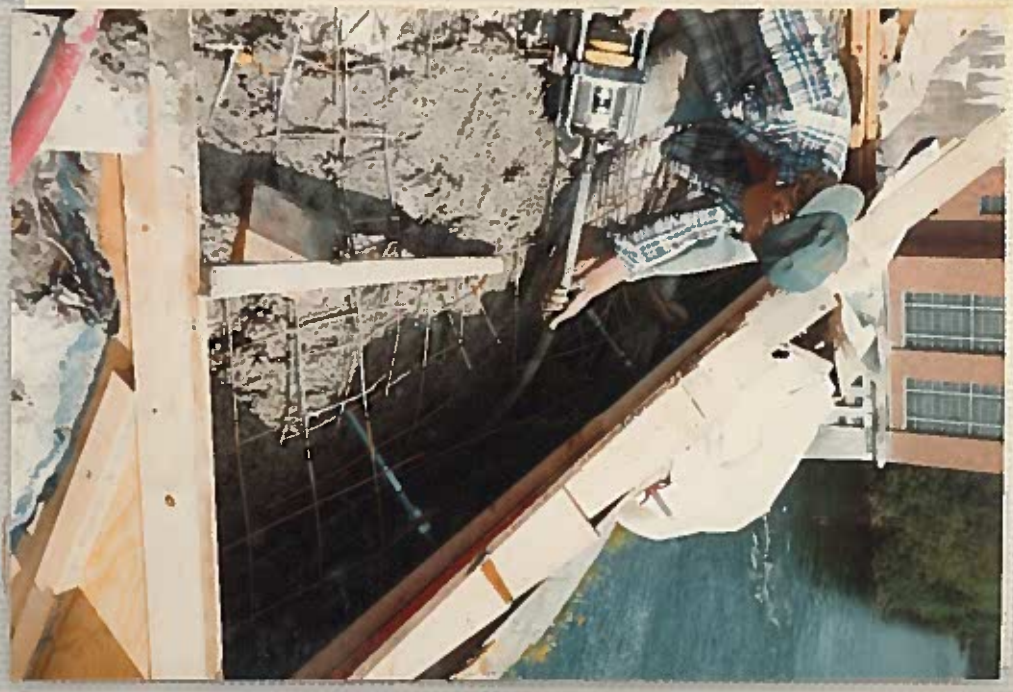












Form #3 nearly finished - Cement 2/3 way full

Aug 31 63

17-35

Sept 1. 63

Port hole in Bay #5 so vibrator CAN be used

17-35

STRIPPING FORM #3 (Just Loosening bolts) Plywood not Removed till Sept 2.

17-35

Vibrator in use on Form #5

Aug 31 63

17-35

BAY 5

STRIPPING FORMS

18-35

Sept. 2. 83

BAY 3

STRIPPED AND REMOVING "CONES"

TO be finished with "SCRUB COAT" (GROUT)

18-35

Sept. 2. 83

BAY 3

REMOVING "CONES"

TO be finished WITH A "SCRUB COAT" (GROUT)

18-35

BAY 5 -

APPLYING "SCRUB COAT"

18-35










PET 7.41
VOL 0.2







Sept. 8 83

2 nd. Pour.

Slump Test AT mixer

PAT Ford - Empire Soils.

19-35-

2 nd. Pour.

STAN Borden, C.T. male Company

John Anderson, Hudson Riv - Black Riv. -

taking Slump test AT Form on

Spillway.

19-35-

Sept. 8-83

2 nd. Pour -

Slurry (Grout) used To

Lubricate and paint 5" pipe -

being Caught - to be dumped

After hardening

19-35-

2 nd. Pour.

Concrete coming thru

5" pipe After Slurry.

to be Tested (Slump)

19-35-

Sept. 8-83

Sept 9-83

Showing Keyway on edge of Form #3

19-35

Sept. 9-83

Showing Keyway on Form #3

19-35

Sept. 9-83

Stripping Form #2

19-35

Sept. 9-83

OVERALL View of Alternate Forms NEAR Power house.

Dick Jewett

19-35

















Sept-14-93

Bad Spot (not Vibrated)

on Form #2 -

20-35

Bad Spot (left)

Chipped out and

Re-formed

20-35

Sept 15-93

Starting forms over

Dow values.

6" over-lay

20-35

Sept 14-93

Natural Rock Formation -

too high. Chipped out for

better pour -

under walkway

20-35

View FROM E.S. West.

FORMS READY FOR POUR.

DICK Levette has

21-35

UNDER WALKWAY -

READY FOR POUR.

21-35

Oct. 20-83

STAN Borden & John Anderson INSpecting FORM WORK under CAT. WALK.

22-35

High pressure water Cleaning old Concrete - by Log Chute - Channel Side

Oct 7 83

21-35






OCT-20




Oct 21




Oct-25



Form work on inside
Corner by E.S. west

22-35

Drilling for bolts to hold
forms on log chute.

23-35

Oct. 25-83

Starting mesh on Control
house Sub-structure-

23-35

All of Mesh work
on Control House
Sub-structure

24
27
35

Oct 28-83

FORMS ON CURVE of Spillway
NEAR middle - Covered FOR
WINTER by McPAC.

LAST DAY of CONSTRUCTIVE
WORK by McPAC.

28-35

4 BAY, FROM Middle of
Spillway to NEAR E.S. West -
Ready FOR POURING - Covered
FOR winter -

LAST DAY of CONSTRUCTIVE
WORK by Mc PAC CREW -

28-35

NOV. 3-83

LAST 2 BAYS by E.S. West -
Ready FOR POUR - Covered FOR
WINTER -

LAST DAY of CONSTRUCTION
WORK by McPAC CREW -

28-35

NOV. 3-83

OVER-All VIEW of
Spillway - LAST DAY of
Mc PAC CONSTRUCTION WORK

28-35


Nov 3






Nov 3







The NEXT Four Photos Shows Mc Pak dismantling Forms. The Rest of Photos Shows ALL WORK AS Mc Pak Left Jobsite —

NOV. 3-83

FIRST BAY UNDER WALKWAY, NEXT TO CONTROL HOUSE SUB-STRUCTURE- NOT READY FOR POUR - COVERED FOR WINTER - LAST DAY OF CONSTRUCTIVE WORK BY McPAK.

28-35

NOV. 3-83

2nd BAY UNDER WALKWAY - NOT READY FOR POUR. COVERED FOR WINTER.

LAST DAY of CONSTRUCTIVE WORK by McPAK-

28-35

NOV. 3-83

LAST McPAK JOB - TAKING RAFTS OUT OF CHANNEL FOR WINTER STORING

32-35

Mc PAK dismantling FORMS
by E. J. west Power. House

28-35

FORMS NEAR middle of
Spillway - towards Power House
being dismantled by Mc PAK

28-35

NOV-7-83

Dismantling FORMS NEAR
E. J. west .by Mc PAK

28-35

NOV. 7. 83

FORM WORK NEAR E.J. West
being dismantled by Mc PAK.

28-35










Nov 9


Nov 9


Nov 9



Nov. 9-83

Partially dismantled Form
Near E. J. west.

As McPak Left Job

29-35

Nov. 9. 83

Bad 2nd Pour by McPak.
Re-chipped and Formed.

As McPak Left Job

29-35

Nov. 9. 83

As McPak Left Job site
Photo Taken near Corner of
Control House

29-35

Nov. 9. 83

Form (small) at end of
walkway - NOT Ready for Pour.

As McPak Left it. —

29-35

Piled Lumber From dismantled Forms by McPAK.

AS IT looked After McPAK Left

NEAR E.J. west

29-35

NOV. 9-83

Form Lumber Piled by McPAK, After dismantaling Forms.

AS McPAK Left Job.

NEAR E.J. west

29-35

NOV. 9-83

Mesh INSTALLED by McPAK-

Control House Sub-Structure.

AS McPAK Left Job

29-35

NOV. 9-83

Piled Lumber and Steel Whalers From 3 Forms NEAR E.J west.

AS McPAK Left Job

29-35




Nov 9


Nov 9


Nov 9




Nov 9


Nov 9


Nov 9

Pile of wire mesh by E.J. west As Left by McPak

29-35

Center of Spillway - The only Form Left that was Ready for Pour-

As Left by McPak

29-35

NOV. 9-83

Piled Lumber From 3 Forms dismantled by McPak.

The Forms were Ready for Pour - near E.J. west.

As Left by McPak

29-35

NOV. 9-83

Mesh + tool box, As Left by McPak

29-35

Backing TRAILOR in To Pick up

Mc PAKS MATERIAL

41-35

JAN. 10 84

Loading McPAKS LUMBER.

41-35

Loading McPAKS HARDWARE in

TRAILOR -

Steel WHALERS
"She" BOLTS
WING NUTS
WASHERS
SAfety ANGLE IRONS
SAfety ROPE
¼" CABLE
⅜ CABLE

41-35

JAN 10 84

Digging McPAKS out of Snow -

41-35









Jan 9 84

Loading McPaks Hardware

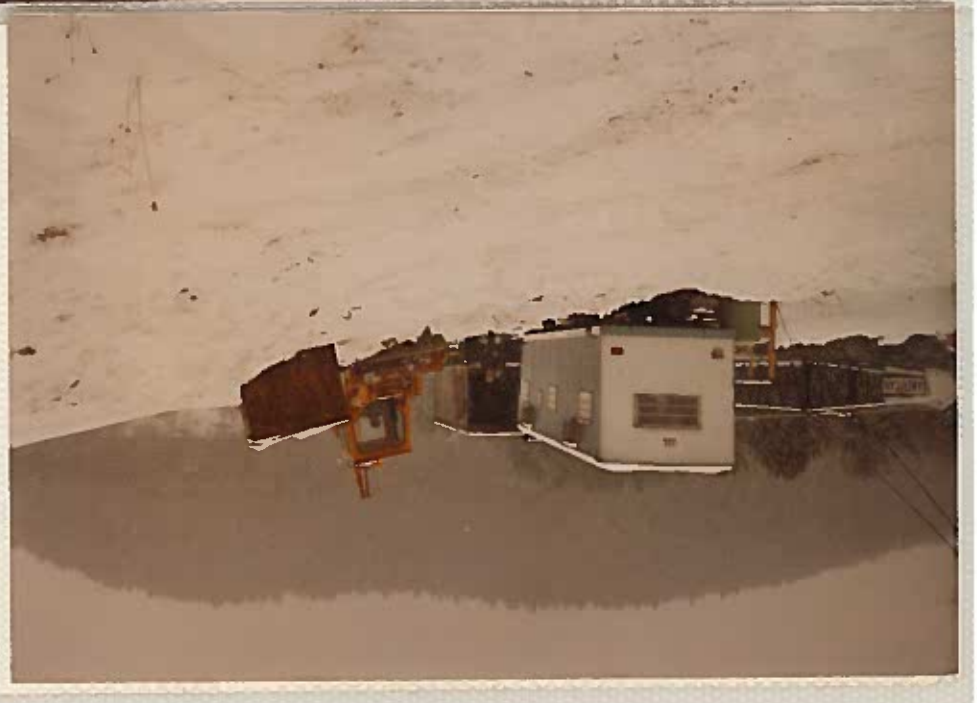
in Trailor -

Steel Whalers washers
Wing nuts
She Bolts Cable
Angle iron
Ropes

41 35







JAN 10 64

Breaking Road thru Snow
to McPaks Lumber.

41-35

JAN 10 64

Breaking Road thru Snow
to McPaks Lumber

41-35

JAN 10 64

McPaks Lumber & Hardware
in tractor-trailer up on Road
off District Property

41-35

JAN 10 64

the END


HR RA RD




ALL MCPAK


MCPAK

Jan 4 64

Mc PAK Lumber on Top of Picture.

H.R.B.R Lumber on bottom

41-35

Jan 4 64

District Lumber

MARKED

41-35

JAN. 4 64

McPAK Lumber

MARKED.

H-R-B.R. Lumber MARKED

41-35

JAN 4-64

Mc PAK Lumber MARKED

41-35

Conklingville Dam
As-Built Photo →

Nov 9, 83 - March 29, 84

NOV. 7- 83

Center of Spillway - the only Form Left by McPAK that was Ready For Pour - Form 8A

As Left by McPAK

29-35'

Form Lumber piled by McPAK, After dismantling Forms near E.J. west.

As Left by McPAK

29-35'

NOV. 9- 83

Pile of mesh wire near E.J. west.

As Left by McPAK

29-35'

NOV. 9- 83

Partially dismantled Form near E.J. west. Form 13B

As Left by McPAK

29-35'

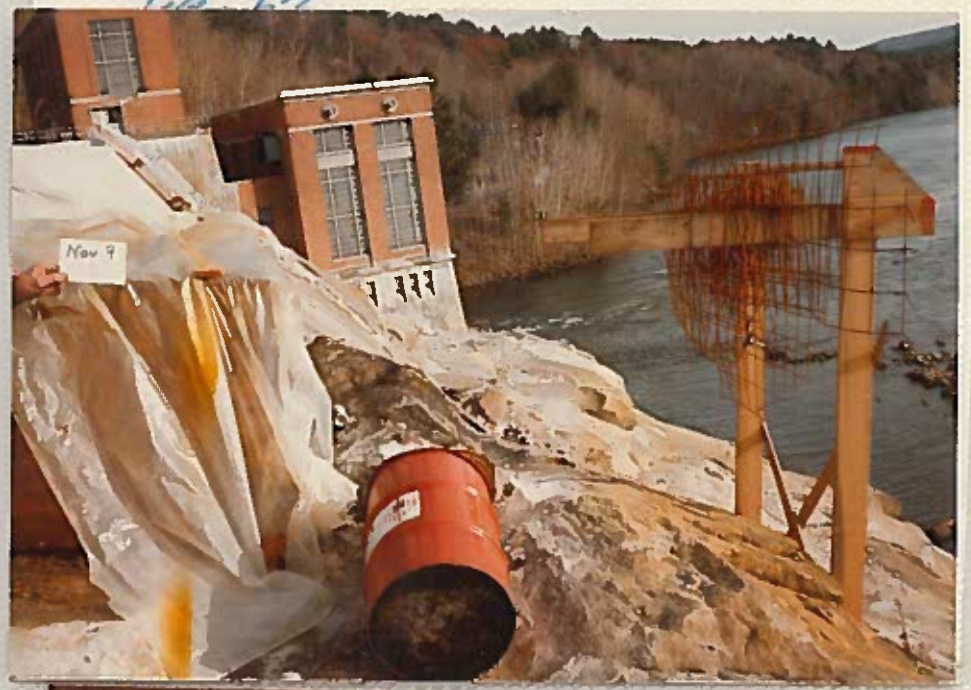

Nov 9


Nov 9




Nov 9


Nov 9


Nov 9


Nov 9


Nov 9

Piled Lumber & Steel Whalers
From 3 dismantled Forms.

As McPak Left it.

29-33

Mesh & Tool box

As Left by McPak

29-33

Nov. 9. 63

Overall Shot Taken From
Corner of Control House -

As Left by McPak

29-33

Nov. 9-63

Bad 2nd. Pour by
McPak - Re-chipped & Formed.

As Left by McPak

29-33

Small Form #6 AT end of Spillway, NOT Ready FOR POUR -

AS Left by McPAK

29-35

NOV. 9. 83

Mesh - INSTALLED by McPAK -

Control House Sub-structure.

AS Left by McPAK

29-35

NOV. 9. 83

Piled Lumber FROM 3 FORMS dismantled by McPAK.

These FORMS were Ready FOR POURING.

AS Left by McPAK

29-35

APPROACH CHANNEL WALL

AS Left by McPAK

-35




Nov 9


Nov 9


Nov.9


Nov 18




Nov 18



LANGE-FINN STARTING WORK ON DAYS NEXT TO CONTROL HOUSE.

FORMS LEFT BY MC PAK- NOT READY FOR POURING

30-33

LANGE-FINN STARTING WORK ON BAYS NEXT TO CONTROL HOUSE.

FORMS LEFT BY MC PAK- NOT READY FOR POURING.

30-33

NOV. 18-83

SAWING STOP LOGS IN LOG CHUTE FOR REMOVAL, TO START FORMS

30-33

NOV. 17-83

NORTHVILLE CREW WORKING ROAD ON DAM.

30-33

Fixing Muddy Road on dam so 80 Ton Crane can get into Position.

30-34

Nov 18-83

Fixing Muddy Road on dam.

30-33

Nov. 83

Fixing Muddy Road on dam with Gravel - 80 Ton Crane due At Noon. (Ar. 1:00 P.M.)

30-35

Assembling Crane

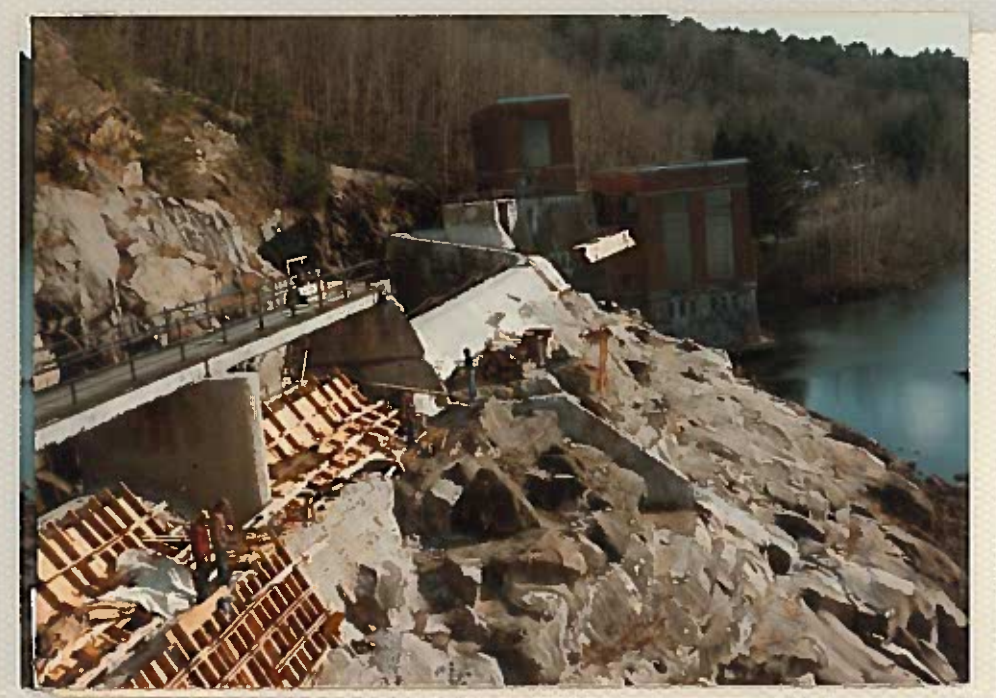
31-35

















NOV. 21-83

MATERIAL being PUT ON SPILLWAY by 80 TON CRANE

31-35

NOV. 21-83

DEBRIS being TAKEN OFF SPILLWAY by CRANE.

31-35

NOV. 21-83

CLEANING SURFACE CONCRETE IN LOGWAY CHUTE FOR POUR.

31-35

NOV. 21-83

BAY NEXT TO CONTROL HOUSE being READIED FOR POUR

#(2)

31-35

ARRIVAL of FIRST CONCRETE FOR LARGE-FINN FOR 1st POUR IN BAY NEXT TO CONTROL HOUSE SUB-STRUCTURE

31-35'

POURING BAY NEXT TO CONTROL HOUSE #1

31-35'

NOV. 22-53

FINISHING BAY #1 LOWER SECTION

32-35'

NOV. 22-53

FINISHING BAY #1 LOWER SECTION

32-35'

AMERICAN

Nov.22




00.23



Paving Bay 6 - End of Walkway

32-35

Nov. 23-83

Small Repaired Section - bad Pour by McPAC

32-35

Nov. 23-83

Bay 6 - End of Walkway

32-35

Small Repaired Section - bad Pour by McPAC

32-35

NOV. 23-83

Day #2 - Top Section

32-33'

NOV. 23-83

Anderson & Borden —

Perfect slump Test

32-33'

NOV. 23-83

Day #1 - Top Section

32-33'

Re-bars installed

in Log chute -

MANY MORE PUT IN




Nov 23




Nov 23


NOU 26


NOU 26





NOV. 26-83

CRACKS in POUR -

Bay #1 - UPPER

CLASS "H" MIX

33-35'

NOV. 26-83

CRACKS in POUR -

Bay #1 - UPPER

CLASS "H" MIX

33-35'

STRIPPING FORMS ON BAY #1

UPPER SECTION

33-35'

NOV. 26-83

PATCHING Honey-Combed Piece

BAY #2 - UPPER

33-35'

33-32

Pulling Stop Logs From
Ice Chute.

NOV. 26-83

Winching Stop Logs
From Ice Chute

33-33

33-33

37 Lower Stop
downstream
gs out of Ice Chute

NOV. 27-83

37 downstream
Stop Logs out of
Ice Chute

-37

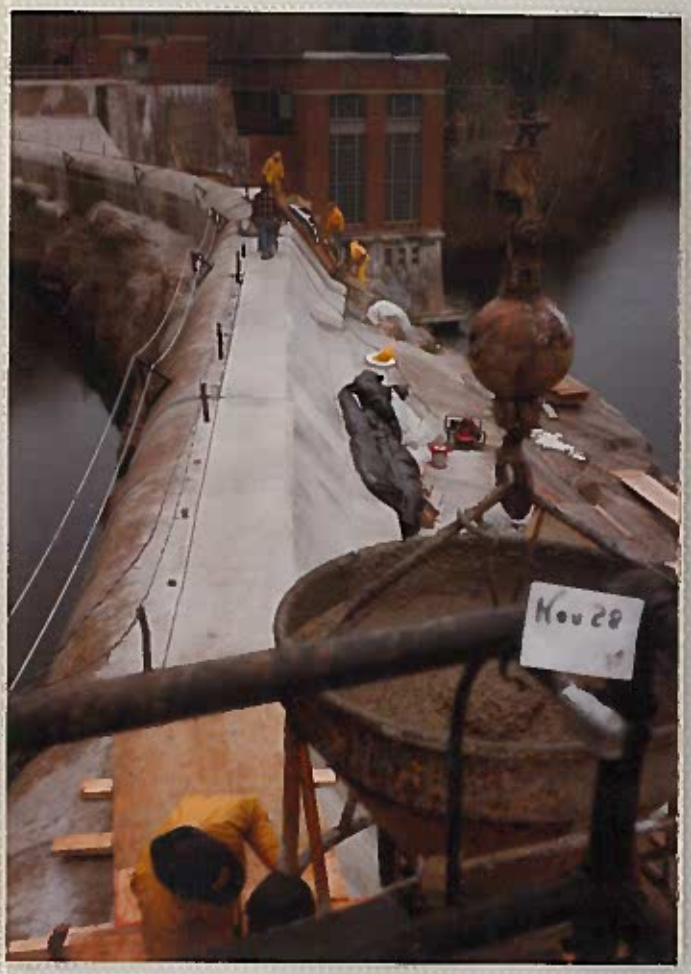











Nov 28




Nov 29

Nov. 26-83

)Ailing + Setting

e-BARS in Log Chute.

ctting Ready For Pour-

ote Symons FORMS

33-35'

Nov. 28-83

Concrete being wheeled

to BAY 8-A

34-35'

Nov. 28-83

Pouring Log Chute

34-35'

Nov. 28-83

Pouring Log Chute

34'-3"

NOV.30-83

pplying Flexolith Gel

VERTICAL Joint At

om of STAIRS.

34-34

NOV.30-83

Wheeling Concrete to

BAY 13-B

34-33

NOV.30-83

POURING BAY 13-B

34-35

NOV.30-83

POURING 13-B

34-33


NOV 30


NOV 30













35-35

Just-Poured Bay 13-B

Dec 1-83

Welding Support braces in ice chute.

35-35

Dec 1-83

Stripped Forms from 1-way chute

35-35

Dec 1-83

Stripping - Forms in Log way chute

35-35

Dec 5-83

Pouring Bay 14

35'-35'

Sunday - 9:30 AM.
START of 7" Snow Storm

BAY 14 Covered - Poured

next DAY

35'-35'

Starting work on BAY 14

35'-35'

Log Chute

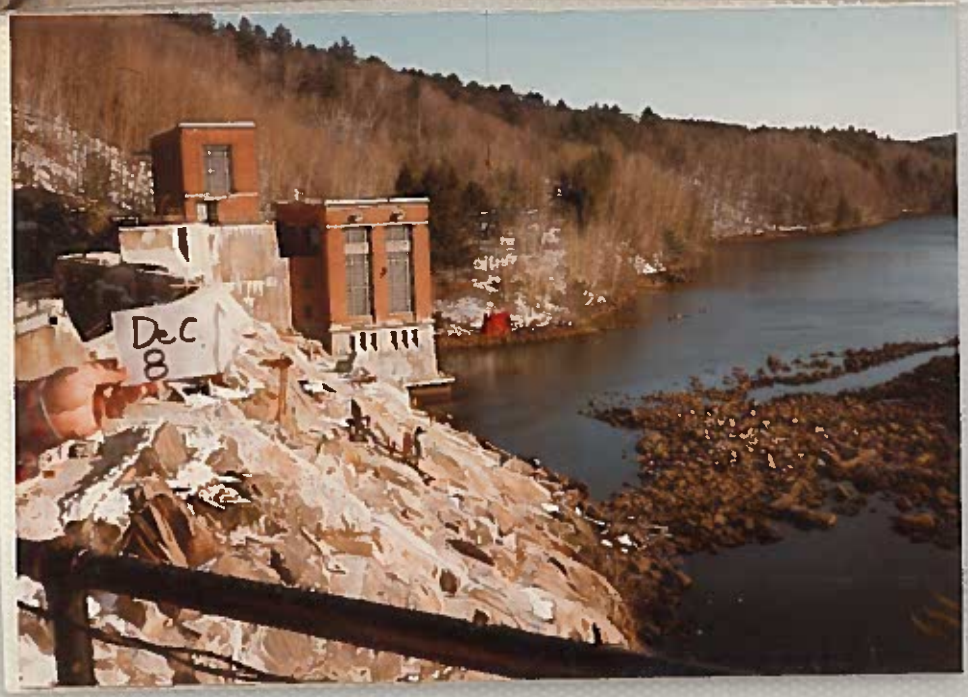
AFTER Pour Sets UP

Filled with Concrete debris.

35-35


Dec 7




Dec 8



Dec 7 - 83

Grouting Re-bars in Ice Chute

36-35

Dec 7 - 83

Cast concrete in Log Chute, Showing poured Key-way

36-35

Dec 8-83

Heater being craned on Spillway, to heat Bay 15

36-35

Dec 9.83

Heating Bay 15 (Poured Dec.12)

36-35

Dec. 8 - 83

Bay 15 being Poured.
(wheeled)

34-33

Dec. 13 83

Diver trying to plug
ice chute Leak.

37-33

Dec. 9-83

Progress in ice chute.

oured on Dec. 15

36-33

Dec. 14-83

Getting ice chute
Ready For Pour-

37-33









Bay 17 being Poured.

Pumped Concrete.

37-35

Dec. 15-83

Pouring Bay 17.

Pumped Concrete.

37-35

Dec 15 83

Checking Slump & Air

For Pour in Bay 17

38-35

Dec 14-83

Ed LAPANN -

Where he Stopped After Falling From top of Spillway.

Waiting For Corinth Emer. Squad.

37-35

Dec 15 83

ange- Finns Concrete pump
Boom Truck Filling bay 17

And ½ of Ice chute

38-35

Dec 15 83

Fore Bay and Back of Power
house Showing Route of 5" Concrete
Pipe, For Pumped Concrete in bay 17

38-35

Dec 15 83

ange-Finns Concrete pump
boom Truck by E.J. West.
lling Bay 17

And ½ of Ice chute

38-35

Dec 15 83

Pouring Bay 17

38-35





37 37






IEC
10







Dec. 16 83

Pouring Bay 13A

39-35

Dec. 20 83

Forming Bay 9

39-35

Working on Vertical Joint at bottom of steps, by Bridge

38-35

Dec 20 83

Ice Chute.

First half poured.

upper half being made Ready -

(Poured Dec 30th)

39-35

Mc PAK Lumber brought FROM Spillway -

39 35

Mc PAK MATERIAL (Lumber) Just brought FROM Spillway.

39-35

Dec 21 63

Mc PAKS Lumber brought FROM Spillway

39 35

Dec 21 · 63

Mc PAK Lumber brought From Spillway.

39 35






Dec
21


Dec
21

Dec 21 83

Mc Paks MATERIAL
(Lumber)
Just brought FROM Spillway

39 35







BAYS 9 AND 10 HEATED & COVERED.

39 - 35

Dec 28 - 83

HEATING BAY 9

39 - 35

Dec 28 83

POURING BAY 10

40 - 35

POURING BAY 10

40 - 35

Pouring upper half of ice chute

Pouring upper half of Ice Chute - Concrete Pipe Thru Power House

40-35

Dec 30 63

Pouring upper half of ice chute

40-35

FINISHING OFF ICE CHUTE.

Dec 30

ASHT




SMH 6





41-32-

Filling Bay 9

JAN 6 84

41-33-

Joint Sealer
"EVASOT 50"
installed on Bay 10

41-34-

Filling Bay 9

JAN 5 - 84

Cleaning out Joint on Bay #10 - For installation of Joint Sealer "EVASOT 50"

Getting CRANE Ready FOR
WINTER STORAGE (ON JOB SITE)

McPAK.S LUMBER MARKED in
Red on Snow

41-35

L. F. CRANE Bedded down
FOR WINTER-

41-35





Job down For
WINTER









MAR- 15 - 64

START Chipping Construction

Joints on # 4-A . Above

bridge.

42

Mar 16 64

STARTING TO FORM

4 - A

42

MAR - 16 - 64

Pouring 4-A -

bottom half

Mar 16 64

Pouring 4-A

Top half

Mar 16. 64

Chipping 3-A

42

Mar 19. 64

Dick drying 2nd half of 3-A

42

Mar 19 64

Forming 2nd half 3-A

Mar 20 64

Sawing 2-A



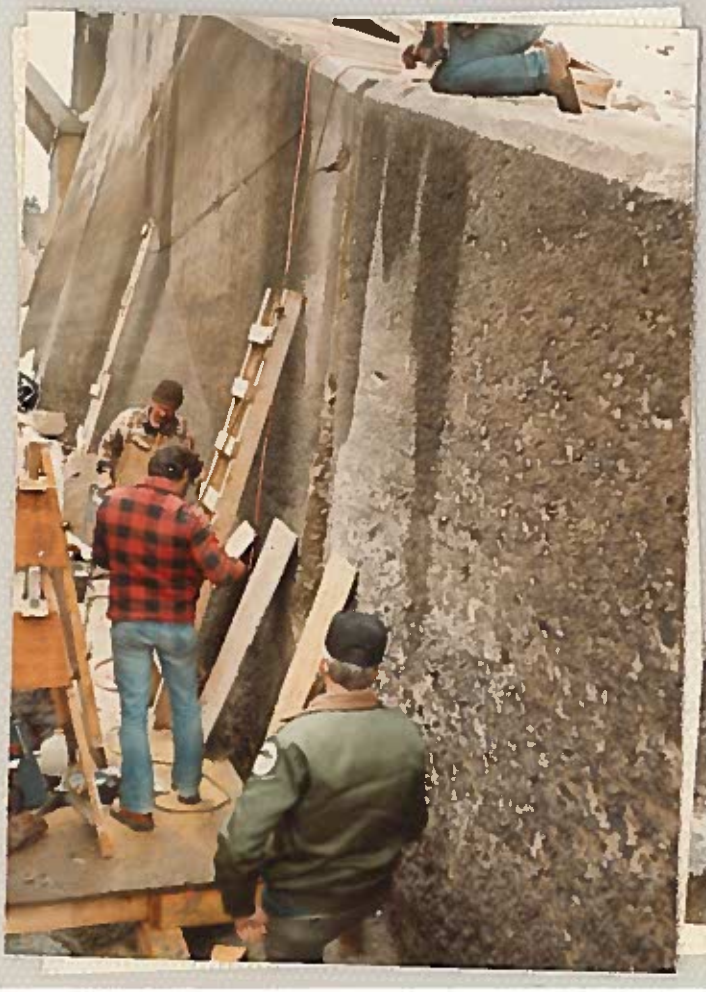














Mar 20 84

Cleaning 2-A

42

Mar 20 84

Applying Apoxy to 2-A

(IN. About 12")

42

MAR. 20 84

1-A being formed

MAR20 84

Apoxy binder being Applied

TO 2-A

MAR. 20-64

2-A being formed

43

MAR. 21-64

43

1-A
1 Foot deep

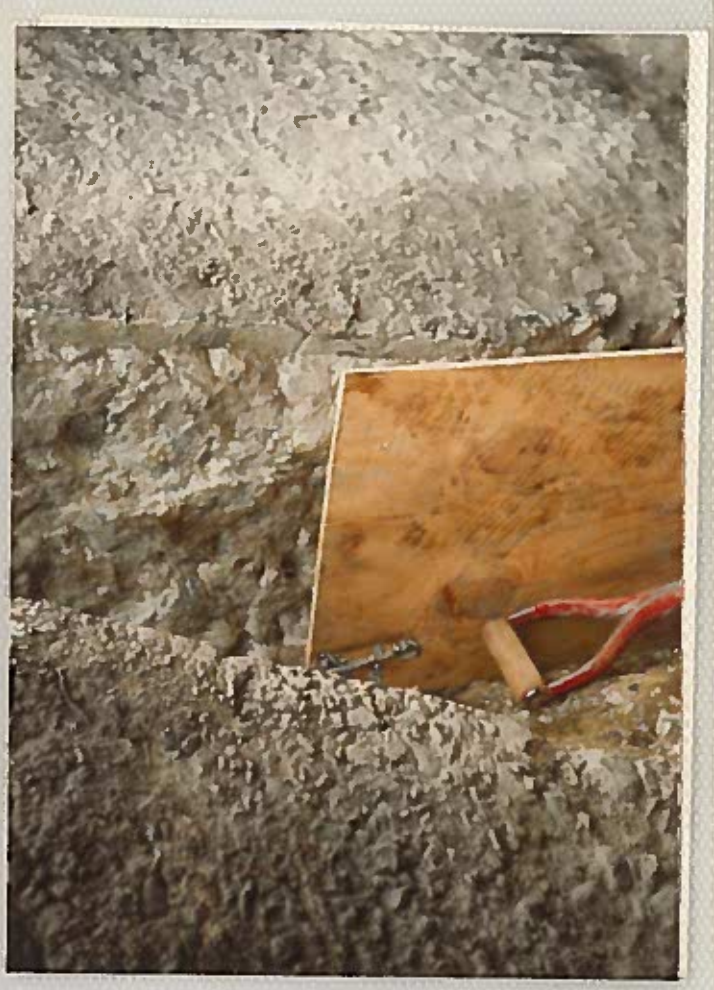
MAR. 21 64

1-A being Formed
Apoxy bindee Applied
About 1 Foot deep

Mar 22-64

1-A formed & poured

















MAR. 22 - 54

4 A Finished

43

MAR. 22 - 54

3 - A Finished

43

MAR 22 - 54

2 A finished

Mar 25 54

54

Above Bridge

1 - 2 - 3 - 4 A's

Finished

Pouring Vertical Joint
under C.H. Steps.

Mar [redacted] 84

45

Working on 4-B - Control House Corner

And #1 - Control House Sub-Structure

44

Mar 29 84

Pouring vertical Joint
under C.H. Steps

45

44

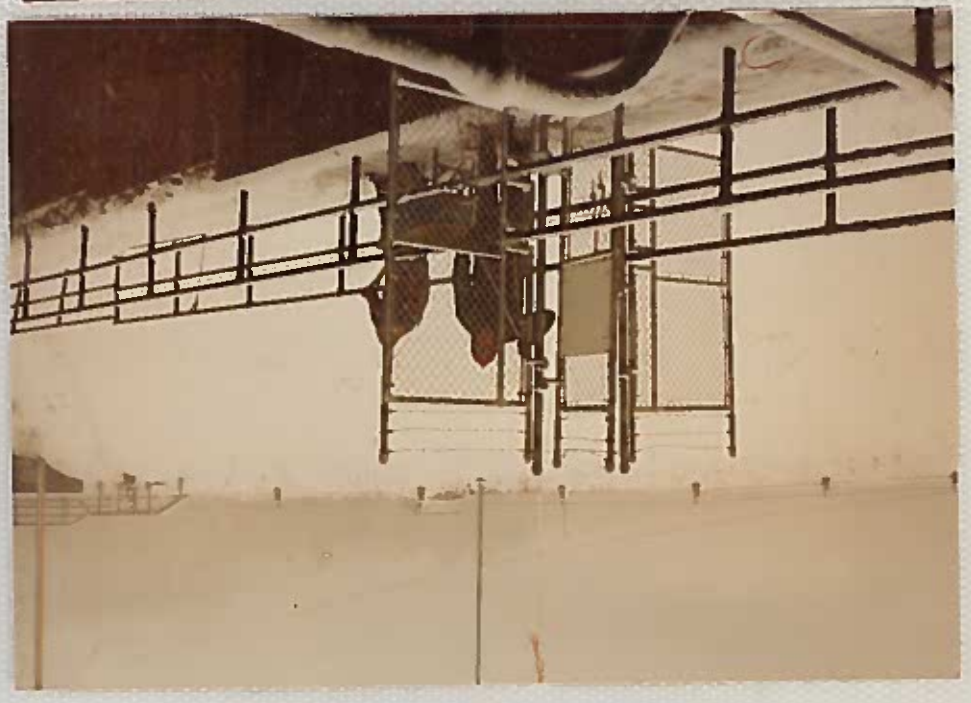
Work on 3-B
by Control House

Mar 28 84









Mar 28 54

Working on 4-B Corner of C.H.

Also #1 - C.H. Sub. - Structure

44

Mar 29 54

Pouring Vertical Joint under C.H. Steps

45

Mar 25 54

Work on 3-B by C.H.

44

Mar 29 54

Pouring Vertical Joint under C.H. Steps

FEDERAL ENERGY REGULATORY COMMISSION

ROUTING CODE _____

WASHINGTON, D.C. 20426

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

FIRST CLASS

P-12252

Robert S. Foltan
Hudson River-Black River Regulating Dist
350 Northern Blvd
Albany, NY 12204-1028

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Pat Wood, III, Chairman;
William L. Massey, Linda Breathitt,
and Nora Mead Brownell.

Hudson River-Black River Regulating District Project No. 12252-000

ORDER ISSUING LICENSE

(Issued September 25, 2002)

1. This order issues an original license to the Hudson River-Black River Regulating District (District) for the project dam and reservoir components (Conklingville Dam and Great Sacandaga Lake) of a unit of hydropower development that also includes a powerhouse and generating facilities.[1] The powerhouse and generating facilities at the Conklingville Dam are currently licensed to Erie Boulevard Hydropower, LP (Erie) as the E.J. West Project No. 2318. We are designating the components of the unit of development operated and maintained by the District as the Great Sacandaga Lake Project No. 12252.

2. The District's license application was filed in the context of an Offer of Settlement regarding license applications for several projects on the Sacandaga and Hudson Rivers in New York. In separate orders we are approving the Offer of Settlement [2] and issuing new licenses for E.J. West and the three other Erie projects covered by the Settlement Offer.[3]

[1]The District is a New York State agency which was organized in 1922 pursuant to Article VII-A of the Conservation Law of the New York State Code (N.Y. Envtl. Conser. Law § 15-2101 et seq.). It is authorized to plan, finance, build, operate and maintain various storage reservoirs in the State, including Conklingville Dam and Great Sacandaga Lake.

[2]Erie Boulevard Hydropower, LP and Hudson River Black River Regulating District, 101 FERC ¶ _____(2002).

[3]Erie Boulevard Hydropower, LP, 101 FERC ¶ _____ (E.J. West); 101 FERC ¶_____ (Stewarts Bridge Project No. 2047); 101 FERC ¶ _____ (Hudson River Project No. 2482); and 101 FERC ¶ _____ (Feeder Dam Project No. 2554).

3. This order is the public interest because it preserves the benefits of hydroelectric generation, will not result in any major, long-term adverse environmental impacts, includes enhancements to the existing aquatic and terrestrial environments, recreation, and cultural resources, and brings under license for the first time all components of the unit of hydropower development that includes Conklingville Dam, Great Sacandaga Lake, and the associated hydroelectric generating facilities, as required by the Federal Power Act (FPA).[4] We find therefore that issuance of a license for the Great Sacandaga Lake Project, with the conditions attached hereto, will serve the public interest because it is best adapted to the comprehensive development of the Sacandaga River and upper Hudson River Basins.

BACKGROUND

4. Erie's predecessor Niagara Mohawk Power Corporation (Niagara Mohawk) filed applications for new licenses, pursuant to Sections 4(e) and 15 of the FPA,[5] authorizing the continued operation and maintenance of four projects. Listed in order from upstream to downstream, the projects are:

- E.J. West, located at River Mile (RM) 6 on the Sacandaga River above its confluence with the Hudson River;[6]
- Stewart's Bridge Project No. 2047, located at RM 3 on the Sacandaga River;
- Hudson River Project No. 2482, consisting of the Spier Falls development at RM 212 of the Hudson River and the Sherman Island development at RM 209 of the Hudson River; and

[4]16 U.S.C. §§ 791a-825r, as amended.

[5]16 U.S.C. § 797(e), 808.

[6]The Sacandaga River is a navigable waterway of the United States. See 8 FPC 231 (1949). Therefore, Section 23(b)(1) of the FPA, 16 U.S.C. § 817(1), requires the unit of development that includes the E.J. West Project, Great Sacandaga Lake, and Conklingville Dam to be licensed.

o Feeder Dam Project No. 2554, located at RM 203 on the Hudson River.[7]

5. The District's operation of Great Sacandaga Lake controls flows through the E.J. West generating facilities and the Sacandaga River downstream through its confluence with the Hudson River. The District's operations also impact flows in the Hudson River downstream of its confluence with the Sacandaga River, but to a lesser degree.

6. The original license for E.J. West included only the powerhouse and generating facilities. Niagara Mohawk's new license application initially proposed to license only the facilities already licensed. The Commission however determined that Conklingville Dam and Great Sacandaga Lake are included in the "unit of development" with the E.J. West generating facilities and must therefore be licensed.[8] On April 14, 1993, Niagara Mohawk filed an amendment to its license application for the E.J. West Project to include Conklingville Dam and Great Sacandaga Lake.

[7]Niagara Mohawk was issued original licenses for Stewarts Bridge in 1950 (9 FPC 896), E.J. West in 1963 (29 FPC 1290), and Hudson River in 1968 (40 FPC 185). Moreau Manufacturing Corporation (Moreau), a subsidiary of Niagara Mohawk, was issued an original license for Feeder Dam in 1968 (40 FPC 201). The original licenses for E.J. West, Hudson River, and Feeder Dam expired on December 31, 1993. Applications for new licenses for these projects were filed on December 13, 18, and 20, 1991, respectively. The original license for Stewarts Bridge expired on July 1, 2000; the application for a new license was filed on June 23, 1998.

[8]See letter to Niagara Mohawk dated August 27, 1992 from the Director, Division of Project Review, Office of Hydropower Licensing. A "project" is defined in section 3(11) of the FPA, 16 U.S.C. § 796(3)(11), as "a complete unit of development, consisting of all dams, powerhouses, impoundments, water rights, and lands which are used in connection with such unit." The complete unit of development must be licensed, but the Commission is not required to place all parts of the unit of development under a single license. For ownership or other reasons, the Commission can license different parts of a complete unit of development in different licenses. See, e.g., Orange and Rockland Utilities, 44 FERC ¶ 61,235 n.30 (1988); Susquehanna Power Co., 32 FPC 826 (1964); Finch, Pruyn, & Co., 33 FPC 321 (1965); Niagara Mohawk Power Co., 40 FPC 185 (1968); Pacific Gas and Electric Company, 52 FPC 1898 (1974).

7. Public notice of the E.J. West application as amended, requesting comments and motions to intervene, was issued on November 10, 1993.[9] Many entities filed motions to intervene.[10]

8. In 1999, the four Niagara Mohawk projects were transferred to Erie, which became the relicense applicant for the projects.[11]

9. On April 12, 2000, as amended on July 30, 2001, Erie amended its relicense applications by filing a Settlement Offer dated March 27, 2000 covering all four applications.[12] The Settlement Offer, which is signed by most of the parties to the

[9]58 Fed. Reg. 62,337 (November 26, 1993).

[10]Timely motions to intervene were filed by the Adirondack Park Agency; Town of Hadley and County of Saratoga, New York; County of Fulton, New York; Great Sacandaga Lake Association; Great Sacandaga Lake Fisheries Federation, Inc.; New York State Department of Environmental Conservation; Adirondack Mountain Club; U.S. Department of the Interior; New York Rivers United, on behalf of itself and American Whitewater, Natural Heritage Institute, and Trout Unlimited; Sacandaga Marine, Inc.; Adirondack Board Sailing Club; Finch, Pruyn, and Company; the District; Day Country Store; Adirondack Hydro Development Company; New York State Electric and Gas Company; Fort Miller Associates; Curtis Palmer Hydroelectric Company, L.P.; J. Andrews; Frank Wozniak; and Fourth Branch Associates. A timely request to intervene was filed by Mr. Donal O'Leary on March 6, 1992, but the request was not accompanied by a certificate of service, as required by 18 C.F.R. § 385.2010(h). The record does not indicate that Mr. O'Leary subsequently participated in this proceeding. His request to intervene is therefore denied.

[11]See Niagara Mohawk Power Corp. and Erie Boulevard Hydropower, LP, 88 FERC ¶ 62,082 (1999), aff'd, 90 FERC ¶ 61,148 (2000). The 1999 order also transferred the license for the Feeder Dam project from Moreau to Niagara Mohawk.

[12]The July 30, 2001 amendment added two tables pertaining to storage operations that had been inadvertently omitted from Section 3, which pertains to operation of Great Sacandaga Lake. Erie's revision was filed after consultation with the District, New York State Department of Environmental Conservation , Saratoga and Fulton Counties, and the Great Sacandaga Lake Fisheries Federation. No party filed comments in response to the revisions.

relicense proceedings,[13] contains revised and additional environmental measures. Comments on the Settlement Offer were filed by Adirondack Hydro Development Corporation (AHDC) and the Mercer Companies, Inc. (Mercer). Erie filed reply comments to AHDC and Mercer.

10. Also on April 12, 2000, Erie and the District filed an amendment to the E.J. West application to add the District as a co-applicant. The amendment requested issuance of separate licenses under separate project numbers for Erie (the powerhouse and generating facilities) and for the District (Great Sacandaga Lake and Conklingville Dam).[14] This request is being granted and a license is being issued to the District for the Great Sacandaga Lake Project No. 12252.

11. On April 14 and 15, 2000, the Commission issued notices that the four license applications, as amended by the Settlement Offer, were ready for environmental analysis. On May 16, 2001, the Commission issued a Draft Environmental Impact Statement (Draft EIS) on all four applications, including the District's facilities. Comments on the Draft EIS were filed by Erie, the District, the New York Department of Environmental Conservation (NYSDEC), the U.S. Department of the Interior (Interior), the U.S. Environmental Protection Agency (EPA), Adirondack Mountain Club (ADK), Saratoga County, and AHDC.

12. On August 27, 2001, the District filed a notice of withdrawal of its application for a license. The District stated that it supports the Settlement Offer and issuance of a license to Erie for the powerhouse and generating facilities, but does not see a need for the dam and reservoir to be licensed. Many parties timely filed protests.[15] Under our

[13]The signatories to the Settlement Offer are listed in the order approving that agreement. See 101 FERC ¶ _____, n.12.

[14]Public notice requesting comments and interventions was issued on May 2, 2001. 66 Fed. Reg. 23,251-252 (May 5, 2001). A timely motion to intervene and protest was filed by Paul Nolan. Mr. Nolan's protest is addressed in the Order Approving Settlement Agreement.

[15]Protests were filed by Erie, U.S. Department of the Interior, Adirondack Mountain Club, Curtis/Palmer Hydroelectric Co., L.P., NYSDEC, Saratoga County, New York Rivers United, and American Rivers. Comments were also filed by Adirondack Hydro Development Company and the Great Sacandaga Lake Fisheries Federation, Inc. Erie also filed on January 16, 2002, a motion for an order finding Great Sacandaga Lake (continued...)

regulations, the timely protests render the District's withdrawal ineffective until the Commission issues an order accepting the withdrawal.[16]

13. The Final EIS was issued on November 30, 2001. The EIS contains background information, analysis of impacts, and the basis for a finding of no significant impact on the environment. Comments on the final EIS were filed by Adirondack Hydro Development Company (AHDC), New York State Department of Environmental Conservation (NYSDEC), and U.S. Environmental Protection Agency (EPA). These comments have been considered in the preparation of this order.

14. On February 8, 2002, the Commission staff transmitted to the parties draft license articles for the Great Sacanadaga Lake Project. A public meeting to discuss the draft articles was held at NYSDEC's offices on March 12, 2002. Comments on the draft articles were filed by Erie, NYSDEC, and the District on March 4, April 11, and April 12, 2002, respectively. The comments express concerns about certain of the draft articles and request modification or deletion of some of them from any license issued for the Great Sacandaga Lake Project. These comments have also been taken into account in determining the appropriate conditions for the Great Sacandaga Lake license.

PROJECT DESCRIPTION

15. The Conklingville Dam impounds 25,940-acre Great Sacandaga Lake. The dam and lake are located in Saratoga, Fulton, and Hamilton Counties, New York. The dam and lake, which are located entirely within the boundaries of New York's Adirondack State Park, were constructed by New York to provide flood control and summer flow augmentation for communities bordering the Hudson River below the Sacandaga River confluence. Releases from the dam, which was completed in 1930, control inflow to the E.J. West Project No. 2318 powerhouse. The lake contains substantial storage capacity[17] and its operating regime affects, in addition to E.J. West and the natural resources associated with the lake, hydroelectric projects and other industrial facilities, municipalities, and natural resources downstream on the Sacandaga River and below the confluence of the Hudson and Sacandaga Rivers.

[15](...continued)
and Conklingville Dam to be jurisdictional, to which the District responded in opposition on February 14, 2002.

[16]18 C.F.R. § 385.216(b)(2).

[17]The lake has a gross storage capacity of about 681,000 acre-feet.

16. The Great Sacandaga Lake Project includes: (1) a concrete canal; (2) the 1,100-foot-long- and 100-foot-high earth fill and concrete Conklingville Dam with an outlet consisting of two spillways and spillway weir; and (3) Great Sacandaga Lake. The normal maximum lake elevation level is 768.00 feet National Geodetic Vertical Datum (NGVD).

DISCUSSION

17. As discussed in the Order Approving Settlement Agreement, the Settlement Offer resolves a range of resource use issues and is in the public interest, and we include in the individual licenses articles implementing the appropriate terms of the Settlement Offer, along with provisions that will enable us to ensure compliance with all license conditions. Here we discuss the provisions specific to the Great Sacandaga Lake Project.

18. Section 3 of the Settlement Offer establishes an operating plan based on maintaining certain maximum and minimum elevations for Great Sacandaga Lake and four annual lake level curves that seek to reconcile various goals in addition to flood control: reducing winter drawdowns in Great Sacandaga Lake; providing flows for water quality and fish habitat in the Hudson River; increasing Great Sacandaga Lake elevations for fall recreation, minimizing energy losses to hydroelectric projects, enhancing whitewater recreation on the Sacandaga River, and providing base flows in the Sacandaga River.

19. There are currently no winter drawdown limits. Under the Settlement Offer, minimum winter lake levels of 748, 749, and 750 feet National Geodetic Vertical Datum (NGVD) would apply beginning in 2000, 2010, and 2020, respectively.[18] The District is also required to allocate sufficient daily releases from Great Sacandaga Lake to meet minimum daily average flow requirements on the Hudson River just below its confluence with the Sacandaga River to help meet the Hudson River base flow requirement below Feeder Dam and daily flow targets at the confluence.[19] The specific allocation required

[18]Exceptions are provided for maintenance of the dam and to provide additional flow control storage based on a spring snow survey. Reductions below the usual minimum level are, except in emergencies, to be the subject of negotiations among the District, NYSDEC, Erie, and the affected counties. Section 3.3.1.

[19]Settlement Offer Section 7.3 provides for Erie to provide a base flow below the Feeder Dam project of 1,500 cubic feet per second.

depends on the level of Great Sacandaga Lake and is adjusted in 2013 in order to accommodate the implementation of base flows at the Stewarts Bridge Project.[20]

20. A target lake level of 760 feet NGVD through October 15 applies to facilitate fall recreation on Great Sacandaga Lake,[21] subject to exceptions to maintain base flows and augmentation flows in the Hudson River, base flows in the Sacandaga River,[22] and the downstream whitewater demand schedule established in Section 5.5 of the Settlement Offer.[23]

21. The District also undertakes in the Settlement Offer to make reasonable efforts to limit water releases from Great Sacandaga Lake in an effort to maintain maximum flows in the Hudson River below the confluence with the Sacandaga for the purpose of minimizing energy losses to downstream hydroelectric projects.[24]

22. The District will also provide the daily volume of water needed to sustain the whitewater demand flow in the Sacandaga River below Stewarts Bridge if the water is

[20]Settlement Offer Section 3.4. Section 5.3 establishes a Sacandaga River base flow schedule below Stewarts Bridge for three different periods; license issuance to December 31, 2012, January 1, 2013 to June 1, 2020, and June 2, 2020 to license expiration. Exceptions to the lake level curves are provided for maintenance, emergencies, critical low flows in the Hudson River, and to maintain the navigability of the Champlain Canal, which is supplied with water from the Feeder Canal at the Feeder Canal Dam Project. A consultation requirement also applies to these exceptions. Settlement Offer Section 3.4.3.

[21]The Settlement Offer provides for Erie to construct a canoe portage trail linking Great Sacandaga Lake with the tailwaters of the Stewarts Bridge reservoir (Section 4.2) and a paved scenic overlook adjacent to Conklingville Dam (Section 4.3). Erie has also agreed to install trashrack overlays on the turbine intakes to prevent turbine entrainment and mortality of Great Sacandaga Lake resident fish (Section 4.2). No downstream fish passage facilities are to be provided, in order to help maintain resident fish populations in the lake.

[22]The base flow schedule for the Sacandaga River below Stewart's Bridge is in Section 5.3.

[23]See Settlement Offer pp. 52-55.

[24]Section 3.6, pp. 33-35.

available,[25] subject to a provision to change flow releases for this purpose in emergency circumstances.[26]

WATER QUALITY CERTIFICATION

23. Under Section 401(a)(1) of the Clean Water Act (CWA),[27] the Commission may not issue a license for a hydroelectric project unless the state water quality certifying agency has issued a water quality certification for the project or has waived certification. Section 401(d) of the CWA provides that state certification shall become a condition on any federal license or permit that is issued.[28] Only a reviewing court can revise or delete these conditions.[29]

24. Erie applied for water quality certification covering the E.J. West Project portion of the unit of development. The District did not directly apply for water quality certification, but we construe its joinder of Erie's license application to encompass a request for issuance to it by NYSDEC of water quality certification for the project dam and reservoir, since the Districts's operation of the dam and reservoir results in a discharge to the Sacandaga River.

25. NYSDEC issued Section 401 water quality certification to the District for the operation of the dam and Great Sacandaga Lake, subject to certain conditions, on February 5, 2002. The conditions are attached as Appendix A to this order.[30]

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[25]The whitewater program is discussed in the order issuing a license for Stewarts Bridge.

[26]See Settlement Offer Section 5.5.1.1.

[27]33 U.S.C. § 1341(a)(1).

[28]33 U.S.C. § 1341(d).

[29]See American Rivers v. FERC, 229 F.3d 99 (D.C. Cir. 1997).

[30]NYSDEC also issued water quality certification to Erie for the already licensed powerhouse and generating facilities on February 5, 2002. The conditions of that certification are Appendix A to the order issuing a new license for Project No. 2318.

ENVIRONMENTAL IMPACT STATEMENT

26. The EIS on Erie's and the District's license applications, as amended by the Settlement Offer, includes an examination of water quality, the maintenance of stable minimum flows, fisheries (including fish passage), vegetation and wildlife, geological resources, visual resources, cultural resources, aesthetic resources, and recreation.

27. The Settlement Offer will have many beneficial effects. Water level fluctuations in Great Sacandaga Lake will be moderated, enhancing conditions for fisheries and wetlands and reducing the potential for erosion of the shorelines. The modified releases from Conklingville Dam will have beneficial environmental effects downstream by allowing for the provision of minimum flows downstream of the Feeder Dam Project and base flows downstream of the Stewarts Bridge Project to improve water quality and fish habitat. Benefits of the Settlement Offer in addition to those related to operation of Great Sacandaga Lake include measures to protect against turbine entrainment and fish passage at Stewarts Bridge, Hudson River, and Feeder Dam, and recreational enhancements, including whitewater releases, access trails, campgrounds, canoe/boat take-outs and put-ins, and portage trails.[31]

28. Based on the EIS prepared for all of the license applications, the Commission concludes that issuance of a new license for the Great Sacandaga Lake Project, as conditioned herein, will not result in any major, long-term adverse environmental impacts.

SECTION 18 FISHWAY PRESCRIPTIONS

29. Section 18 of the FPA,[32] states that the Commission shall require construction, maintenance, and operation by a licensee of such fishways as the Secretaries of Commerce or the Interior may prescribe. Section 2.3 of the Settlement Offer requests the Commission to include in the new license a reservation of the Secretary of the Interior's authority to require the construction, operation, and maintenance of fishways. Consistent with Commission practice, Article 405 includes the requested reservation.

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[31]See EIS Sections V.B.1., V.B.2, and V.B.5.

[32]16 U.S.C. § 811.

RECOMMENDATIONS OF FEDERAL AND STATE FISH AND WILDLIFE AGENCIES

30. Section 10(j)(1) of the FPA[33] requires the Commission, when issuing a license, to include conditions based on the recommendations of federal and state fish and wildlife agencies submitted pursuant to the Fish and Wildlife Coordination Act,[34] for the protection and enhancement of fish and wildlife and their habitat affected by the project. The recommendations of the fish and wildlife agencies for the Great Sacandaga Lake Project, as reflected in the Settlement Offer, are included in the license.

THREATENED AND ENDANGERED SPECIES

31. Section 7(a) of the Endangered Species Act (ESA)[35] requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species, or result in the destruction or adverse modification of designated critical habitat.

32. Only one federally listed species, the threatened bald eagle, is known to occur or could occur in the area of the Great Sacandaga Lake project. The draft EIS included a Biological Assessment (BA) which found that issuing the license for the Great Sacandaga Lake Project would have no effect on bald eagles.[36] The FWS service comments on the draft EIS do not discuss the bald eagle.

OTHER ISSUES

Headwater Benefits

33. FPA Section 10(f) provides that when a license is directly benefitted by an upstream hydropower or storage project of another licensee, permittee, or the United States, the licensee must reimburse the owner of the upstream project for a portion of its interest, maintenance, and depreciation costs deemed "equitable" by the Commission. The payees must reimburse the Commission for the cost of making the determination.

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[33]16 U.S.C. § 803(j)(1).

[34]16 U.S.C. § 661 et seq.

[35]16 U.S.C. § 1536(a)(2).

[36]Draft EIS, p. 104.

Similarly, when an unlicensed power project is benefitted by a licensed project or a government project, the Commission must determine a headwater benefit payment to be made to the provider of the benefit.[37] Each license includes a standard article implementing Section 10(f).

34. We are including the standard headwater benefits article for original licenses.[38] The District noted that the draft article was the standard article for new licenses and requested that the article be deleted. Although there are currently no upstream projects that could create a headwater benefit to the Great Sacandaga Lake Project,[39] we cannot assume that this will continue to be the case throughout the term of the license.

Article 401 – Lake Elevation Reports

35. Article 401 requires the District, on a monthly basis, to prepare and publish a report of daily lake elevations, inflows to the lake, and flows of the Hudson River, and to make the report available on the District's website. The District requests that the article be revised to afford it a reasonable period of time to upgrade its website for this purpose. The article has been revised to afford the District six months following issuance of the license in which to do so.

Article 402 -- Operating Objectives for Great Sacandaga Lake

36. Erie states that Article 402, subsection (c) should be modified to include Figures A-C of the Settlement Offer, which illustrate the level curves for the three different time periods over which they differ, and Appendix E to the Settlement Offer, lookup tables that show the relationship between lake Level Curves and NGVD datum for Great Sacandaga Lake elevations. It states that inclusion of these figures and tables will clarify and facilitate compliance with the terms of the new license. These items were omitted

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[37]The rules implementing Section 10(f) are at 18 C.F.R. Part 11, Subpart B.

[38]Article 202.

[39]There are two projects upstream from Conklingville Dam on the Sacandaga River, the 663 kilowatt (kW) Lake Algonquin Project No. 7274 and the 725 kW Christine Falls Project No. 4639. Neither of these less-than-one MW projects however has any storage capability and both operate run-of-river. They therefore provide no headwater benefit to any downstream project.

from the draft article only because they could not readily be reproduced. They are instead incorporated into Article 402 by reference.[40]

37. Subsection (c) defines Level Curve 3 as the "annual Guide Curve the licensee shall follow over the course of any given year, subject to balancing inflow to Great Sacandaga Lake with other operating constraints." Erie suggests that the definition would be more clear and consistent with the intent of the Settlement Offer, if the words "such as targeted minimum and maximum flows" were inserted at the end of the sentence. Erie's request is reasonable and no party has objected. The revision will therefore be made.

38. Erie also states that subsection (d) of Article 402 omits language from Section 3.3 of the Settlement Offer stating that prior notice to NYSDEC of drawdowns below the target elevation for winter drawdown is not required in emergencies. This language however is included in the third paragraph of that subsection.

39. Erie states that subsection (f) of Article 402 omits language from Settlement Offer Section 3.4.1 indicating that drawdowns below Level Curve 1 will be for the minimum duration necessary. That omission has been remedied.

40. NYSDEC notes that the last sentence of Article 402, subsection (h), stated that the licensee is "not required to notify or consult with NYSDEC prior to lowering Great Sacandaga Lake below the targeted elevation for maximum winter drawdown for flow augmentation as described in this article." NYSDEC states that the sentence should be corrected to reflect the provisions of Paragraph 3.3.1 of the Settlement Offer. The provisions of Paragraph 3.3.1 are reflected in subsection (d). The last sentence in subsection (h) was erroneously included and has been deleted.

41. Subsection (k) of Article 402 requires the District to operate the project so as to provide the daily volume of water necessary, if it is available, to sustain the whitewater demand flow in the Sacandaga River below Stewarts Bridge as provided for in the Stewarts Bridge license. Subsection (l) requires the District to provide flows sufficient to

[40]Erie also recommends that the entirety of Section 3 and other sections of the Settlement Offer should be made an appendix to the Great Sacandaga Lake license. The license articles were carefully crafted to capture the agreement of the parties as reflected in the Settlement Offer, except to the extent the Settlement Offer may be inconsistent with the FPA or important Commission policies. Because the Settlement Offer is incorporated into the license by dint of water quality certificate condition A.1., Erie need not be concerned that the Settlement Offer will not be captured by the license.

facilitate the release of an instantaneous base flow, beginning in 2013, to the Sacandaga River below Stewarts Bridge as described in the Stewarts Bridge license. Erie states that tables showing the whitewater demand and base flow schedules for Stewarts Bridge, which Erie is required to meet, should be included in the Great Sacandaga Lake license directly rather than simply referenced in order to facilitate the District's compliance with its own requirements and the Commission's oversight, particularly because Stewarts Bridge is subject to maximum daily fluctuation requirements and has very little ability to reregulate discharges from the Lake.

42. The District's license obligations as described in Article 402 would not change as a result of including the tables nor do we see any particular advantage with respect to license compliance of including directly, rather than referencing, these tables. The District however has not objected to Erie's request and the request is not unreasonable. We will therefore include these tables in Article 402 as requested.

Article 403 – Erosion and Sedimentation Control

43. About 60 percent of the reservoir shoreline is developed for recreation and commercial uses, including 4,200 private camps, 110 beach clubs or associations, and over 75 commercial operations, including 20 marinas. Access of all of these entities to the reservoir shoreline is authorized under permits issued by the District. Over the years these permittees have removed the natural shoreline armor (cobbles, boulders, and vegetation) to encourage the development of beaches and to install docks and other support facilities. This practice, along with other factors,[41] has contributed to shoreline erosion in these areas. Power generation does not appear to contribute to shoreline erosion, as it involves less than one inch of water level fluctuation per day.[42] Of the undeveloped shoreline, about 25 percent is susceptible to moderate erosion and four percent to severe erosion. The remaining undeveloped shoreline has only slight erosion potential. The District has had for over 60 years a practice of reinforcing those shoreline areas prone to erosion with rip-rap.[43]

[41]In general, erosion results from waves, wind, and ice-scouring.

[42]EIS, p. 58. Saratoga disagrees that hydroelectric operations do cause contribute to erosion, but does not explain how one-inch daily fluctuations could materially contribute to erosion.

[43]Rip-rap is a permanent, erosion-resistant ground cover composed of large, loose stones underlain by a filter fabric or granular materials.

44. The only operational feature potentially contributing to shoreline erosion that will materially change under the Settlement Offer is the advent of reservoir operation for "aggressive storage."[44] The reservoir storage capacity between elevations 768 feet and 777 feet NGVD has traditionally been used as a buffer zone to absorb unexpected high flow events. Under the terms of the Settlement Offer this storage capacity could be used for aggressive storage, in which water in excess of the targeted maximum flows in the Hudson and Sacandaga Rivers is stored for later release to enable more efficient use of available flows by downstream hydroelectric projects.[45] As a result, the shoreline above 768 feet NGVD may be more frequently exposed to erosive forces associated with wave action and more frequent soil inundation. This would occur only during rare occasions when lake levels are at the highest point, typically during June and July. In its comments filed September 14, 2001 on the draft EIS, Saratoga County questioned the absence of a recommendation for soil erosion monitoring and control requirements for Great Sacandaga Lake. Saratoga County expressed particularly concern about additional shoreline erosion attributable to aggressive use of storage. .[46]

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[44]One positive aspect of the Settlement Offer in this regard is a reduction in the depth of winter drawdown, from 23 feet currently to about 18 feet by 2020. This should reduce shoreline erosion from ice scouring to the extent that under-ice drawdown is a contributing factor.

[45]See Settlement Offer Tables D, E, and F and EIS Table 2. The downstream projects most affected by aggressive storage include (in order from upstream to downstream) Stewarts Bridge, Curtis/Palmer Project No. 2609, Hudson River, Feeder Dam, Glens Falls Project No. 2385, South Glens Falls Project No. 5461, and Hudson Falls Project No. 5276. The effect of the Settlement Offer on the downstream projects is discussed at EIS Section VI.

[46]Saratoga comments on draft EIS, filed July 2, 2001, p. 2. Saratoga County also suggested the District should be made to compensate property owners for erosion. We reject this suggestion. Nothing in the record of this proceeding indicates that shoreline erosion from project operations is occurring on property that does not belong to the District, which maintains a buffer zone above the high water mark around the entire reservoir. To the extent that project-related erosion may damage the property of others in the future, the preventive and remedial measures required by Article 403 notwithstanding, the remedy would lie in a state court action seeking damages. The Commission has no authority to award damages. See South Carolina Public Service Authority v. FERC, 850 F.2d 788 (D.C. Cir. 1988); P.U.D. No. 1 of Pend Oreille County, 11 FPC 786 at 788 (1952).

45. The EIS recommends that the District develop a plan to monitor shoreline erosion, establish its primary cause, and identify the entity responsible for minimizing or remediating it, in particular with respect to operation of the Great Sacandaga Lake Project under the terms of the Settlement Offer.[47] Article 403 would establish such a requirement. The draft article included a requirement to consult Saratoga and Fulton Counties and the New York State Office of Parks, Recreation, and Historic Preservation (SHPO) in the development of the plan.

46. Erie states that the shoreline monitoring measures and plan are inconsistent with the Settlement Offer, unnecessary, and redundant of the District's existing programs and policies that have been in effect since the 1930's. Erie also opposes specifically a provision of the article that would require Fulton and Saratoga Counties to be consulted in the preparation of the plan. Erie states that Saratoga's expression of interest in this issue is non-specific and it has not shown that it has any relevant regulatory authority. Erie states that if the Commission does not exclude this article, it should at least delete from it any requirement to consult the two counties. Erie adds that it is redundant to include consultation with the New York State Office of Parks, Recreation, and Historic Preservation (SHPO) because the SHPO's principal interest, cultural resources, is covered by other license articles.[48] The District concurs with Erie's comments, and adds that the draft article should be either deleted entirely or amended to adopt the District's existing erosion control program as a condition of the license. On March 14, 2002, Saratoga filed a letter stating that soil erosion control issues can be adequately addressed through the District's existing program and the provisions of NYSDEC's Clean Water Act Section 401 water quality certification for the project.

47. Although the record does not indicate that existing hydroelectric operations are causing shoreline erosion, there are other public interest considerations leading us to conclude that Article 403 is appropriate for inclusion in this license. First, our public interest inquiry is not limited to impacts of project operation directly attributable to generation of electricity. FPA Section 10(a)(1) provides that project purposes include all purposes for which the project is operated in the context of the river basin, including flood control, control of erosion and sedimentation, water quality within and downstream of the project, navigation, recreation, cultural resources, fish and wildlife, and others.

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[47]EIS p. 167.

[48]Erie Comments on Draft License Articles, pp. 2-3. Erie does not explicitly state its interest in this issue, but it appears to be concerned that implementation of the requirement to have an approved plan will result in costs that downstream licensees, including Erie, will have to bear under existing agreements with the District.

Erosion from whatever cause may affect such recreation, water quality, and various other resources.

48. Second, the purpose of license articles is to ensure that our decisions with respect to specific aspects of the public interest are defined and enforceable. The District's existing erosion control practices, while not evidently deficient, are ill-defined. The state rules applicable to the District's operation of the reservoir are codified in Title 6, Part 606 of the New York Code of Rules and Regulations (NYCRR Part 606).[49] The NYCRR Part 606 regulations contain no rules with respect to control of erosion and sedimentation. The District's Handbook for permit holders merely states that the District "undertakes shoreline stabilization wherever erosion threatens private land or public facilities. However, the District will not halt an eroding embankment or restore a washed-out beach simply to maintain or improve the recreational characteristics of a permit area."[50] Nothing therein establishes an obligation on the part of the District could be enforced through the license. Third, the advent of aggressive storagemay cause erosion attributable to project operations. This has the potential to adversely affect adjacent property owners and cultural resources.

49. The provisions of the water quality certification with respect to erosion control are also not a substitute for a Commission approved erosion control plan.[51] The water quality

[49]A copy of NYCRR Part 606 is attached to the District's comments on the draft license articles. The NYCRR Part 606 rules pertain for the most part to access, including permitting, maintenance costs and responsibilities, structures, and fees. The District also included a copy of its handbook for permit holders, which provides more specific information on the obligations attached to a permit.

[50]Handbook, p. 17. The District states in its comments on the draft license articles that Niagara Mohawk described the District's erosion control program in Niagara Mohawk's April 14, 1993 amendment to the E.J. West application to include the reservoir, but the District states that it has not reviewed that description and offers only to provide a description of its program following the issuance of the license.

[51]See, e.g., Great Northern Paper, Inc., 77 FERC ¶ 61,068 (1996), order on reh'g, 85 FERC ¶ 61,316 (1998), aff'd, Conservation Law Foundation v. FERC, 216 F.3d 41 (D.C. Cir. 2000) (state or local zoning ordinances inadequate substitute for a Commission-approved buffer zone plan); Public Service Company of New Hampshire, 75 FERC ¶ 61,111 n.65 (1996) (rejecting licensee proposal to substitute adherence to state land use regulations for buffer zone); Greenwood County, S.C., 94 FERC ¶ 61,033 (2001) (continued...)

certification moreover includes no provisions for monitoring or any effort to identify causes of erosion, but only for control of erosion during maintenance and construction activities.[52]

50. We also think it is appropriate for Fulton and Saratoga Counties to be consulted in the preparation of the plan. The project is located within these counties and even if they have no regulatory authority with respect to the reservoir operations, the recreational use of the reservoir has a direct and substantial impact on the local economy. Although Saratoga County states that it no longer wishes to be consulted, the license is being issued for a term of 40 years, during which many changes of circumstance are likely to occur. Article 403 will reserve Saratoga County's right to consultation, which it may decline to exercise in response to any request from the District.

51. We agree that including the SHPO in the consultation requirements for this plan would be redundant of the requirement in Article 404 to consult with the SHPO to develop a Cultural Resources Management Plan, and have amended Article 403 accordingly.

Article 404 – Cultural Resources Management Plan

52. A Multiple Programmatic Agreement (PA) was executed by Niagara Mohawk in 1996 for 14 New York projects, including the E.J. West powerhouse and generating facilities, but not Conklingville Dam or Great Sacandaga Lake.[53] The PA requires the licensee to prepare a Cultural Resources Management Plan (CRMP) for each project within one year of license issuance. A review of the files of the New York State Historic Preservation Officer (SHPO) shows that two mapped native American cultural sites may

[51](...continued)
(refusing licensee's request to use the county shoreline permitting program in whole or part as its own shoreline permitting program).

[52]See Appendix A.

[53]See "Programmatic Agreement Among the Federal Energy Regulatory Commission, the Advisory Council on Historic Preservation, and the New York State Historic Preservation Officer for Managing Historic Properties That may be Affected by a License Issuing to Niagara Mohawk Power Corporation, Beebee Island Corporation, or Moreau Manufacturing Company for the Continued Operation of 14 Hydroelectric Projects in Upstate New York," executed on July 19, 1996 and filed with the Commission July 23, 1996.

be in proximity to the shoreline of Great Sacandaga Lake. Article 404 therefore requires the District, pursuant to Section 106 of the National Historic Preservation Act[54] and its implementing regulations[55] to develop a CRMP in consultation with the SHPO and other appropriate entities to protect any cultural properties associated with the dam and reservoir.[56]

53. The District states that the Settlement Offer does not obligate it to prepare a detailed CRMP and that it is not a party to the PA under which Erie agreed to prepare a CRMP for the E.J. West generating facilities. The District also states that only two of twelve site areas[57] within or along the reservoir shoreline are subject to possible erosion[58] from reservoir operations, and that Erie, not the District, agreed to contact the SHPO to identify the precise location of the sites within the two relevant site areas to determine if they are actually subject to erosion. The District states that these facts indicate that preparation of a complete CRMP is unnecessary and, to the extent any CRMP is required, the funding should be a requirement of Erie's license for E.J. West.

54. Licensing of both the dam and reservoir is required under the FPA. The Commission cannot dispense with its obligations under NHPA Section 106 regarding the project dam and reservoir merely because the complexities of the Upper Hudson relicense proceedings resulted in a PA being executed prior to the Settlement Offer that did not cover facilities that are required to be licensed, or because the parties to the Settlement Offer elected not to address cultural resources in that document. The CRMP required by Article 404 follows the same guidelines and requirements applicable to the other projects covered by the PA.

Article 408 – Standard Uses and Conveyances Article

55. Article 408 is the standard uses and occupancy article included in every license issued by the Commission. This article establishes the conditions under which licensees

[54] 16 U.S.C. § 470f.

[55] 36 C.F.R. Part 800.

[56] See Article 404.

[57] A "site area" is a one-mile diameter circle within which an archeological site is located.

[58] See EIS p. 131.

many grant permission for certain types of use and occupancy of project lands and waters, such as non-commercial piers, landings, and boat docks, and may convey certain minor interests in project lands and waters without prior Commission approval.

56. The District objects to the inclusion of this standard article on the basis that it is inconsistent with the State of New York's existing program for the annual issuance of temporary, renewable permits for the use of lands in and around the reservoir, and may be inconsistent with the New York Constitution. The District states that NYCRR Part 606 comprehensively addresses the use of the reservoir's water and buffer zone lands for the purpose of protecting the reservoir's aesthetic, environmental, and scenic qualities, and that in some respects they exceed the requirements of the standard use and occupancy article. The District adds that while many aspects of the New York regulations are not inconsistent with the standard article, there may be some conflicts, such as a requirement for agency consultation prior to annual reissuance of use permits, or that the District would be required to obtain prior authorization from the Commission before permitting the operation of a commercial marina that can accommodate more than ten watercraft. The District concludes by requesting that in lieu of Article 408, the Commission should substitute an article providing for the District to continue managing the state-owned land in and around the reservoir pursuant to the existing New York Regulations, incorporate these regulations into the license, and require the District to notify the Commission in the event of any changes to those regulations.

57. We decline to exclude the standard uses and occupancy article from the license. The purpose of this article is to establish uniform standards for the uses of project lands and waters that a licensee may permit without obtaining prior Commission authorization. These uses and occupancies do not require prior Commission authorization because, as a class, they do not have significant environmental impacts. The license article does not require a licensee to issue permits for any of the uses and occupancies permitted therein. It simply allows the licensee to issue such permits without prior Commission authorization.

58. For other uses and occupancies, the Commission has made a policy determination that they are potentially of significant impact and therefore require public notice and opportunity for comment prior to Commission review and approval. To the extent that state regulations would permit the licensee to authorize such uses and occupancies

without prior Commission authorization, those regulations must yield to the federal regulations.[59]

59. We have reviewed the provisions of Title 6, Part 606, of the NYCRR and find that they may reasonably be considered a land and water management plan of the kind licensees are ordinarily required to submit for Commission approval. Thus, to the extent these provisions do not conflict with Article 408 or any other provisions of the license, we will approve them as a land and water management plan under the license.[60] It would moreover be impractical and is unnecessary to review all of the uses and occupancies the District has previously permitted. We will therefore grandfather those uses and occupancies existing as of the issuance date of this license.[61]

60. We also note that the District's concern that subsection (d) requires agency consultation and 60 days' prior notice to the Commission for the annual reissuance of any permit authorized by that subsection are unfounded.[62] This subsection requires 60 days

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[59]See California v. FERC, 495 U.S. 490 (1990). The District also suggests that the uses and occupancy article may conflict with Article XIV of the New York Constitution, which provides, in pertinent part:

> The lands of the state . . . constituting the forest preserve as now fixed by law, shall be forever kept as wild forest lands. They shall not be leased, or sold or exchanged, or be taken by any corporation, public or private, nor shall the timber thereon be sold, removed, or destroyed.

The District states that because the entirety of the reservoir and its buffer zone lie within the "forest preserve" as defined by New York law, Article 408 may put the District's management of the shoreline lands in conflict with the state constitution. The District however identifies no specific conflict and we see none in Article 408. Nothing in the article requires the licensee to issue a permit for any use or occupancy. It merely states that the licensee is able to do so without prior Commission authorization under specified circumstances.

[60]See Article 407.

[61]See Ordering Paragraph (E).

[62]This subsection permits the licensee to convey fee title to, easements or rights-of-way across, or leases of project lands for various developmental projects such as: roads and bridges; sewer lines; pipelines that do not discharge into project waters; transmission (continued...)

prior notice to the Commission's Office of Energy Projects, including a description of the project lands to be conveyed, the nature of the proposed use, and the identity of any agencies consulted and approvals required. If the Commission does not, within 45 days of the filing date require the licensee to file an application for prior approval, the licensee may convey the interest at the end of that period. The prior notice requirement applies only to the initial conveyance.

61. The foregoing clarifications should allay the District's concerns, yet the District appears to object to any requirement to obtain prior Commission authorization of future uses and occupancies that are not authorized by this article on the ground that such authorizations would require "a full blown license amendment application."[63] Indeed, all revisions to a license, no matter how small, are by definition amendments, although the procedural and substantive requirements for the amendment application will vary according to the nature of the amendment.[64] An application to amend the Conklingville Dam license would be a non-capacity related amendment.[65] Such applications very rarely involve a broad reexamination of the spectrum of public interest issues involved in a license application, but must only contain "those exhibits that require revision in light of the nature of the proposed amendments."[66] The Commission's regulations encourage licensees who are contemplating such an amendment application to consult with Commission staff prior to filing to determine what supporting information is required in the circumstances of the particular application.[67]

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[62](...continued)
lines; marinas accommodating no more than 10 watercraft at a time; recreational development consistent with a Commission-approved plan; and other uses occupying five acres or less that are 75 feet or more horizontally from the normal surface water elevation, where no more than 50 acres of project lands are conveyed in any calendar year.

[63]District comments on draft license articles, p. 6.

[64]Consumers Energy Company and The Detroit Edison Company, 87 FERC ¶ 61,150 (1999); Citizens Utility Company, 68 FERC ¶ 61,310 at 62,286 (1994).

[65]This assumes the District does not amend the license to install generating capacity additional to that authorized by Erie's license for E.J. West.

[66]18 C.F.R. § 4.201(c).

[67]18 C.F.R. § 4.201(d)(2).

Consultation Requirements

62. AHDC states that not all entities that receive benefits from operation of the Great Sacandaga Lake Project in the form of flood control and flow augmentation ("statutory beneficiaries") are hydroelectric projects and may therefore not have an interest in the full range of issues considered in the settlement discussions. AHDC urges the Commission to include in the license an article requiring the District to consult broadly with all statutory beneficiaries on matters concerning operation of the Project.[68] We decline to do so. All of the statutory beneficiaries have had the opportunity to participate in the license proceeding and settlement discussions. The license includes numerous requirements for consultation based on the Settlement Offer or generally applicable Commission policies. Any significant changes in project operations during the term of the license will require a license amendment application, in which interested entities will have an opportunity to participate in the ordinary course. Under these circumstances, we see no reason to burden the District with an open-ended consultation requirement which no other entity seeks.[69]

COMPREHENSIVE PLANS

63. Section 10(a)(2)(A) of the FPA[70] requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project.[71] Federal and state agencies filed 29 qualifying comprehensive plans, of which we identified three

[68]AHDC Supplemental Comments on Final EIS, filed April 25, 2002, p. 2.

[69]We note as well that nothing in this license relieves the District of any consultation or procedural requirements with respect to the interests of statutory beneficiaries that apply under the New York State Environmental Conservation Law.

[70]16 U.S.C. § 803(a)(2).

[71]Comprehensive plans are defined at 18 CFR 2.19 (2000).

federal and six state comprehensive plans that are applicable.[72] We did not find any inconsistencies.

ECONOMIC BENEFITS OF PROJECT POWER

64. In determining whether a proposed project will be best adapted to a comprehensive plan for developing a waterway for beneficial public purposes, the Commission considers a number of public interest factors, including the economic benefits of project power.

65. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in Mead Corp., [73] the Commission employs an analysis that uses current costs to compare the costs of the project and likely alternative power, with no forecasts concerning potential future inflation, escalation, or deflation beyond the license issuance date. The basis purpose of the Commission's economic analysis is to provide a general estimate of the potential power benefits and the costs of a project, and reasonable alternatives to project power. The estimates helps to support an informed decision

[72](1) Fish and Wildlife and Canadian Wildlife Service, North American Waterfowl Management Plan: A Strategy for Cooperation, U.S. Department of the Interior and Environment Canada, Washington, D.C., 1986; (2) Fish and Wildlife: Fisheries USA: The Recreational Fisheries Policy of the U.S. Fish and Wildlife Service, Washington, D.C., undated; (3) Adirondack Park Agency, Adirondack Park State Land Master Plan, Ray Brook, New York, January 1985; (4) Adirondack Park Agency, New York State wild, scenic, and recreational rivers system field investigation summaries, Albany, New York, 21 reports, undated; (5) New York State Wild, Scenic, and Recreational River System Act, Albany, New York, March 1985; (6) New York State Executive Law, Article 27 - Adirondack Park Agency Act, Albany, New York, July 1, 1981; (7) New York Department of Environmental Conservation, Regulation for Administration and Management of the Wild, Scenic, and Recreational River Systems in New York State excepting Adirondack Park, Albany, New York, March 26, 1986; (8) New York State Parks, Recreation, and Historic Preservation, State Comprehensive Outdoor Recreation Plan, 1994; (9) New York State Department of Environmental Conservation. 1979. Hudson River Basin Water and Related Land Resources; Level B Study Report and Environmental Impact Statement. Albany, New York. September 1979; (10) New York State Office of Parks, Recreation, and Historic Preservation. 1983. People, Resources, Recreation. Albany, New York. March 1983; (11) State of New York Hudson River Regulating District. 1923. General Plan for the Regulation of the Flow of the Hudson River and Certain of its Tributaries. Albany, New York. June 7, 1923.

[73]72 FERC ¶ 61,207 (1995).

concerning what is in the public interest with respect to a proposed license. In making its decision, the Commission considers the project power benefits both with the applicant's proposed mitigation and enhancement measures and with the Commission's modifications and additions to the applicant's proposal.

66. Staff considered the Great Sacandaga Lake and E.J. West Projects together for purposes of this analysis because they comprise a single unit of development. Based on the Settlement Offer, the E.J. West portion of the unit of development would produce an average of 70.2 gigawatt-hours (GWh) of energy annually at an annual cost of about $2.9 million, or 32.65 mills per kilowatt-hour (mills/kWh). This is about $905,000, or 12.89 mills/KWh, less than the current cost of alternative power.

PROJECT SAFETY

67. Conklingville dam is classified as a high hazard potential structure.[74] As such, it is subject to Part 12, Subpart D of the Commission's regulations, which requires licensees to submit periodically to the Commission's Division of Dam Safety and Inspections (D2SI) within the Office of Energy Projects a report prepared by an independent consultant approved by the Commission.[75] A dam stability evaluation in a recent independent consultant's report on Conklingville Dam determined that the existing embankment dam meets the Commission's FERC dam safety criteria. The same report also determined that the probable maximum flood (PMF) at Conklingville Dam would overtop the downstream Stewarts Bridge embankment dam by about 1.2 feet and potentially cause the failure of that dam.[76]

68. D2SI requested Niagara Mohawk, the then-Licensee for E.J. West and Stewarts Bridge, to submit a plan and schedule to address the inadequate spillway capacity at

[74]A high hazard dam is a dam the failure of which might endanger life or cause significant property damage, or which meets the criteria for high hazard potential as defined by the U.S. Army Corps of Engineers. See 18 C.F.R. § 12.31(b).

[75]18 C.F.R. Part D.

[76]It was initially believed that the side channel spillway at Conklingville Dam has unacceptable factors of safety at flood flows. A subsequent independent consultant's report, submitted on February 21, 2002, concluded that the side channel spillway exceeds the Commission's factor of safety values and is stable under all loading conditions. By letter dated April 12, 2002, D2SI concurred with this conclusions and determined that no remedial measures are needed.

Stewarts Bridge. A physical model study of the E. J. West outlet works was performed to document its operational capacities. Based on the study, Niagara Mohawk proposed to raise the side channel spillway crest at E.J. West by two feet, install a spillway crest gate, and revise project operations during extreme floods. This would increase the level of Great Sacandaga Lake 1.4 feet to elevation 788.0 feet during the PMF event, and thereby reduce the PMF outflow from 52,000 cfs to 40,000 cfs. The study determined that this would have negligible impacts to lake front property.

69. D2SI accepted the results of the physical model study and directed the licensee (which by this time had become Erie) to submit a plan and schedule for resolving the inadequate spillway capacity at Stewarts Bridge. As a result, Erie submitted a report including a proposal to post-tension of the E.J. West spillway and raise the retaining walls, and proposed modifications to the E.J. West outlet works. D2SI accepted the findings and recommendations in the report. Erie and the District are negotiating a Memorandum of Understanding (MOU) to implement the recommendations.

70. D2SI has directed that the inadequate spillway capacity problem at Stewarts Bridge Dam must be resolved no later than November 30, 2003.[77] If the District and Erie are not able to conclude an MOU, Erie will be required to make appropriate modifications to the Stewarts Bridge dam. In light of this, Erie has submitted a proposal to re-evaluate the PMF at Conklingville Dam and to do a feasibility study of increasing the flood discharge capacity at the Stewarts Bridge penstock. These proposals are currently under Commission review.

LICENSE TERM

71. Pursuant to FPA Section 6,[78] original license terms shall not exceed 50 years from the date on which the license is issued. Pursuant to FPA Section 15(c)[79] new license terms shall not be less than 30 years nor more than 50 years. Our general policy, applicable to both original and new licenses, is to establish license terms of 30, 40, or 50-

[77]This directive is included in Article 303 of the new license for Stewarts Bridge.

[78]16 U.S.C. § 796.

[79]16 U.S.C. § 808(c).

years for projects with little, moderate, or extensive redevelopment, new construction, new capacity, or environmental mitigation and enhancement measures, respectively.[80]

72. The Settlement Offer contemplates 40-year license terms for all of the licenses. Because the term of the licenses was likely an important element in the negotiations that led to the Settlement Offer, because the applicants propose moderate environmental mitigation and enhancement measures, and because it is appropriate for purposes of a comprehensive cumulative environmental impact analysis when the licenses expire,[81] we are issuing this license for the Great Sacandaga Lake Project for a term of 40 years..

SUMMARY OF FINDINGS

73. The EIS includes background information, analysis of impacts, discussion of enhancement measures, and support for related license articles. The project, with the required measures contained in this license, will not result in any major, long-term adverse environmental impacts.

74. The design of this project is consistent with the engineering standards governing dam safety. The project will be safe if operated and maintained in accordance with the requirements of this license.

75. Based on our review of the agency and public comments, and our evaluation of the environmental and economic effects of the proposed project and its alternatives pursuant to FPA Section 10(a)(1), we find that the Great Sacandaga Lake Project, with the conditions attached thereto, will be best adapted to the comprehensive development of the Sacanadaga and Upper Hudson River Basins for all beneficial public purposes.

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[80]Many original licenses are issued for projects at existing dams. Such licenses seldom encompass the kind of extensive developmental or environmental investment to qualify for a 50-year license.

[81]Our policy is to "coordinate the expiration dates of licenses to the maximum extent possible, to maximize future considerations of cumulative impacts . . . in contemporaneous proceedings at relicensing." Policy Statement on Use of Reserved Authority in Hydropower Licenses to Ameliorate Cumulative Impacts, 59 Fed. Reg. 66,714 (Dec. 28, 1994), FERC Stats. & Regs., Reg. Preambles ¶ 31,010 at 31,219 (Dec. 14, 1994); 18 C.F.R. § 2.23.

The Commission orders:

(A) This license is issued to the Hudson River-Black River Regulating District (Licensee) for a period of 40 years, effective the first day of the month in which the license is issued, to operate and maintain the Great Sacandaga Lake Project No. 12252. This license is subject to the terms and conditions of the Federal Power Act (FPA), which is incorporated by reference as part of this license, and subject to the regulations the Commission issues under the provisions of the FPA.

(B) The project consists of:

(1) The following features: (a) a 25,950-acre Great Sacandaga Lake impoundment with a total gross storage of 681,000 acre-feet; (b) an 1,100-foot-long, 100-foot-high earth fill and concrete dam; (c) an outlet structure including two 8 feet by 18 feet siphon spillways and three 8 feet in diameter Dow valves electric motor and manually operated; (d) a 400-foot-long spillway weir; (e) an 8-inch-thick concrete lined, 20-foot-wide concrete canal delivering water from the reservoir to the forebay; and (f) a control house.

(2) All of the structures, fixtures, equipment or facilities used to operate or maintain the project and located within the project boundary, all portable property that may be employed in connection with the project and located within or outside the project boundary, and all riparian or other rights that are necessary or appropriate in the operation or maintenance of the project.

(3) The exhibits A, F, and G shall be filed according to the requirements of Article 201 and made part of the license upon their approval.

(C) This license is subject to the water quality certification conditions submitted by the New York Department of Environmental Conservation pursuant to Section 401(a)(1) of the Clean Water Act. The water quality certificate is Appendix A to this order.

(D) This license is subject to the articles set forth in Form L-3, 54 FPC 1817 (1975), entitled "Terms and Conditions of License for Constructed Major Project Affecting Navigable Waters of the United States," and the following additional articles:

Article 201. Within 120 days of the date of issuance of the license, the licensee shall file three original sets of Exhibits A, F and G for Commission approval.

Article 202. If the licensee's project is directly benefitted by the construction work of another licensee, a permittee, or the United States on a storage reservoir or other headwater improvement, the licensee shall reimburse the owner of the headwater improvement for those benefits, at such time as they are assessed. The benefits will be assessed in accordance with Subpart B of the Commission's regulations.

Article 301. Within 90 days of completion of construction of the facilities directed by any article of this license (trashracks, fish passage, recreation facilities, etc.), the licensee shall file for Commission approval revised Exhibits F and G as appropriate, to show those project facilities as built.

Article 302. (a) Within one year from the date of issuance of this license, the licensee shall file for Commission approval a plan to consult with the holder(s) of the licenses for South Glens Falls Project No. 5461, Hudson Falls Project No. 5276, Northumberland Project No. 4244, and Waterford Project No. 10648 concerning means for determining whether operation of the Great Sacandaga Lake Project reduces generation at those projects. The licensee shall prepare the plan in consultation with the licensee for said projects and Erie Boulevard Hydropower, L.P.

(b) The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the consulted entities, and specific descriptions of how the consulted entities' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the consulted entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons.

(c) The Commission reserves the right to require changes to the plan. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Article 304. Within six months from the date of issuance of this order, the Licensee shall file, for approval, Exhibits A, F, and G in accordance with Ordering Paragraph (C) of the order issuing this license.

Article 401. *Lake Elevation Reports.* The licensee shall, on a monthly basis, prepare and publish a report of daily Great Sacandaga Lake elevations, inflows to Great Sacandaga Lake, and flows of the Hudson River. The report shall be made available on the Licensee's web site no later than six months from the date of license issuance. The licensee shall notify the New York State Department of Environmental Conservation,

New York Rivers United, licensees of Commission-licensed hydroelectric projects on the Sacandaga and Hudson Rivers, and the Commission if United States Geological Survey gage number 01327750 (Fort Edward gage) fails to operate properly for any period longer than two weeks.

Article 402. *Operating Objectives for Great Sacandaga Lake.* (a) The licensee shall operate the Great Sacandaga Lake to achieve the following objectives while maintaining the goal of controlling floods on the Hudson River:

- Maintaining the lake at the targeted elevations during the late winter consistent with the use of storage for flow augmentation;
- Providing flows in the Hudson River to maintain water quality and fish habitat;
- Targeting higher than current lake elevations to enhance fall lake recreation;
- Minimizing energy losses to affected hydroelectric projects by the aggressive use of storage while maintaining other objectives;
- Enhancing whitewater recreation on the Sacandaga River;
- Providing base flows in the Sacandaga River.

(b) When the licensee is releasing flows from Great Sacandaga Lake, it shall ensure that releases shall allow the licensee for Stewart's Bridge Project No. 2047 to provide a base flow and whitewater flows below Project No. 2047, a minimum average daily flow below the confluence of the Hudson and Sacandaga Rivers, and a base flow below the Feeder Dam Project No. 2554.

(c) Lake elevations of Great Sacandaga Lake shall be constrained in accordance with the following annual guide level curves:

Level Curve 1 -- Elevation 756 feet National Geodetic Vertical Datum (NGVD) From May 1 through Labor Day, then linearly interpolated to 740 feet NGVD on October 15 and maintained at 740 feet NGVD through March 31 of the following year, then linearly interpolated back to 756 feet NGVD on May 1. Level Curve 1 is considered the bottom of available storage and Great Sacandaga Lake may be drawn below this Level Curve 1 only under the circumstances described in this article.

Level Curve 2 -- represents the top of buffer storage; buffer storage between Level Curves 1 and 2 is primarily reserved to augment flows on the Hudson and Sacandaga Rivers for water quality, and to provide whitewater flows in the Sacandaga River.

Level Curve 3 -- represents the annual Guide Curve the licensee shall follow over the course of any given year, subject to balancing inflow to Great Sacandaga Lake with other operating constraints, such as targeted minimum and maximum flows. Level Curve 3 represents the top of conservation storage. Storage between Level Curves 2 and 3 is used to augment flows on the Hudson and Sacandaga Rivers for water quality and power generation, as well as to provide whitewater flows in the Sacandaga River.

Level Curve 4 -- This represents the top of the flood pool and is set at 773 feet NGVD throughout the year. Lake levels shall approach this elevation only in accordance with the licensee's responsibility to utilize the storage capacity of the lake to control flooding on the Hudson River.

The targeted elevation of maximum winter drawdown in Level Curve 3 shall be 748 feet NGVD from the date of license issuance through June 1, 2010, 749 feet NGVD from June 2, 2010 to June 1, 2020, and 750 feet NGVD from June 2, 2020 through the date of license expiration. Figures A through C of the Settlement Offer filed on April 14, 2000, as modified on July 30, 2000 in Project Nos. 2047, et al., which illustrates this transition, and Appendix E thereof, which shows the relationship between lake level curves and U.S. Geological Survey datum for Great Sacandaga Lake elements, are hereby incorporated by reference.

(d) *Winter Drawdowns*. The licensee may operate Great Sacandaga Lake below the targeted elevation for maximum winter drawdown established in subsection (c) above following consultation with the New York State Department of Environmental Conservation (NYSDEC) pursuant to subsection (e) for:

(1) Maintenance, repair, or reconstruction of the Conklingville Dam; for which the licensee shall obtain prior NYSDEC approval; and

(2) Provision of additional storage for flood control purposes, as indicated by the existence of a water equivalent of 8.6 inches at the first March snow survey. The licensee shall consult with the NYSDEC Regional Director for Region 5 in advance of drawing the lake below the target winter elevation.

Prior to drawing the lake down below the targeted elevations for maximum winter drawdown as provided for in subsection (d), the licensee shall: (1) consult with NYSDEC

Region 5 staff, Fulton and Saratoga Counties, and Erie Boulevard Hydropower, L.P. (Erie) or any successor licensee regarding the need for drawdowns for flood protection purposes, describing the need for the drawdown, the approximate drawdown level needed, and the approximate duration of the drawdown. NYSDEC is expected to notify the U.S. Fish and Wildlife Service and Adirondack Park Agency of the licensee's request. The purpose of consultation is to seek a consensus of these parties on the need to draw the lake down below the targeted elevations for maximum winter drawdown. The licensee shall document its consultation, maintain a copy of the documentation on file, and provide copies to Erie and the Counties within 30 days of the conclusion of consultation. If consensus is not achieved, the licensee shall determine the drawdown level in consultation with NYSDEC.

The licensee may draw the lake below the target elevation for winter drawdown without prior notification of NYSDEC in the case of an emergency related to dam safety, protection of human life and property, or rescue activities. The licensee shall notify NYSDEC, Fulton and Saratoga Counties, Erie, and the Commission's New York Regional Office within 24 hours of the commencement of any drawdown and the related emergency. This notification shall be followed within the subsequent 24 hours by submission to NYSDEC of a description of the need for an emergency drawdown and any related emergency actions. The licensee shall maintain documentation of the notification on file, and provide a copy of such documentation to Erie and Fulton and Saratoga Counties within 30 days of the occurrence.

All drawdowns below the targeted elevation for maximum winter drawdown shall be for the minimum duration necessary and the lake elevation shall be restored above the target level as soon as possible after the circumstances requiring the drawdown have passed.

(e) *Flow Augmentation.* The licensee shall allocate sufficient daily water volume releases from Great Sacandaga Lake to meet minimum daily flow requirements on the Hudson River just below the confluence with the Sacandaga River and to help meet the 1,500 cubic foot per second (cfs) instantaneous Hudson River base flow requirement below Feeder Dam Project. No. 2554. For this purpose, the licensee shall use the minimum average daily flows shown on the following table, as adjusted in subsection (g), to help meet these objectives.

Operation of Great Sacandaga Lake to Target Flow Augmentation Needs on the Hudson River Just Below the Confluence with the Sacandaga River	
Great Sacandaga Lake Level Curve	Minimum Average Daily Flow Target on the Hudson River Just Below the Confluence with the Sacandaga River (in cubic feet per second)
From Date of License Issuance through June 1, 2013	
1.00 - 1.19 [a]	1,500 [d]
1.20 - 1.50 [b,c]	1,760
2.50 - 3.00 [c]	2,250
3.50 [c]	3,000
4.00 [c]	4,000
From June 2, 2013 to License Expiration	
1.00 - 1.19 [a]	1,500 [d]
1.20 - 2.50 [c]	1,760
3.00 [c]	2,000
3.50 [c]	3,000
4.00 [c]	4,000

[a] The licensee shall confer with the New York State Department of Environmental Conservation in accordance with subsection (g) below to determine the appropriate flow that shall be provided below Level Curve 1.00.

[b] For Levels above 1.50, the corresponding minimum daily average flow targets on the Hudson River exceed the 1,760 cfs required for water quality. The flow targets are designed to increase hydroelectric operating efficiency at Hudson River hydroelectric projects (*i.e.*, generation).

[c] Flows between specified ranges are to be interpolated.

[d] See exception below in subsection (g).

(f) *Drawdown exceptions to Level Curve 1.* The licensee shall draw Great Sacandaga Lake below Level Curve 1 only in accordance with the exceptions specified below. In all cases, drawdowns below Level Curve 1 will be for the minimum duration necessary and the lake elevation will be restored above Level Curve 1 as soon as possible after the circumstances requiring drawdown have passed. As soon as Great Sacandaga Lake rises above Level 1, Hudson River flows shall be restored per the table in subsection (e) and subsection (g), as applicable. Reasons for drawing below Level Curve 1 may include, but not necessarily be limited to the following:

- Maintenance, repair or reconstruction of the Conklingville Dam;
- Any emergency situations related to dam safety, human life and property, or rescue activities;
- The need for flow augmentation because of critical low flows in the Hudson River which adversely affect water quality conditions (see subsection (h) below for consultation procedures for drawdowns below Level Curve 1 for flow augmentation).

(g) *Drawdown Exceptions during the Champlain Canal Navigation Season.* During the Champlain Canal Navigation Season (approximately May 1 through mid-November), if the elevation of Great Sacandaga Lake drops below Level 1.2 (interpolated between Level Curves 1 and 2) and an interim minimum average daily flow has not been invoked per subsection (h), the minimum average daily flow on the Hudson River just below the confluence with the Sacandaga River shall be increased by the flow being diverted from the Hudson River to the Feeder Canal. The resulting minimum average daily flow shall remain in effect until either Great Sacandaga Lake rises above Level 1.2 or an interim minimum average daily flow is established per subsection (h).

(h) *Consultation on Drawdown Exceptions for Flow Augmentation.* If the elevation of Great Sacandaga Lake reaches Level 1.2 (interpolated between Level Curves 1 and 2) at any time and the lake elevation is continuing to drop, the licensee shall, within 48 hours of the lake reaching Level 1.2, notify the NYSDEC. At any time between Memorial Day and Labor day, the licensee shall also provide general, public notification in the event an emergency drawdown occurs that shall require Great Sacandaga Lake to be drawn below Level 1.2. Notification shall be provided within 48 hours following the commencement of the emergency drawdown. Within seven working days of the lake reaching Level 1.2, the licensee shall consult with NYSDEC, Erie Boulevard Hydropower, LP, the U.S. Fish and Wildlife Service, the Adirondack Part Agency, and Fulton and Saratoga Counties to establish an interim minimum average daily flow that

shall be invoked should the lake actually reach Level 1.0. To the extent possible, the decision on an interim minimum average daily flow shall be determined by consensus among the participants. In the absence of consensus, the licensee will, in consultation with NYSDEC, within the seven day period described above, make the final determination on the minimum average daily flow that shall be invoked should the lake actually reach Level 1.0. As soon as the lake rises above Level 1.0, the minimum average daily flow shall be restored as per the table in subsection (e).

The licensee shall consider the following factors, in consultation with NYSDEC and the consulted entities, in establishing an interim minimum average daily flow:

- The goal of minimizing the extent and duration of lake drawdown below Level Curve 1.
- Water quality conditions on the Hudson River at the time;
- Natural inflow into Great Sacandaga Lake
- Natural flow in the Hudson River above Hadley
- Minimum base flow in the Sacandaga River;
- The quantity of flow being diverted from the Hudson River to the Feeder Canal; and
- Other meteorological circumstances, such as precipitation and temperature.

In the event an interim minimum average daily flow is implemented that may take Great Sacandaga Lake below Level Curve 1, the licensee shall periodically consult with NYSDEC to determine whether changes in conditions warrant raising or lowering the interim minimum average daily flow. Consultation shall continue until Great Sacandaga Lake is restored to above Level 1.2.

(i) *Operation for Fall Recreation.* To facilitate recreation through Columbus Day, the licensee shall regulate Great Sacandaga Lake in accordance with Level Curve 3. A minimum lake elevation of 760 feet NGVD on October 15 is considered a target elevation, and the licensee may operate Great Sacandaga Lake below elevation 760 feet NGVD to:

- Maintain flow augmentation needs on the Hudson River as a daily average of 1,760 cfs below Feeder Dam and an instantaneous flow of no less than 1,500 cfs below Feeder Dam using the target flows shown on the table in subsection (e) and the provisions of subsection (g) above;
- Maintain Sacandaga River Base Flows;
- Maintain the whitewater demand schedule (see subsection (k) below); and
- Address other conditions as requested by NYSDEC.

(j) *Operation for Aggressive Use of Storage.* (1) For the purpose of minimizing energy losses to affected downstream hydroelectric projects, the licensee shall make every reasonable attempt to limit water releases from the Great Sacandaga Lake to not exceed the target maximum flows in the Hudson River below its confluence with the Sacandaga River, based on the relationship shown in the following Tables A and B. The Licensee shall make every reasonable attempt to limit water releases from the Great Sacandaga Lake below E.J. West, as shown in Table C.

Table A
Targeted Maximum Hudson River Flow Below the Confluence with the Sacandaga River

Great Sacandaga Lake Elevation (feet NGVD)	Targeted Maximum Flow (cfs)
735.00 - 755.00	6,000
755.01 - 769.00	8,000
769.99	10,000
770.00	20,000
773.00	26,000
776.00 and above	32,000

Note: For those GSL elevations not shown above, the targeted maximum allowable flow should be linearly interpolated.

Table B Targeted Maximum Hudson River Flow Below the Confluence with the Sacandaga River	
Great Sacandaga Lake Level	Targeted Maximum Flow (cfs)
1.00-1.19	4,000
1.20	6,200
1.50	6,500
2.50-3.00	7,500
3.50	8,500
4.00	28,500
Note: For those GSL elevations not shown above, the targeted maximum allowable flow should be linearly interpolated.	

Table C Targeted Maximum Flows Below E.J. West [1]	
Great Sacandaga Lake Elevation (feet NGVD)	Maximum Average Daily Flow Target below E.J. West (cfs)
735.00 - 745.00	2,000
745.01 - 765.00	4,000
768.00	5,400
771.00	8,000
772.00	10,000
774.00	14,000
777.00	25,800
Note: For those GSL elevations not shown above, the targeted maximum allowable flow should be linearly interpolated.	

[1] Tables A and B and the table in subsection (e) on flow augmentation take precedence over Table C.

(2) In cases where exceedance of the target maximum daily average flow targets shown in Tables A, B, or C, respectively, is needed, the Licensee shall restore the respective river to below the applicable maximum average daily flow target as soon as possible after circumstances requiring the exceedance have passed. Reasons for exceeding the maximum flows shown in Tables A, B, or C include, but are not limited to, the following:

- o Maintenance, repair, or reconstruction of the Conklingville Dam;
- o Observation of lake elevations rising above elevation 771 feet NGVD and anticipation of unusual meteorological conditions that may result in flooding around Great Sacandaga Lake above Level Curve 4;
- o Any emergency situations related to dam safety, human life and property, or rescue activities.

(3) The following notification and consultation provisions for exceedance of target maximum flows in the Hudson River shall be undertaken as circumstances warrant:

- o The licensee shall consult with appropriate NYSDEC Region 5 staff, Fulton and Saratoga Counties, and downstream hydroelectric project owners and municipalities regarding the need to exceed the maximum flows shown on the table in subsection (j)(1) above. Consultation shall include the need for the exceedance, estimation of the consequences to downstream properties and hydroelectric facilities as a result of the exceedance, and an estimation of the approximate duration of the exceedance. The licensee shall maintain on file documentation of the consultation, and copies shall be provided to NYSDEC, Fulton and Saratoga Counties, Erie, and affected downstream entities within 30 days following the end of the exceedance.
- o Consultation with NYSDEC, Fulton and Saratoga Counties, and downstream hydroelectric project owners and municipalities shall not be deemed necessary where consultation would impair the licensee's ability to address immediate dangers relating to dam safety, human life and property, or rescue activities. However, the licensee shall notify NYSDEC, Fulton and Saratoga Counties, and affected downstream entities as soon as possible of the emergency situation and its expected duration. In such emergency

circumstances, the licensee shall prepare a report discussing the rationale and circumstances for exceeding the target flows. The report shall be maintained on file and copies shall be provided to NYSDEC, Fulton and Saratoga Counties, Erie, affected downstream hydroelectric project owners and municipalities, the Commission within 30 days of the occurrence. Two copies shall be sent to the Commission; one to the New York Regional Office, and the other to the Director, Division of Hydropower Compliance and Administration.

(k) *Operation for Whitewater Recreation.* For the purpose of enhancing whitewater recreation, the licensee shall operate the Great Sacandaga Lake to provide the daily volume of water, if available, needed to sustain the whitewater demand flow in the Sacandaga River below Stewarts Bridge dam as provided for in the license for the Stewarts Bridge Project No. 2047. The whitewater demand schedule is shown on the following table.

Sacandaga River Whitewater Demand Schedule (as established in the license for Stewarts Bridge Project No. 2047, 101 FERC ¶ _____)					
June 1 - June 22 Weekends Only		June 23 - September 8 Daily		September 9 - September 23 Weekends Only	
GSL Level and Elevations	WW Hrs.	GSL Level and Elevations	WW Hrs.	GSL Level and Elevations	WW Hrs.
1.00 - 1.19	None	1.00 - 1.19	None	1.00 - 1.19	None
1.20	4 hours	1.20	5 hours	1.20	3 hours
2.00	5 hours	2.00	7 hours	2.35	3 hours
2.75 and above	6 hours	2.35 and above	8 hours	3.00 and above	6 hours

The licensee shall have the right to change flow releases for whitewater recreation under emergency circumstances.

(l) *Operation for Base Flows in the Sacandaga River.* The licensee shall provide sufficient flow volumes to facilitate the release of an instantaneous base flow, beginning in 2013, to the Sacandaga River below the Stewarts Bridge Project No. 2047 as described

in Article 405 of the license for that project. In the event neither of the turbine/generator units at the E.J. West Project No. 2318 are operating, the licensee shall cooperate with the licensee for Project No. 2318 to ensure that base flows are maintained in the Sacandaga River without violating impoundment fluctuation restrictions in the license for Project No. 2047. The base flow schedule is shown on the following table:

Base Flow Schedule for Stewarts Bridge Project No. 2047 (as established in the license for Stewarts Bridge Project No. 2047, 101 FERC ¶ _____)	
Great Sacandaga Lake Elevation	**Base Flow (cfs)**
01/01/13 to 06/01/20	
Greater than or equal to elevation 752	350 (349-351)
Between elevation 749 and 752	300 (299-301)
Less than or equal to elevation 749	300 (299-301) cfs or inflow (n.1), whichever is less
06/02/20 to License Expiration	
Greater than or equal to elevation 752	350 (349-351)
Between elevation 750 and 752	300 (299-301)
Less than or equal to elevation 750	300 (299-300) cfs or inflow (n.1), whichever is less
Other Conditions: If the Hudson River flow below the Sacandaga River confluence is greater than 25,000 cfs, then the base flow that must be achieved by release is 200 cfs.	
n.1. Inflow is measured at the Hope USGS gage and adjusted for drainage area only. The drainage area factor is equivalent to the drainage area at Conklingville Dam outlet (1,044 square miles) divided by the drainage area at the Hope gage (491 square miles) or 2.13. Inflow shall not be adjusted for lake evaporation.	

Article 403. *Erosion and Slope Stability.* Within one year from the date of issuance of this license, the licensee shall file for Commission approval a plan to monitor erosion and slope stability and to identify, minimize, and remediate any erosion or sedimentation resulting from project construction and operation.

The plan shall be based on geological, soil, and groundwater conditions at the Project site and on project design and operation, and shall include, at a minimum, the

following items: (1) a description of the actual site conditions; (2) procedures for the licensee's monitoring of shoreline erosion throughout the term of the license, including the frequency of monitoring; (3) the method to be used to determine the extent to which observed erosion is related to project operations; (4) measures proposed to control project-induced erosion, to prevent slope instability, and to minimize the quantity of sediment resulting from project construction and operation; (5) a description of any measures proposed to be taken by the licensee to stabilize the shoreline at locations where erosion is determined not to be caused by project operations; (6) procedures to prevent or minimize harm to archeological sites at or near the shoreline; (7) detailed descriptions, functional design drawings, and specific topographical locations of all control measures; and (8) a specific implementation schedule and details for erosion monitoring and measures to control erosion.

The licensee shall prepare the plan after consultation with the New York State Department of Environmental Conservation and Saratoga and Fulton Counties, New York.

The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the consulted entities, and specific descriptions of how the consulted entities' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the consulted entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on geological, soil, and groundwater conditions at the site.

The Commission reserves the right to require changes to the plan. No land-disturbing or land-clearing activities shall begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Article 404. *Development of Cultural Resources Management Plan.* (a) Within one year of the date of issuance of this license, the Licensee shall file for Commission approval a Cultural Resources Management Plan (CRMP) specifying how Historic Properties shall be managed in the Great Sacandaga Lake Project's area of potential effect, as defined in 36 C.F.R. Section 800.2(c), during the term of the license. The Licensee shall prepare the CRMP in consultation with the New York State Historic Preservation Officer (SHPO), Erie Boulevard Hydropower L.L.C., Indian Tribes, including the St. Regis Mohawk Tribe, and interested persons, as defined in 36 C.F.R. § 800.1(c)(2). The Licensee shall seek the SHPO's concurrence in the CRMP.

The Licensee shall ensure that the CRMP is consistent with "Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines" (48 Fed. Reg. 44,716-740 (September 29, 1983) (Secretary's Standards), and shall take the following standards and documents into account: (1) U.S. Department of the Interior, 1990, "The Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings"; (2) U.S. Department of the Interior, 1991, National Register Bulletin 15, "How to Apply the National Register Criteria for Evaluation"; (3) U.S. Department of the Interior, 1991, National Register Bulletin 16A, "How to Complete the National Register Registration Form"; (4) U.S. Department of the Interior, 1991, National Register Bulletin 16B, "How to Complete the National Register Multiple Property Documentation Form"; (5) U.S. Department of the Interior, 1993, National Register Bulletin 36, "Guidelines for Evaluating and Registering Historical Archaeological Sites and Districts"; (6) Duncan Hay, 1991, Hydroelectric Development in the United States 1880-1946, Edison Electric Institute, Washington, D.C. (two volumes); (7) Duncan Hay, 1991, A History of Hydroelectric Power in New York State, prepared for Niagara Mohawk Power Corporation, by the New York State Museum, Albany, New York; and (8) Duncan Hay, 1990, New York State Hydroelectric Inventory, prepared for Niagara Mohawk Power Corporation, by the New York State Museum. Albany, New York (13 volumes). The CRMP shall be developed by or under the direct supervision of a person or persons who meet, at a minimum, the professional qualifications standards for architectural history and archeology in the Secretary's Standards (48 Fed. Reg. 44738-739).

(b) *CRMP Contents.* The CRMP shall, at a minimum, include principles and procedures to address the following: (1) completion, if necessary, of identification of Historic Properties within the Projects' areas of potential effect; (2) continued use and maintenance of Historic Properties; (3) protection of Historic Properties threatened by shoreline erosion, other project-related ground-disturbing activities, and vandalism; (4) mitigation of unavoidable adverse effects on Historic Properties; (5) treatment and disposition of any human remains that may be discovered, taking into account any applicable state laws and the Advisory Council on Historic Preservation's "Policy Statement Regarding Treatment of Human Remains and Grave Goods" (September 27, 1988, Gallup, NM); (6) compliance with the Native American Graves Protection and Repatriation Act (25 U.S.C. Section 3001), if Tribal or Federal lands are within any of the project areas; (7) discovery of previously unidentified Historic Properties during project operations; (8) public interpretation of the historic and archeological values of the Project; and (9) coordination with the SHPO and interested persons during implementation of the CRMP.

(c) *CRMP Review and Implementation.* The Licensee shall submit the CRMP, along with documentation of the views of the SHPO and interested persons, to the

Commission for review and approval. If the SHPO has concurred in the CRMP, and the Commission determines that the CRMP is adequate, the Commission shall forward a copy of the CRMP to the Advisory Council on Historic Preservation (Advisory Council), which shall have 30 days to review the CRMP. If the Advisory Council does not object to the CRMP, the Commission shall proceed to ensure that the Licensee implements the CRMP.

If the Advisory Council objects to the CRMP, the Commission shall consult with the Advisory Council in an effort to reach agreement on the CRMP. If agreement cannot be reached, the Commission shall request that the Advisory Council's comments as follows: If the Commission determines that the objection cannot be resolved, the Commission shall forward all documentation relevant to the dispute to the Advisory Council and request that the Advisory Council comment. Within 30 days after receiving all pertinent documentation, the Advisory Council shall either: (1) provide the Commission with recommendations, which the Commission shall take into account in reaching a final decision regarding the dispute; or (2) notify the Commission that it shall comment pursuant to 38 C.F.R. § 800.6(b) and Section 110(1) of the National Historic Preservation Act, and proceed to comment.

If the SHPO has not concurred in the CRMP, or the Commission finds the CRMP inadequate, the Commission shall consult with the Licensee and the SHPO to seek agreement on the CRMP. If concurrence is not reached within 30 days, the Commission shall request that the Advisory Council enter into consultation to seek agreement on the CRMP. If agreement is reached on the CRMP, the Commission shall forward a copy of the revised CRMP to the Advisory Council for review as follows: If the SHPO has concurred in the CRMP, and the Commission determines that the CRMP is adequate, the Commission shall forward a copy of the CRMP to the Advisory Council, which shall have 30 days to review the CRMP. If the Advisory Council does not object to the CRMP, the Commission shall proceed to ensure that the Licensee implements the CRMP. If the Advisory Council objects to the CRMP, the Commission shall consult with the Advisory Council in an effort to reach agreement on the CRMP. If agreement cannot be reached, the Commission shall request that the Advisory Council comment pursuant to the procedures stated in the previous paragraph.

If agreement on the CRMP cannot be reached among the Commission, the SHPO, the Licensee, and the Advisory Council, the Commission or the SHPO shall request that the Advisory Council comment pursuant to the procedures set forth two paragraphs prior to this paragraph, or the Advisory Council may terminate consultation and comment sua sponte.

(d) *Annual Report*. The Licensee will, on every anniversary of the license issuing following Commission approval of the CRMP, file a report with the Commission and the SHPO of activities conducted under the implemented CRMP. This obligation shall terminate in the year when all activities conducted under the implemented CRMP have been completed.

(e) *Interim Treatment of Historic Properties*. Pending review and implementation of the CRMP the Licensee shall consult with the SHPO and interested persons regarding the effect of the following: (1) all activities, including recreational developments, that require ground-disturbance; (2) new construction, demolition, or rehabilitation of project facilities; and (3) active erosion of archeological sites due to project operations. Consultation shall be in accordance with 36 C.F.R. §§ 800.4 and 800.5(a)-(c), with the Licensee acting as the Agency Official. If the Licensee and the SHPO agree that the activity shall not adversely effect Historic Properties, the Licensee may proceed in accordance with any agreed-upon treatment measures or conditions.

If either the Licensee or the SHPO determines that the activity shall have an adverse effect, and the affected property is a National Historic Landmark, the Licensee shall submit the matter to the Commission, which shall initiate the process set forth at 36 C.F.R.§ 800.5(e). Otherwise, the Licensee and the SHPO shall consult to develop a strategy for avoiding or mitigating such adverse effects. If the Licensee and the SHPO can reach agreement, the Licensee shall implement the agreed-upon strategy. If they disagree, the Licensee shall submit the matter to the Commission, which shall initiate the process set forth at 36 C.F.R. § 800.5(e).

Article 405. Authority is reserved by the Commission to require the licensee to construct, operate, and maintain, or to provide for construction, operation, and maintenance of, such fish passage facilities as may be prescribed by the Secretary of the Interior under Section 18 of the Federal Power Act.

Article 406. *Procedural Requirements*. The licensee shall comply with the procedural requirements found in Section 2.5 (Dispute Resolution), 2.6 (Reopeners), and 2.7 (License Amendments) of the Settlement Offer filed April 12, 2000, as amended July 30, 2001, and approved at 101 FERC ¶ _____ (2002).

Article 407. (a) In accordance with the provisions of this article, the licensee shall have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the

purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee shall also have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of and ensure compliance with the covenants of the instrument of conveyance for, any interests that it has conveyed, under this article.

If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the licensee shall take any lawful action necessary to correct the violation. For a permitted use and occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The type of use and occupancy of project lands and water for which the licensee may grant permission without prior Commission approval are:

(1) landscape plantings;

(2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 watercraft at a time and where said facility is intended to serve single family type dwellings;

(3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and

(4) food plots and other wildlife enhancement.

To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The licensee shall also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee shall:

(1) inspect the site of the proposed construction;

(2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site; and

(3) determine that the proposed construction is needed and would not change the basic contour of the reservoir shoreline.

To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of the standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or right-of-way across, or leases of, project lands for:

(1) replacement, expansion, realignment, or maintenance of bridges or roads where all necessary state and federal approvals have been obtained;

(2) storm drains and water mains;

(3) sewers that do not discharge into project waters;

(4) minor access roads;

(5) telephone, gas, and electric utility distribution lines;

(6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary;

(7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69 kV or less); and

(8) water intake or pumping facilities that do not extract more than one million gallons per day from a project reservoir.

No later than January 31 of each year, the licensee shall file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for:

(1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained;

(2) sewer or effluent lines that discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained;

(3) other pipelines that cross project lands or waters but do not discharge into project waters;

(4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained.

(5) private or public marines that can accommodate no more than 10 watercraft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina;

(6) recreational development consistent with an approved Exhibit R or approved report on recreational resources of an Exhibit E; and

(7) other uses, if; (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year.

At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must submit a letter to the Director, Office of Energy Projects, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted and any federal or state approvals required for the proposed use. Unless the Director, within 45 days from the filing date requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee shall consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved Exhibit R or approved report on recreational resources of an Exhibit E; or, if the project does not have an approved Exhibit R or approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; (ii) the grantee shall take all reasonable precautions to ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands shall occur in a manner that shall protect the scenic, recreational, and environmental values of the project, and (iii) the grantee shall not unduly restrict public access to project waters.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be change to exclude land conveyed under this article only upon approval of revised Exhibit G drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article shall be excluded the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposal to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised Exhibit G drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article shall not apply to any part of the public lands and reservations of the United States included within the project boundary.

Article 408. The provisions of Title 6, Part 606 of the New York Code or Rules and Regulations are hereby incorporated into this license as the licensee's land and water management plan to the extent they do not conflict with any provision of this license. The licensee shall notify the Commission of any change in these regulations.

(E) The uses and occupancies of Great Sacandaga Lake existing as of the date of issuance of this license and permitted by the licensee are hereby approved by the Commission.

(F) The licensee shall serve copies of any Commission filing required by this order on any entity specified in this order to be consulted on matters related to that filing. Proof of service on these entities must accompany the filing with the Commission.

(G) This order is final unless a request for rehearing is filed within 30 days from the date of its issuance, as provided in Section 313(a) of the Federal Power Act. The filing of a request for rehearing does not operate as a stay of the effective date of this license or of any other date specified in this order, except as specifically ordered by the Commission. The licensee's failure to file a request for rehearing shall constitute acceptance of this license.

By the Commission.

(S E A L)

Linwood A. Watson, Jr.,
Deputy Secretary.

Appendix A

Great Sacandaga Lake Project No. 12252
New York Water Quality Certification Conditions

A. ADMINISTRATION

1. This certificate includes and incorporates the **Settlement** [filed April 12, 2000, including Technical Corrections filed on July 30 ,2000].

2. Inspections: The project, including relevant records, is subject to inspection at reasonable hours and intervals, upon reasonable notice to the certificate holder, by an authorized representative of the Department [of Environmental Conservation] to determine whether the applicant is complying with this certification. A copy of this certification, including the **Settlement** as well as the FERC license and all pertinent maps, drawings and special conditions must be available for inspection by the Department staff during such inspections at the project.

3. Emergencies: With the exception of emergency provisions described in the Settlement (see subsection 2.8), the following procedures shall apply to activities conducted at the Project in response to an emergency:

Prior to commencement of emergency activities, the NYS DEC must be notified and must determine whether to grant approval. If circumstances require that emergency activities be taken immediately such that prior noitice to the NYS DEC is not possible, then the NYS DEC must be notified by the certificate holder(s) within 24 hours of commencement of emergency activities. In either case, notification must be made by certified mail, telegram, or other written form of communication, including fax and electronic mail. This notification must be followed within 3 weeks by submission of the following information:

(1) A description of the action;
(2) Location map and plan of the proposed action;
(3) Reasons why the situation is an emergency.

All notifications, requests for emergency authorizations and information submitted to support such requests shall be sent to the Regional Permit Administrator at:

New York State Department of Environmental Conservation

Regional Permit Administrator
232 Hudson Street, P.O. Box 220
Warrensburg, N.Y. 12885

4. Modifications and Revocations: The DEC reserves the right to modify or revoke this certificate when:

1) the scope of the authorized activity is exceeded or a violation of any condition of this certificate or provisions of the [Environmental Conservation Law] and pertinent regulations is found;
2) the certificate was obtained by misrepresentation or failure to disclose relevant facts;
3) new material information is discovered;
4) environmental conditions, relevant technology, or applicable law or regulation have materially changed since the certificate was issued.

B. OPERATING CONDITIONS

5. Project Operation: Project Operation shall be in accordance with the **Settlement**, in particular, section 3.0.

6. Project Monitoring: Flow and water level monitoring shall be conducted in accordance with the **Settlement**, in particular, Section 2.13.

C. PROJECT MAINTENANCE AND CONSTRUCTION

Note: All matters pertaining to "Project Maintenance and Construction" shall be addressed to:

Regional Permit Administrator
New York State Department of Environmental Conservation
232 Hudson Street, P.O. Box 220
Warrensburg, N.Y. 12885

7. Maintenance Dredging: The certificate holder shall install and maintain appropriate turbidity control structures while conducting any maintenance dredging activities in the Great Sacandaga Lake and contiguous canal or river.

8. Sediment Analysis and Disposal: The certificate holder must sample any sediments to be disturbed or removed from the project waters and test them for

contaminants. Sampling and testing shall be accomplished according to a protocol submitted to and approved by the Department prior to sampling.

9. Erosion and Sediment Control: The certificate holder shall ensure that the following erosion and sediment control measures, at minimum, are adhered to during routine maintenance and construction that may result in sediments and/or contaminants entering Great Sacandaga Lake or the waters immediately downstream of Conklingville Dam.

   a. Isolate in-stream work from the flow of water and prevent discolored (turbid) discharges and sediments caused by excavation, dewatering and construction activities from entering the waters of Great Sacandaga Lake and the waters immediately downstream of Conklingville Dam.

   b. Prohibit heavy construction equipment from operating below the mean high water level of Great Sacandaga Lake and the waters immediately downstream of Conklingville Dam until the work area is protected by an appropriate turbidity control structure.

   c. Minimize soil disturbance, grade so as to prevent or minimize erosion and provide temporary and permanent stabilization of all disturbed areas and stockpiles to minimize the potential for erosion and subsequent sedimentation within Great Sacandaga Lake and the waters immediately downstream of Conklingville Dam.

   d. Protect all waters from contamination by deleterious materials such as wet concrete, gasoline, solvents, epoxy resins or other materials used in construction, maintenance and operations of the Project.

   e. Install and maintain erosion control structures on the down slope of all disturbed areas to prevent eroded material from entering Great Sacandaga Lake and/or the waters immediately downstream of Conklingville Dam. Erosion control structures must be installed before commencing any activities involving soil disturbance and all erosion control structures must be maintained in a fully functional condition.

   f. Ensure complete removal of all dredged/excavated material and construction debris from the bed and banks of Great Sacandaga Lake and the waters immediately downstream of Conklingville Dam.

g. Ensure that all temporary fill and other materials placed in the waters of Great Sacandaga Lake or the waters immediately downstream of Conklingville Dam are completely removed, immediately upon completion of construction, unless otherwise directed by the Department.

10. Placement of cofferdams, construction of temporary access roads or ramps, or other temporary structures which encroach upon the bed or banks of Great Sacandaga Lake or the waters immediately downstream of Conklingville Dam. The design of all such structures must be approved by the Department prior to installation.

11. Construction Drawdowns: Whenever construction and/or maintenance activities require lowering the water level of the Project's impoundments below normal operating limits, the water level shall not be drawn down more than 1 foot per hour. During refill, the water level of the impoundment shall not be allowed to rise more than one foot per hour.

12. River Flow: During any period of maintenance and/or construction activity, the certificate holder shall continuously maintain adequate flows immediately downstream of work sites as provided for in this certificate.

13. Turbidity Monitoring: During maintenance or construction-related activities in or near Great Sacandaga Lake or the waters immediately downstream of Conklingville Dam, the certificate holder will monitor the turbidity of project waters. The certificate holder specifically agrees that if, at any time, turbidity measurements exceed background, all related construction on the project will cease until turbidity is returned to a pre-construction condition.

14. Notifications: The Regional Permit Administrator must be notified in writing at least two weeks prior to commencing any work performed under the authority of this certificate.

KLEINSCHMIDT ASSOCIATES

NIAGARA MOHAWK POWER CORPORATION

E.J. WEST HYDRO DEVELOPMENT
Stage/discharge relationships

R.1334

February 1998

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1.0 INTRODUCTION

The hydraulic model study was carried out to develop an accurate discharge rating curve for the E.J. West development for use in evaluating the upstream and downstream effects, up to and including the Probable Maximum Flood, on E.J. West and points downstream.

The model was also used to verify the general hydraulics of the facility and identify any potential operating problems with the Dow valves or siphons that may occur up to and during the passage of the PMF.

2.0 THE MODEL

2.1 Model Limits and Scales

The model was built to a scale of 1/50 and constructed from a point approximately 1400 ft. downstream of the main dam axis to 1200 ft. upstream (Figure 1 and Photo 1). The length of reach upstream was required to ensure that the approach flow conditions to the intake canal were well established and that the head losses at the canal entry were correctly reproduced. The length of downstream reach was likewise selected such that the flow was uniform at the model outlet.

2.2 Model Construction

The upstream part of the model from the main dam axis was constructed within an existing waterproofed wooden enclosure while the downstream reach was contained within concrete block perimeter walls, laid directly on the laboratory floor slab, and waterproofed on the inside.

Selected riverbed contours were drawn on the floor within the walls using projection slides taken directly off the bathymetric and topographic charts. Steel rods were bent to take the individual contour line shapes, then carefully adjusted to the correct level on top of vertical steel rods by means of a laser level. When the contours over the whole model area had been levelled into position and checked, the model was filled with pea gravel which was then carefully vibrated into place, and screeded flush with the rods. The final step in completing the model topography was to consolidate the surface of the gravel with successive applications of a liquid cement slurry. The resulting model surface had a roughness that gave the correct headlosses at scale.

All the concrete structures associated with the Development were made up of clear acrylic plexiglas. The internal and external geometry of the Dow valve and

siphon structures were faithfully reproduced. At the powerhouse, only the intake and outlet cross-sections were modelled to ensure correct simulation of the entry and exit velocities. Inside the structure, an articulated sharp crested weir equipped with a hoist and vernier gauge was installed at the turbine axes to maintain water level control.

Flows to the model were provided by one of laboratory's permanent pumping stations and measured with two separate v-notch weirs. Entry to the model was via a perforated distribution header located at the upstream end of the model. An overflow, consisting of a circular standpipe equipped with a calibrated orifice and control valve at its outlet, was installed at the upstream end of the model. The inlet to the standpipe consisted of a series of push-fit sections that could be added or removed as required. In this manner, the inlet of the overflow could be easily set to a predetermined reservoir elevation, allowing the model to quickly stabilize. The overflow discharge was measured with the orifice plate and controlled by the valve.

At the downstream end of the model an adjustable flap gate was installed so as to maintain and regulate the tailwater level. The flow over the flap gate discharged into a return channel leading to the laboratory sump.

2.3 *Water Level Measurement*

Steady state flow water levels were measured at nine locations in the forebay and tailrace by means of manually read point gauges accurate to 0.1 mm, corresponding to 5 mm (1/4") in the prototype (Figure 1). Nine pressure taps were installed in the right (inboard) siphon (Figure 2). Later on in the study, two taps were added to the outboard siphon at S1 and S3. Transient water level movements and surface turbulence that were expected to occur during priming and depriming of the siphons were followed using high precision capacitance probes linked to a computer.

3.0 TESTING

3.1 Testing Procedures

A typical test consisted of the following steps for a given flow condition;

- estimate the reservoir elevation and discharge from the calculated discharge rating curve
- set the crest of the overflow slightly below the required reservoir elevation
- introduce a discharge into the model 10% higher than the estimated value
- allow model to stabilize with some flow going over the overflow
- calculate the flow going to the intake canal (Q total - Q overflow)
- adjust downstream water level to match tailwater stage/discharge curve; allow model to stabilize
- measure water surface profile through to reservoir forebay .

3.2 Testing Program

The testing program followed the Status Quo Simulation No. 1 tests given below;

TABLE 1 - STATUS QUO SIMULATION NO. 1 TESTING PROGRAM

RUN	CALC. FLOW	RELEASE FACILITIES	WATER SURFACE ELEVATION
1	5,400	Powerhouse	768 @ forebay (P6)
2		Powerhouse, 1 Dow valve	768 @ forebay (P6)
3		Powerhouse, 2 Dow valve	771 @ forebay (P6)
4		Powerhouse, 3 Dow valve	771 @ forebay (P6)
5		Powerhouse, 3 Dow valves, spillway	773 @ forebay (P6)
6		Powerhouse, 3 Dow valves, siphons, spillway	Priming range
7	41,000	Powerhouse, 3 Dow valves, siphons, spillway	
8	41,000	3 Dow valves, siphons, spillway	
9		3 Dow valves, siphons, spillway	775 @ reservoir (P1)
10		3 Dow valves, siphons, spillway	780 @ reservoir (P1)
11		3 Dow valves, siphons, spillway	785 @ reservoir (P1)
12		3 Dow valves, siphons, spillway	790 @ reservoir (P1)

3.3 *Powerhouse Calibration*

First tests were made to calibrate the powerhouse for a flow of 5,400 cfs. This was achieved by introducing a discharge of 5,400 cfs. into the model and then setting the crest elevation of the weir to give a reading of approximately 768 ft. at the forebay (Gauge P6). The vernier reading on the articulated weir hoist was noted and then the same procedure followed for four other elevations up to 770 ft. A graph was then drawn of water surface elevation vs vernier reading and this relationship used to establish the powerhouse discharge over the range of expected conditions.

3.4 *Status Quo Simulation No. 1 Tests*

Status Quo Simulation No. 1 tests were carried out following the procedures described in Section 3.1.

For each run made, the flow conditions from the forebay through to the powerhouse, Dow valves and siphons were followed using red dye tracer, and videos and still photographs taken. Special attention was paid to any vortex generating tendencies upstream of the Dow valves. These observations, together with the headloss measurements through the intake canal to the reservoir elevations upstream, allowed a rating curve to be developed as well as a complete evaluation of the hydraulic conditions to be made.

3.4.1 *Rating Curves*

Rating curves developed at each of the pressure taps, located in the upstream part of the model for the Status Quo Simulation No 1 tests, are presented in Figure 3 (Powerhouse shut-off).

3.4.2 *General Flow Conditions and Observations*

Run #1 - Forebay elevation 768 ft.; Powerhouse = 5,400 ft^3/s

Flows at the canal entry were well aligned and uniform right through to the bend just upstream of the forebay. In the forebay itself, a large back eddy was observed in front of the right side turbine intake, generated by the bend just upstream (Photo 2). The turbine intakes were unevenly supplied due to the skewed flow. The flow from the bottom of the canal supplied the right side intakes while the flow from the surface supplied the left ones.

Run #2 - Forebay elevation 768 ft.; Powerhouse, 1 Dow valve; Q = 8,000 ft^3/s

Flows at the entry were essentially the same as described in Run #1. Along the bottom of the canal at the junction with the offtake to the Dow valves and siphons, the flow turned smoothly towards the open Dow valve. Above the Dow valve entry, upwelling was observed as a portion of the flow collided with the face of the siphon structure and was deflected upward. Conditions at the powerhouse were unchanged.

Out in front of the control house structure, swirling was observed but no real vortex. However, a test carried out during the visit of NIAMO and FERC representatives for the same conditions, but with the forebay elevation at 765 ft., showed that a permanent vortex was present above the Dow valve stop log recess. When the stop log recess was blocked at the top, an intermittent vortex formed out in front of the control house.

Run #3 - Forebay elevation 771 ft.; Powerhouse, 2 Dow valves; Q = 12,000 ft^3/s

General flow conditions were similar to Run #2 except that a large air entraining vortex was found to form upstream of the control house. The vortex was strong enough to draw down 1/2"x1/2"x1/16" polyethylene plates, equivalent to 2'x2'x3" ice pans in the prototype (Photo 3). Conditions at the powerhouse were unchanged.

Runs #4 & 5 - Forebay elevation 773 ft.; Powerhouse, 3 Dow valves, spillway; Q = 20,000 ft^3/s

A marked increase in headloss at the canal entry was observed with a distinct drawdown of flow upstream of the bridge. Turbulence increased upstream of the control house and the big vortex was still present. At elevation 773 ft., flow over the side channel spillway was relatively uniform and flows to the powerhouse intakes were more evenly distributed because drawoff to the spillway eliminated the back eddy in the forebay.

Runs #6 - #12 - Siphon priming; 3 Dow valves, siphon(s), spillway; Q = 35,000 - 50,000 ft^3/s

The flow to the model was gradually increased and observations made of the two siphons. These tests were carried out with the powerhouse shut down.

Flows to the control house were skewed with a large back eddy out in front of the right (inboard) siphon. The flow was essentially travelling across the siphon intake, severely reducing its flow capacity. The flow supply to the the left (outboard) siphon was considerably better.

As the discharge and upstream water level was increased, the flow through the left siphon began to break away from the end of the downstream chute. At elevation 774 ft., even with the upstream vents sealed off, the jet coming off the downstream chute was insufficient to plug the siphon outlet. The left (outboard) siphon finally primed at reservoir elevation 781 ft. (776 ft. at the control house), resulting in a general drop in water level of about 6" but no evidence of surging in the intake canal or wave action (Figure 3). Flow through the siphon under primed conditions was poor, with a large breakaway zone along the downstream chute (Photo 4) that severely restricted the discharge. However, the combination of the flow to the siphon and substantial turbulence destroyed the vortex out front.

The right (inboard) siphon eventually primed at reservoir elevation 784.5 ft. (776.5 ft. at the control house), resulting in an additional drop in water level but again with no noticable surge or wave action. Flow through the siphon was rough with considerable air being entrained due to the turbulence upstream of the control house; water level fluctuations occasionally exposed the vents allowing air to enter the siphon.

With the inboard siphon primed, flows to the siphon structure were more uniform and there was a marked improvement in flow conditions in the outboard siphon. The breakaway zone disappeared and both siphons ran full.

The inflow was gradually increased until the reservoir reached the current P.M.F. level of 785.65 ft. Total discharge at this elevation was determined to be 49,689 cfs. (Photo 5). Under these conditions, there was a drop in level in the order of 10 ft. at the canal entry (Photo 6). Flow was extremely turbulent in the canal and especially so in front of the control house (Photo 7). Flow separation around the bridge piers leading to the logway was pronounced because the piers were skew to the direction of flow. Below the bend in the spillway channel, the velocity was so high that a return eddy carried flow back upstream along the left side rock wall. In the forebay itself, the water level was flush with the wing walls both sides of the powerhouse intake (Photo 8). This test in particular showed the complexity of the outlet works flow and the need for the hydraulic model. The combination of the head losses produced by the above mentioned flow conditions resulted in a total discharge that was approximately 10% less than that calculated theoretically.

The pressures in both siphons at the crown and the crest were measured at the P.M.F. reservoir elevation and the following values obtained;

TABLE 2 - SIPHON CROWN AND CREST PRESSURES (ft.)
- RESERVOIR ELEVATION 785.65 ft. -

	OUTBOARD	INBOARD
Crown (S1)	-20.8	-18.3
Crest (S3)	-65.6	-53.0

The results show that both siphons will operate in a fully primed condition and no vacuum will form at the crown because pressures are higher than -28 ft., the generally accepted threshold at which dissolved air starts to come out of solution. At the siphon crests though, pressures are well below this value and cavitation bubbles will develop in this region. As these bubbles travel down the siphon chute they will implode as the pressure rises, causing damage to the concrete surfaces.

The discharge was then gradually reduced and the water level lowered. Both siphons deprimed almost simultaneously at reservoir elevation 774.4 ft.

Tests with Dow valves closed

A test was carried out to see how the siphons operated with the Dow valves closed. As with the previous tests, the inflow was gradually increased and the reservoir and control house pressure taps monitored. Both siphons primed almost simultaneously at reservoir elevation 779 ft. (776 ft. at the control house) and did not draw any air.

The inflow was then increased to 49,869 cfs. (the discharge obtained with all the valves open and the P.M.F. reservoir elevation at 785.65 ft.), and the reservoir rose to elevation 787.3 ft. One Dow valve was opened and the reservoir dropped to 787 ft., and when two were opened it fell to 786.4 ft. With the two valves open, the inboard siphon started to draw air. With all three valves open, the reservoir returned to its previously determined elevation.

3.4.3 Discussion of Results and Conclusions

The results from the Status Quo Simulation #1 tests show that the rating curves obtained from the model give discharges that are 10% less than those calculated for a given reservoir elevation (Figure 4). At the siphon structure the difference is even greater (Figure 5). The differences can be attributed to the losses at the canal entry, which are otherwise difficult to calculate, that the siphons prime much later than originally anticipated and that they probably run below their design capacity due to the way they are supplied. It should be noted that the rating curve will not be the same but shift to the right (higher discharge) as the reservoir drops from its P.M.F. level, because the siphons remain primed down to reservoir elevation 774.4 ft. As the receding flood hydrograph has no impact on the P.M.F. maximum flood elevation and discharge, actual flow values were not measured.

The large vortex that forms in front of the control house when the Dow valves are operating draws air down right to the valve itself. This induces pressure fluctuations and will cause the valve to vibrate. Significant vibrations have in fact been detected already in the control house when the Dow valves run. Another important

consideration is that floating debris could easily be drawn down and potentially block the conduit or jam in the valve causing structural damage. Potentially, the reservoir could be drained if a valve became jammed open and the stoplog slots obstructed.

The siphons prime at a reservoir elevation higher than was originally considered in the design. While the siphons will operate in a fully primed condition and no vacuum will form in their crowns, severe cavitation will occur downstream of the crest. The inboard siphon draws air at the P.M.F. reservoir elevation with the three Dow valves open, an element which is not accurately reproduced on the model due to scale effects (the prototype will draw more air than the model). There is therefore a risk that it may not actually prime at the P.M.F. reservoir elevation with the significance being that the prototype inboard siphon may not pass hardly any flow at all, reducing the total discharge. The siphons prime much earlier and run air free when the Dow valves are closed.

Flows over the spillway are skewed due to the high velocity in the canal at P.M.F. conditions and the bridge piers create an obstruction to the flow. The effective length of the spillway is therefore greatly reduced under these conditions.

To obtain a better understanding of the discharge capacity of the outlet works, a series of rating curves, developed for each of the individual components (Dow valves, siphons and spillway) would be of value.

3.5 *Rating Curves for Individual Structures*

Following discussions of the results obtained from the Status Quo Simulation No. 1 Tests, the decision was made to develop rating curves for each of the individual components of the outlet structures. The results would be used to determine the flows through the individual structures for the model tests already completed and as input for the H.E.C. 1 reservoir math model simulations. All tests would be made with the powerhouse shut down.

3.5.1 *Spillway Rating Curve*

The spillway was calibrated by closing off the siphons and three Dow valves and then introducing upstream a minimum of three discharges, covering the expected flow range. For each discharge, water level measurements were obtained at each of the pressure tap locations along the intake canal through to the reservoir, enabling a rating curve to be developed at each point. With combinations of the outlet works operating, the rating curves at P4 or P5 would determine the portion of the flow going to the spillway.

3.5.2 *Siphon Rating Curves*

The spillway and Dow valves were then blocked off and using the same procedure as above, a rating curve developed for each of the siphons. In addition to measuring the water levels through the canal and reservoir, pressure readings taken at the crown and crest of each siphon were taken. These readings would be used in past and future tests to determine the portion of the flow going to the siphons.

3.5.3 *Dow Valve Rating Curves*

The spillway and siphons were then blocked off and rating curves similarly developed for the Dow valves. A pressure tap was installed in the conduits downstream of the valves with the object of obtaining a discharge/pressure relationship in each valve.

3.5.4 *Results*

The rating curves for each of the structures are presented in Figures 6 to 13. The 'best fit' relationships that match each curve is presented in Table 3.

The values obtained from the rating curves were compared to the results obtained from the "Status Quo Simulation No. 1 Tests". Flows to the Dow valves and

siphons were determined from the "best fit" relationship derived at P3, and the relationship at P5 was used for the spillway. If the total flow was under 35,000 cfs. it was assumed both siphons operated as weirs; if the total flow was above 35,000 cfs., the left siphon was primed and if the total flow was above 46,000 cfs., both siphons were primed. The total flow obtained from the rating curves gave values that were within ± 5% of the total flows from the tests.

3.6 *Tests with Spillway Crest Raised to 773 ft. and Siphons Blocked*

The rating curves developed from the previous phase of the study were used as input to the HEC-1 reservoir flood routing math model. A sensitivity analysis, with different initial reservoir starting elevations and outlet structures operating, was carried out to determine a strategy that would maximize the outflow volume while at the same time limit the peak outflow to 41,000 cfs. In this analysis, it was assumed that the powerhouse was closed, the siphons were blocked off and that the Dow valves were shut at elevation 771 ft., when men could still get into the gate house and operate the valves. The rationale for adopting this modus operandi was based on the results of the Status Quo Simulation No. 1 Tests that revealed problems with priming the siphons, the presence of low crest pressures and a strong vortex in front of the Dow valves.

The results from the sensitivity analysis showed that the above criteria would be respected if the spillway crest was raised to elevation 773 ft. Tests were conducted on the model to confirm the levels in the intake canal and reservoir computed by the math model for discharges of 30,000 cfs., 41,000 cfs. and 50,000 cfs.

The actual rating curves are presented in Figure 14 and the "best fit" equations in Table 4. Also shown on Figure 14 are the elevations of the various retaining walls that bound the intake canal. With a discharge of 41,000 cfs., the reservoir elevation at P1 was 788.44 ft. Along the section of canal between the reservoir and the control house (P2 and P3) there is very little freeboard available and water splashes occasionally over the

wall. Either installing a deflector, consisting of a flat horizontal plate attached to the top of the wall to intercept the splash, or raising the walls themselves, should be considered.

At the powerhouse (P6), the water surface elevation is almost 4 ft. higher than the intake deck and the retaining walls in this area (Photo 9). The walls and deck will either have to be raised and a deflector installed, or provision made for erosion protection downstream if the flow is allowed to overtop.

3.7 *Tests with Spillway Crest Raised to 773 ft. and Siphons Vented*

A test was also made with the siphons unblocked but the air vents raised above the water surface (Photo 10). In the model, the siphons ran in a partially primed condition, flowing full with a mixture of water and air. Due to the higher water surface elevation at P3, observations made on the model and backed up with subsequent calculations, showed that the siphon flows were unstable, passing from siphonic to weir flow as the air vent chimneys, acting as open piezometers with water standing in them at the elevation of the hydraulic grade line, alternately filled and emptied with water. As the vents emptied, the siphons would prime and they would gulp air. The overall result was a drop in reservoir elevation from 788.44 ft. to 784.92 ft. and lower levels along the intake canal. However, the water levels would fluctuate, due to the unstable siphon discharge.

An additional test was conducted in the model, with a discharge of 41,000 cfs., where each of the siphons were vented with two 2 ft. diameter holes drilled just downstream from the crown. In this location, the vents are above the hydraulic grade line and allow for the free passage of air. This test showed that in the model, the siphons ran full up to the location of the vents, and then at free surface. The discharge through them was determined to be 6,200 cfs., which is a value that falls between weir and siphonic flow conditions. However, a pressure measurement taken at the crest gave a value of 765 ft., (i.e. -8 ft. below the siphon crest elevation) which indicates that cavitation will not be a problem. With the siphons discharging in this partially primed mode, the reservoir elevation was 786.6 ft. at P1 and 782.5 ft. at the powerhouse intake (P6). The values are presented in Figure 14.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Status Quo Simulation No. 1 Tests

The conclusions from the Status Quo Simulation No. 1 tests were as follows;

- The rating curves obtained from the model study give discharges approximately 10% lower than those calculated for a given reservoir elevation.

- An undesirable large air and trash entraining vortex forms in front of the control house when two or three Dow valves are open. It disappears however, once the siphons prime.

- The siphons prime much later than originally anticipated and once primed, will be subjected to extreme cavitation damage downstream from their crests.

4.2 Individual Rating Curve Tests

- The individual rating curves developed for each structure gave total discharges, when combined together, within 5% of the values obtained during Status Quo Simulation No 1 Tests.

4.3 Spillway Crest Elevation Raised to Elevation 773 ft.; Dow valves and Siphons Blocked

- With the Dow valves and siphons blocked and a discharge of 41,000 cfs., the reservoir will attain elevation 788.4 ft.

4.4 *Spillway Crest Elevation Raised to Elevation 773 ft.; Dow valves Blocked and Siphons Vented*

- With the siphons open and the vents raised above the water surface, the reservoir elevation was 784.92 ft. The siphons, however, were unstable and hunted between weir and siphonic flow.

- Venting the siphons just downstream of their crowns produced a stable flow and a reservoir elevation of 786.6 ft. Water levels along the intake canal were approximately 1 ft. lower than those obtained with the siphons and Dow valves blocked.

TABLE 3 - RATING CURVES FOR INDIVIDUAL STRUCTURES

$$Q\ (ft^3/s) = a\ (ELV - H_o)^b$$

PRESSURE TAP	SPILLWAY			DOW VALVE LEFT			DOW VALVE CENTER			DOW VALVE RIGHT		
	H_o (ft)	a	b	H_o (ft)	a	b	H_o (ft)	a	b	H_o (ft)	a	b
P1	771	1121.06	1.366	703	278.4	0.563	703	311.2	0.542	703	169.0	0.667
P2	771	1167.56	1.532	703	279.5	0.563	703	315.6	0.539	703	180.18	0.652
P3	771	1159.55	1.508	703	280.2	0.563	703	315.4	0.540	703	181.71	0.650
P4	771	1177.8	1.755	703	278.9	0.563	703	314.4	0.540	703	181.43	0.65
P5	771	1058.26	1.674									
P6	771	1107.49	1.579									

PRESSURE TAP	SIPHON RIGHT WEIR FLOW			SIPHON RIGHT SIPHONIC			SIPHON LEFT WEIR FLOW			SIPHON LEFT SIPHONIC		
	H_o (ft)	a	b	H_o (ft)	a	b	H_o (ft)	a	b	H_o (ft)	a	b
P1	773	64.78	1.62	742	195.43	0.908	773	58.87	1.58	742	536.12	0.644
P2	773	68.61	1.58	742	194.44	0.91	773	61.74	1.55	742	523.57	0.652
P3	773	69.14	1.57	742	220.38	0.875	773	60.70	1.56	742	515.89	0.656
P4				742	196.15	0.907				742	575.87	0.625
S1											1.69×10^{-52}	19.25
S3	773	270.98	4.00		1.9943×10^{47}	-15.2647	773	59.88	1.567			

TABLE 4 - RATING CURVE FOR SPILLWAY WITH CREST ELEVATION 773 FT.

- SIPHONS AND DOW VALVES BLOCKED

$$Q\ (ft^3/s) = a\ (ELV - H_o)^b$$

PRESSURE TAP	H_o (ft.)	a	b
P1	773	3,377.39	0.906
P2	773	4,083.0	0.943
P3 *	773	2,534.84	1.150
P4	773	761.50	2.045
P5	773	1,594.08	1.445
P6	773	3,368.85	1.053

* Relationship not precise due to water level instability



Photo 1. The 1/50 scale model.

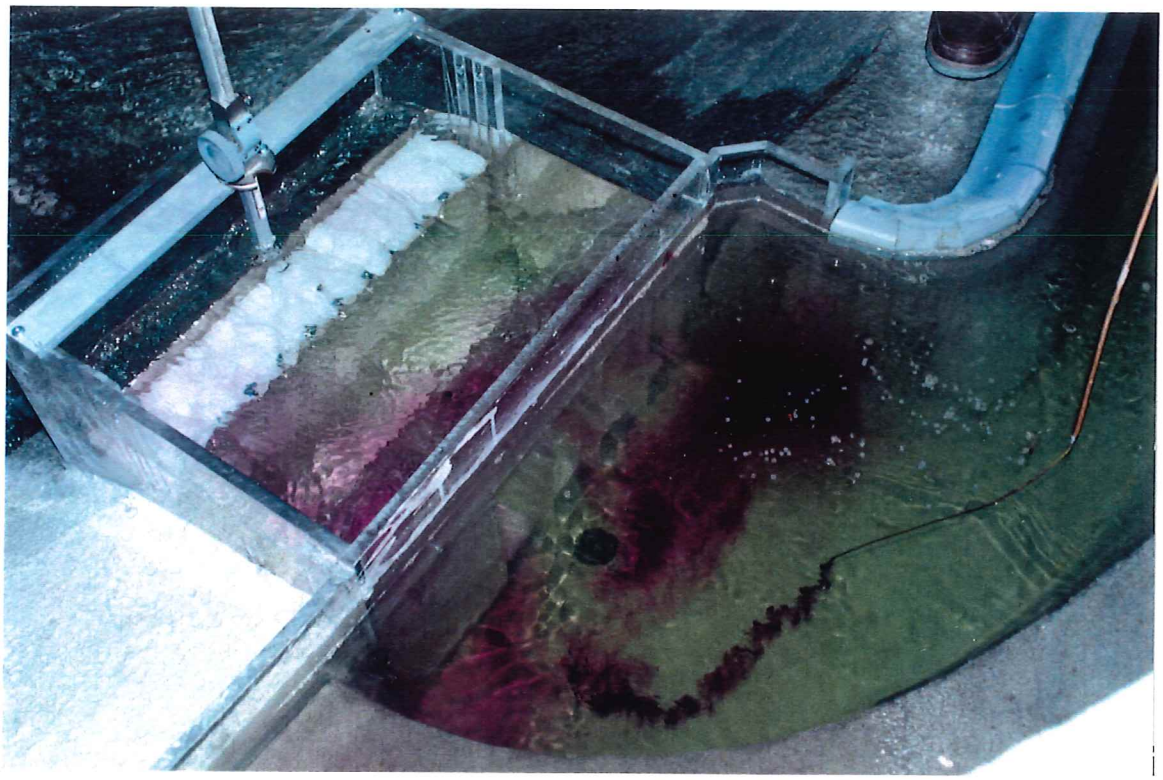


Photo 2. Forebay elevation 768 ft. Flow conditions at powerhouse intake. Q = 5,400 cfs.



Photo 3. Forebay elevation 771 ft. Vortex in front of control house. Q = 12,000 cfs (powerhouse and two Dow valves open).



Photo 4. Reservoir elevation 781 ft. Outboard siphon primed showing breakaway zone. Q ≈ 35,000 cfs (three Dow valves open; powerhouse closed).

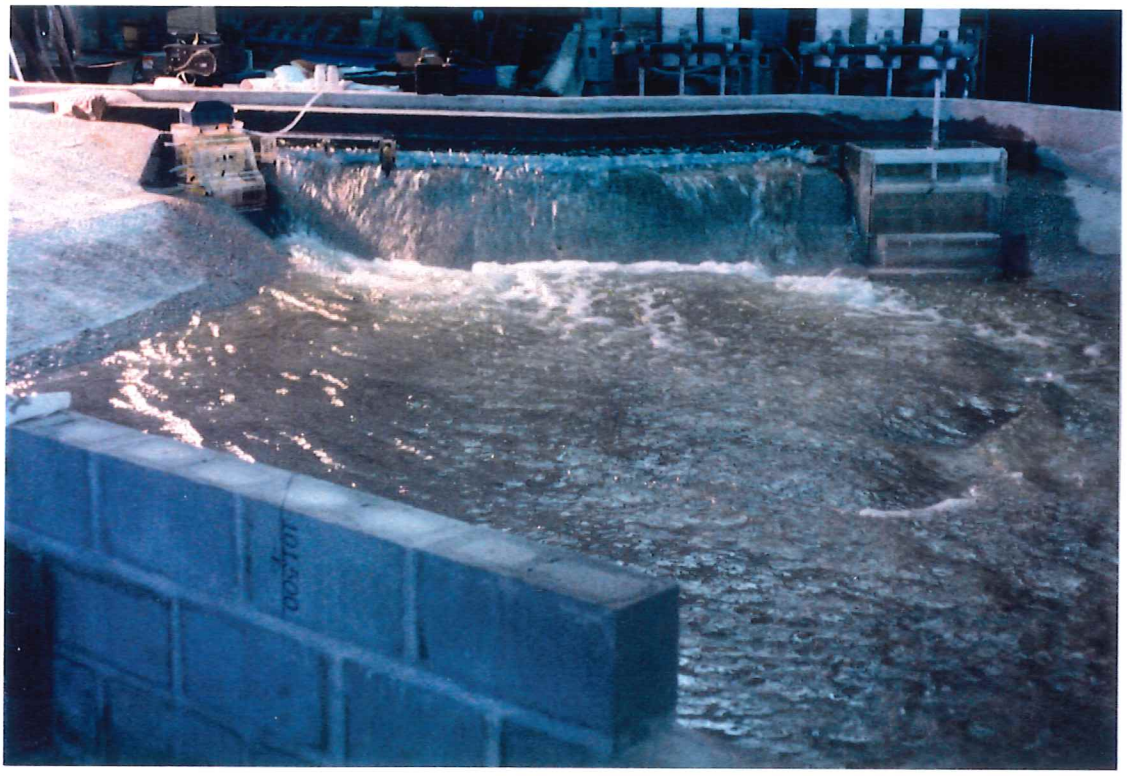


Photo 5. Flow conditions downstream with reservoir elevation 785.65 ft. (P.M.F. - Q = 49,689 cfs).

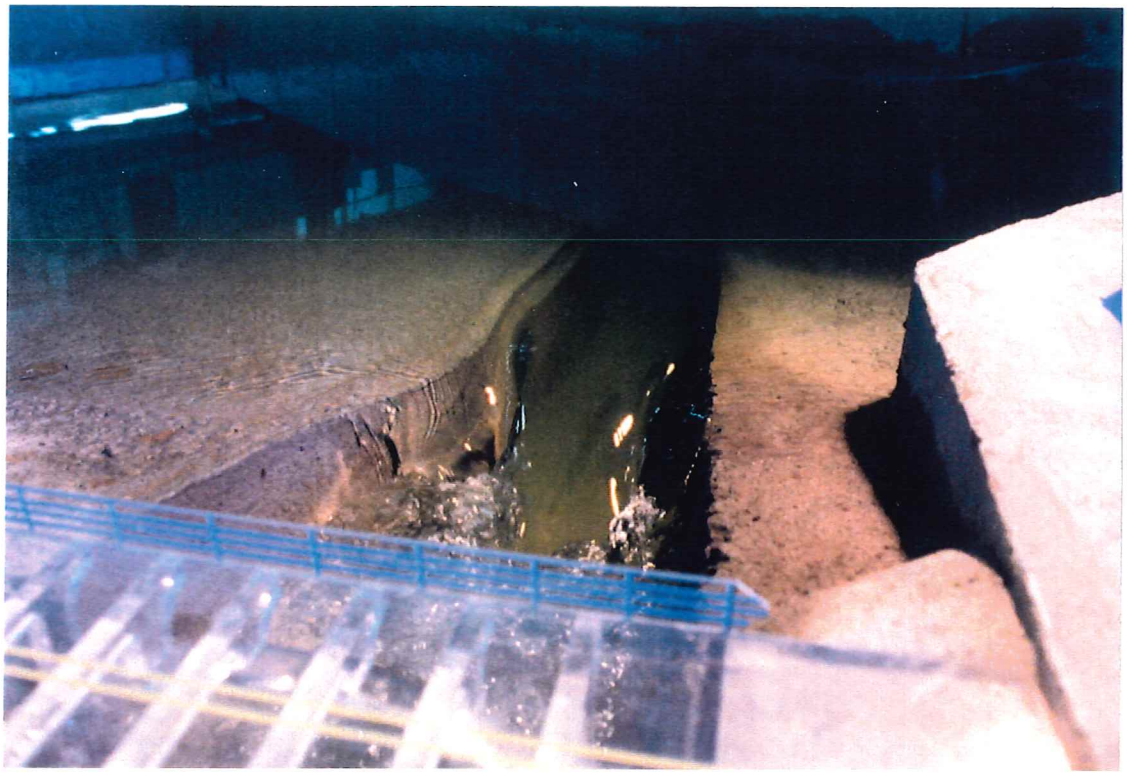


Photo 6. Reservoir elevation 785.65 ft. Flow at the entry to the intake canal. (P.M.F.- Q = 49,689 cfs).



Photo 7. Reservoir elevation 785.65 ft. Turbulence in the intake canal and in front of the control house. (P.M.F. - Q = 49,689 cfs).

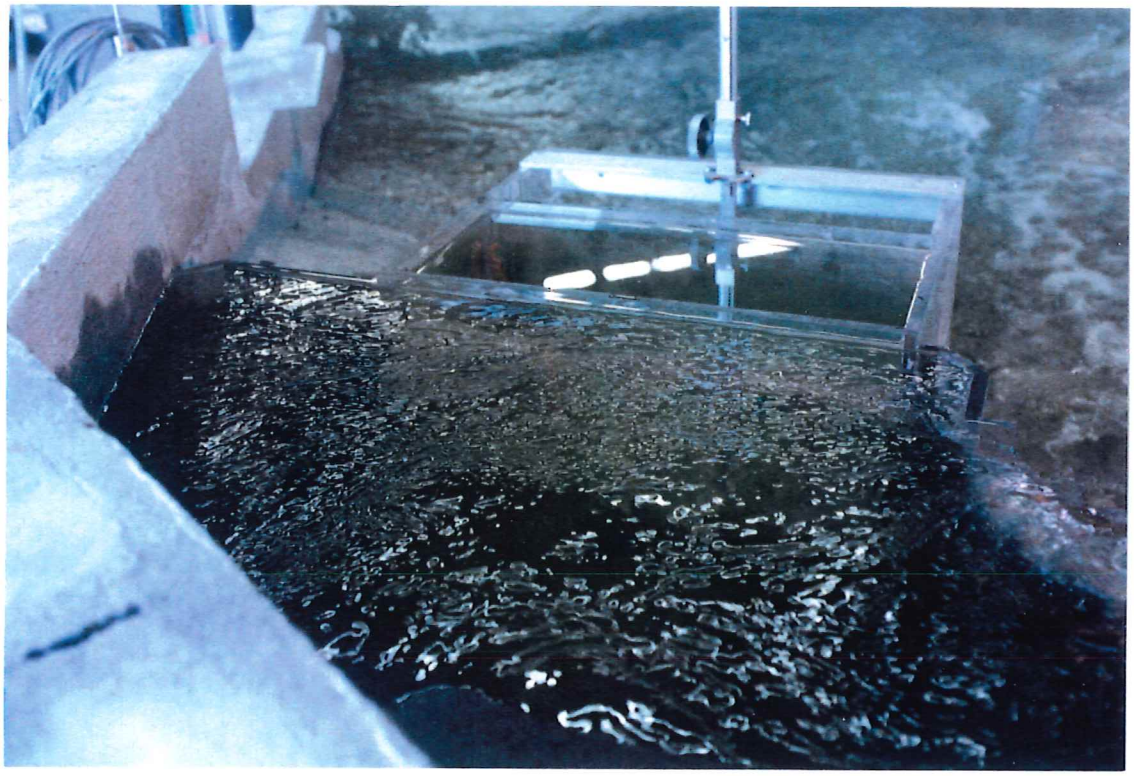


Photo 8. Reservoir elevation 785.65 ft. The forebay. (P.M.F. - Q = 49,689 cfs).

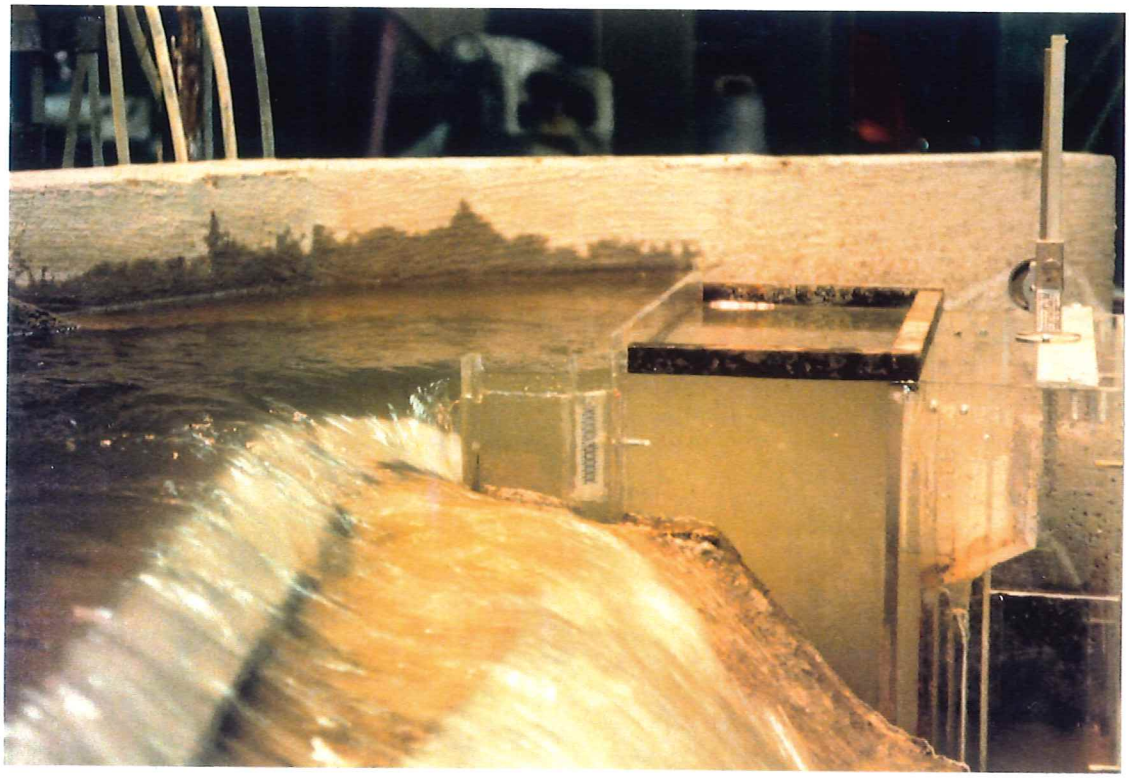
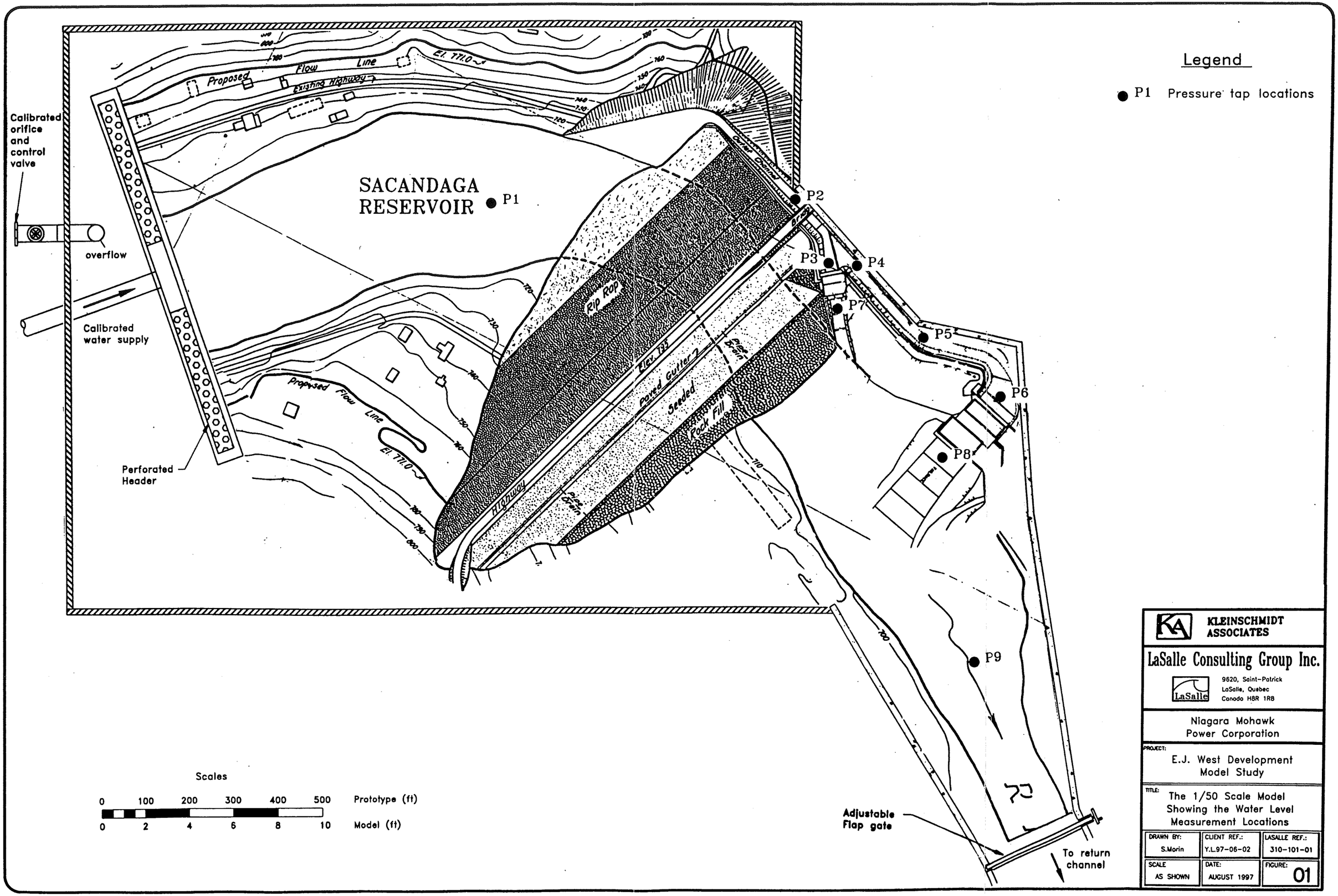


Photo 9. Q = 41,000 cfs. - Spillway raised to elevation 773 ft. - Siphons, powerhouse and Dow valves closed off. - Walls and deck raised in the vicinity of the powerhouse.



Photo 10. Q = 41,000 cfs. - Spillway raised to elevation 773 ft. - Dow valves and powerhouse closed but siphons open and vents raised.



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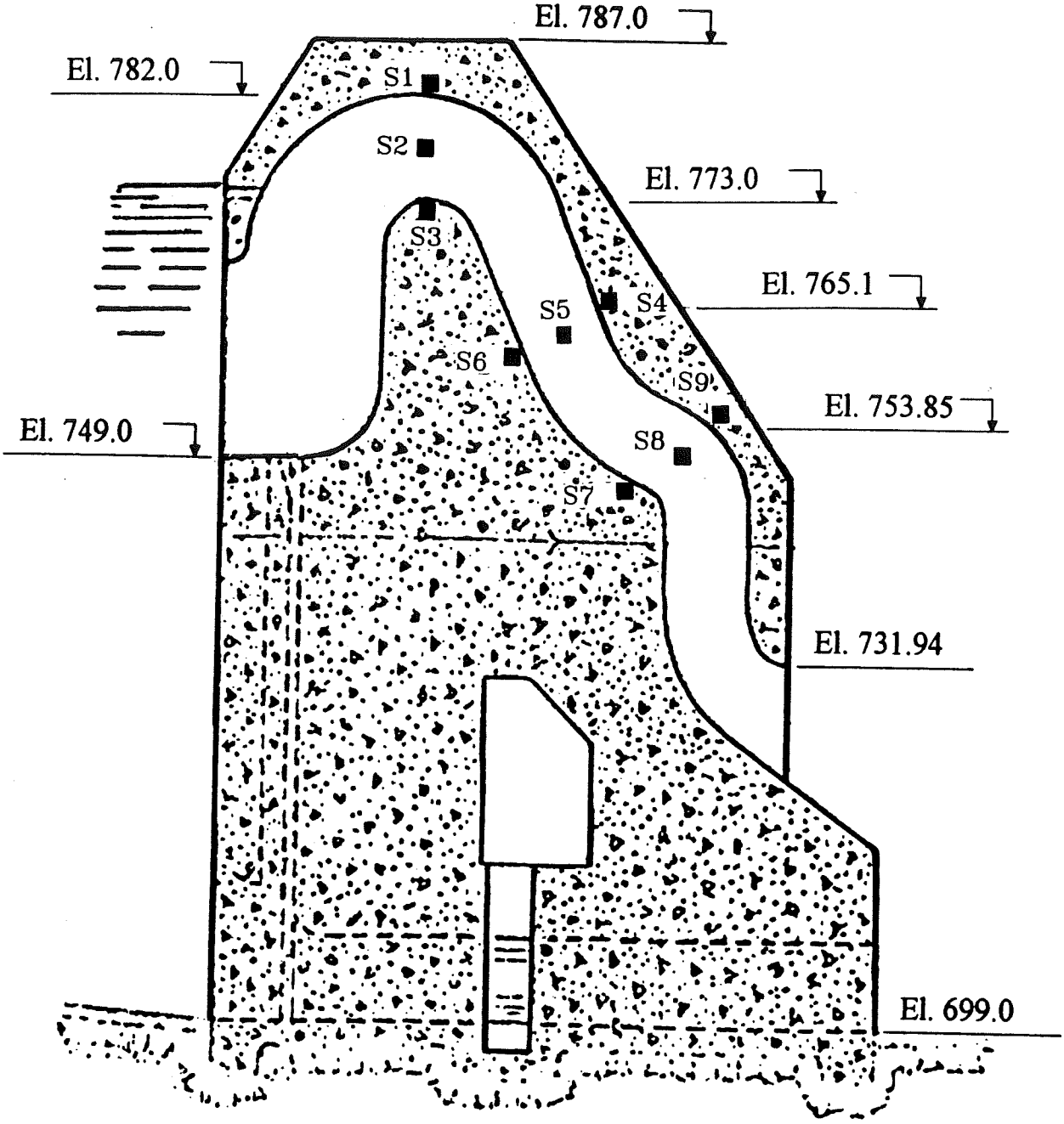
Niagara Mohawk Power Corporation

PROJECT: E.J. West Development Model Study

TITLE: The 1/50 Scale Model Showing the Water Level Measurement Locations

DRAWN BY:	CLIENT REF.:	LASALLE REF.:
S.Morin	Y.L.97-06-02	310-101-01
SCALE: AS SHOWN	DATE: AUGUST 1997	FIGURE: 01



SECTION THRU SIPHON

Legend

■ S1 Pressure tap locations

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PROJECT: E.J. West Development Model Study

Niagara Mohawk Power Corporation

TITLE: Pressure Tap Locations in Siphon

DRAWN BY:	CLIENT REF.:	LASALLE REF.:
S.Morin	Y.L.97-06-02	310-101-02
SCALE: ———	DATE: AUGUST 1997	FIGURE: 02

FIGURE 3
Status Quo Simulation No 1 - Rating Curves

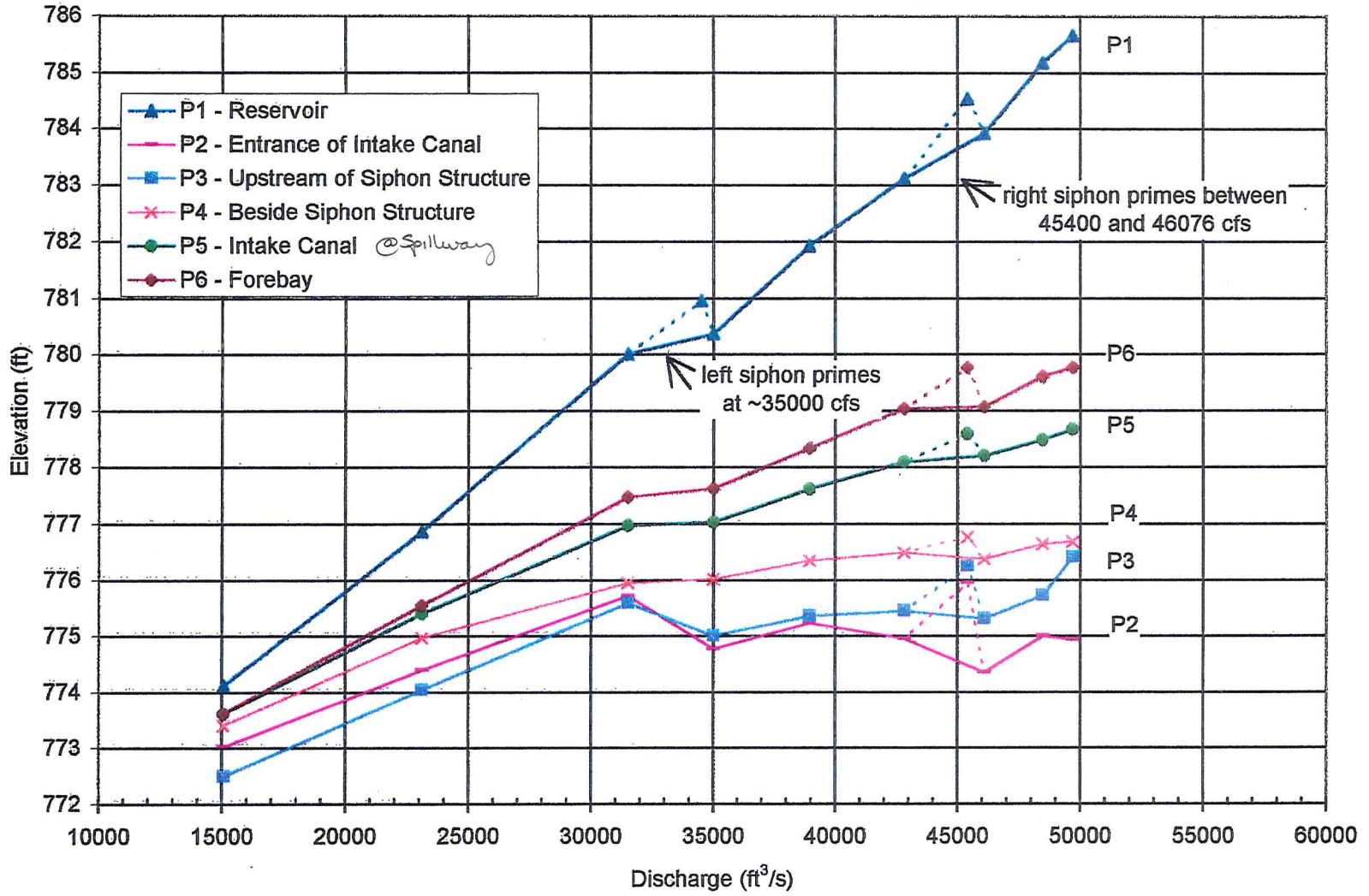


FIGURE 4
Status Quo Simulation No 1- Rating Curve at Reservoir

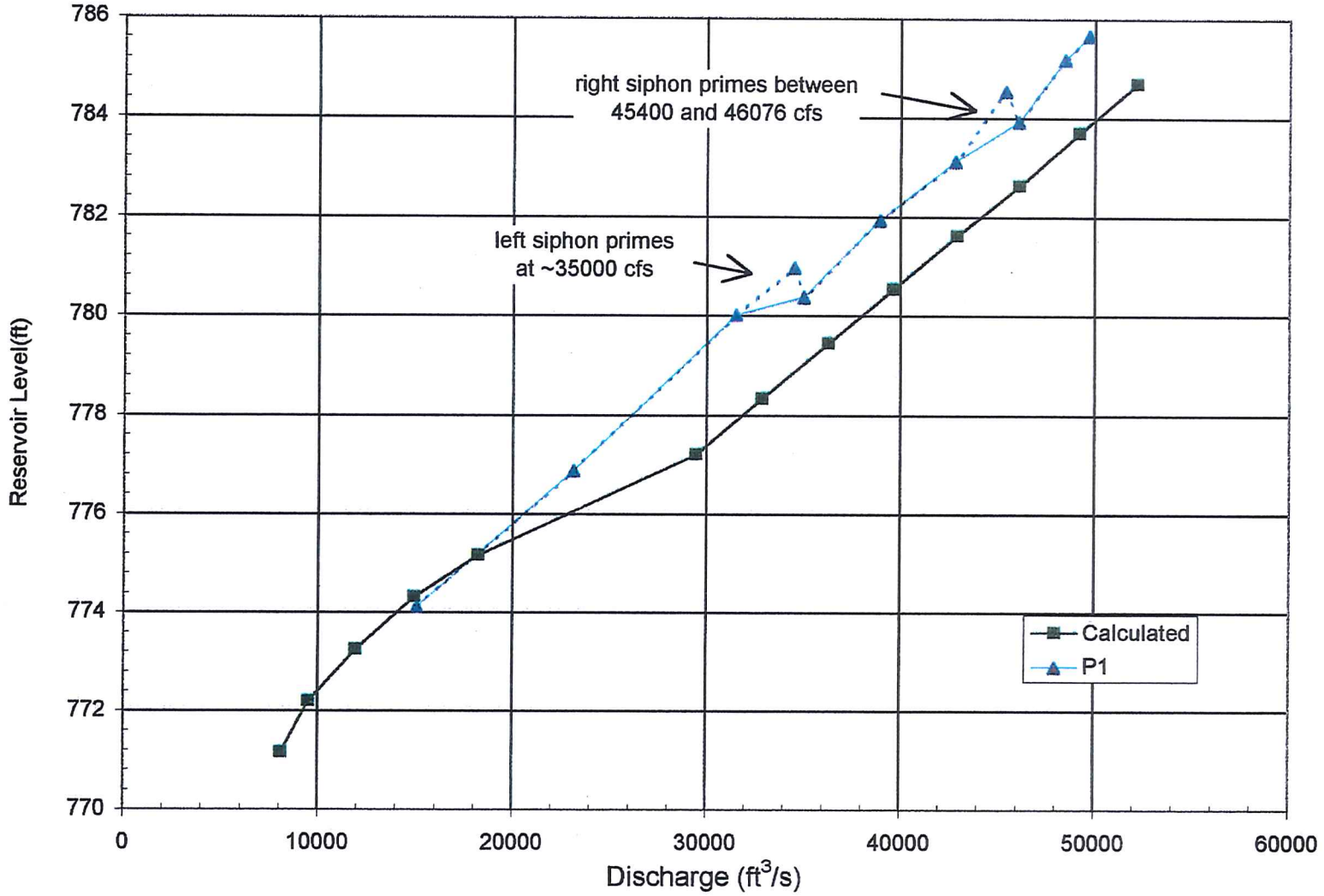


FIGURE 5
Status Quo Simulation No1 - Rating Curve at Siphon Structure

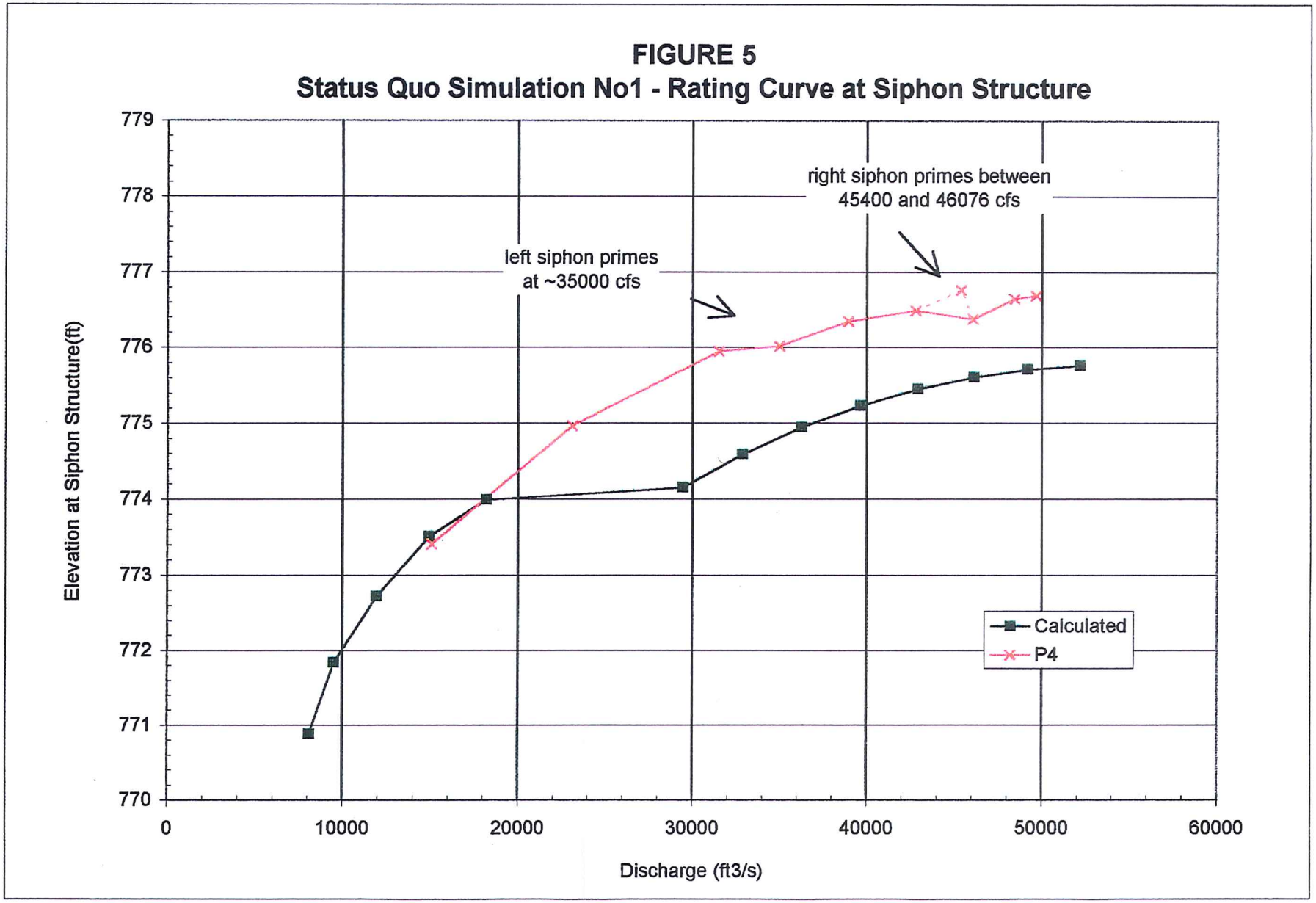


FIGURE 6
Individual Rating Curves for Structures - Spillway
(Dow Valves and Siphons Blocked - Crest Elevation 771 ft)

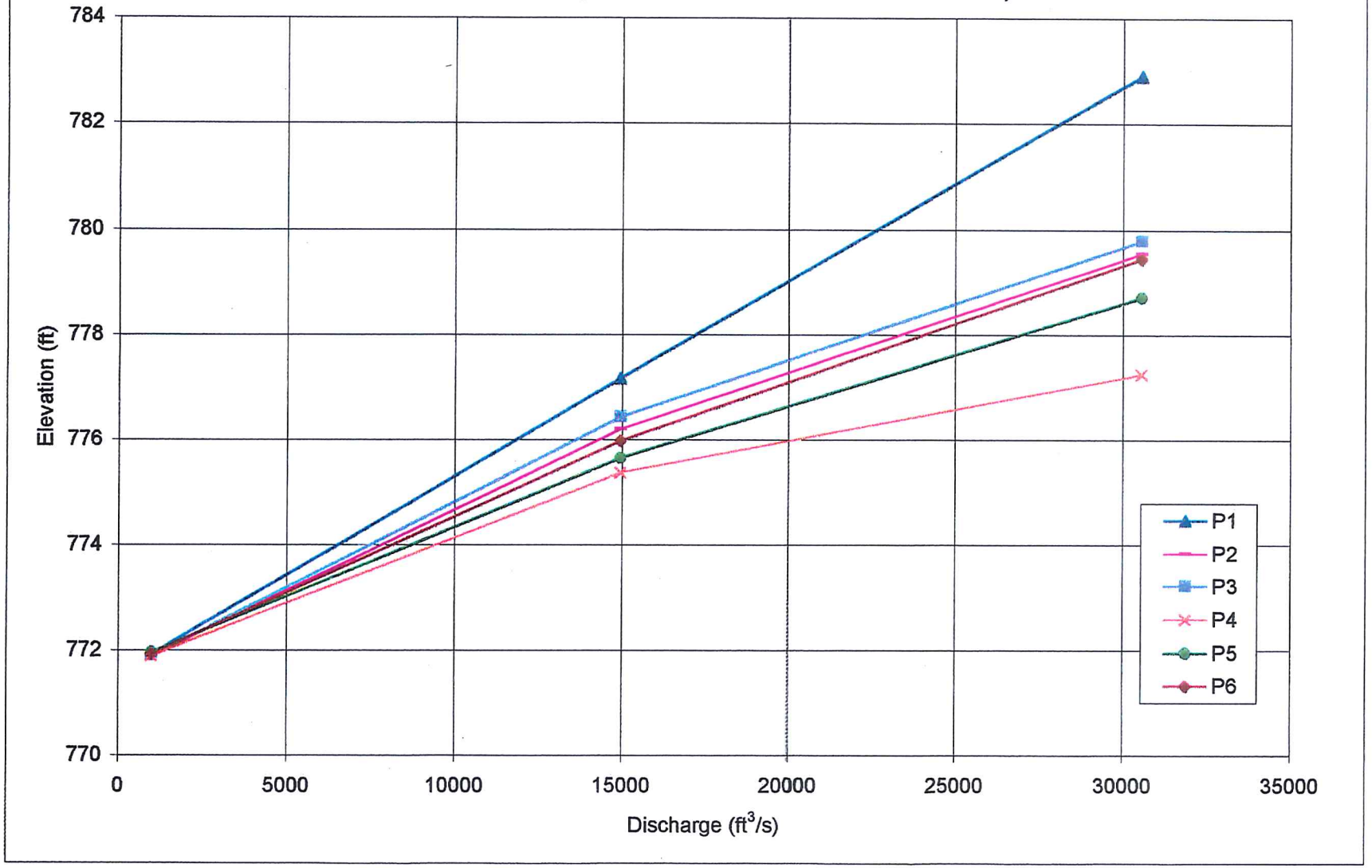


FIGURE 7
Individual Rating Curves for Structures
Left Dow Valve

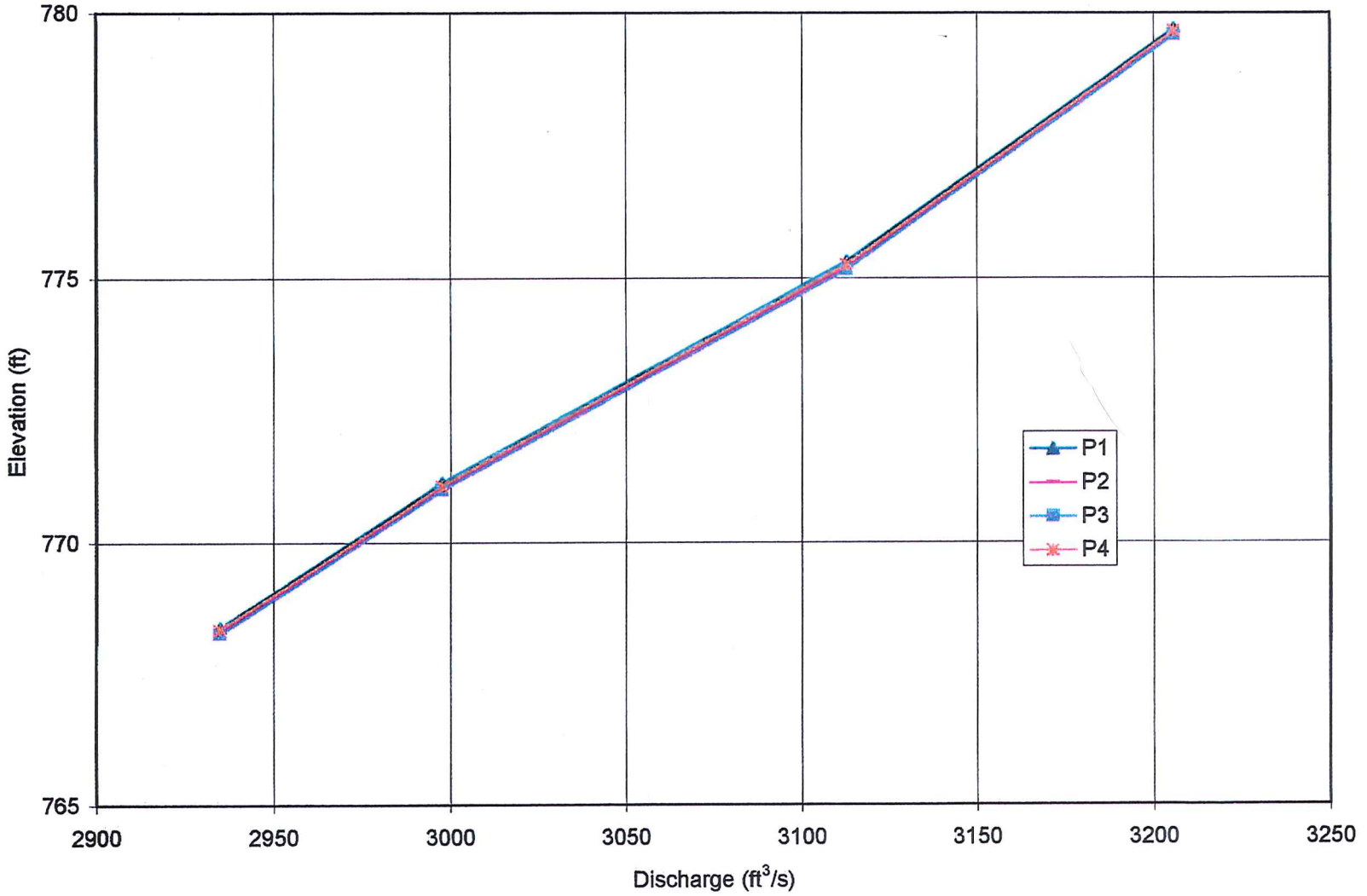


FIGURE 8
Individual Rating Curves for Structures
Center Dow Valve

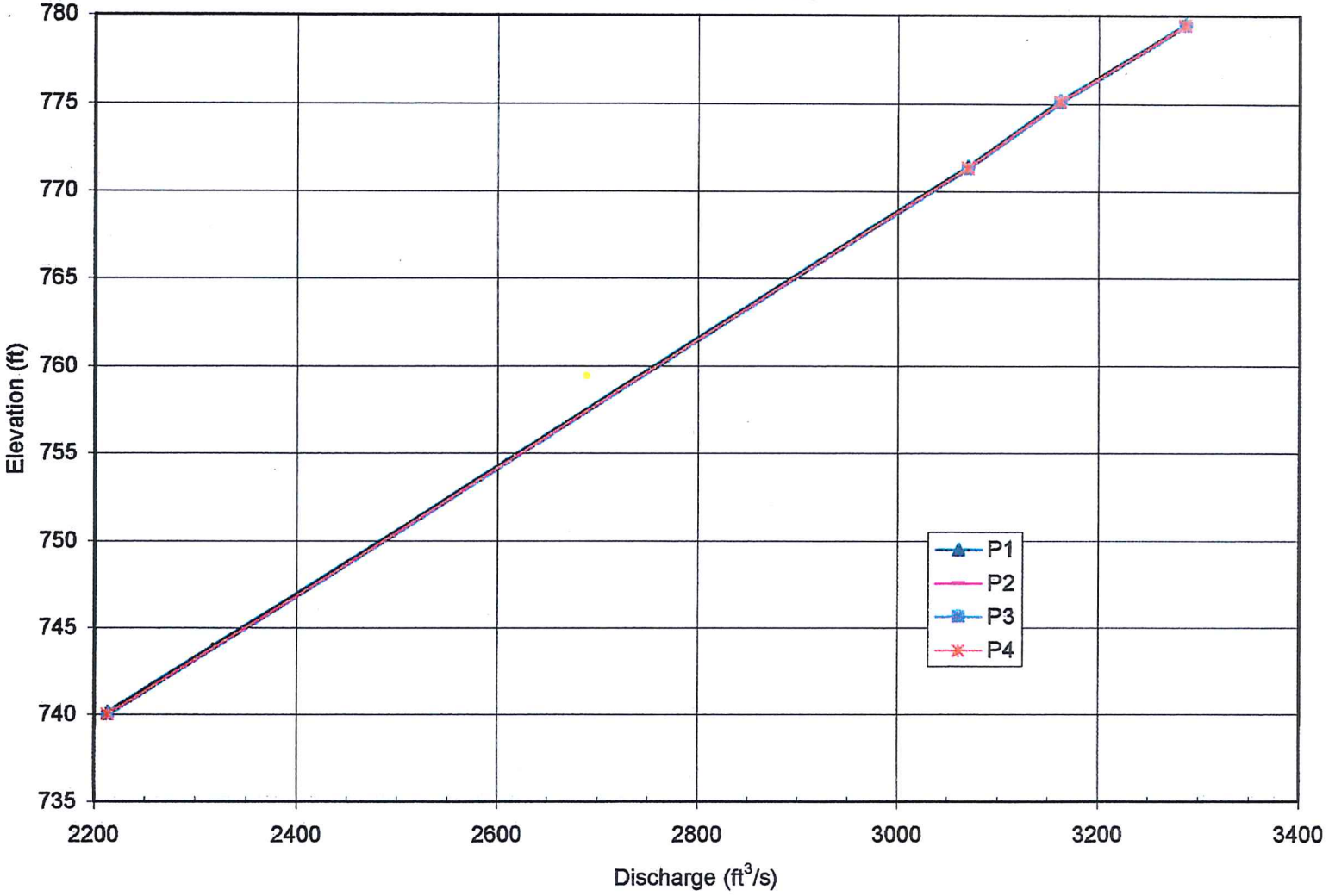


FIGURE 9
Individual Rating Curves for Structures
Right Dow Valve

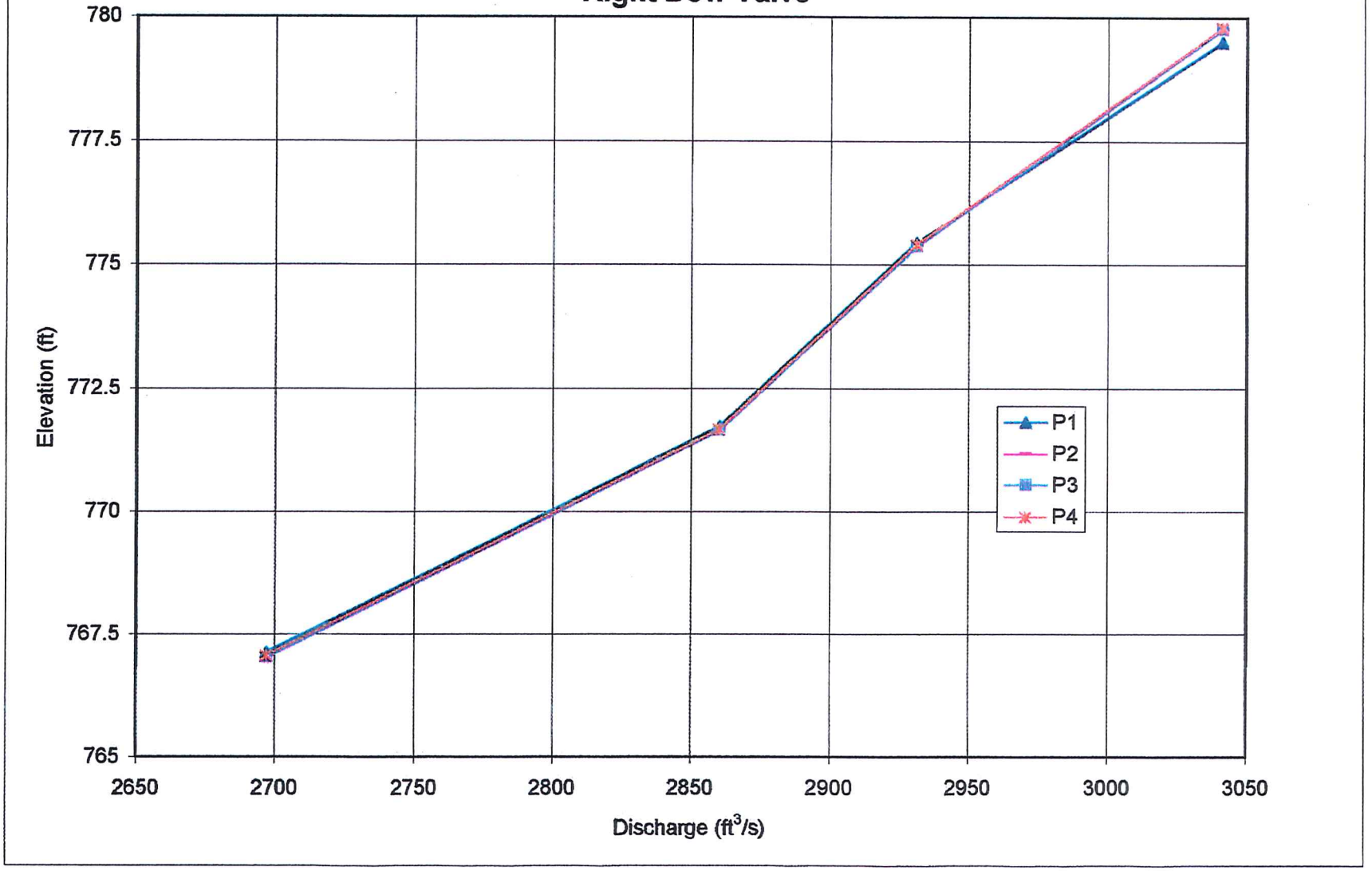


FIGURE 10
Individual Rating Curves for Structures
Left Siphon - Weir Flow

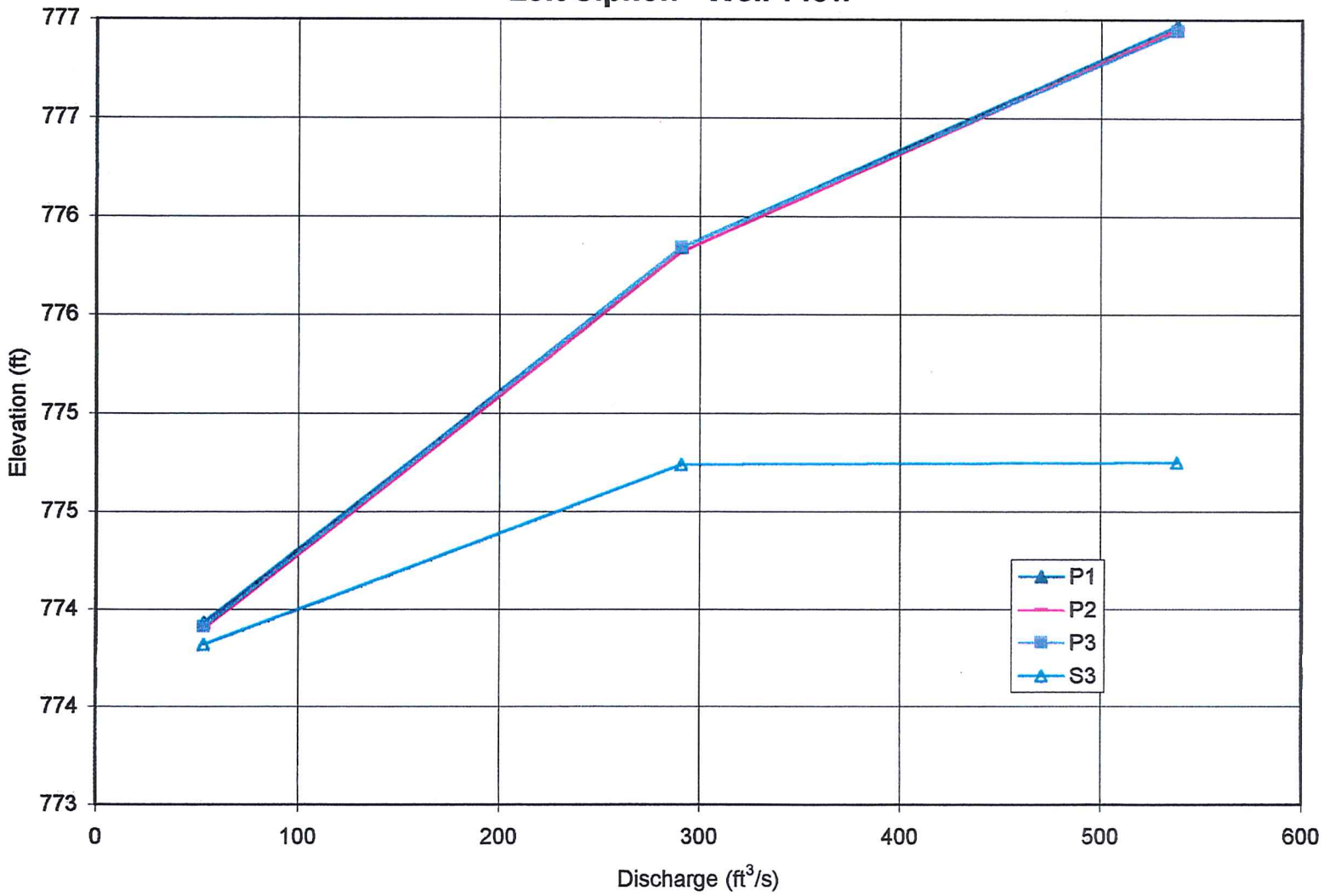


FIGURE 11
Individual Rating Curves for Structures
Right Siphon - Weir Flow

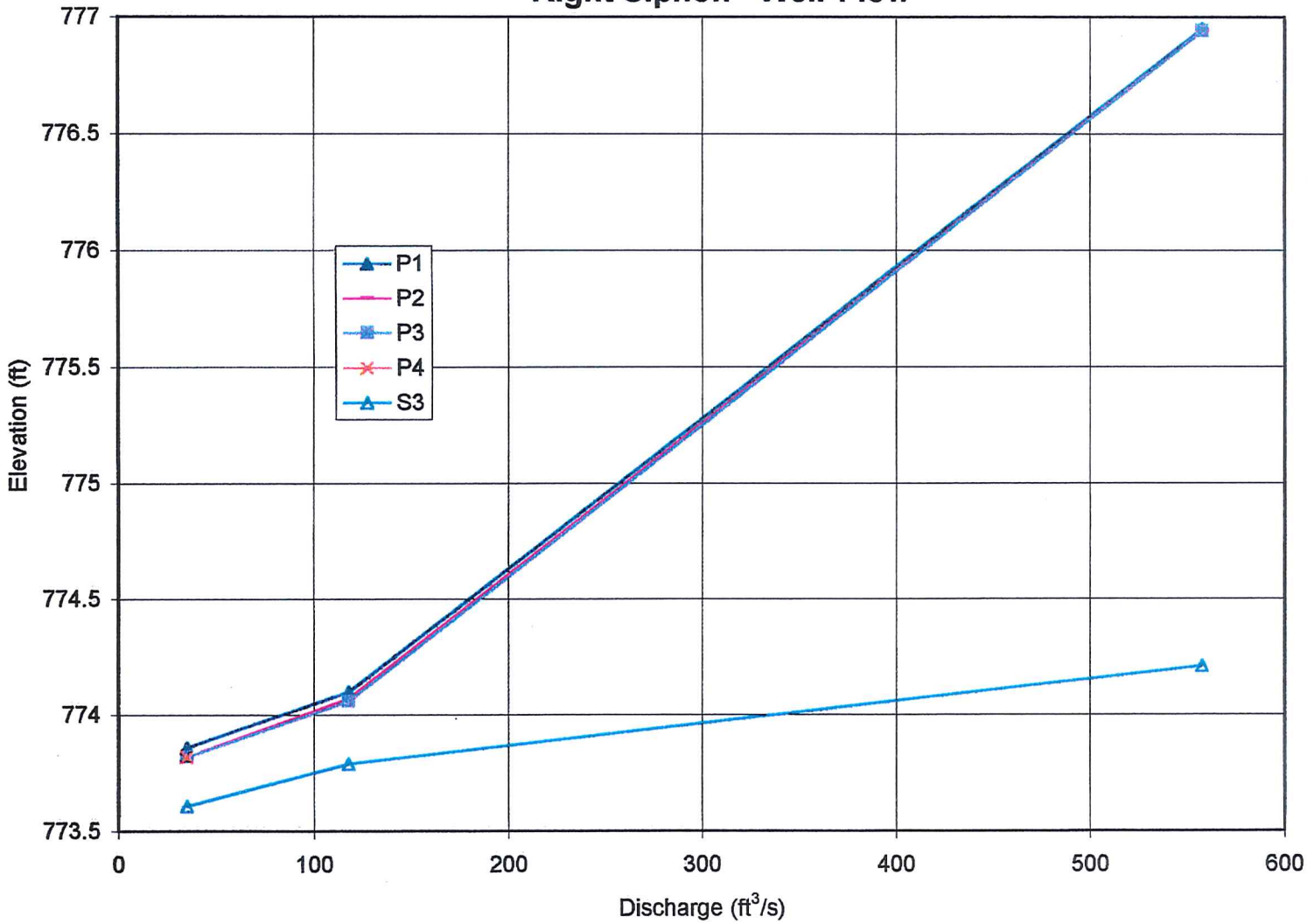


FIGURE 12
Individual Rating Curves for Structures
Left Siphon - Siphonic Flow

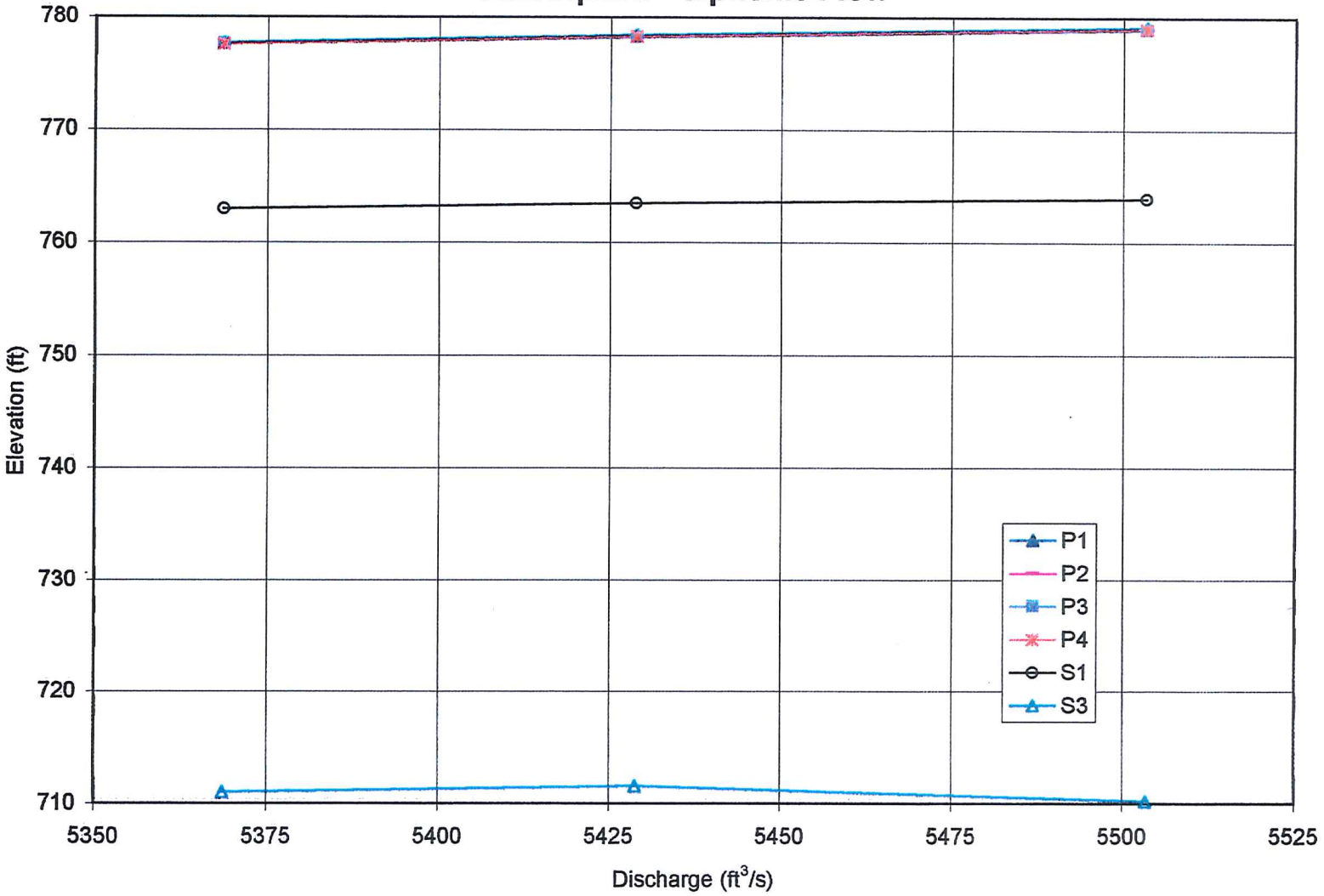


FIGURE 13
Individual Rating Curves for Structures
Right Siphon - Siphonic Flow

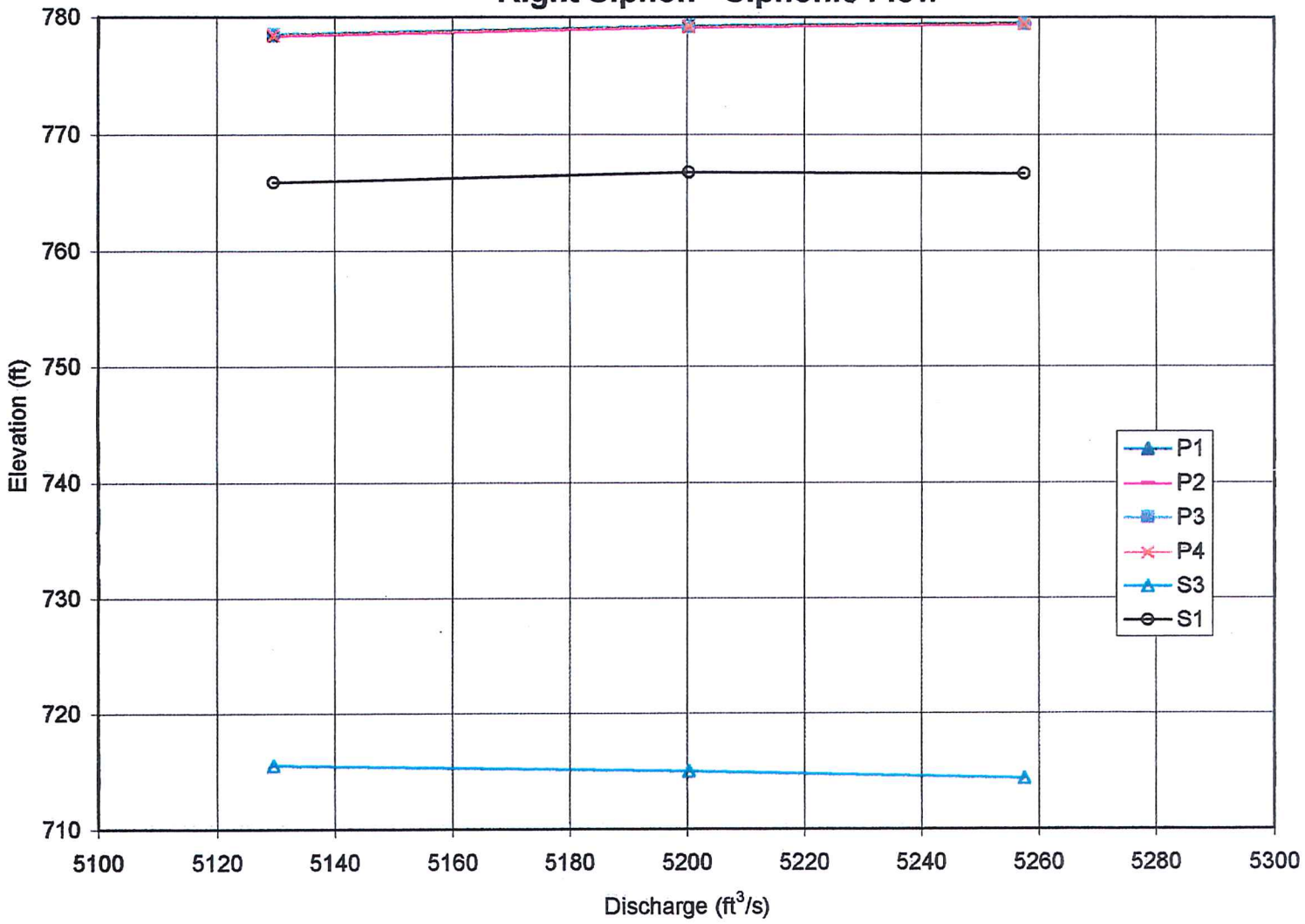
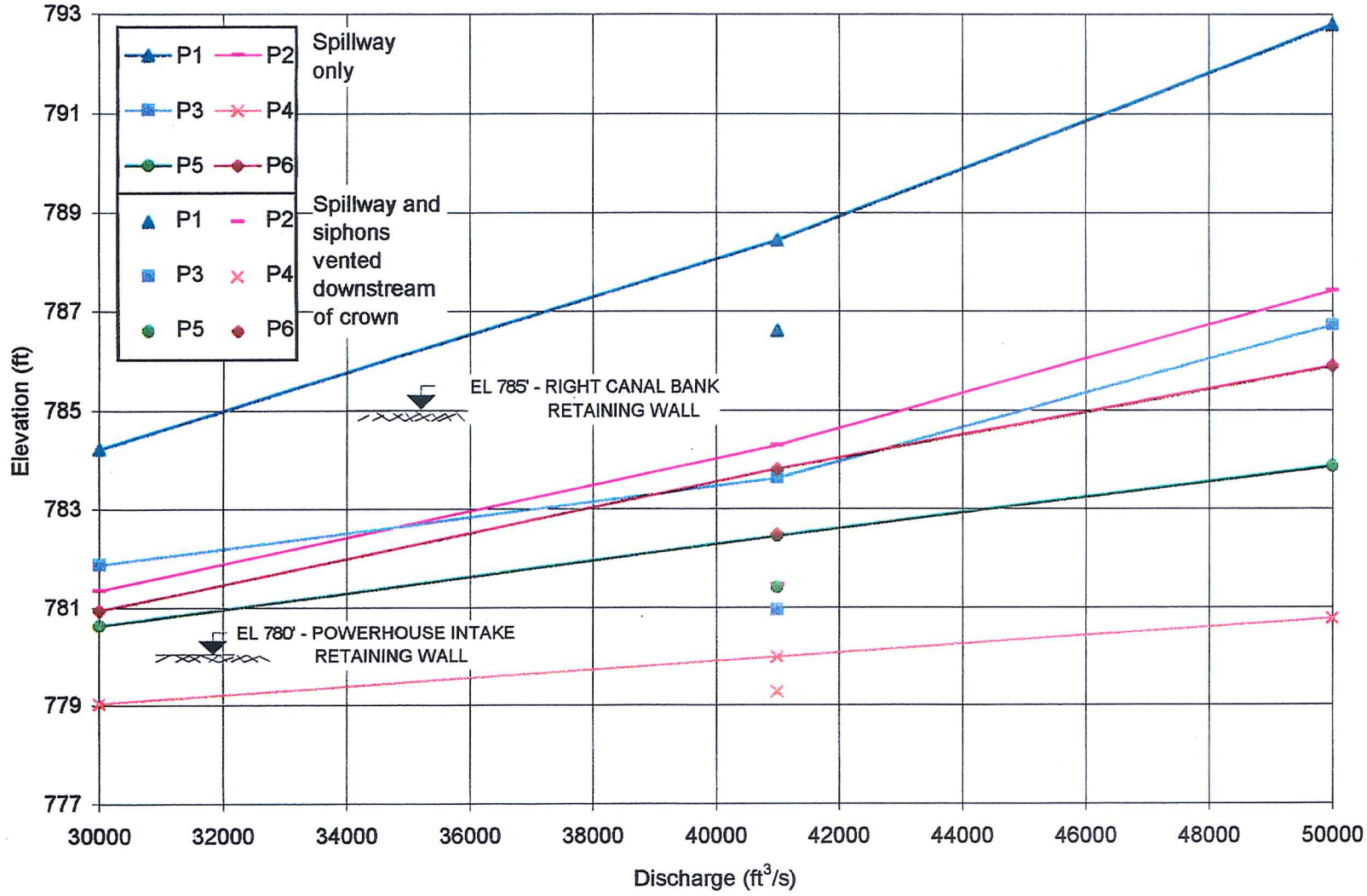


FIGURE 14
Rating Curves with Spillway at Crest Elevation 773 ft



GENERAL NOTES

CONCRETE AND REINFORCEMENT NOTES

1. PROVIDE CONCRETE CONFORMING TO THE REQUIREMENTS OF THE SPECIFICATIONS AND WITH A MINIMUM COMPRESSIVE STRENGTH F'c OF 4500 PSI AT 28 DAYS UNLESS NOTED OTHERWISE.
2. REMOVE CONCRETE AT LOCATIONS AND TO THE DEPTH INDICATED ON THE DRAWINGS. EXISTING CONDITIONS MAY WARRANT ADDITIONAL REMOVAL BEYOND THE LOCATION AND/OR DEPTH INDICATED ON THE DRAWINGS OR MAY LIMIT THE EXTENTS TO WHICH CONCRETE CAN BE REPAIRED. SUBMIT TO THE DIRECTOR'S REPRESENTATIVE FOR APPROVAL, A PLAN SHOWING THE METHOD, EQUIPMENT, AND SEQUENCE FOR THE REMOVAL WORK, INCLUDE IN THE PLAN THE METHOD OF PREVENTING CONSTRUCTION DEBRIS FROM ENTERING THE WATERWAY. BLASTING OR DYNAMITING WILL NOT BE PERMITTED, UTILIZED REMOVAL METHODS USED SUCH THAT CONCRETE TO REMAIN IS NOT IMPAIRED.
3. MAKE A SAWCUT ALONG ALL LIMITS OF CONCRETE REMOVAL WHERE ADJACENT SURFACE CONCRETE IS TO REMAIN. PROVIDE A MINIMUM SAWCUT DEPTH OF 2 INCHES UNLESS NOTED OTHERWISE.
4. PROTECT EXPOSED REINFORCING STEEL WHICH IS TO REMAIN IN THE STRUCTURE FROM DAMAGE, AND BLAST-CLEAN TO THE SATISFACTION OF THE DIRECTOR'S REPRESENTATIVE.
5. WHERE DRILLING AND CEMENT GROUTING BOLTS OR REINFORCING BARS IS REQUIRED IN THE CONTRACT DOCUMENTS, CLEAN, DRY, AND PREPARE HOLES IN ACCORDANCE WITH THE GROUT MANUFACTURER'S SPECIFICATIONS.
6. CHAMFER ALL EXPOSED EDGES OF CONCRETE 1 INCH UNLESS OTHERWISE NOTED. EXCLUDE CHAMFERS ON HORIZONTAL JOINTS.
7. FINISHING CAST-IN-PLACE CONCRETE SURFACES: IMMEDIATELY AFTER FORMS HAVE BEEN REMOVED, REMOVE ALL PROJECTIONS AND IRREGULARITIES FROM SURFACES EXPOSED TO VIEW AND NEATLY FILL ALL CAVITIES WITH MORTAR.
8. PROVIDE ELECTROPLATED OR NONFERROUS FORMING HARDWARE, SUCH AS TIES AND "ALL-THREADS" THAT ARE TO REMAIN IN THE CONCRETE, TO PREVENT CORROSION.
9. THE LOCATIONS OF REQUIRED CONSTRUCTION JOINTS (INCLUDING CONTRACTION, ISOLATION AND/OR EXPANSION JOINTS) ARE SHOWN ON THE DRAWINGS. THE CONTRACTOR MAY ELECT TO INTRODUCE ADDITIONAL CONSTRUCTION JOINTS IN THE CONCRETE STRUCTURES, PENDING THE APPROVAL OF THE DIRECTOR'S REPRESENTATIVE. SUBMIT PROPOSED CONSTRUCTION JOINTS FOR APPROVAL BY THE DIRECTOR'S REPRESENTATIVE. AT EACH VERTICAL CONSTRUCTION JOINT, PROVIDE WATERSTOP THAT PROVIDES A CONTINUOUS BARRIER, AND ALSO PROVIDES A KEYWAY. HORIZONTAL CONSTRUCTION JOINTS SHALL BE PROVIDED WITH WATERSTOPS THAT PROVIDE A CONTINUOUS BARRIER. THE INSTALLATION OF ALL CONSTRUCTION JOINTS SHALL BE INCLUDED IN THE CONTRACTOR'S BID PRICE. NO ADDITIONAL PAYMENT WILL BE MADE BY THE OWNER FOR SUCH CONSTRUCTION JOINTS.
10. PROVIDE REINFORCEMENT CONFORMING TO ASTM A615, GRADE 60 DEFORMED BARS.
11. PROVIDE THE FOLLOWING MINIMUM COVER ON ALL CAST-IN-PLACE REINFORCING BARS, UNLESS NOTED OTHERWISE:
    SPILLWAY CREST EXPOSED FACES: 4"
    SURFACES EXPOSED TO FLOWING WATER: 3"
    CONCRETE CAST AGAINST GRADE AND DEMOLISHED SURFACES: 3"
    OTHER SURFACES: 2"
12. PROVIDE EMBEDMENT OF CONCRETE REINFORCEMENT AND CLASS B LAP SPLICES IN ACCORDANCE WITH TABLE 1 ON THIS SHEET, UNLESS NOTED OTHERWISE. WHEN BARS OF DIFFERENT SIZES ARE SPLICED, PROVIDE SPLICE LENGTH BASED ON THE LARGER OF EMBEDMENT LENGTH OF THE LARGER BAR AND TENSION LAP SPLICE LENGTH OF THE SMALLER BAR.

TABLE 1
BAR DEVELOPMENT LENGTH AND LAP SPLICE LENGTH

	f'c=4,500psi fy=60,000 psi UNCOATED			
BAR SIZE	DEVELOPMENT / EMBEDMENT LENGTH, Ld		SPLICE LENGTH CLASS - B	
	TOP BARS	OTHER BARS	TOP BARS	OTHER BARS
#3	1'-0"	1'-0"	1'-4"	1'-0"
#4	1'-2"	1'-0"	1'-7"	1'-2"
#5	1'-6"	1'-2"	1'-11"	1'-6"
#6	1'-9"	1'-5"	2'-4"	1'-9"
#7	2'-7"	2'-0"	3'-4"	2'-7"
#8	2'-11"	2'-3"	3'-10"	2'-11"
#9	3'-4"	2'-7"	4'-3"	3'-4"
#10	3'-9"	2'-11"	4'-10"	3'-9"
#11	4'-2"	3'-2"	5'-4"	4'-2"

NOTES FOR TABLE 1:

1. TOP BARS ARE DEFINED AS HORIZONTAL BARS (AND BARS INCLINED LESS THAN 45 DEGREES TO THE HORIZONTAL) SO PLACED THAT MORE THAN 12 INCHES OF FRESH CONCRETE IS CAST IN THE MEMBER DIRECTLY BELOW THE BARS.
2. FOR CLASS A SPLICES, USE THE EMBEDMENT LENGTH.

13. WHERE INDICATED, PROVIDE CEMENT-GROUTED DOWELS EMBEDDED INTO EXISTING CONCRETE OR ROCK WITH EMBEDMENT LENGTH CORRESPONDING TO THE DEVELOPMENT LENGTH IN TABLE 1 UNO. PROVIDE GROUT HOLE DIAMETER OF 2 TIMES THE NOMINAL BAR DIAMETER, BUT NOT LESS THAN 2 INCHES.
14. NON-SHRINK CEMENTITIOUS GROUT SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI AT 28 DAYS.
15. FOR ALL ADHESIVE (EPOXY) GROUTED REINFORCING DOWELS AND THREADED ANCHOR RODS SHOWN ANCHORED IN EXISTING CONCRETE OR ROCK, PROVIDE THE MINIMUM EMBEDMENT PER THE TABLES BELOW UNLESS NOTED OTHERWISE ON THE DRAWINGS. EMBEDMENT IS BASED ON HILTI HIT- RE 500 V3 ADHESIVE, OR EQUAL, TO DEVELOP THE YIELD STRENGTH OF THE REINFORCING DOWEL OR ANCHOR ROD. PROVIDE DRILL HOLE DIAMETER, AND PREPARE HOLE IN ACCORDANCE WITH THE ADHESIVE GROUT MANUFACTURER'S RECOMMENDATIONS.

BAR SIZE	MINIMUM EMBEDMENT (IN)
#4	10
#5	12
#6	15
#8	20

ANCHOR ROD DIAMETER (IN)	MINIMUM EMBEDMENT (IN)
1/2	6
5/8	8
3/4	10

16. UNLESS OTHERWISE INDICATED, SLOPE ALL HORIZONTAL CONCRETE SURFACES 1/8 INCH PER FOOT FOR DRAINAGE. UNLESS OTHERWISE INDICATED, THE NOMINAL ELEVATION INDICATED ON THE DRAWINGS IS THE HIGH POINT OF THE CONCRETE SURFACE.
17. PREPARE ALL SURFACES THAT ARE TO RECEIVE CONCRETE PLACEMENTS PRIOR TO THE PLACEMENT OF CAST-IN-PLACE CONCRETE IN ACCORDANCE WITH SPECIFICATION SECTION 033000.
18. WHERE CONCRETE REMOVAL AND REPLACEMENT NECESSITATES ADJACENT SEPARATE CONCRETE PLACEMENTS, DO NOT PERFORM CONCRETE REMOVAL WITHIN 1 FT. OF ADJACENT REPAIR AREAS. COMBINE ADJACENT AREAS WITHIN THIS 1 FT. BUFFER IS NOT ATTAINABLE INTO A SINGLE REPAIR AREA.
19. IN SEQUENCING WORK, DO NOT BEGIN CONCRETE REMOVAL AT A LOCATION ADJACENT TO A COMPLETED REPAIR OR FACING UNTIL A MINIMUM OF 7 CURING DAYS HAVE PASSED.

GENERAL NOTES

ENVIRONMENTAL NOTES

1. FOLLOW ALL SWPPP AND PERMIT REQUIREMENTS. PROVIDE EROSION AND SEDIMENT CONTROL (E&SC) MEASURES IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
2. STREAM CONSERVATION: CONDUCT OPERATIONS IN ACCORDANCE WITH ALL PROJECT PERMITS AND THE CONTRACT EROSION AND SEDIMENT CONTROL MEASURES TO PREVENT ANY DAMAGE TO THE WATERWAYS FROM POLLUTION BY DEBRIS, SEDIMENT, OTHER FOREIGN MATERIAL, OR FROM THE MANIPULATION OF EQUIPMENT AND/OR MATERIALS IN OR NEAR THE WATERWAY. DO NOT INCREASE TURBIDITY THAT WILL CAUSE SUBSTANTIAL VISIBLE CONTRAST IN THE WATERS DOWNSTREAM OF CONSTRUCTION. DO NOT RETURN DIRECTLY TO A STREAM, OR TO A DITCH IMMEDIATELY FLOWING INTO A STREAM, ANY WATER WHICH HAS BEEN USED FOR WASH PURPOSES OR OTHER SIMILAR OPERATIONS WHICH COULD CAUSE THIS WATER TO BECOME POLLUTED WITH SAND, SILT, CEMENT, OIL, OR OTHER IMPURITIES. IF THE CONTRACTOR USES WATER FROM A STREAM, CONSTRUCT AN INTAKE OR TEMPORARY DAM TO PROTECT AND MAINTAIN WATER RIGHTS AND TO SUSTAIN FISH LIFE DOWNSTREAM. REMOVE THESE TEMPORARY MEASURES AND RESTORE THE AREA AT THE COMPLETION OF THE WORK.
3. VISIBLY TURBID DISCHARGES FROM DEWATERING OPERATIONS OR EXCAVATION ACTIVITIES ARE NOT ALLOWED TO ENTER ANY WATERWAY. PROVIDE ALL MEASURES NECESSARY TO ELIMINATE THE TURBIDITY PRIOR TO DISCHARGE.
4. DO NOT ALLOW THE ENTRANCE OF FRESH CONCRETE INTO THE WATERWAY. CLEAN EQUIPMENT, TOOLS, AND TRUCKS USED IN THIS PROJECT IN SUCH A MANNER AS TO PREVENT WASH WATER FROM ENTERING THE WATERWAY. WET CONCRETE IS HIGHLY TOXIC TO FISH. LOCATE WASH LOCATIONS AT LOCATIONS ACCEPTED BY THE DIRECTOR'S REPRESENTATIVE.
5. SPILLAGE OF OIL AND HAZARDOUS SUBSTANCES IS ESPECIALLY PROHIBITED BY SECTION 311 OF THE CLEAN WATER ACT OF 1977. MEASURES INCLUDING PROPER MAINTENANCE OF CONSTRUCTION EQUIPMENT, DESIGNATING FUEL/HAZARDOUS SUBSTANCES HANDLING AREAS TO ALLOW SPILLS TO BE CONTAINED BEFORE REACHING THE WATERWAY, INSTRUCTING PERSONNEL NOT TO DISPOSE OF OIL AND OTHER SUCH MATERIALS INTO DRAINS OR INTO THE WATERWAY DIRECTLY, AND OTHER NECESSARY PROCEDURES SHALL BE IMPLEMENTED PRIOR TO ANY CONSTRUCTION ACTIVITIES. IF IN SPITE OF SUCH PLANNING, OIL/HAZARDOUS SUBSTANCES ARE SPILLED INTO A WATER COURSE, GIVE IMMEDIATE NOTIFICATION TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION AT TELEPHONE NUMBER (800) 457-7362, THE NATIONAL RESPONSE CENTER AT TELEPHONE NUMBER 1-800-424-8802. RETAIN A CONTAINMENT BOOM AND A SUPPLY OF HAY, STRAW, OR OTHER ABSORBENT ON SITE SO THAT IT MAY BE RAPIDLY DEPLOYED TO SOAK UP ANY POSSIBLE SPILLAGE, PENDING DEPARTMENT OF ENVIRONMENTAL CONSERVATION AND/OR COAST GUARD ARRIVAL ON THE SCENE. THE USE OF CHEMICAL DISPERSING AGENTS AND EMULSIFIERS IS NOT AUTHORIZED WITHOUT PRIOR SPECIFIC FEDERAL OR STATE APPROVAL.
6. THE WORK TO BE PERFORMED UNDER THIS CONTRACT IS NOT ANTICIPATED TO REQUIRE THE DISTURBANCE, DESTRUCTION OR REMOVAL OF ANY KNOWN MATERIALS CONTAINING ASBESTOS WITH THE EXCEPTION OF NON-FRIABLE GLAZING COMPOUND ON THE EXISTING CONTROL HOUSE WINDOWS AND PRESUMED CONTENT IN FRIABLE WIRE JACKETING. SHOULD THE CONTRACTOR UNCOVER OR IDENTIFY MATERIALS CONTAINING ASBESTOS DURING CONSTRUCTION, IT IS THE EXPRESS INTENT OF THIS CONTRACT THAT THESE MATERIALS NOT BE DISTURBED IN ANY WAY. SHOULD THE CONTRACTOR NEED TO REMOVE OR DISTURB SUCH MATERIALS IN ANY WAY TO COMMENCE WORK, COMPLY WITH INDUSTRIAL CODE RULE 56 OF THE N.Y.S. DEPARTMENT OF LABOR. OBTAIN WRITTEN PERMISSION FROM THE DIRECTOR'S REPRESENTATIVE BEFORE PROCEEDING. A HAZARDOUS MATERIALS SURVEY REPORT HAS BEEN PREPARED FOR THIS PROJECT AND IS PROVIDED WITH THE CONTRACT DOCUMENTS.
7. THE PRESENCE OF LEAD-BASED PAINT HAS BEEN IDENTIFIED ON THE RED GUARDRAILS EAST OF THE CONTROL HOUSE, ON PAINTED FEATURES (WOOD, TIN, STEEL AND CONCRETE) IN THE CONTROL HOUSE, AND ON THE EXISTING OUTLET VALVES. CONDUCT ALL REMOVAL AND RECONSTRUCTION WORK IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS. THE COST OF REMOVAL, HANDLING, AND DISPOSAL OF ALL HAZARDOUS MATERIAL SHALL BE INCLUDED IN THE CONTRACT. SHOULD THE CONTRACTOR ENCOUNTER HAZARDOUS MATERIAL (E.G. ASBESTOS, LEAD, ETC.,) IN LOCATIONS NOT IDENTIFIED IN THE CONTRACT DOCUMENTS, REPORT FINDINGS TO THE DIRECTOR'S REPRESENTATIVE AND OBTAIN WRITTEN PERMISSION FROM THE STATE BEFORE PROCEEDING. A HAZARDOUS MATERIALS SURVEY REPORT HAS BEEN PREPARED FOR THIS PROJECT AND IS PROVIDED WITH THE CONTRACT DOCUMENTS.
8. REFER TO DRAWINGS FOR REQUIREMENTS RELATED TO WATER CONTROL DURING CONSTRUCTION.

EROSION AND SEDIMENT CONTROL NOTES

1. THE PROJECT BASIS OF DESIGN DOCUMENTS INCLUDE THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL, AND THE STATE POLLUTION DISCHARGE ELIMINATION SYSTEM (SPDES) GENERAL PERMIT (GP-0-25-001) REPORTS AND RELATED DOCUMENTS. OBTAIN THESE AVAILABLE DOCUMENTS ONLINE FOR REFERENCE. REFER TO THE EROSION AND SEDIMENT CONTROL DRAWINGS FOR LOCATIONS OF SILT FENCE.
2. OBTAIN A COPY OF GENERAL PERMIT (GP-0-25-001), BECOME FAMILIAR WITH ITS CONTENTS, AND COMPLETE AND SIGN A CONTRACTOR'S CERTIFICATION STATEMENT.
3. IMPLEMENT BEST MANAGEMENT PRACTICES AS REQUIRED. IMPLEMENT ADDITIONAL BEST MANAGEMENT PRACTICES AS DICTATED BY CONDITIONS THROUGHOUT THE DURATION OF CONSTRUCTION AND INCLUDE THE COST IN THE CONTRACT BID PRICE.
4. PERFORM BEST MANAGEMENT PRACTICES AND PROVIDE CONTROLS CONFORMING TO FEDERAL, STATE, AND LOCAL REQUIREMENTS AND MANUAL OF PRACTICE, AS APPLICABLE. IMPLEMENT ADDITIONAL CONTROLS AS DIRECTED BY PERMITTING AGENCY OR BY THE DIRECTOR'S REPRESENTATIVE.
5. MINIMIZE DISTURBANCE OF EXISTING VEGETATION TO THE MAXIMUM EXTENT PRACTICAL AND AS REQUIRED BY THE GENERAL PERMIT.
6. LOCATE STAGING AREAS, ANY TEMPORARY PARKING, AND MATERIAL DELIVERY AND STORAGE WITHIN DEFINED DISTURBANCE LIMITS.
7. DETAIN AND PROPERLY TREAT OR DISPOSE OF ALL WASH WATER FROM ALL CONSTRUCTION VEHICLES AND EQUIPMENT.
8. MAINTAIN ON SITE, OR KEEP READILY AVAILABLE, SUFFICIENT OIL AND GREASE ABSORBING MATERIALS TO CONTAIN AND CLEAN-UP FUEL OR CHEMICAL SPILLS AND LEAKS.
9. CONTROL DUST ON THE SITE. THE USE OF MOTOR OILS OR OTHER PETROLEUM BASED OR TOXIC LIQUIDS FOR DUST SUPPRESSION OPERATIONS IS PROHIBITED.
10. CHECK ALL SEEDED AREAS REGULARLY TO IDENTIFY DEFICIENCIES AND THAT A GOOD STAND IS MAINTAINED. FERTILIZE, WATER, AND RESEED AREAS AS NECESSARY.
11. REPAIR SILT FENCES TO THEIR ORIGINAL CONDITIONS IF DAMAGED AND REMOVE SEDIMENT FROM THE SILT FENCES WHEN IT REACHES ONE-HALF THE HEIGHT OF THE SILT FENCE.
12. PASS ALL PUMPED WATER FROM DEWATERING OPERATIONS THROUGH A SEDIMENT TRAPPING DEVICE BEFORE BEING DISCHARGED. THESE DEVICES INCLUDE, BUT ARE NOT LIMITED TO, SEDIMENT BAGS, PORTABLE SEDIMENT TANKS, AND SEDIMENT TRAPS.
13. NYSDEC GP-0-25-001 STATES THAT TEMPORARY STABILIZATION MEANS THAT EXPOSED SOIL HAS BEEN COVERED WITH MATERIALS AS SET FORTH IN THE TECHNICAL STANDARD, NEW YORK STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL, TO PREVENT THE EXPOSED SOIL FROM ERODING. THE MATERIALS CAN INCLUDE, BUT ARE NOT LIMITED TO, MULCH, SEED AND MULCH, AND EROSION CONTROL MATS (E.G., JUTE TWISTED YARN, EXCELSIOR WOOD FIBER MATS).
14. NYSDEC GP-0-25-001 STATES THAT FINAL STABILIZATION MEANS THAT ALL SOIL DISTURBANCE ACTIVITIES HAVE CEASED AND A UNIFORM, PERENNIAL VEGETATIVE COVER WITH A DENSITY OF EIGHTY (80) PERCENT OVER THE ENTIRE PERVIOUS SURFACE HAS BEEN ESTABLISHED; OR OTHER EQUIVALENT MEASURES, SUCH AS PERMANENT LANDSCAPE MULCHES, ROCK OR WASHED/CRUSHED STONE HAVE BEEN APPLIED ON ALL DISTURBED AREAS THAT ARE NOT COVERED BY PERMANENT STRUCTURES, CONCRETE OR PAVEMENT.
15. PROVIDE ALL EROSION AND SEDIMENT CONTROLS CONFORMING TO NYSDEC SPDES GP-0-25-001.
16. REMOVE AND RESTORE ALL LAYDOWN, STAGING, AND STOCKPILE AREAS AT COMPLETION OF CONSTRUCTION. PERFORM DEEP RIPPING AND DECOMPACTION AS NECESSARY PRIOR TO RESEEDING. PERFORM SEEDING IN ACCORDANCE WITH SPECIFICATION SECTION 329200.

INVASIVE SPECIES CONTROL NOTES

1. ALL EQUIPMENT USED ON PROJECT SITES, WHETHER IT BE HAND OR POWER DRIVEN, MUST BE CLEANED PRIOR TO ENTERING ONTO AND PRIOR TO LEAVING THE SITE. THIS IS AN EFFORT TO REDUCE TRANSPORT OF INVASIVE PLANT SEEDS OR PLANT PROPAGULES AND REDUCE THE POTENTIAL FOR NEW INVASIVE INTRODUCTIONS. USE STEAM OR HOT WATER TO CLEAN EQUIPMENT PRIOR TO MOBILIZING ON SITE. THE EQUIPMENT BROUGHT TO THE SITE SHALL BE INSPECTED BY THE DEPARTMENT PRIOR TO BEING UNLOADED. WHEN REMOVING EQUIPMENT FROM THE SITE, CLEANING WITH WATER, AIR, OR BY MECHANICAL MEANS MAY BE SUBSTITUTED IF STEAM OR HOT WATER IS NOT AVAILABLE. WASH WATER AND MATERIALS GENERATED BY ONSITE CLEANING SHALL BE CONTAINED BY MEASURES CONFORMING TO THE SWPPP.
2. REMOVE ALL UNSUITABLE MATERIAL FROM THE SITE AND DISPOSE IN A LOCATION OBTAINED BY THE CONTRACTOR IN ACCORDANCE WITH 6NYCRR PART 360 REGULATIONS AND OTHER MUNICIPAL, STATE OR FEDERAL REGULATORY REQUIREMENTS. PROVIDE PROOF THAT THE DISPOSAL SITE IS APPROVED BY THE NYSDEC REGIONAL SOLID HAZARDOUS MATERIALS ENGINEER AND SUBMIT THE LOCATION IN WRITING FOR PRE-APPROVAL BY THE DIRECTOR'S REPRESENTATIVE PRIOR TO TRANSPORTING ANY MATERIALS.

SEQUENCING OF CONSTRUCTION AND SPECIAL RESTRICTIONS NOTES

1. THE FOLLOWING REQUIRES SPECIAL ATTENTION AND EXTRA COORDINATION IN ORDER TO MEET REQUIRED WINDOW OF ACCEPTABLE DATES AND TIME SPECIFIC SEQUENCE OF TASKS APPROPRIATELY.
2. REMOVAL OF INVASIVE PLANTS: SHALL BE DONE AS PART OF CLEARING AND GRUBBING IN ACCORDANCE WITH THE SPECIFICATIONS.
3. SEEDING AND PLANTING: SHALL BE DONE IN ACCORDANCE WITH THE SPECIFICATIONS.
4. TREE REMOVAL AND PROTECTION: THE NORTHERN LONG-EARED BAT (MYOTIS SEPTENTRIONALIS) IS LISTED STATEWIDE AS A FEDERALLY ENDANGERED SPECIES THAT MAY OCCUPY TREES GREATER THAN 3 INCHES DIAMETER AT BREAST HEIGHT (3" DBH) AS HABITAT BETWEEN APRIL 1ST AND SEPTEMBER 30TH OF THE YEAR. THIS PROJECT INVOLVES THE REMOVAL OF TREES GREATER THAN 3" DBH. TREES MUST NOT BE CUT DURING THAT TIME, BUT MAY BE CUT DURING THE WINTER CUTTING PERIOD OF OCTOBER 1ST THROUGH MARCH 31ST. IF PROJECT CONDITIONS CHANGE AND ADDITIONAL TREE REMOVALS ARE NECESSARY, WHETHER UNDER CLEARING AND GRUBBING OR TREE REMOVALS, THE DIRECTOR'S REPRESENTATIVE MUST BE NOTIFIED PRIOR TO THE START OF ANY TREE REMOVAL. TREE REMOVALS WILL BE ALLOWED ONLY AFTER COORDINATION AND APPROVAL BY THE DIRECTOR'S REPRESENTATIVE. PROTECT WOODED AND FORESTED AREAS TO REMAIN WITH TEMPORARY CONSTRUCTION FENCING.
5. IMPOUNDMENT LEVEL: AS DETAILED IN WATER CONTROL PLAN, DRAWING G-101, AND THE UPPER HUDSON / SACANDAGA RIVER OFFER OF SETTLEMENT DATED MARCH 27, 2000.

CONSTRUCTION PFMA NOTES

1. CONTRACTOR TO ATTEND AND PARTICIPATE IN A CONSTRUCTION POTENTIAL FAILURE MODE ANALYSIS (PFMA) PROCESS OUTLINED BY FEDERAL ENERGY REGULATORY COMMISSION, ENGINEERING GUIDELINES FOR THE EVALUATION OF HYDROPOWER PROJECTS, CHAPTER 17 - POTENTIAL FAILURE MODE ANALYSIS, DECEMBER 16, 2021, EXPECTED TO INCLUDE THE FOLLOWING:
   1.1. PROVIDE CONSTRUCTION PERSONNEL ASSIGNED TO OVERSEE THE WORK ON THE PROJECT, EXPERIENCED IN ALL PHASES OF CONSTRUCTION, AND FAMILIAR WITH THE PROPOSED MEANS AND METHODS OF CONDUCTING ALL ASPECTS OF WORK. SUBMIT RESUME(S) AND CONTACT INFORMATION FOR PARTICIPATING PERSONNEL.
   1.2. AFTER AWARD AND NEAR THE START OF CONSTRUCTION, COORDINATE WITH THE DIRECTOR'S REPRESENTATIVE ON THE SCHEDULING OF A CONSTRUCTION PFMA SESSION.
   1.3. PLAN TO MAKE CONSTRUCTION PERSONNEL AVAILABLE FOR TWO PRE-SESSION PLANNING MEETINGS IN ADVANCE OF THE CONSTRUCTION PFMA SESSION. EACH MEETING IS EXPECTED TO BE OF A 4 HOUR DURATION. COORDINATE SCHEDULE FOR THE MEETINGS WITH THE DIRECTOR'S REPRESENTATIVE.
   1.4. CONSTRUCTION PERSONNEL THEN ARE REQUIRED TO PARTICIPATE IN THE PFMA SESSION. THE PFMA SESSION IS EXPECTED TO BE 16 HOURS IN DURATION (2 DAY MEETING). THE SESSION IS EXPECTED TO BE ONSITE (OR AT A LOCATION NEAR THE SITE).
   1.5. AFTER THE SESSION, THERE MAY BE A FOLLOW-UP COORDINATION WITH CONSTRUCTION PERSONNEL THAT IS EXPECTED TO BE RESOLVED OVER A MEETING OF A 4 HOUR DURATION.

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STATE OF NEW YORK · JOSHUA MICHAEL RICE · No. 085538 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C, E
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE: GENERAL NOTES

DRAWING NUMBER: G-004

SHEET 4 OF 148

Aug 25 2026 - 12:42pm
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164G-004.dwg
36x24 PLOT SHEET

OUTLET STRUCTURE MODIFICATIONS SEQUENCING NOTES

RECOMMENDED CONSTRUCTION SEQUENCING FOR OUTLET STRUCTURE MODIFICATIONS IS NOTED HEREIN. REFER TO THE WATER CONTROL PLAN ON DWG. G-101 FOR WATER CONTROL REQUIREMENTS. NOTE THAT THE SEQUENCING NOTED HEREIN IS INTENDED TO PROVIDE GUIDANCE REGARDING THE APPROACH TO THE CONSTRUCTION, AND DOES NOT NECESSARILY IDENTIFY ALL RELATED WORK. NOR IS THIS INTENDED TO PRECLUDE OTHER APPROACHES TO CONSTRUCTION OR SEQUENCING. SUBMIT TO THE DIRECTOR'S REPRESENTATIVE A WORK SEQUENCING PLAN FOR THE OUTLET STRUCTURE MODIFICATIONS FOR REVIEW AND APPROVAL PRIOR TO COMMENCING OUTLET STRUCTURE IMPROVEMENTS.

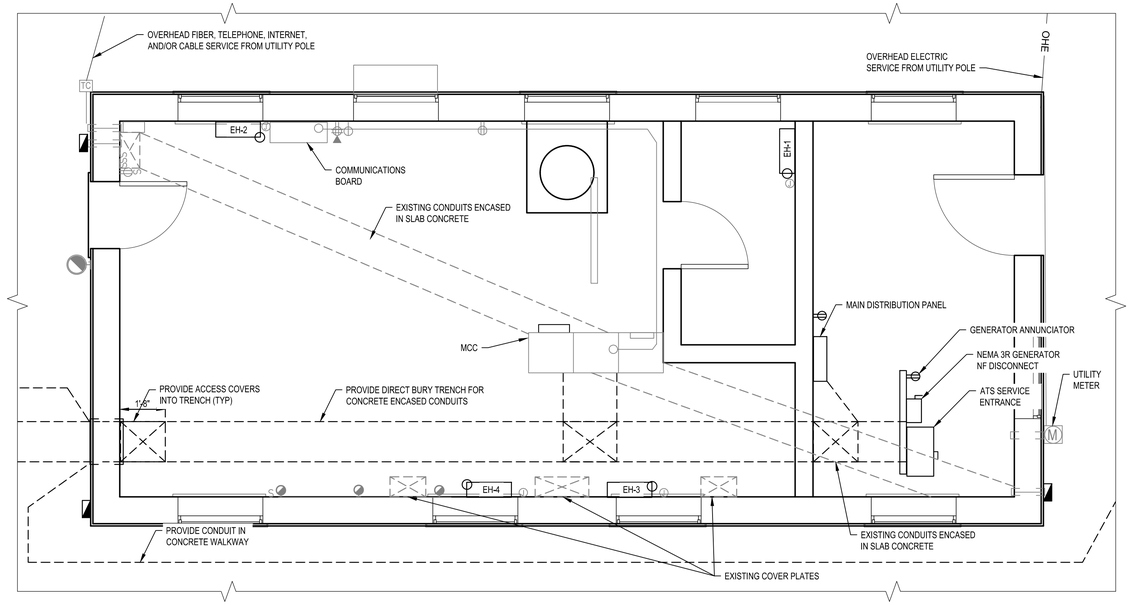
1. ELECTRICAL WORK:
   A. PROVIDE PORTABLE GENERATOR FOR TEMPORARY POWER FOR CRITICAL BUILDING OPERATIONS FOR WHEN UTILITY POWER IS DISRUPTED, SUCH AS VALVE OPERATION, SECURITY, AND LIGHTING. FOR VALVE OPERATION, UTILIZE EXISTING MCC CABINETS UNTIL SUCH TIME THAT TWO REPLACEMENT VALVES ARE OPERATIONAL. PROVIDE TEMPORARY SOOW CORDS, RATED FOR 100A, FROM OUTPUT OF MCC CONTACTS, DOWN ACCESS SHAFT, AND OVER TO VALVE MOTOR DISCONNECTS TO ACCOMMODATE THE REMOVAL OF THE EXISTING FEEDERS TO THE VALVE MOTORS. PROVIDE TEMPORARY TRANSFER SWITCH UPSTREAM OF MCC FOR USE BY TEMPORARY GENERATOR OR BY INCOMING ELECTRICAL SERVICE. AN ALTERNATIVE PLAN MAY BE SUBMITTED FOR APPROVAL BY THE DISTRICTS REPRESENTATIVE.
   B. SUBMIT A WORK PLAN DEMONSTRATING THAT POWER IS SUPPLIED TO AT LEAST TWO VALVES DURING ALL STAGES OF CONSTRUCTION. VALVES WILL NOT BE OPERATED SIMULTANEOUSLY. THE PLAN SHALL ACCOUNT FOR OVERHEAD CRANE OPERATION, LIGHTING, SUMP PUMP, VENTILATION, AND OTHER SERVICES NEEDED FOR PROJECT OPERATION.
   C. REROUTE POWER AND CONTROL TO THE VALVE GALLERY, INCLUDING THE TWO EXISTING OUTLET VALVES (NUMBERS 1 & 2) THAT ARE TO REMAIN OPERATIONAL UNTIL THE THIRD VALVE (NUMBER 3) HAS BEEN REPLACED AND SUCCESSFULLY COMMISSIONED.
   D. E-CONTRACT IS RESPONSIBLE FOR PROVIDING TEMPORARY AND BACKUP POWER AS NEEDED TO PERFORM THE WORK IN THE E-CONTRACT DRAWINGS AND PROJECT SPECIFICATIONS. THE C-CONTRACT IS RESPONSIBLE FOR THE TEMPORARY AND BACKUP POWER AS NEEDED TO PERFORM THE WORK OUTLINED IN THE C-CONTRACT DRAWINGS AND PROJECT SPECIFICATIONS.
   E. PRIOR TO EXCAVATING CONCRETE, THE UNDERGROUND CONDUITS UNDERNEATH MUST BE DE-ENERGIZED.

2. STAGE 1:
   A. REMOVE EXISTING ACCESS STAIRS AND DELIVER TO OWNER'S DESIGNATED AREA. (PROVIDE TEMPORARY ACCESS TO DIRECTOR'S REPRESENTATIVE WHILE ACCESS TO AND WITHIN THE VALVE CHAMBER IS DISRUPTED.) REMOVE EXISTING ACCESS SHAFT LADDER. INSTALL TEMPORARY VALVE CHAMBER VENTILATION.
   B. PERFORM OTHER REMOVALS AT ACCESS SHAFT AND AT VALVE CHAMBER CEILING AND PROVIDE TEMPORARY WEATHER PROTECTION OVER ACCESS SHAFT.
   C. PROVIDE NEW ACCESS SHAFT JIB CRANE AND HOIST.
   D. PROVIDE FLOOR OVERLAY, TRANSFER CART RAILS AND TRANSFER CART AT BOTTOM OF ACCESS SHAFT AND COMMISSION TRANSFER CART FOR OPERATION.
   E. PROVIDE OVERHEAD CRANE, INCLUDING RUNWAY, RAILS, POWER, FESTOON SYSTEM, LIGHTING, ETC. AND COMMISSION CRANE FOR OPERATION.
   F. BORE VALVE AERATION HOLE THROUGH CENTER WALL AND BORE VENTILATION HOLE INTO THE EXISTING OUTLET NUMBER 3 AERATION DUCT AND TEMPORARILY PLUG THE DUCT.
   G. PROVIDE NEW ACCESS STAIRS, ACCESS SHED, ROOF VENTILATOR, LIGHTING AND EQUIPMENT HATCH.

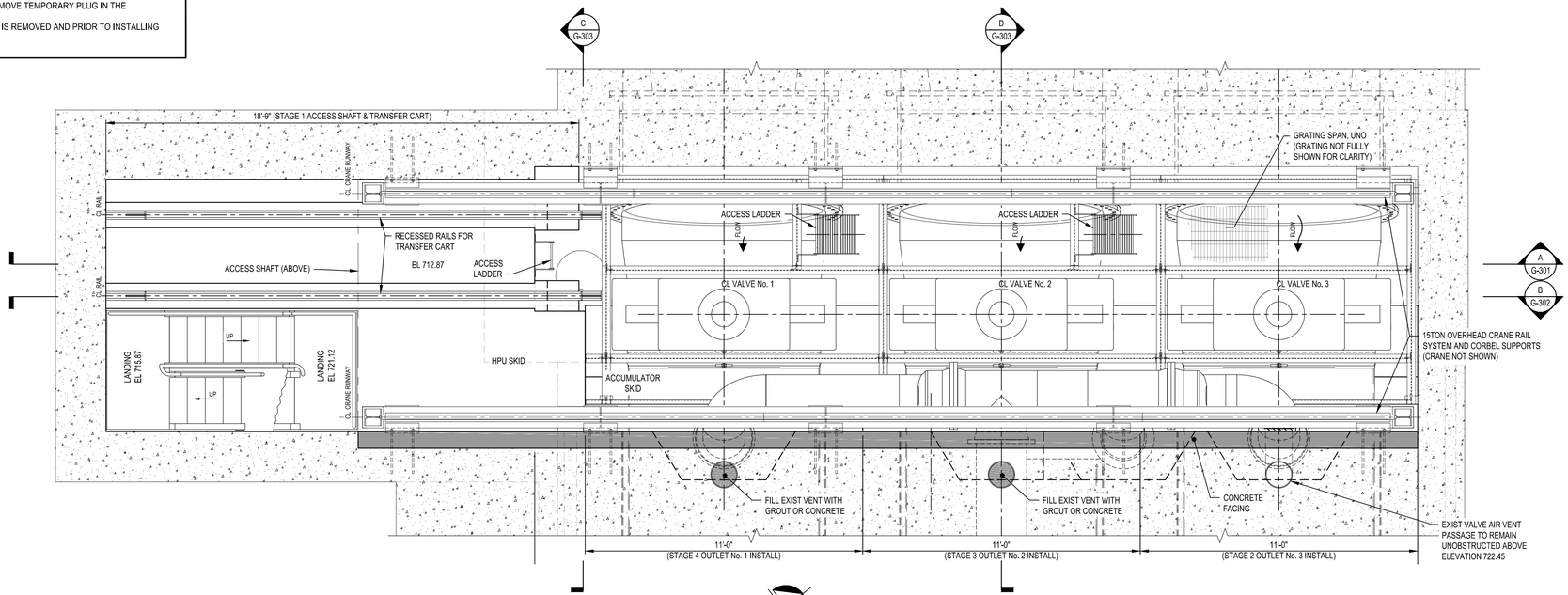
3. STAGE 2:
   A. COORDINATE WITH DIRECTOR'S REPRESENTATIVE FOR LAKE DISCHARGE THROUGH THE EJ WEST HYDROELECTRIC PROJECT DURING A PERIOD WHEN LAKE DISCHARGE IS FORECAST TO BE WITHIN PLANT CAPACITY AND FOR TEMPORARY LOCKOUT / TAGOUT OF OUTLET VALVES. REFER TO WATER CONTROL PLAN ON DWG. G-101.
   B. PROVIDE, OR INSTALL AND SEAL OWNER-FURNISHED, UPSTREAM BULKHEAD AT OUTLET NUMBER 3. PROVIDE TEMPORARY COFFERDAM ACROSS THE TAILRACE CHANNEL.
   C. REMOVE EXISTING OUTLET VALVE.
   D. INSTALL GROUTED DOWELS THROUGH VALVE PIT FLOOR AND END WALL.
   E. REMOVE EXISTING OUTLET CONDUIT, MACHINERY, AND SURROUNDING CONCRETE TO THE LIMITS INDICATED FOR OUTLET NUMBER 3.
   F. PROVIDE DOWNSTREAM OUTLET NUMBER 3 CONDUIT LINER AND STOP GATE GUIDES AT OUTLET NUMBER 3.
   G. PROVIDE STOP GATE AT OUTLET NUMBER 3, AND REMOVE TEMPORARY COFFERDAM.
   H. PROVIDE VALVE NUMBER 3 AERATION PIPING, INCLUDING TEMPORARY BLIND FLANGES AT HEADER TO OUTLET NUMBERS 1 & 2.
   I. PLACE CONCRETE AND SEAL EXPOSED DEMOLITION SURFACES AS INDICATED.
   J. PROVIDE REPLACEMENT OUTLET NUMBER 3 CONDUIT TRANSITION, VALVE INCLUDING CONCRETE PIERS AND BEARING, FLEXIBLE JOINT AND ANCILLARY WORKS, INCLUDING POWER, HPU, HYDRAULICS, CONTROLS, VALVE NUMBER 3 OPERATING PLATFORM, ETC. AND DRY COMMISSION VALVE NUMBER 3. LEAVE VALVE IN CLOSED POSITION.
   K. FILL UPSTREAM CONDUIT LINER NUMBER 3 BY TEMPORARY MEANS.
   L. REMOVE UPSTREAM BULKHEAD FROM INTAKE NUMBER 3.
   M. REMOVE STOP GATE FROM OUTLET NUMBER 3.

4. STAGE 3:
   A. REPLACE OUTLET NUMBER 2 WORKS SIMILAR TO OUTLET NUMBER 3, MAINTAINING POWER AND CONTROL TO EXISTING VALVE NUMBER 1 AND NEW VALVE NUMBER 3. GROUT EXISTING VALVE NUMBER 2 AERATION DUCT AS INDICATED.

5. STAGE 4:
   A. REPLACE OUTLET NUMBER 1 WORKS SIMILAR TO OUTLET NUMBERS 2 & 3, MAINTAINING POWER AND CONTROL TO NEW VALVES NUMBERS 2 & 3. GROUT EXISTING VALVE NUMBER 1 AERATION DUCT AS INDICATED AND REMOVE TEMPORARY PLUG IN THE VENTILATION DUCT AT OUTLET NUMBER 3.
   B. PROVIDE NEW SUMP AND PUMP ONCE EXISTING VALVE NUMBER 1 AND ADJOINING CONDUIT IS REMOVED AND PRIOR TO INSTALLING NEW CONDUIT AND VALVE.
   C. PUT ACCESS SHAFT ROOF VENTILATOR INTO OPERATION.



2 CONTROL HOUSE PLAN EL 786.12
SCALE: 3/8" = 1'-0"



3 VALVE CHAMBER PLAN EL 729
SCALE: 3/8" = 1'-0"

LEGEND

EXISTING CONCRETE (SECTION)

LIMITS OF CONCRETE PLACEMENT

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. SEE DRAWING G-101 FOR WATER CONTROL NOTES AND REQUIREMENTS.

2' 0 2' 4' 6'
3/8" = 1'-0"

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STATE OF NEW YORK · JOSHUA MICHAEL · REED · No. 085538 · LICENSED PROFESSIONAL ENGINEER

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TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

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MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM 4
0	06/22/2026	BID DOCUMENTS

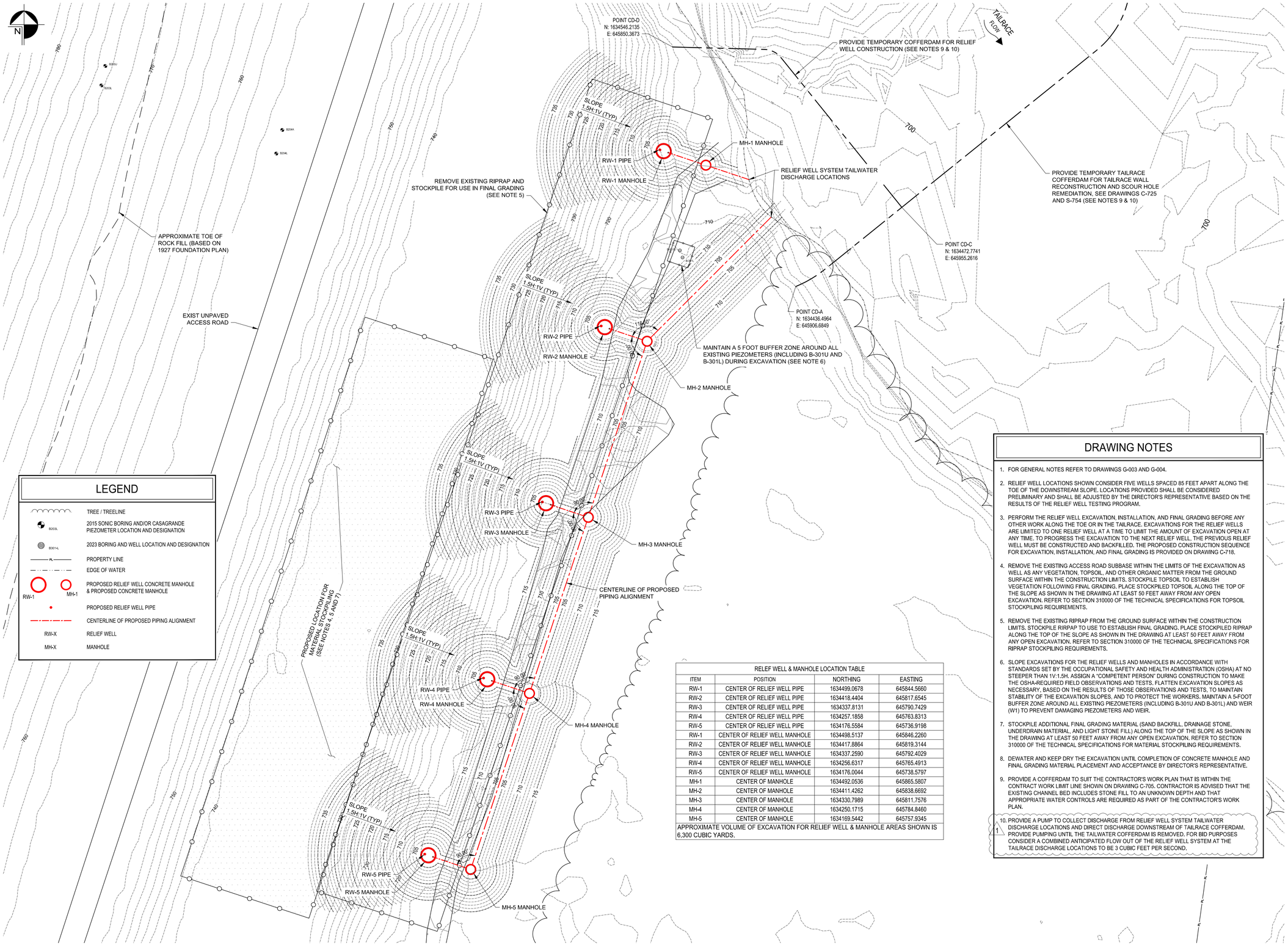
PROJECT NUMBER:	47164-C, E
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE: CONTROL HOUSE & VALVE CHAMBER SEQUENCING PLANS

DRAWING NUMBER: G-103

SHEET 12 OF 148

Aug 27,2026 - 1:06pm
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164G-103.dwg
36x24 PLOT SHEET



LEGEND

- TREE / TREELINE
- B203L — 2015 SONIC BORING AND/OR CASAGRANDE PIEZOMETER LOCATION AND DESIGNATION
- B301L — 2023 BORING AND WELL LOCATION AND DESIGNATION
- PL — PROPERTY LINE
- EDGE OF WATER
- RW-1 / MH-1 — PROPOSED RELIEF WELL CONCRETE MANHOLE & PROPOSED CONCRETE MANHOLE
- PROPOSED RELIEF WELL PIPE
- CENTERLINE OF PROPOSED PIPING ALIGNMENT
- RW-X — RELIEF WELL
- MH-X — MANHOLE

RELEF WELL & MANHOLE LOCATION TABLE

ITEM	POSITION	NORTHING	EASTING
RW-1	CENTER OF RELIEF WELL PIPE	1634499.0678	645844.5660
RW-2	CENTER OF RELIEF WELL PIPE	1634418.4404	645817.6545
RW-3	CENTER OF RELIEF WELL PIPE	1634337.8131	645790.7429
RW-4	CENTER OF RELIEF WELL PIPE	1634257.1858	645763.8313
RW-5	CENTER OF RELIEF WELL PIPE	1634176.5584	645736.9198
RW-1	CENTER OF RELIEF WELL MANHOLE	1634498.5137	645846.2260
RW-2	CENTER OF RELIEF WELL MANHOLE	1634417.8864	645819.3144
RW-3	CENTER OF RELIEF WELL MANHOLE	1634337.2590	645792.4029
RW-4	CENTER OF RELIEF WELL MANHOLE	1634256.6317	645765.4913
RW-5	CENTER OF RELIEF WELL MANHOLE	1634176.0044	645738.5797
MH-1	CENTER OF MANHOLE	1634492.0536	645865.5807
MH-2	CENTER OF MANHOLE	1634411.4262	645838.6692
MH-3	CENTER OF MANHOLE	1634330.7989	645811.7576
MH-4	CENTER OF MANHOLE	1634250.1715	645784.8460
MH-5	CENTER OF MANHOLE	1634169.5442	645757.9345

APPROXIMATE VOLUME OF EXCAVATION FOR RELIEF WELL & MANHOLE AREAS SHOWN IS 6,300 CUBIC YARDS.

DRAWING NOTES

1. FOR GENERAL NOTES REFER TO DRAWINGS G-003 AND G-004.
2. RELIEF WELL LOCATIONS SHOWN CONSIDER FIVE WELLS SPACED 85 FEET APART ALONG THE TOE OF THE DOWNSTREAM SLOPE. LOCATIONS PROVIDED SHALL BE CONSIDERED PRELIMINARY AND SHALL BE ADJUSTED BY THE DIRECTOR'S REPRESENTATIVE BASED ON THE RESULTS OF THE RELIEF WELL TESTING PROGRAM.
3. PERFORM THE RELIEF WELL EXCAVATION, INSTALLATION, AND FINAL GRADING BEFORE ANY OTHER WORK ALONG THE TOE OR IN THE TAILRACE. EXCAVATIONS FOR THE RELIEF WELLS ARE LIMITED TO ONE RELIEF WELL AT A TIME TO LIMIT THE AMOUNT OF EXCAVATION OPEN AT ANY TIME. TO PROGRESS THE EXCAVATION TO THE NEXT RELIEF WELL, THE PREVIOUS RELIEF WELL MUST BE CONSTRUCTED AND BACKFILLED. THE PROPOSED CONSTRUCTION SEQUENCE FOR EXCAVATION, INSTALLATION, AND FINAL GRADING IS PROVIDED ON DRAWING C-718.
4. REMOVE THE EXISTING ACCESS ROAD SUBBASE WITHIN THE LIMITS OF THE EXCAVATION AS WELL AS ANY VEGETATION, TOPSOIL, AND OTHER ORGANIC MATTER FROM THE GROUND SURFACE WITHIN THE CONSTRUCTION LIMITS. STOCKPILE TOPSOIL TO ESTABLISH VEGETATION FOLLOWING FINAL GRADING. PLACE STOCKPILED TOPSOIL ALONG THE TOP OF THE SLOPE AS SHOWN IN THE DRAWING AT LEAST 50 FEET AWAY FROM ANY OPEN EXCAVATION. REFER TO SECTION 310000 OF THE TECHNICAL SPECIFICATIONS FOR TOPSOIL STOCKPILING REQUIREMENTS.
5. REMOVE THE EXISTING RIPRAP FROM THE GROUND SURFACE WITHIN THE CONSTRUCTION LIMITS. STOCKPILE RIPRAP TO USE TO ESTABLISH FINAL GRADING. PLACE STOCKPILED RIPRAP ALONG THE TOP OF THE SLOPE AS SHOWN IN THE DRAWING AT LEAST 50 FEET AWAY FROM ANY OPEN EXCAVATION. REFER TO SECTION 310000 OF THE TECHNICAL SPECIFICATIONS FOR RIPRAP STOCKPILING REQUIREMENTS.
6. SLOPE EXCAVATIONS FOR THE RELIEF WELLS AND MANHOLES IN ACCORDANCE WITH STANDARDS SET BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AT NO STEEPER THAN 1V:1.5H. ASSIGN A "COMPETENT PERSON" DURING CONSTRUCTION TO MAKE THE OSHA-REQUIRED FIELD OBSERVATIONS AND TESTS. FLATTEN EXCAVATION SLOPES AS NECESSARY, BASED ON THE RESULTS OF THOSE OBSERVATIONS AND TESTS, TO MAINTAIN STABILITY OF THE EXCAVATION SLOPES. AND TO PROTECT THE WORKERS. MAINTAIN A 5-FOOT BUFFER ZONE AROUND ALL EXISTING PIEZOMETERS (INCLUDING B-301U AND B-301L) AND WEIR (W1) TO PREVENT DAMAGING PIEZOMETERS AND WEIR.
7. STOCKPILE ADDITIONAL FINAL GRADING MATERIAL (SAND BACKFILL, DRAINAGE STONE, UNDERDRAIN MATERIAL, AND LIGHT STONE FILL) ALONG THE TOP OF THE SLOPE AS SHOWN IN THE DRAWING AT LEAST 50 FEET AWAY FROM ANY OPEN EXCAVATION. REFER TO SECTION 310000 OF THE TECHNICAL SPECIFICATIONS FOR MATERIAL STOCKPILING REQUIREMENTS.
8. DEWATER AND KEEP DRY THE EXCAVATION UNTIL COMPLETION OF CONCRETE MANHOLE AND FINAL GRADING MATERIAL PLACEMENT AND ACCEPTANCE BY DIRECTOR'S REPRESENTATIVE.
9. PROVIDE A COFFERDAM TO SUIT THE CONTRACTOR'S WORK PLAN THAT IS WITHIN THE CONTRACT WORK LIMIT LINE SHOWN ON DRAWING C-705. CONTRACTOR IS ADVISED THAT THE EXISTING CHANNEL BED INCLUDES STONE FILL TO AN UNKNOWN DEPTH AND THAT APPROPRIATE WATER CONTROLS ARE REQUIRED AS PART OF THE CONTRACTOR'S WORK PLAN.
10. PROVIDE A PUMP TO COLLECT DISCHARGE FROM RELIEF WELL SYSTEM TAILWATER DISCHARGE LOCATIONS AND DIRECT DISCHARGE DOWNSTREAM OF TAILRACE COFFERDAM. PROVIDE PUMPING UNTIL THE TAILWATER COFFERDAM IS REMOVED. FOR BID PURPOSES CONSIDER A COMBINED ANTICIPATED FLOW OUT OF THE RELIEF WELL SYSTEM AT THE TAILRACE DISCHARGE LOCATIONS TO BE 3 CUBIC FEET PER SECOND.

1 PLAN
SCALE: 1" = 20'

20' 0 20' 40'
1" = 20'

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REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS
MARK	DATE	DESCRIPTION

PROJECT NUMBER:	47164-C
DESIGNED BY:	KMM
DRAWN BY:	KMM
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE:

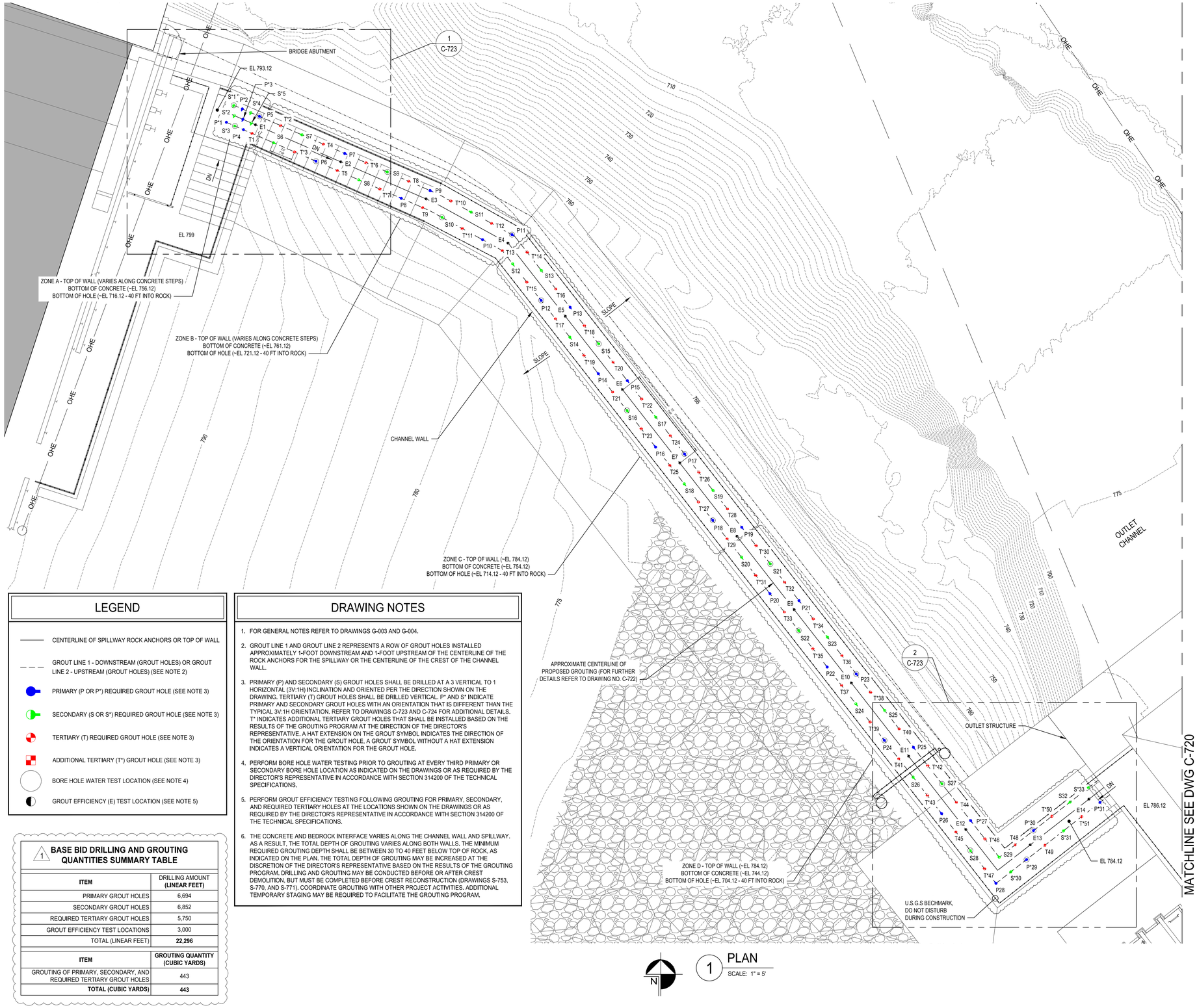
RELIEF WELL & MANHOLE EXCAVATION PLAN

DRAWING NUMBER:

C-712

SHEET 27 OF 148

Aug 25 2026 - 3:31pm
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164C-712.dwg
36x24 PLOT SHEET



LEGEND

- CENTERLINE OF SPILLWAY ROCK ANCHORS OR TOP OF WALL
- GROUT LINE 1 - DOWNSTREAM (GROUT HOLES) OR GROUT LINE 2 - UPSTREAM (GROUT HOLES) (SEE NOTE 2)
- PRIMARY (P OR P*) REQUIRED GROUT HOLE (SEE NOTE 3)
- SECONDARY (S OR S*) REQUIRED GROUT HOLE (SEE NOTE 3)
- TERTIARY (T) REQUIRED GROUT HOLE (SEE NOTE 3)
- ADDITIONAL TERTIARY (T*) GROUT HOLE (SEE NOTE 3)
- BORE HOLE WATER TEST LOCATION (SEE NOTE 4)
- GROUT EFFICIENCY (E) TEST LOCATION (SEE NOTE 5)

DRAWING NOTES

1. FOR GENERAL NOTES REFER TO DRAWINGS G-003 AND G-004.
2. GROUT LINE 1 AND GROUT LINE 2 REPRESENTS A ROW OF GROUT HOLES INSTALLED APPROXIMATELY 1-FOOT DOWNSTREAM AND 1-FOOT UPSTREAM OF THE CENTERLINE OF THE ROCK ANCHORS FOR THE SPILLWAY OR THE CENTERLINE OF THE CREST OF THE CHANNEL WALL.
3. PRIMARY (P) AND SECONDARY (S) GROUT HOLES SHALL BE DRILLED AT A 3 VERTICAL TO 1 HORIZONTAL (3V:1H) INCLINATION AND ORIENTED PER THE DIRECTION SHOWN ON THE DRAWING. TERTIARY (T) GROUT HOLES SHALL BE DRILLED VERTICAL. P* AND S* INDICATE PRIMARY AND SECONDARY GROUT HOLES WITH AN ORIENTATION THAT IS DIFFERENT THAN THE TYPICAL 3V:1H ORIENTATION. REFER TO DRAWINGS C-723 AND C-724 FOR ADDITIONAL DETAILS. T* INDICATES ADDITIONAL TERTIARY GROUT HOLES THAT SHALL BE INSTALLED BASED ON THE RESULTS OF THE GROUTING PROGRAM AT THE DIRECTION OF THE DIRECTOR'S REPRESENTATIVE. A HAT EXTENSION ON THE GROUT SYMBOL INDICATES THE DIRECTION OF THE ORIENTATION FOR THE GROUT HOLE, A GROUT SYMBOL WITHOUT A HAT EXTENSION INDICATES A VERTICAL ORIENTATION FOR THE GROUT HOLE.
4. PERFORM BORE HOLE WATER TESTING PRIOR TO GROUTING AT EVERY THIRD PRIMARY OR SECONDARY BORE HOLE LOCATION AS INDICATED ON THE DRAWINGS OR AS REQUIRED BY THE DIRECTOR'S REPRESENTATIVE IN ACCORDANCE WITH SECTION 314200 OF THE TECHNICAL SPECIFICATIONS.
5. PERFORM GROUT EFFICIENCY TESTING FOLLOWING GROUTING FOR PRIMARY, SECONDARY, AND REQUIRED TERTIARY HOLES AT THE LOCATIONS SHOWN ON THE DRAWINGS OR AS REQUIRED BY THE DIRECTOR'S REPRESENTATIVE IN ACCORDANCE WITH SECTION 314200 OF THE TECHNICAL SPECIFICATIONS.
6. THE CONCRETE AND BEDROCK INTERFACE VARIES ALONG THE CHANNEL WALL AND SPILLWAY. AS A RESULT, THE TOTAL DEPTH OF GROUTING VARIES ALONG BOTH WALLS. THE MINIMUM REQUIRED GROUTING DEPTH SHALL BE BETWEEN 30 TO 40 FEET BELOW TOP OF ROCK, AS INDICATED ON THE PLAN. THE TOTAL DEPTH OF GROUTING MAY BE INCREASED AT THE DISCRETION OF THE DIRECTOR'S REPRESENTATIVE BASED ON THE RESULTS OF THE GROUTING PROGRAM. DRILLING AND GROUTING MAY BE CONDUCTED BEFORE OR AFTER CREST DEMOLITION, BUT MUST BE COMPLETED BEFORE CREST RECONSTRUCTION (DRAWINGS S-753, S-770, AND S-771). COORDINATE GROUTING WITH OTHER PROJECT ACTIVITIES. ADDITIONAL TEMPORARY STAGING MAY BE REQUIRED TO FACILITATE THE GROUTING PROGRAM.

1 BASE BID DRILLING AND GROUTING QUANTITIES SUMMARY TABLE

ITEM	DRILLING AMOUNT (LINEAR FEET)
PRIMARY GROUT HOLES	6,694
SECONDARY GROUT HOLES	6,852
REQUIRED TERTIARY GROUT HOLES	5,750
GROUT EFFICIENCY TEST LOCATIONS	3,000
TOTAL (LINEAR FEET)	**22,296**

ITEM	GROUTING QUANTITY (CUBIC YARDS)
GROUTING OF PRIMARY, SECONDARY, AND REQUIRED TERTIARY GROUT HOLES	443
TOTAL (CUBIC YARDS)	**443**

N

1 PLAN
SCALE: 1" = 5'

5' 0 5' 10'
1" = 5'

36x24 PLOT SHEET

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

Colliers Engineering & Design
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Rochester, NY 14604
Phone: 585.232.5135
COLLIERS ENGINEERING & DESIGN CT, P.C.
www.colliersengineering.com

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STATE OF NEW YORK
JOSHUA MICHAEL REED
No. 085538
LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES:
04/30/2028

CONTRACT:
CONSTRUCTION

TITLE:
PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM
NYS DAM ID #205-0415

LOCATION:
233 COUNTY ROUTE 8
HADLEY, NY
SARATOGA COUNTY

CLIENT:
NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

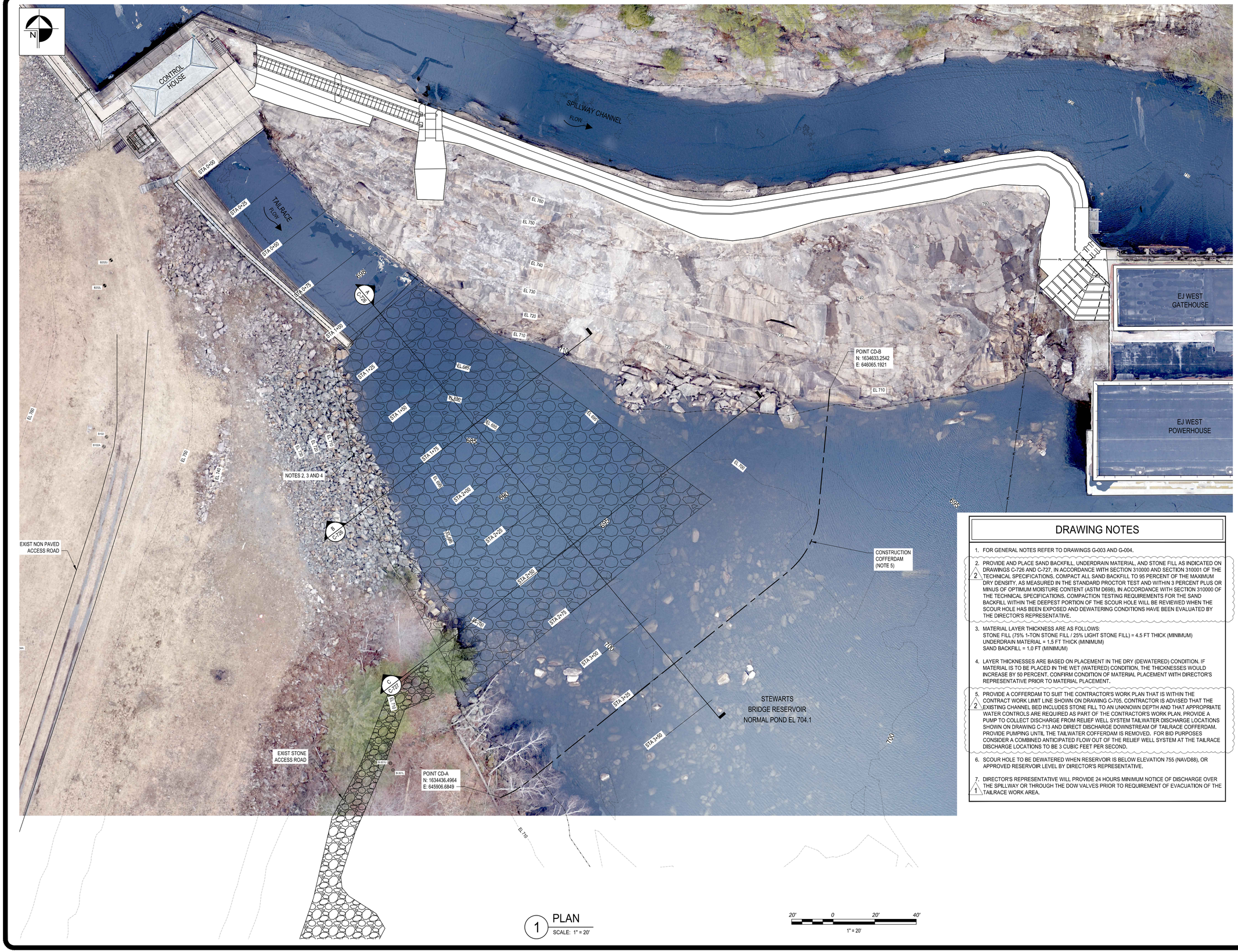
MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C
DESIGNED BY:	KMM
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE:
SPILLWAY & CHANNEL WALL FOUNDATION IMPROVEMENTS GROUTING PLAN – 1

DRAWING NUMBER:
C-719

SHEET 34 OF 148



1 PLAN
SCALE: 1" = 20'

20' 0 20' 40'
1" = 20'

DRAWING NOTES

1. FOR GENERAL NOTES REFER TO DRAWINGS G-003 AND G-004.
2. PROVIDE AND PLACE SAND BACKFILL, UNDERDRAIN MATERIAL, AND STONE FILL AS INDICATED ON DRAWINGS C-726 AND C-727, IN ACCORDANCE WITH SECTION 310000 AND SECTION 310001 OF THE TECHNICAL SPECIFICATIONS. COMPACT ALL SAND BACKFILL TO 95 PERCENT OF THE MAXIMUM DRY DENSITY, AS MEASURED IN THE STANDARD PROCTOR TEST AND WITHIN 3 PERCENT PLUS OR MINUS OF OPTIMUM MOISTURE CONTENT (ASTM D698). IN ACCORDANCE WITH SECTION 310000 OF THE TECHNICAL SPECIFICATIONS. COMPACTION TESTING REQUIREMENTS FOR THE SAND BACKFILL WITHIN THE DEEPEST PORTION OF THE SCOUR HOLE WILL BE REVIEWED WHEN THE SCOUR HOLE HAS BEEN EXPOSED AND DEWATERING CONDITIONS HAVE BEEN EVALUATED BY THE DIRECTOR'S REPRESENTATIVE. (2)
3. MATERIAL LAYER THICKNESS ARE AS FOLLOWS:
   STONE FILL (75% 1-TON STONE FILL / 25% LIGHT STONE FILL) = 4.5 FT THICK (MINIMUM)
   UNDERDRAIN MATERIAL = 1.5 FT THICK (MINIMUM)
   SAND BACKFILL = 1.0 FT (MINIMUM)
4. LAYER THICKNESSES ARE BASED ON PLACEMENT IN THE DRY (DEWATERED) CONDITION. IF MATERIAL IS TO BE PLACED IN THE WET (WATERED) CONDITION, THE THICKNESSES WOULD INCREASE BY 50 PERCENT. CONFIRM CONDITION OF MATERIAL PLACEMENT WITH DIRECTOR'S REPRESENTATIVE PRIOR TO MATERIAL PLACEMENT.
5. PROVIDE A COFFERDAM TO SUIT THE CONTRACTOR'S WORK PLAN THAT IS WITHIN THE CONTRACT WORK LIMIT LINE SHOWN ON DRAWING C-705. CONTRACTOR IS ADVISED THAT THE EXISTING CHANNEL BED INCLUDES STONE FILL TO AN UNKNOWN DEPTH AND THAT APPROPRIATE WATER CONTROLS ARE REQUIRED AS PART OF THE CONTRACTOR'S WORK PLAN. PROVIDE A PUMP TO COLLECT DISCHARGE FROM RELIEF WELL SYSTEM TAILWATER DISCHARGE LOCATIONS SHOWN ON DRAWING C-713 AND DIRECT DISCHARGE DOWNSTREAM OF TAILRACE COFFERDAM. PROVIDE PUMPING UNTIL THE TAILWATER COFFERDAM IS REMOVED. FOR BID PURPOSES CONSIDER A COMBINED ANTICIPATED FLOW OUT OF THE RELIEF WELL SYSTEM AT THE TAILRACE DISCHARGE LOCATIONS TO BE 3 CUBIC FEET PER SECOND. (2)
6. SCOUR HOLE TO BE DEWATERED WHEN RESERVOIR IS BELOW ELEVATION 755 (NAVD88), OR APPROVED RESERVOIR LEVEL BY DIRECTOR'S REPRESENTATIVE.
7. DIRECTOR'S REPRESENTATIVE WILL PROVIDE 24 HOURS MINIMUM NOTICE OF DISCHARGE OVER THE SPILLWAY OR THROUGH THE DOW VALVES PRIOR TO REQUIREMENT OF EVACUATION OF THE TAILRACE WORK AREA. (1)

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CONSULTANT

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STATE OF NEW YORK · JOSHUA MICHAEL RUPP · No. 085538 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
2	08/28/2026	ADDENDUM #4
1	08/11/2026	ADDENDUM #3
0	06/22/2026	BID DOCUMENTS

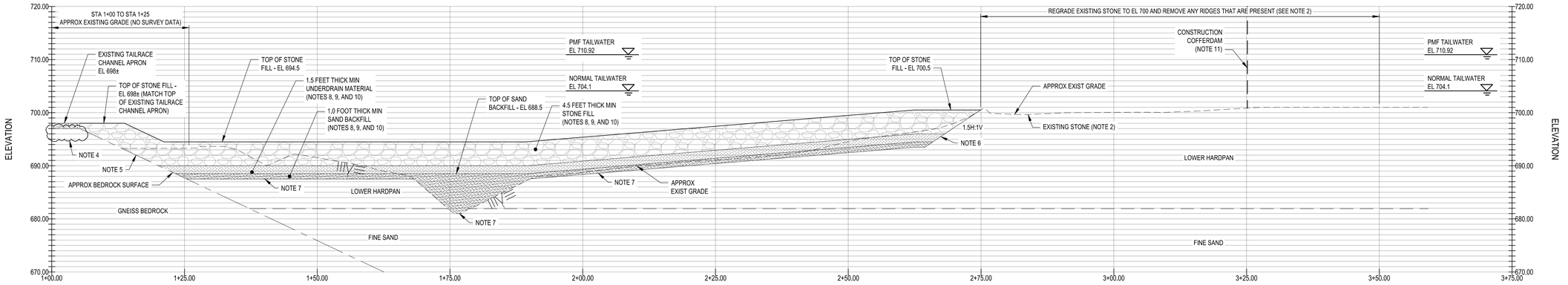
PROJECT NUMBER:	47164-C
DESIGNED BY:	KMM
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE: TAILRACE SCOUR HOLE REMEDIATION PLAN

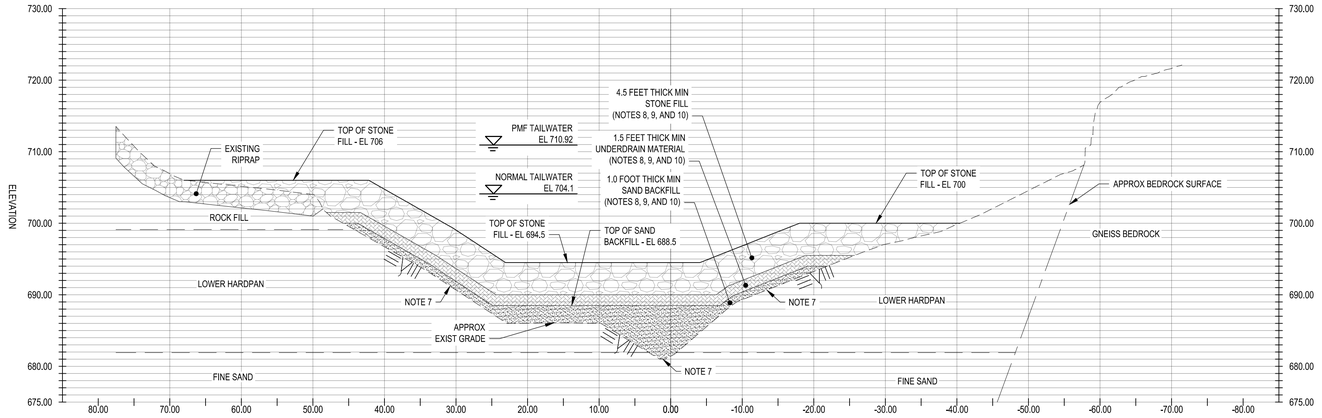
DRAWING NUMBER: C-725

SHEET 40 OF 148

Aug 25,2026 - 3:33pm
I:\OGS\47164\99\00.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164C-725.dwg
36x24 PLOT SHEET



A C-725 SECTION
SCALE: 1" = 10'



B C-725 SECTION
SCALE: 1" = 10'

LEGEND

- STONE FILL
- UNDERDRAIN MATERIAL
- SAND BACKFILL
- EXISTING STONE FILL
- EXISTING TAILRACE CHANNEL CONCRETE APRON

DRAWING NOTES

1. FOR GENERAL NOTES REFER TO DRAWINGS G-003 AND G-004.
2. REGRADE EXISTING STONE FILL ALONG THE GROUND SURFACE TO EL 700 WITHIN THE LIMITS SHOWN. DISPLACED STONE FILL IS PRESENT ALONG THE GROUND SURFACE DOWNSTREAM OF THE SCOUR HOLE IN THE PROPOSED LOCATION OF THE COFFERDAM.
3. ROCK EXCAVATION IS NOT REQUIRED TO ACHIEVE LAYER THICKNESS. IN AREAS WHERE BEDROCK IS EXPOSED, PLACE SAND BACKFILL, UNDERDRAIN MATERIAL, AND STONE FILL ON ROCK AS REQUIRED TO ACHIEVE THE GRADES SHOWN. REDUCE SAND BACKFILL AND UNDERDRAIN MATERIAL THICKNESSES TO SUIT FIELD CONDITIONS TO ACHIEVE TOP OF STONE FILL GRADE AS SHOWN. OMIT STONE FILL AND ADDITIONAL FILTER LAYERS IN AREAS WHERE TOP OF ROCK IS ABOVE THE PROPOSED GRADE OF STONE FILL.
4. PLACE STONE FILL, FLOWABLE FILL, OR CONCRETE UNDER THE EXISTING TAILRACE CHANNEL APRON IF THE TOE OF THE APRON IS UNDERMINED AND EXPOSED. CONFIRM CONDITIONS AND REPAIR METHODS WITH THE DIRECTOR'S REPRESENTATIVE. FOR PURPOSES OF PREPARING BID, ASSUME FIELD CONDITIONS REQUIRE NO MORE THAN 10 CUBIC YARDS TOTAL OF MATERIAL PLACEMENT AT UNDERMINED AND EXPOSED AREA AT APRON TOE. COMPENSATION FOR WORK REQUIRING MORE THAN 10 CUBIC YARDS WILL BE EXECUTED VIA CHANGE OR FIELD ORDER, AS FOUND ACCEPTABLE TO THE DIRECTOR'S REPRESENTATIVE. (1)
5. EXPOSE THE APPROXIMATE BEDROCK SURFACE DOWNSTREAM OF THE EXISTING TAILRACE CHANNEL APRON TO REACH THE GRADES SHOWN.
6. EXCAVATE THE EXISTING GRADE IN AREAS SHOWN TO ACHIEVE THE FINAL TOP OF STONE FILL GRADES SHOWN. SLOPE THE EXCAVATIONS IN ACCORDANCE WITH STANDARDS SET BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AT NO STEEPER THAN 1V:1.5H. ASSIGN A "COMPETENT PERSON" DURING CONSTRUCTION TO MAKE THE OSHA-REQUIRED FIELD OBSERVATIONS AND TESTS. FLATTEN EXCAVATION SLOPES AS NECESSARY, BASED ON THE RESULTS OF THOSE OBSERVATIONS AND TESTS, TO MAINTAIN STABILITY OF THE EXCAVATION SLOPES, AND TO PROTECT THE WORKERS.
7. PREPARE THE SUBGRADE BEFORE SAND BACKFILL PLACEMENT IN ACCORDANCE WITH SECTION 310000 OF THE TECHNICAL SPECIFICATIONS.
8. PROVIDE SAND BACKFILL, UNDERDRAIN MATERIAL, AND STONE FILL AS SHOWN IN ACCORDANCE WITH SECTION 310000 AND SECTION 310001 OF THE TECHNICAL SPECIFICATIONS. COMPACT ALL SAND BACKFILL TO 95 PERCENT OF THE MAXIMUM DRY DENSITY, AS MEASURED IN THE STANDARD PROCTOR TEST AND WITHIN 3 PERCENT PLUS OR MINUS OF OPTIMUM MOISTURE CONTENT (ASTM D698), IN ACCORDANCE WITH SECTION 310000 OF THE TECHNICAL SPECIFICATIONS. COMPACTION TESTING REQUIREMENTS FOR THE SAND BACKFILL WITHIN THE DEEPEST PORTION OF THE SCOUR HOLE WILL BE REVIEWED WHEN THE SCOUR HOLE HAS BEEN EXPOSED AND DEWATERING CONDITIONS HAVE BEEN EVALUATED BY THE DIRECTOR'S REPRESENTATIVE. (2)
9. MATERIAL LAYER THICKNESS ARE AS FOLLOWS:
   STONE FILL (75% 1-TON STONE FILL / 25% LIGHT STONE FILL) = 4.5 FT THICK (MINIMUM)
   UNDERDRAIN MATERIAL = 1.5 FT THICK (MINIMUM)
   SAND BACKFILL = 1.0 FT (MINIMUM)
10. LAYER THICKNESSES SHOWN AND PROVIDED IN THE ABOVE NOTE ARE BASED ON PLACEMENT IN THE DRY (DEWATERED) CONDITION. IF MATERIAL IS TO BE PLACED IN THE WET (WATERED) CONDITION, THE THICKNESSES WOULD INCREASE BY 50 PERCENT. CONFIRM CONDITION OF MATERIAL PLACEMENT WITH DIRECTOR'S REPRESENTATIVE PRIOR TO MATERIAL PLACEMENT.
11. PROVIDE A COFFERDAM TO SUIT THE CONTRACTOR'S WORK PLAN THAT IS WITHIN THE CONTRACT WORK LIMIT LINE SHOWN ON DRAWING C-705. CONTRACTOR IS ADVISED THAT THE EXISTING CHANNEL BED INCLUDES STONE FILL TO AN UNKNOWN DEPTH AND THAT APPROPRIATE WATER CONTROLS ARE REQUIRED AS PART OF THE CONTRACTOR'S WORK PLAN. PROVIDE A PUMP TO COLLECT DISCHARGE FROM RELIEF WELL SYSTEM TAILWATER DISCHARGE LOCATIONS SHOWN ON DRAWING C-713 AND DIRECT DISCHARGE DOWNSTREAM OF TAILRACE COFFERDAM. PROVIDE PUMPING UNTIL THE TAILWATER COFFERDAM IS REMOVED. FOR BID PURPOSES CONSIDER A COMBINED ANTICIPATED FLOW OUT OF THE RELIEF WELL SYSTEM AT THE TAILRACE DISCHARGE LOCATIONS TO BE 3 CUBIC FEET PER SECOND. (2)

10' 0 10' 20'
1" = 10'

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CONSULTANT

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2	08/28/2026	ADDENDUM #4
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0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C
DESIGNED BY:	KMM
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

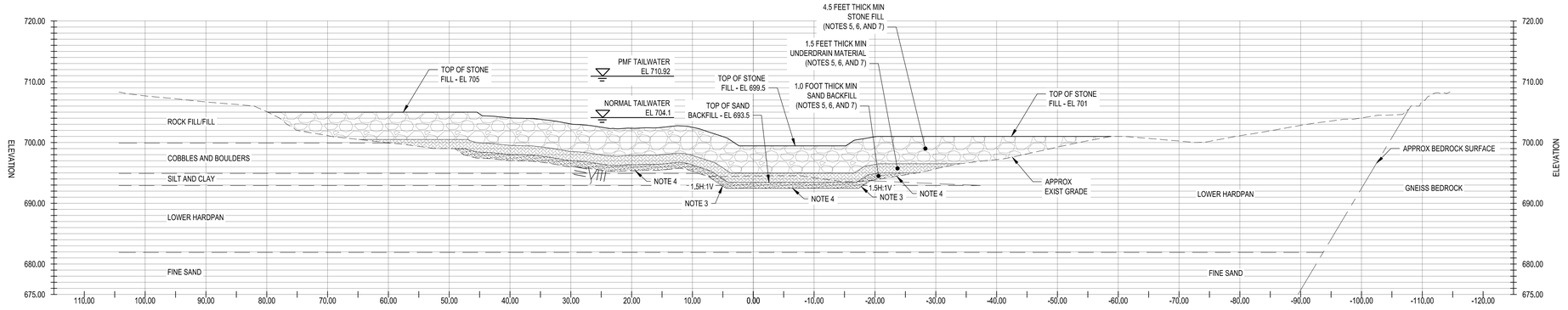
SHEET TITLE:

TAILRACE SCOUR HOLE REMEDIATION SECTIONS – 1

DRAWING NUMBER: C-726

SHEET 41 OF 148

Aug 25 2026 - 3:35pm
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164C-726.dwg
36x24 PLOT SHEET



C / C-725 SECTION

SCALE: 1" = 10'

LEGEND

- STONE FILL
- UNDERDRAIN MATERIAL
- SAND BACKFILL

DRAWING NOTES

1. FOR GENERAL NOTES REFER TO DRAWINGS G-003 AND G-004.
2. ROCK EXCAVATION IS NOT REQUIRED TO ACHIEVE LAYER THICKNESS. IN AREAS WHERE BEDROCK IS EXPOSED, PLACE SAND BACKFILL, UNDERDRAIN MATERIAL, AND STONE FILL AS REQUIRED TO ACHIEVE THE GRADES SHOWN. REDUCE SAND BACKFILL AND UNDERDRAIN MATERIAL THICKNESSES TO SUIT FIELD CONDITIONS TO ACHIEVE TOP OF STONE FILL GRADE AS SHOWN. OMIT STONE FILL AND ADDITIONAL FILTER LAYERS IN AREAS WHERE TOP OF ROCK IS ABOVE THE PROPOSED GRADE OF STONE FILL.
3. EXCAVATE THE EXISTING GRADE IN AREAS SHOWN TO ACHIEVE THE FINAL TOP OF STONE FILL GRADES SHOWN. SLOPE THE EXCAVATIONS SHALL IN ACCORDANCE WITH STANDARDS SET BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AT NO STEEPER THAN 1V:1.5H. ASSIGN A "COMPETENT PERSON" DURING CONSTRUCTION TO MAKE THE OSHA-REQUIRED FIELD OBSERVATIONS AND TESTS. FLATTEN EXCAVATION SLOPES AS NECESSARY, BASED ON THE RESULTS OF THOSE OBSERVATIONS AND TESTS, TO MAINTAIN STABILITY OF THE EXCAVATION SLOPES, AND TO PROTECT THE WORKERS.
4. PREPARE THE SUBGRADE BEFORE SAND BACKFILL PLACEMENT IN ACCORDANCE WITH SECTION 310000 OF THE TECHNICAL SPECIFICATIONS.
1. PROVIDE SAND BACKFILL, UNDERDRAIN MATERIAL, AND STONE FILL AS SHOWN IN ACCORDANCE WITH SECTION 310000 AND SECTION 310001 OF THE TECHNICAL SPECIFICATIONS. COMPACT ALL SAND BACKFILL TO 95 PERCENT OF THE MAXIMUM DRY DENSITY, AS MEASURED IN THE STANDARD PROCTOR TEST AND WITHIN 3 PERCENT PLUS OR MINUS OF OPTIMUM MOISTURE CONTENT (ASTM D698), IN ACCORDANCE WITH SECTION 310000 OF THE TECHNICAL SPECIFICATIONS. COMPACTION TESTING REQUIREMENTS FOR THE SAND BACKFILL WITHIN THE DEEPEST PORTION OF THE SCOUR HOLE WILL BE REVIEWED WHEN THE SCOUR HOLE HAS BEEN EXPOSED AND DEWATERING CONDITIONS HAVE BEEN EVALUATED BY THE DIRECTOR'S REPRESENTATIVE.
6. MATERIAL LAYER THICKNESS ARE AS FOLLOWS:
   STONE FILL (75% 1-TON STONE FILL / 25% LIGHT STONE FILL) = 4.5 FT THICK (MINIMUM)
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   SAND BACKFILL = 1.0 FT (MINIMUM)
7. LAYER THICKNESSES SHOWN AND PROVIDED IN THE ABOVE NOTE ARE BASED ON PLACEMENT IN THE DRY (DEWATERED) CONDITION. IF MATERIAL IS TO BE PLACED IN THE WET (WATERED) CONDITION, THE THICKNESSES WOULD INCREASE BY 50 PERCENT. CONFIRM CONDITION OF MATERIAL PLACEMENT WITH DIRECTOR'S REPRESENTATIVE PRIOR TO MATERIAL PLACEMENT.
1. PROVIDE A COFFERDAM TO SUIT THE CONTRACTOR'S WORK PLAN THAT IS WITHIN THE CONTRACT WORK LIMIT LINE SHOWN ON DRAWING C-705. CONTRACTOR IS ADVISED THAT THE EXISTING CHANNEL BED INCLUDES STONE FILL TO AN UNKNOWN DEPTH AND THAT APPROPRIATE WATER CONTROLS ARE REQUIRED AS PART OF THE CONTRACTOR'S WORK PLAN. PROVIDE A PUMP TO COLLECT DISCHARGE FROM RELIEF WELL SYSTEM TAILWATER DISCHARGE LOCATIONS SHOWN ON DRAWING C-713 AND DIRECT DISCHARGE DOWNSTREAM OF TAILRACE COFFERDAM. PROVIDE PUMPING UNTIL THE TAILWATER COFFERDAM IS REMOVED. FOR BID PURPOSES CONSIDER A COMBINED ANTICIPATED FLOW OUT OF THE RELIEF WELL SYSTEM AT THE TAILRACE DISCHARGE LOCATIONS TO BE 3 CUBIC FEET PER SECOND.

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REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C
DESIGNED BY:	KMM
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE:

TAILRACE SCOUR HOLE REMEDIATION SECTIONS – 2

DRAWING NUMBER: C-727

SHEET 42 OF 148

Aug 25,2026 - 3:37pm
I:\QGS\015996\0\0 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164C-727.dwg
36x24 PLOT SHEET

ELEVATION KEYNOTES ⟨#⟩

1. CONSTRUCTION CONTRACTOR TO PROVIDE FIBERGLASS THERMALLY BROKEN WINDOW SYSTEM WITH INSULATED GLAZING. REFER TO WINDOW ELEVATIONS AND DETAILS ON SHEET A-706 FOR ADDITIONAL INFORMATION.
2. CONSTRUCTION CONTRACTOR TO PROVIDE INSULATED HOLLOW METAL DOOR SYSTEM. REFER TO DOOR SCHEDULE FOR ADDITIONAL INFORMATION.
3. EXISTING BRONZE PLACARD. CONSTRUCTION CONTRACTOR TO PROTECT FROM DAMAGE DURING CONSTRUCTION.
4. EXISTING ELECTRICAL EQUIPMENT. CONSTRUCTION CONTRACTOR TO PROTECT FROM DAMAGE DURING CONSTRUCTION.
5. EXISTING ELECTRICAL CONDUIT. CONSTRUCTION CONTRACTOR TO PROTECT FROM DAMAGE DURING CONSTRUCTION.
6. CONSTRUCTION CONTRACTOR TO REMOVE EXISTING MORTAR AND REPOINT. TYPICAL EXTENT OF MORTARREPOINTING TO BE DETERMINED IN FIELD. CONTRACTOR TO VERIFY WEEP HOLE LOCATIONS AND NOTIFY DIRECTOR'S REPRESENTATIVE OF THOSE LOCATIONS PRIOR TO BRICK REPOINTING WORK.
7. CONSTRUCTION CONTRACTOR TO CLEAN EXISTING EXPOSED WOOD ROOF FRAMING INCLUDING REMOVAL OF ALGAE AND MOSS. PRIME AND CAULK GAPS WITH SEALANT. FINISH ALL EXPOSED WOOD ROOF FRAMING WITH EXTERIOR GRADE PAINT SYSTEM. REFER TO ENVIRONMENTAL DRAWING H-004 FOR ADDITIONAL INFORMATION.
8. CONSTRUCTION CONTRACTOR TO VERIFY IN FIELD EXTENT OF DAMAGED OR LOOSE SLATE SHINGLES AND REPLACE IN KIND TO MATCH EXISTING ROOF SYSTEM. BASED ON VISUAL INSPECTIONS VIA PHOTOS, APPROXIMATELY 43 SF (5% OF ROOF AREA) IS ASSUMED FOR REPLACEMENT; CONTRACTOR TO FIELD VERIFY EXACT QUANTITY PRIOR TO REPLACEMENT. EXISTING SLATE ROOF SHINGLES ARE PRESUMED TO CONTAIN ASBESTOS. REFER TO ENVIRONMENTAL DRAWING H-002 FOR ADDITIONAL INFORMATION.
9. CONSTRUCTION CONTRACTOR TO VERIFY IN FIELD EXTENT OF DAMAGED EXISTING COPPER RIDGE AND HIP FLASHING AND REPLACE DAMAGED OR DEGRADED HIP FLASHING & COPPER RIDGE FLASHING IN KIND TO MATCH EXISTING. BASED ON VISUAL INSPECTIONS VIA PHOTOS, APPROX. 24 LF OF COPPER RIDGE IS ASSUMED FOR REPLACEMENT; CONTRACTOR TO FIELD VERIFY EXACT QUANTITY PRIOR TO REPLACEMENT.
10. 42" HIGH REMOVABLE GUARD RAIL SYSTEM PAINTED OSHA YELLOW.
11. 2" INSULATED METAL PANEL SYSTEM - HORIZONTAL ORIENTATION.
12. ROOF VENTILATOR. REFER TO M-601 FOR MORE DETAILS.
13. REFER TO S-787 FOR ADDITIONAL INFORMATION ON METAL STAIR, RAILING, CONC. FLATWORK AND GRATE FLOOR SYSTEM.
14. CONSTRUCTION CONTRACTOR TO REINSTALL EXISTING SECURITY BARS AT EXTERIOR SIDE OF WINDOW.
15. CONSTRUCTION CONTRACTOR TO PROVIDE VANDALISM MESH AT EXTERIOR SIDE OF WINDOW TO MATCH EXISTING.
16. CONSTRUCTION CONTRACTOR TO REINSTALL EXISTING VANDALISM MESH AT EXTERIOR SIDE OF WINDOW.
17. EXISTING HOLLOW METAL DOOR AND FRAME SYSTEM TO REMAIN.
18. JIB CRANE. REFER TO SHEET M-710 FOR MORE INFORMATION.
19. REFER TO S-792 FOR ADDITIONAL INFORMATION ON THIS EXTERIOR METAL STAIR SYSTEM TO THE TAILRACE WALL.
20. CONSTRUCTION CONTRACTOR TO PREPARE EXISTING OPENING AS REQUIRED AND REINSTALL EXISTING DOOR & FRAME AFTER CONCRETE DOOR SILL REPAIRS HAVE BEEN COMPLETED.

PLAN KEYNOTES ⟨#⟩

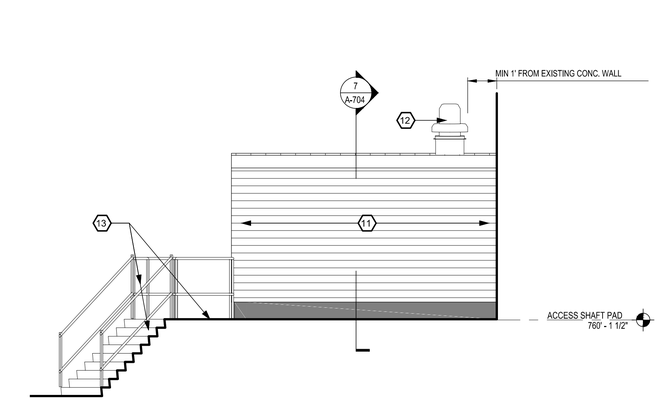
1. FIBERGLASS THERMALLY BROKEN WINDOW SYSTEM WITH INSULATED GLAZING. REFER TO WINDOW ELEVATIONS AND DETAILS ON SHEET A-706 FOR ADDITIONAL INFORMATION.
2. INSULATED HOLLOW METAL DOOR SYSTEM. REFER TO DOOR SCHEDULE FOR ADDITIONAL INFORMATION.
3. REFER TO DRAWING S-730 FOR SCOPE OF WORK AT CONTROL HOUSE CONCRETE DECK.
4. INTERIOR METAL STAIR - REFER TO S-794 FOR ADDITIONAL INFORMATION.
5. ALUMINUM ACCESS DOOR.
6. CONSTRUCTION CONTRACTOR TO REINSTALL EXISTING VANDALISM MESH AT EXTERIOR SIDE OF WINDOW.
7. CONSTRUCTION CONTRACTOR TO INSTALL VANDALISM MESH AT EXTERIOR SIDE OF WINDOW TO MATCH EXISTING.
8. CONSTRUCTION CONTRACTOR TO REINSTALL EXISTING SECURITY BARS AT EXTERIOR SIDE OF WINDOW.
9. CONSTRUCTION CONTRACTOR TO PROVIDE 42" HIGH REMOVABLE GUARD RAIL SYSTEM, PAINTED OSHA YELLOW.
10. DASHED LINES INDICATE UNDERSLAB DRAINAGE FOR ALUMINUM ACCESS DOOR. REFER TO DRAWINGS S-744 FOR UNDERSLAB DRAINAGE WORK.
11. ALUMINUM ACCESS DOOR DRAIN COUPLING. CONSTRUCTION CONTRACTOR TO CONNECT TO UNDERSLAB DRAINAGE. REFER TO DRAWINGS S-744 FOR UNDERSLAB DRAINAGE WORK.
12. REFER TO S-787 FOR ADDITIONAL INFORMATION ON EXTERIOR METAL STAIR, RAILING, CONC. FLATWORK AND GRATE FLOOR SYSTEM AT ACCESS SHAFT PLATFORM.
13. REFER TO S-787 FOR ADDITIONAL INFORMATION ON EXTERIOR METAL STAIR SYSTEM.
14. CONSTRUCTION CONTRACTOR TO PROVIDE NEW PAINT FINISH SYSTEM AT CONCRETE FLOORS, EXTERIOR KNEE WALLS, AND TIN CEILING.
15. REFER TO S-792 FOR ADDITIONAL INFORMATION ON THIS EXTERIOR METAL STAIR SYSTEM TO THE TAILRACE WALL.
16. JIB CRANE. REFER TO SHEET M-710 FOR MORE INFORMATION.
17. CONCRETE SLAB INFILL AT AREAS OF SAWCUTTING PROVIDED BY CONSTRUCTION CONTRACTOR. REFER TO E-721 AND STRUCTURAL DRAWINGS FOR TYPICAL INFILL DETAILS. THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.
18. ROOF VENTILATOR. REFER TO M-601 FOR MORE DETAILS.
19. CONSTRUCTION CONTRACTOR TO PATCH AND FINISH WALL TO MATCH EXISTING FOLLOWING ELECTRICAL TRENCHING. REFER TO E-721 FOR EXTENT OF WORK. THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.
20. CONSTRUCTION CONTRACTOR TO PATCH AND INFILL CONCRETE TO MATCH EXISTING CONCRETE PLATFORM FOLLOWING ELECTRICAL TRENCHING. REFER TO E-721 FOR EXTENT OF WORK. THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.
21. CONSTRUCTION CONTRACTOR TO PREPARE EXISTING OPENING AS REQUIRED AND REINSTALL EXISTING DOOR & FRAME AFTER CONCRETE DOOR SILL REPAIRS HAVE BEEN COMPLETED.

REMOVAL KEYNOTES [#]

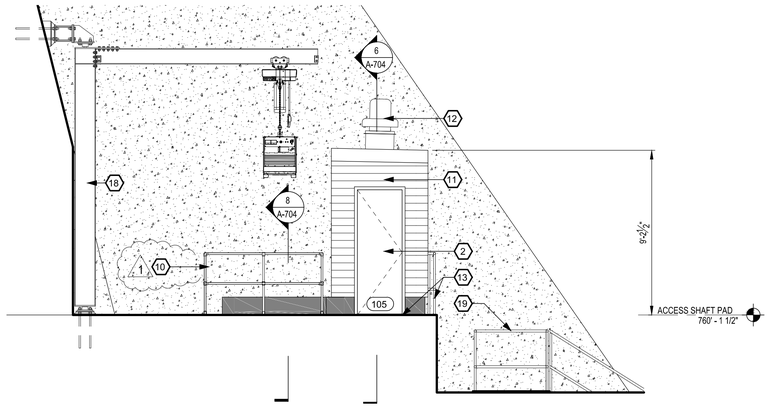
1. CONSTRUCTION CONTRACTOR TO REMOVE EXISTING WINDOW SYSTEM IN ITS ENTIRETY, PREPARE EXISTING OPENING FOR WINDOW INSTALLATION.REMOVE EXISTING RIGID INSULATION AT INTERIOR SIDE OF WINDOW WHERE APPLICABLE.
2. CONSTRUCTION CONTRACTOR TO REMOVE EXISTING DOOR & FRAME AND SALVAGE FOR REINSTALLATION AFTER CONCRETE DOOR SILL REPAIRS HAVE BEEN COMPLETED.
3. CONSTRUCTION CONTRACTOR TO REMOVE A/C WINDOW UNIT AND RETURN TO DIRECTOR'S REPRESENTATIVE FOR STORAGE/RE-USE.
4. CONSTRUCTION CONTRACTOR TO REMOVE EXISTING PAINT AND CORROSION FROM EXPOSED LINTELS AND APPLY PROTECTIVE COATING, TYPICAL ALL DOOR AND WINDOW OPENINGS. REFER TO THE ENVIRONMENTAL DRAWING H-003 FOR ADDITIONAL INFORMATION.
5. CONSTRUCTION CONTRACTOR TO REMOVE EXISTING VANDALISM MESH AT EXTERIOR SIDE OF WINDOW AND SALVAGE FOR REINSTALLMENT. REFER TO CONTROL HOUSE PLAN ON THIS DRAWING.
6. EXISTING ELECTRICAL UTILITY BOX.
7. REFER TO DRAWING S-720, S-722 & S-723 FOR REMOVALS SCOPE AT ACCESS SHAFT PLATFORM.
8. NON-FRIABLE GLAZING COMPOUND ON EXISTING WINDOWS HAS BEEN IDENTIFIED TO CONTAIN ASBESTOS. REFER TO THE ENVIRONMENTAL NOTES ON H-001 DRAWING FOR ADDITIONAL INFORMATION.
9. CONSTRUCTION CONTRACTOR TO REMOVE EXISTING SECURITY BARS AT EXTERIOR SIDE OF WINDOW AND SALVAGE FOR REINSTALLMENT. REFER TO CONTROL HOUSE PLAN ON THIS DRAWING.
10. CONSTRUCTION CONTRACTOR TO PATCH AND REPAIR CONCRETE DOOR SILL, AS REQUIRED.
11. CONSTRUCTION CONTRACTOR TO PREPARE EXISTING CONCRETE FLOOR, EXTERIOR KNEE WALLS AND TIN CEILING TO RECEIVE NEW PAINT FINISH. REFER TO THE ENVIRONMENTAL NOTES ON H-003 DRAWING FOR ADDITIONAL INFORMATION.
12. APPROXIMATE EXTENT OF SLAB SAWCUTTING REQUIRED FOR NEW UNDERSLAB ELECTRICAL WORK. SAWCUTTING AND DEMOLITION PROVIDED BY CONSTRUCTION CONTRACTOR. REFER TO E-721 DRAWING FOR ADDITIONAL INFORMATION. THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS. ELECTRICAL CONTRACTOR TO COORDINATE FINAL LOCATIONS/QUANTITIES.

LEGEND

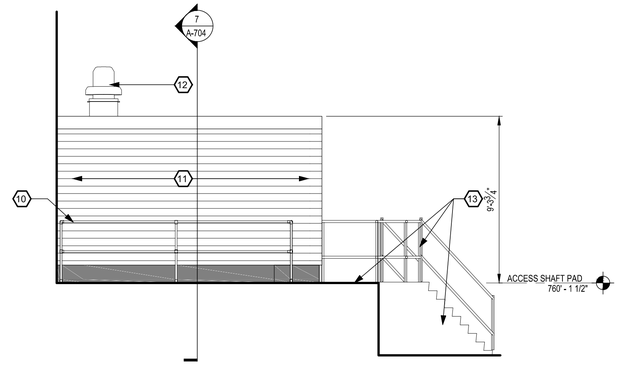
- EXISTING CONCRETE
- LIMITS OF CONCRETE PLACEMENT



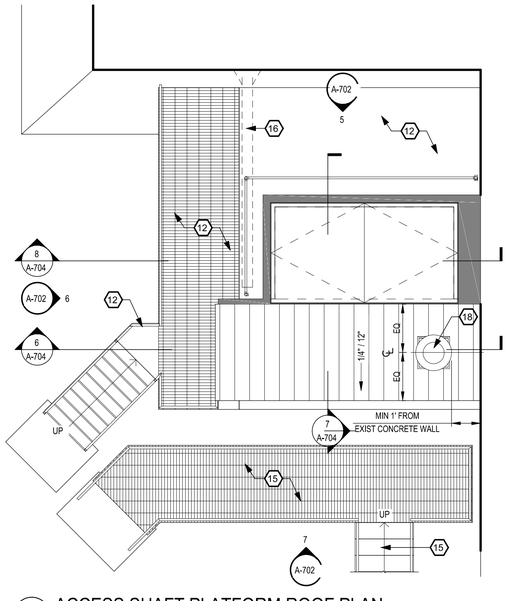
7 EXTERIOR ELEVATION - SOUTH
SCALE : 1/4" = 1'-0"



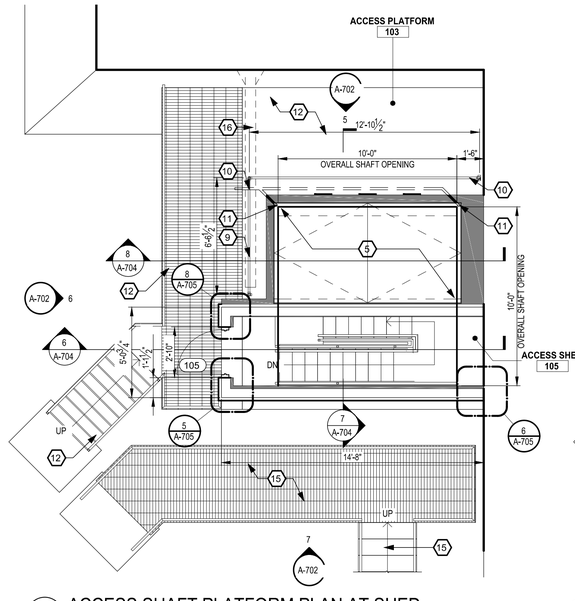
6 EXTERIOR ELEVATION - WEST
SCALE : 1/4" = 1'-0"



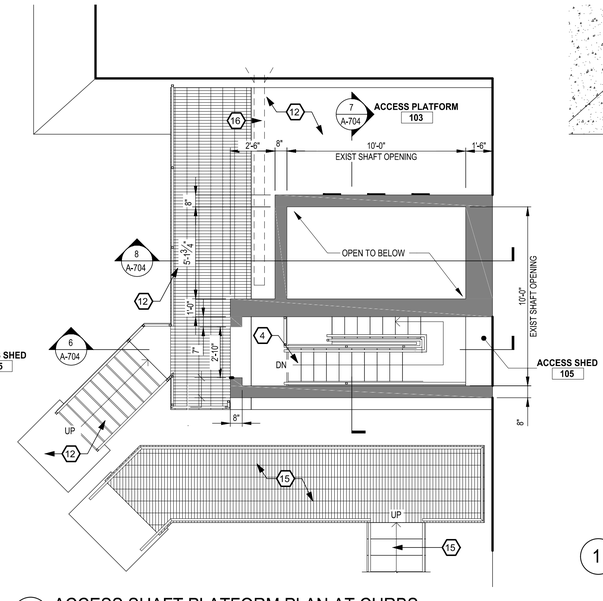
5 EXTERIOR ELEVATION - NORTH
SCALE : 1/4" = 1'-0"



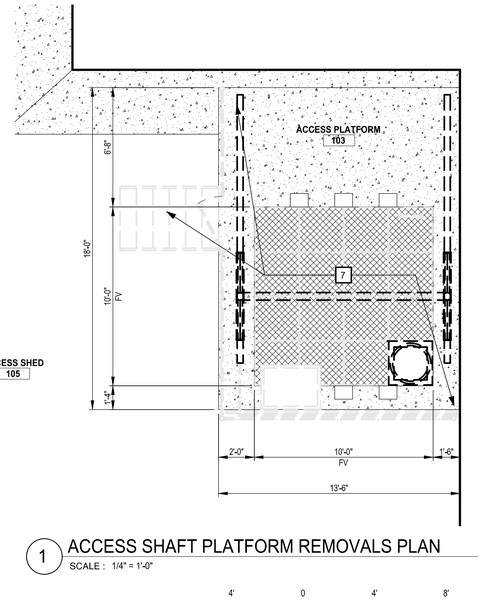
4 ACCESS SHAFT PLATFORM ROOF PLAN
SCALE : 1/4" = 1'-0"



3 ACCESS SHAFT PLATFORM PLAN AT SHED
SCALE : 1/4" = 1'-0"



2 ACCESS SHAFT PLATFORM PLAN AT CURBS
SCALE : 1/4" = 1'-0"



1 ACCESS SHAFT PLATFORM REMOVALS PLAN
SCALE : 1/4" = 1'-0"

4' 0 4' 8'
1/4" = 1'-0"

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

Colliers Engineering & Design
280 East Broad Street
Suite 200
Rochester, NY 14604
Phone: 585.232.5135
COLLIERS ENGINEERING & DESIGN CT, P.C.
www.colliersengineering.com

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ENERGY CODE STATEMENT:

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STATE OF NEW YORK · JOSHUA MICHAEL REED · No. 085538 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C, E
DESIGNED BY:	JLB
DRAWN BY:	SRT
FIELD CHECK:	
APPROVED:	JLB

SHEET TITLE:

ACCESS SHAFT PLATFORM FLOOR PLANS AND EXTERIOR ELEVATIONS

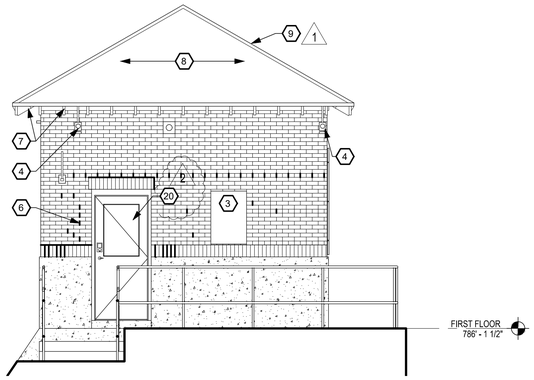
DRAWING NUMBER: A-702

SHEET 44 OF 148

Aug 25,2026 - 2:27pm
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.14 Architecture\A-Series DWG\47164A-702.dwg
36x24 PLOT SHEET

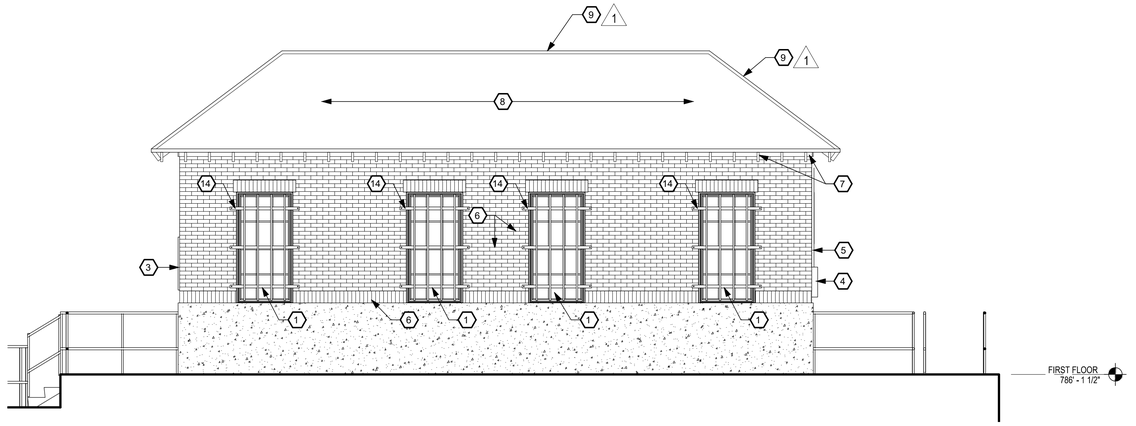
LEGEND

- EXISTING CONCRETE
- LIMITS OF CONCRETE PLACEMENT



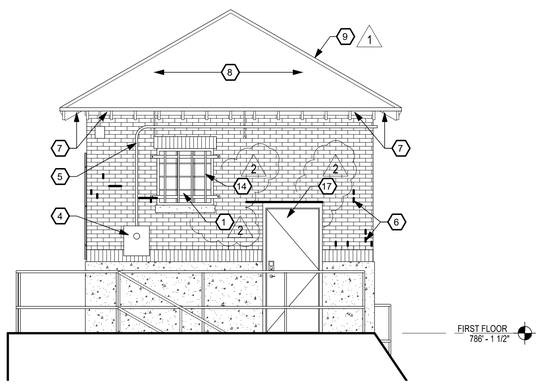
4 EXTERIOR ELEVATION - WEST

SCALE: 1/4" = 1'-0"



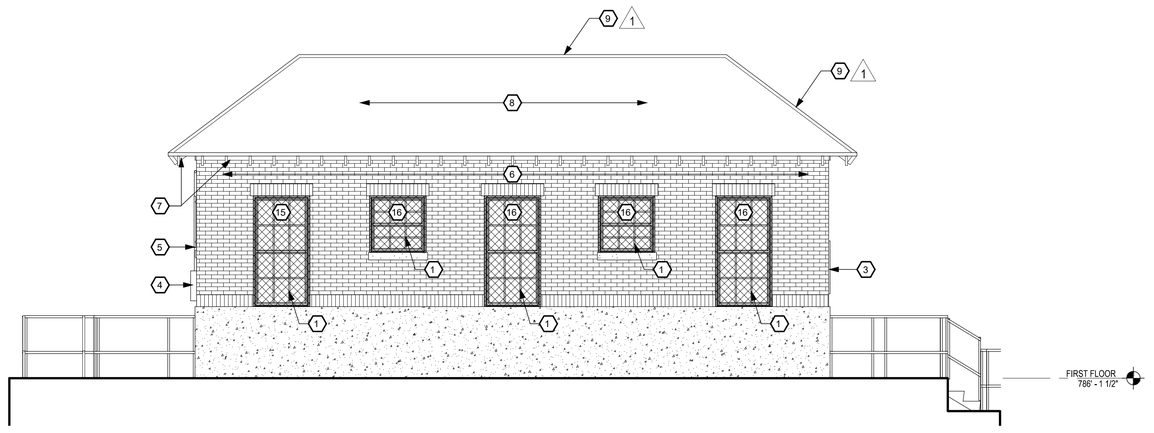
3 EXTERIOR ELEVATION - SOUTH

SCALE: 1/4" = 1'-0"



2 EXTERIOR ELEVATION - EAST

SCALE: 1/4" = 1'-0"



1 EXTERIOR ELEVATION - NORTH

SCALE: 1/4" = 1'-0"

ELEVATION KEYNOTES (#)

1. CONSTRUCTION CONTRACTOR TO PROVIDE FIBERGLASS THERMALLY BROKEN WINDOW SYSTEM WITH INSULATED GLAZING. REFER TO WINDOW ELEVATIONS AND DETAILS ON SHEET A-706 FOR ADDITIONAL INFORMATION.
2. CONSTRUCTION CONTRACTOR TO PROVIDE INSULATED HOLLOW METAL DOOR SYSTEM. REFER TO DOOR SCHEDULE FOR ADDITIONAL INFORMATION.
3. EXISTING BRONZE PLACARD. CONSTRUCTION CONTRACTOR TO PROTECT FROM DAMAGE DURING CONSTRUCTION.
4. EXISTING ELECTRICAL EQUIPMENT. CONSTRUCTION CONTRACTOR TO PROTECT FROM DAMAGE DURING CONSTRUCTION.
5. EXISTING ELECTRICAL CONDUIT. CONSTRUCTION CONTRACTOR TO PROTECT FROM DAMAGE DURING CONSTRUCTION.
6. (1) CONSTRUCTION CONTRACTOR TO REMOVE EXISTING MORTAR AND REPOINT, TYP. EXTENT OF MORTAR REPOINTING TO BE DETERMINED IN FIELD. CONTRACTOR TO VERIFY WEEP HOLE LOCATIONS AND NOTIFY DIRECTOR'S REP OF THOSE LOCATIONS PRIOR TO BRICK REPOINTING WORK. ASSUME 15% OF TOTAL AREA OF BRICK TO BE REPOINTED (APPROX. 120SF)
7. CONSTRUCTION CONTRACTOR TO CLEAN EXISTING EXPOSED WOOD ROOF FRAMING INCLUDING REMOVAL OF ALGAE AND MOSS. PRIME AND CAULK GAPS WITH SEALANT. FINISH ALL EXPOSED WOOD ROOF FRAMING WITH EXTERIOR GRADE PAINT SYSTEM. REFER TO ENVIRONMENTAL DRAWING H-004 FOR ADDITIONAL INFORMATION.
8. CONSTRUCTION CONTRACTOR TO VERIFY IN FIELD EXTENT OF DAMAGED OR LOOSE SLATE SHINGLES AND REPLACE IN KIND TO MATCH EXISTING ROOF SYSTEM. BASED ON VISUAL INSPECTIONS VIA PHOTOS, APPROX. 43 SF (5% OF ROOF AREA) IS ASSUMED FOR REPLACEMENT; CONTRACTOR TO FIELD VERIFY EXACT QUANTITY PRIOR TO REPLACEMENT. EXISTING SLATE ROOF SHINGLES ARE PRESUMED TO CONTAIN ASBESTOS. REFER TO ENVIRONMENTAL DRAWING H-002 FOR ADDITIONAL INFORMATION.
9. (1) CONSTRUCTION CONTRACTOR TO REMOVE EXISTING COPPER RIDGE AND HIP FLASHING AND REPLACE DAMAGED / DEGRADED HIP FLASHING & COPPER RIDGE FLASHING IN KIND TO MATCH EXISTING. BASED ON VISUAL INSPECTIONS VIA PHOTOS, APPROX. 78 LF OF COPPER CAP FLASHING (24' RIDGE CAP + 54' HIP CAP) IS ASSUMED FOR REPLACEMENT; CONTRACTOR TO FIELD VERIFY EXACT QUANTITY PRIOR TO REPLACEMENT AND NOTIFY OWNER REP IF ADDITIONAL CAP FLASHING IS REQUIRED.
10. 42" HIGH REMOVABLE GUARD RAIL SYSTEM PAINTED OSHA YELLOW.
11. 2" INSULATED METAL PANEL SYSTEM - HORIZONTAL ORIENTATION.
12. ROOF VENTILATOR. REFER TO M-601 FOR MORE DETAILS.
13. REFER TO S-787 FOR ADDITIONAL INFORMATION ON METAL STAIR, RAILING, CONC. FLATWORK AND GRATE FLOOR SYSTEM.
14. CONSTRUCTION CONTRACTOR TO REINSTALL EXISTING SECURITY BARS AT EXTERIOR SIDE OF WINDOW.
15. CONSTRUCTION CONTRACTOR TO PROVIDE VANDALISM MESH AT EXTERIOR SIDE OF WINDOW TO MATCH EXISTING.
16. CONSTRUCTION CONTRACTOR TO REINSTALL EXISTING VANDALISM MESH AT EXTERIOR SIDE OF WINDOW.
17. EXISTING HOLLOW METAL DOOR AND FRAME SYSTEM TO REMAIN.
18. JIB CRANE. REFER TO SHEET M-710 FOR MORE INFORMATION.
19. REFER TO S-792 FOR ADDITIONAL INFORMATION ON THIS EXTERIOR METAL STAIR SYSTEM TO THE TAILRACE WALL.
20. CONSTRUCTION CONTRACTOR TO PREPARE EXISTING OPENING AS REQUIRED AND REINSTALL EXISTING DOOR & FRAME AFTER CONCRETE DOOR SILL REPAIRS HAVE BEEN COMPLETED.

4' 0 4' 8'

1/4" = 1'-0"

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

Colliers Engineering & Design

280 East Broad Street
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Rochester, NY 14604
Phone: 585.232.5135
COLLIERS ENGINEERING & DESIGN CT, P.C.
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STATE OF NEW YORK
JOSHUA MICHAEL BUSH
No. 085538
LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT:
CONSTRUCTION

TITLE:
PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM
NYS DAM ID #205-0415

LOCATION:
233 COUNTY ROUTE 8
HADLEY, NY
SARATOGA COUNTY

CLIENT:
NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
2	08/28/2026	ADDENDUM #4
1	08/11/2026	ADDENDUM #3
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C, E
DESIGNED BY:	JLB
DRAWN BY:	SRT
FIELD CHECK:	
APPROVED:	JLB

SHEET TITLE:

CONTROL HOUSE IMPROVEMENTS
EXTERIOR ELEVATIONS

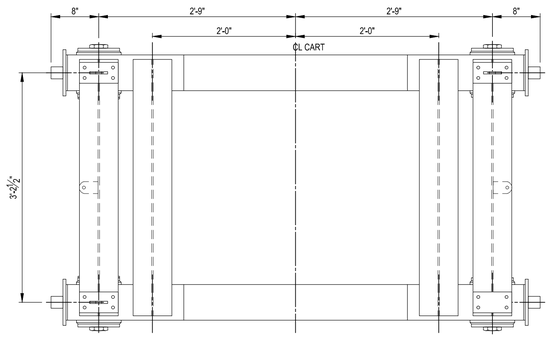
DRAWING NUMBER:

A-703

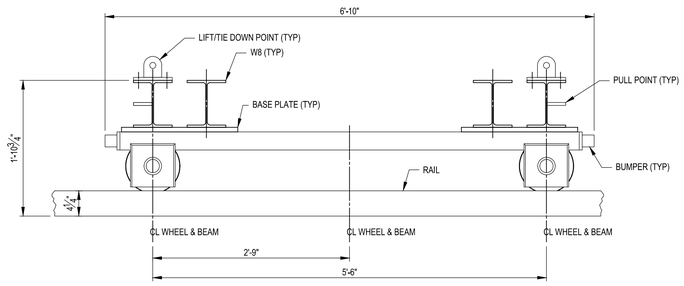
SHEET 45 OF 148

Aug 26,2026 - 7:41am
\\appsProjects\OGS\0115980.000 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.14 Architecture\A-Series DWG\47164A-703.dwg

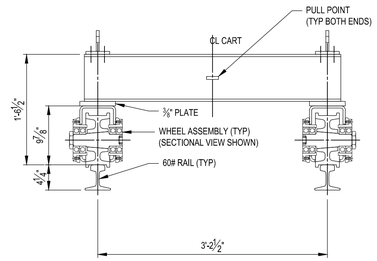
36x24 PLOT SHEET



1 TOP VIEW
SCALE: 1" = 1'-0"



2 SIDE VIEW
SCALE: 1" = 1'-0"



3 END VIEW
SCALE: 1" = 1'-0"

1' 0 1' 2'
1" = 1'-0"

PIPE AND VALVE SCHEDULE

DESCRIPTION	TYPE	USED ON	DIAMETER (IN)	SCHEDULE	MATERIAL	DRAWING	QTY	TABLE NOTE
SUMP PIPE	NA	SUMP SYSTEM	1	40	PVC	M-602		1
CHECK VALVE	CHECK	SUMP SYSTEM	1	40	PVC	1 M-602	2	
AIR VALVE	BUTTERFLY	AIR VENTING	20	NA	STEEL	M-602	3	
AIR VALVE	BUTTERFLY	AIR VENTING	24	NA	STEEL	M-602	1	
OUTLET VALVE	KNIFE	OUTLET	90	NA	STEEL	M-602	3	
OUTLET PIPE	STEEL	OUTLET	90	NA	STEEL	M-602		1
PIPE	STEEL	AIR VENTING	24	20	STEEL	M-602		1
PIPE	STEEL	AIR VENTING	20	20	STEEL	M-602		1
PIPE	STEEL	SIPHON	24	20	STEEL	S-791		1
PIPE	STEEL	OUTLET PRESSURE	1	80	STEEL	M-602		1
VALVE	BALL	OUTLET PRESSURE	1	80	STEEL	M-602	6	
GAUGE	PRESSURE	OUTLET PRESSURE	1	NA	STEEL	M-602	6	
PROPANE PIPE	STEEL	GENERATOR	¾	80	STEEL	M-602		2, 3
PROPANE VALVE	BALL	GENERATOR	¾	NA	BRASS	M-602	2	3
PROPANE VALVE	RELIEF	GENERATOR	¾	NA	BRASS	M-602	2	3
ISOLATION VALVE	BUTTERFLY	RELIEF WELLS	12	NA	SST	"C-713, C-716, C-718"	5	

NOTES:
1. SEE DRAWINGS FOR LENGTHS AND/OR THICKNESS.
2. CONTRACTOR TO DETERMINE LENGTH.
3. CONTRACTOR TO VERIFY DIAMETER WITH EQUIPMENT MANUFACTURER.

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. DIMENSIONS SHOWN ARE FOR GENERAL ENVELOPE OF VALVE COMPONENTS TO ENSURE ADEQUATE INSTALLATION CLEARANCE. CONTRACTOR TO DESIGN CART IN ACCORDANCE WITH SPECIFICATION 41 22 00
3. MINIMUM CAPACITY SHALL BE 30,000 LBS.
4. PIPING AND DEVICES BETWEEN STANDBY GENERATOR AND PROPANE TANK PROVIDED BY ELECTRICAL CONTRACTOR. REFER TO DRAWING SERIES E-700 FOR ADDITIONAL DETAILS. THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT
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Phone: 585.232.5135
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STATE OF NEW YORK · JOSHUA MICHAEL RUSH · No. 085538 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES:
04/30/2028

CONTRACT:
CONSTRUCTION

TITLE:
PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM
NYS DAM ID #205-0415

LOCATION:
233 COUNTY ROUTE 8
HADLEY, NY
SARATOGA COUNTY

CLIENT:
NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS
MARK	DATE	DESCRIPTION

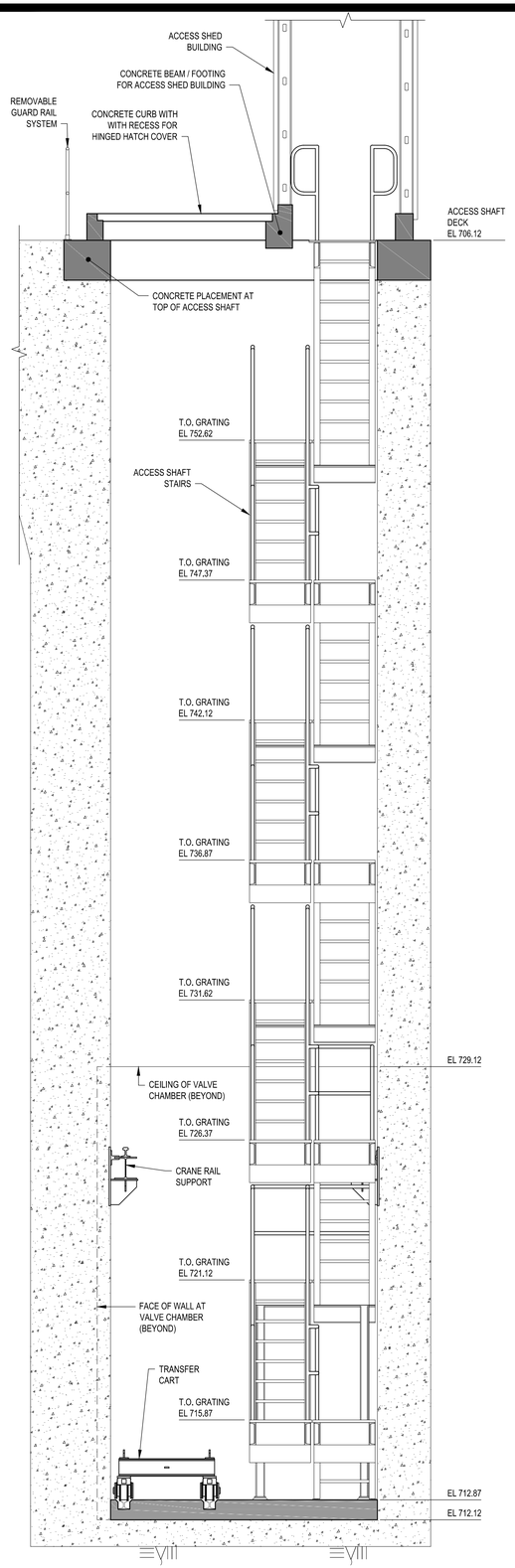
PROJECT NUMBER:	47164-C, E
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE:
OUTLET STRUCTURE IMPROVEMENTS
TRANSFER CART GEOMETRY & PIPING SCHEDULE

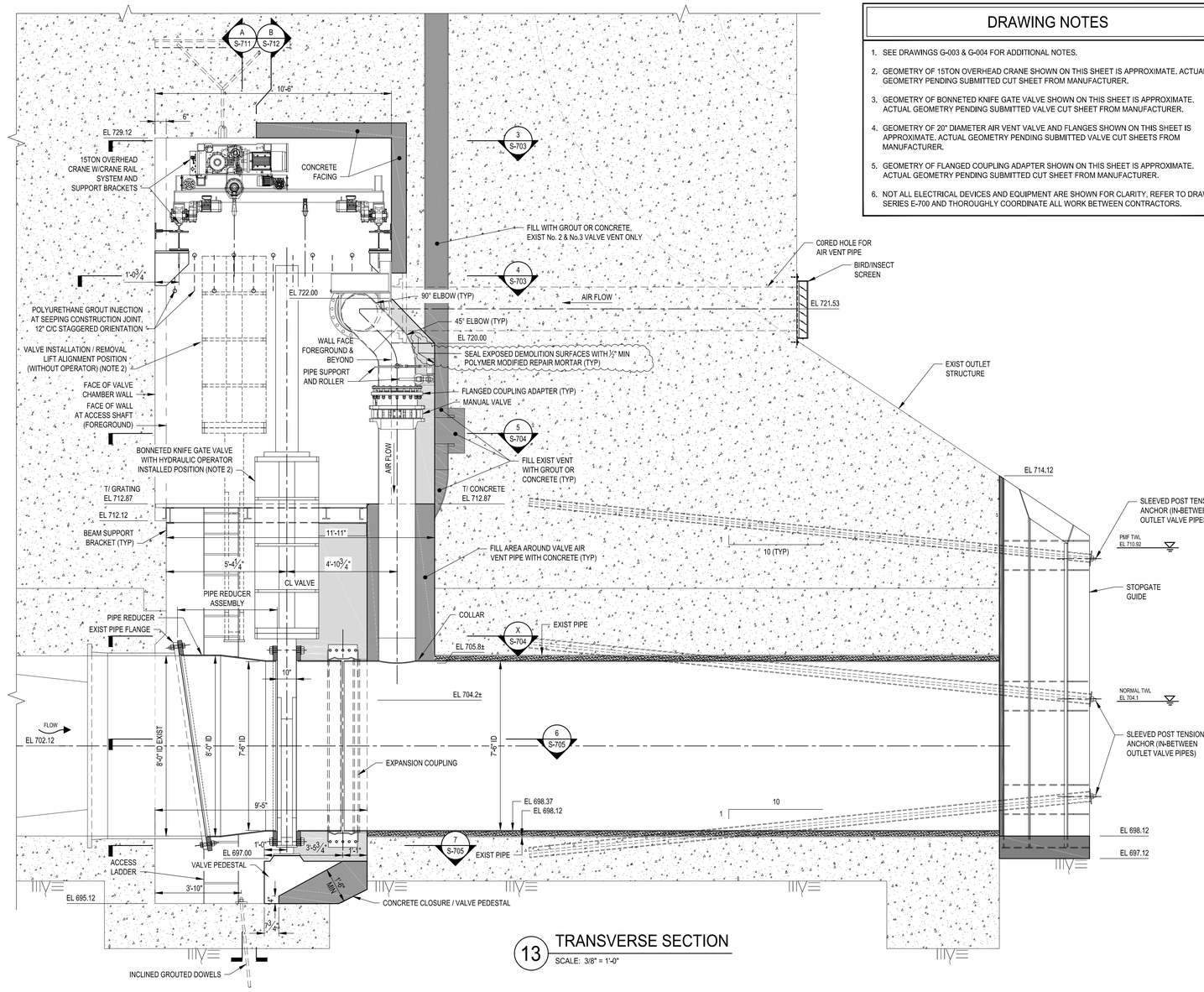
DRAWING NUMBER:
M-708

SHEET 130 OF 148

Aug 25,2026 - 1:22pm
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164M-708.dwg
36x24 PLOT SHEET



12 TRANSVERSE SECTION
SCALE: 3/8" = 1'-0"



13 TRANSVERSE SECTION
SCALE: 3/8" = 1'-0"

LEGEND

- EXISTING CONCRETE (SECTION)
- LIMITS OF CONCRETE PLACEMENT
- 1 POLYMER MODIFIED REPAIR MORTAR SURFACING

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. GEOMETRY OF 15TON OVERHEAD CRANE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.
3. GEOMETRY OF BONNETED KNIFE GATE VALVE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED VALVE CUT SHEET FROM MANUFACTURER.
4. GEOMETRY OF 20" DIAMETER AIR VENT VALVE AND FLANGES SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED VALVE CUT SHEETS FROM MANUFACTURER.
5. GEOMETRY OF FLANGED COUPLING ADAPTER SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.
6. NOT ALL ELECTRICAL DEVICES AND EQUIPMENT ARE SHOWN FOR CLARITY, REFER TO DRAWING SERIES E-700 AND THOROUGHLY COORDINATE ALL WORK BETWEEN CONTRACTORS.

2' 0 2' 4' 6'
3/8" = 1'-0"

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

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STATE OF NEW YORK · JOSHUA MICHAEL RICE · No. 085538 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C, E
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

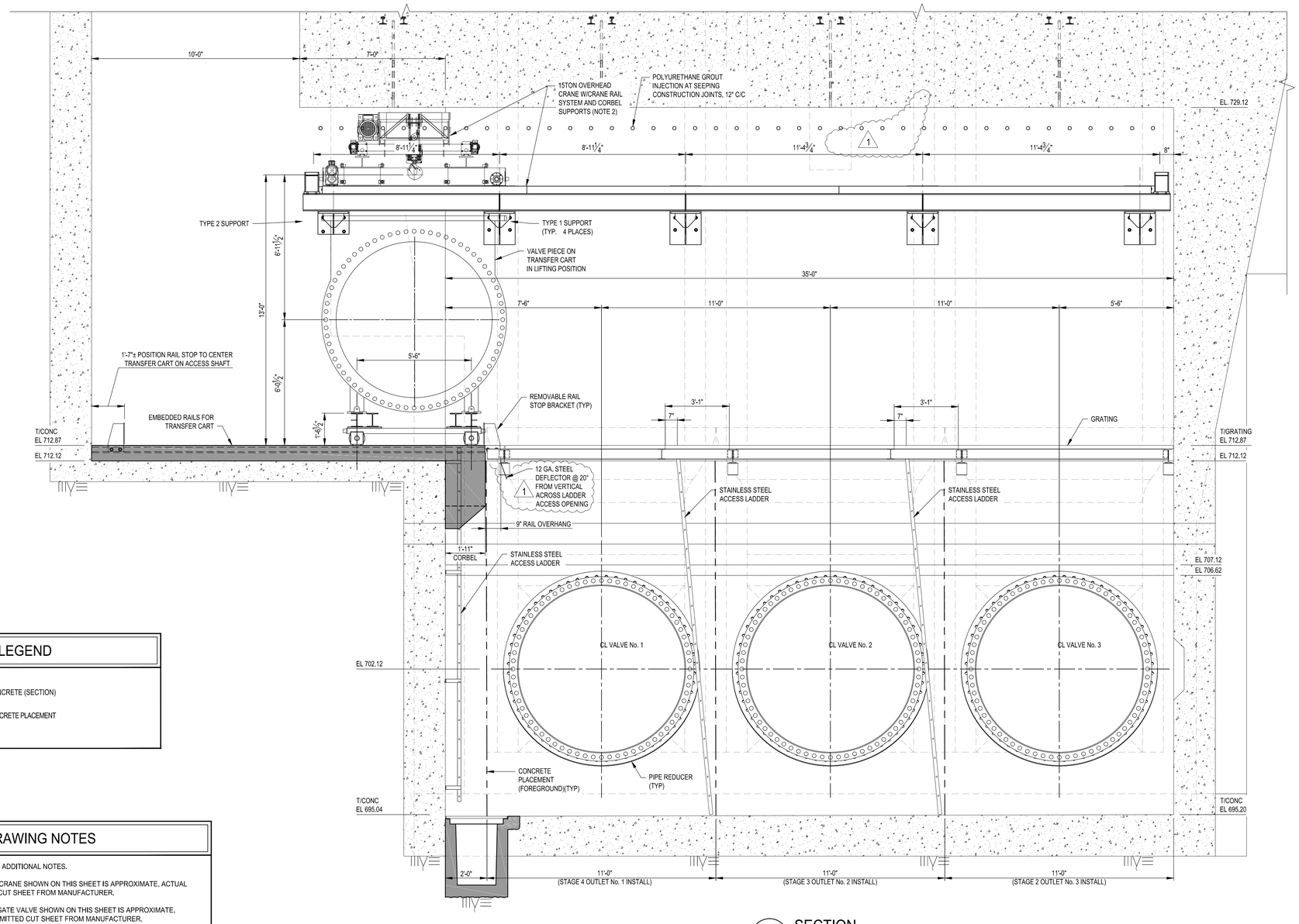
SHEET TITLE:

OUTLET STRUCTURE GENERAL ARRANGEMENT TRANSVERSE SECTIONS

DRAWING NUMBER: S-709

SHEET 57 OF 148

Aug 26,2026 - 8:14am
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-709.dwg
36x24 PLOT SHEET



A S-703 SECTION
SCALE: 3/8" = 1'-0"

LEGEND

- EXISTING CONCRETE (SECTION)
- LIMITS OF CONCRETE PLACEMENT

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. GEOMETRY OF 15TON OVERHEAD CRANE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.
3. GEOMETRY OF BONNETED KNIFE GATE VALVE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.
4. NOT ALL ELECTRICAL DEVICES AND EQUIPMENT ARE SHOWN FOR CLARITY, REFER TO DRAWING SERIES E-700 AND THOROUGHLY COORDINATE ALL WORK BETWEEN CONTRACTORS.

2' 0 2' 4' 6'
3/8" = 1'-0"

36x24 PLOT SHEET
Aug 26,2026 - 8:07am
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-711.dwg

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REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

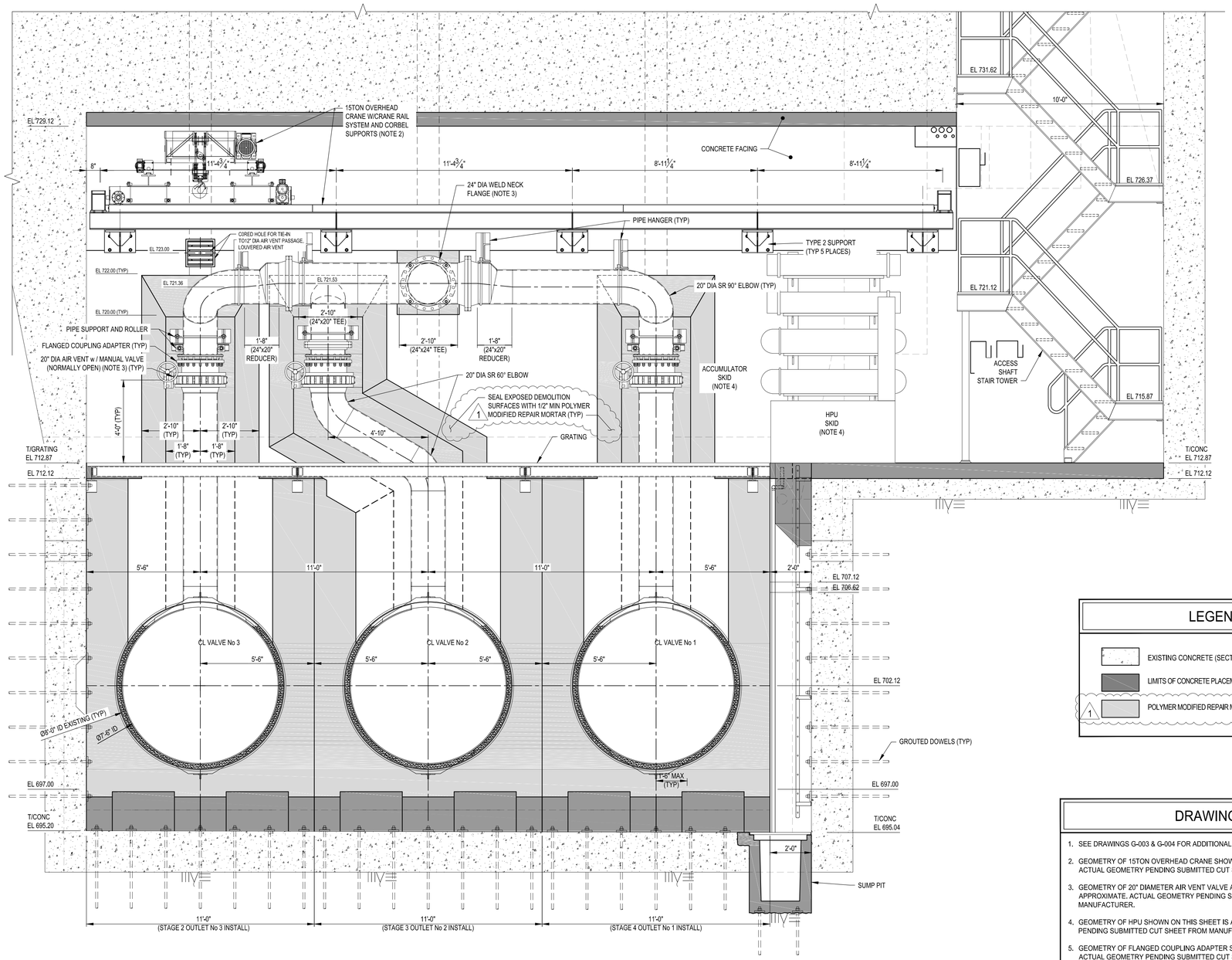
PROJECT NUMBER:	47164-C, E
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE:

OUTLET STRUCTURE GENERAL ARRANGEMENT SECTION – 1

DRAWING NUMBER: S-711

SHEET 59 OF 148



B / S-703 SECTION
SCALE: 3/8" = 1'-0"

LEGEND

- EXISTING CONCRETE (SECTION)
- LIMITS OF CONCRETE PLACEMENT
- 1 POLYMER MODIFIED REPAIR MORTAR SURFACING

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. GEOMETRY OF 15TON OVERHEAD CRANE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.
3. GEOMETRY OF 20" DIAMETER AIR VENT VALVE AND FLANGES SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED VALVE CUT SHEETS FROM MANUFACTURER.
4. GEOMETRY OF HPU SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.
5. GEOMETRY OF FLANGED COUPLING ADAPTER SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.
6. NOT ALL ELECTRICAL DEVICES AND EQUIPMENT ARE SHOWN FOR CLARITY. REFER TO DRAWING SERIES E-700 AND THOROUGHLY COORDINATE ALL WORK BETWEEN CONTRACTORS.

2' 0 2' 4' 6'
3/8" = 1'-0"

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REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C, E
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE:

OUTLET STRUCTURE GENERAL ARRANGEMENT SECTION – 2

DRAWING NUMBER: S-712

SHEET 60 OF 148

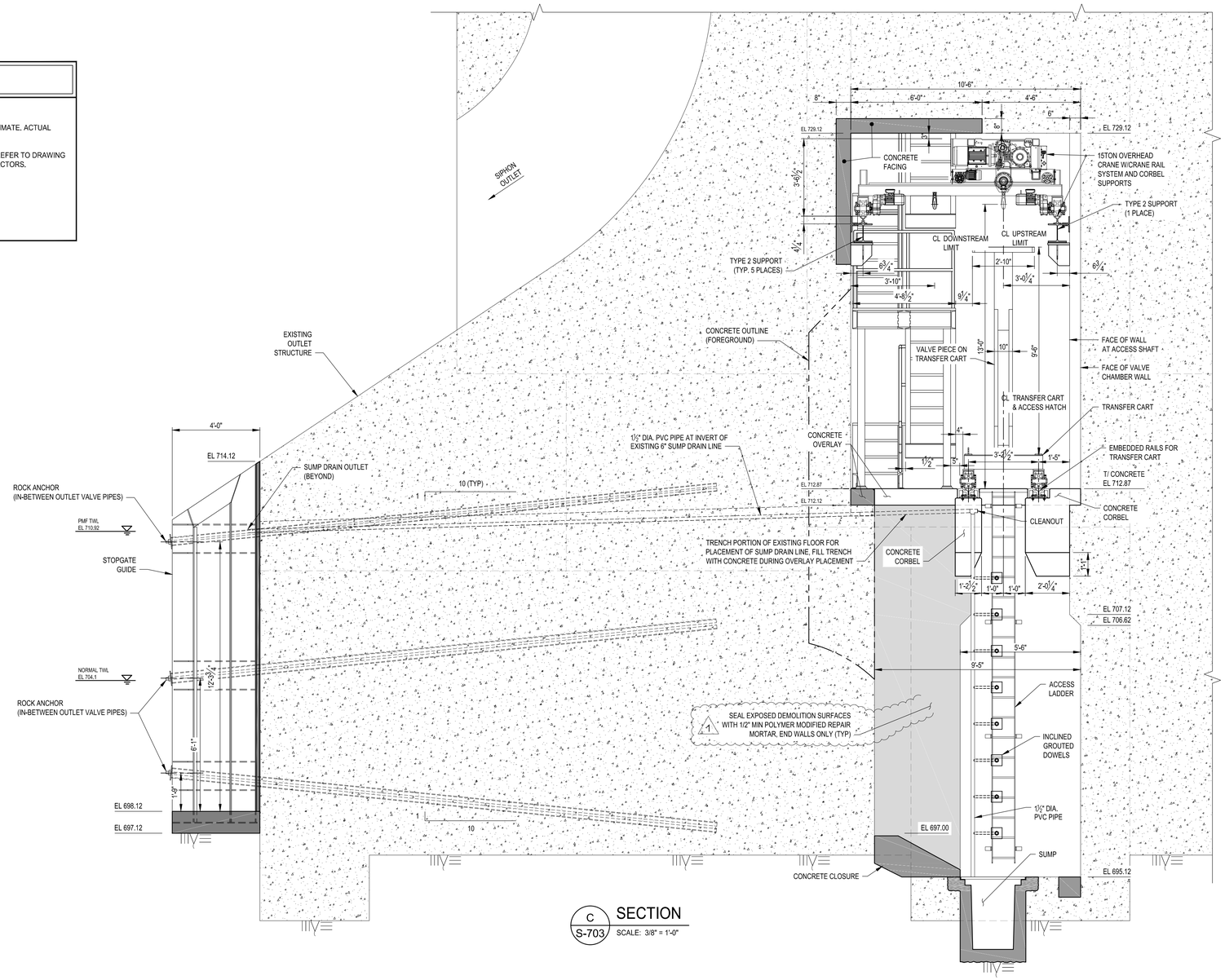
Aug 26,2026 - 3:51pm
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-712.dwg
36x24 PLOT SHEET

LEGEND

- EXISTING CONCRETE (SECTION)
- LIMITS OF CONCRETE PLACEMENT
- 1 POLYMER MODIFIED REPAIR MORTAR SURFACING

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. GEOMETRY OF 15TON OVERHEAD CRANE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.
3. NOT ALL ELECTRICAL DEVICES AND EQUIPMENT ARE SHOWN FOR CLARITY, REFER TO DRAWING SERIES E-700 AND THOROUGHLY COORDINATE ALL WORK BETWEEN CONTRACTORS.



C S-703 SECTION
SCALE: 3/8" = 1'-0"

2' 0 2' 4' 6'
3/8" = 1'-0"

Aug 26,2026 - 9:05am
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-713.dwg

36x24 PLOT SHEET

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REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8, HADLEY, NY, SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

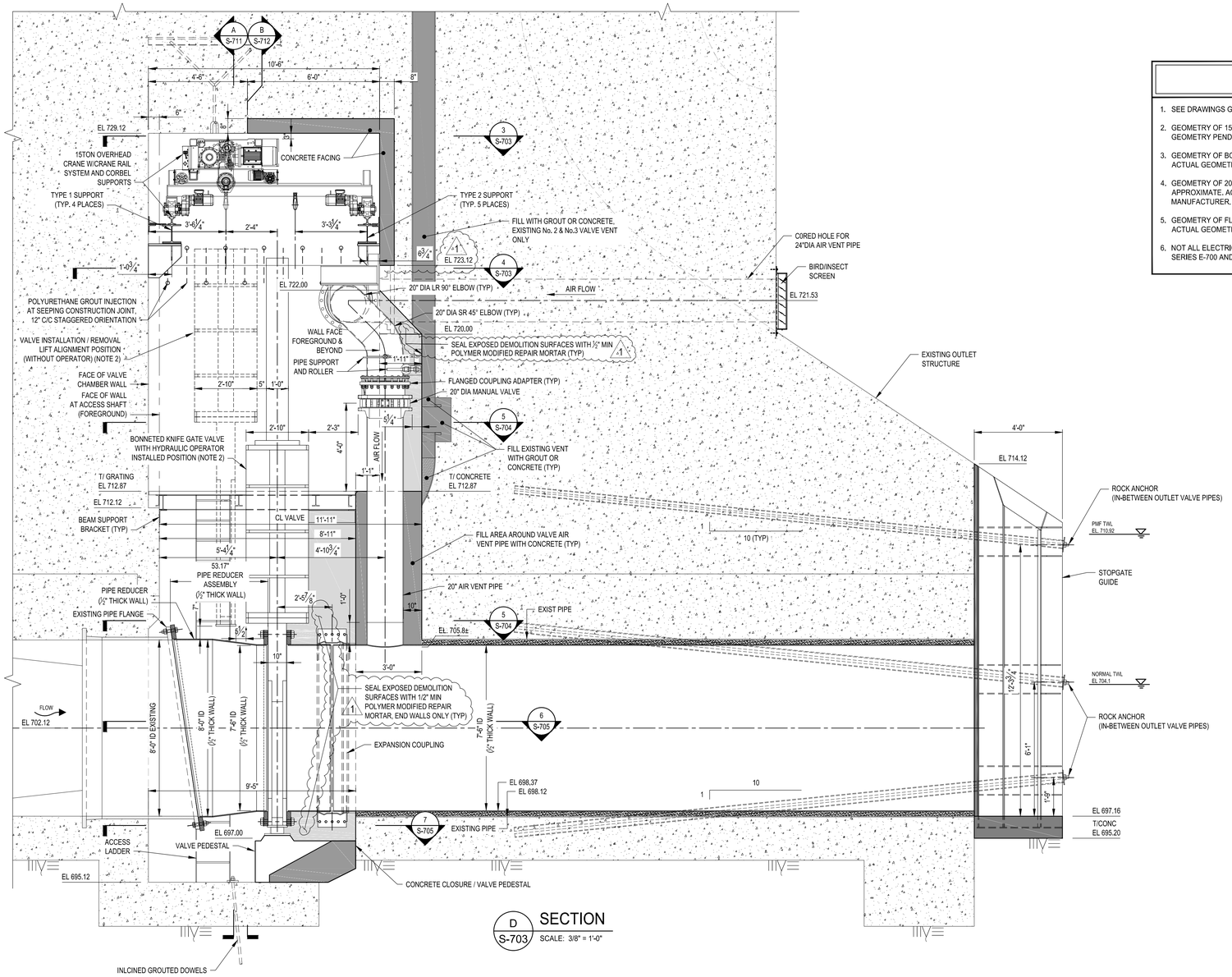
PROJECT NUMBER:	47164-C, E
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE:

OUTLET STRUCTURE GENERAL ARRANGEMENT SECTION – 3

DRAWING NUMBER: S-713

SHEET 61 OF 148



D S-703 **SECTION**
SCALE: 3/8" = 1'-0"

LEGEND

- EXISTING CONCRETE (SECTION)
- LIMITS OF CONCRETE PLACEMENT
- 1 POLYMER MODIFIED REPAIR MORTAR SURFACING

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. GEOMETRY OF 15TON OVERHEAD CRANE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.
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5. GEOMETRY OF FLANGED COUPLING ADAPTER SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.
6. NOT ALL ELECTRICAL DEVICES AND EQUIPMENT ARE SHOWN FOR CLARITY, REFER TO DRAWING SERIES E-700 AND THOROUGHLY COORDINATE ALL WORK BETWEEN CONTRACTORS.

2' 0 2' 4' 6'
3/8" = 1'-0"

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DESIGN & CONSTRUCTION

CONSULTANT

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STATE OF NEW YORK · JOSHUA MICHAEL RICE · No. 085538 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS
MARK	DATE	DESCRIPTION

PROJECT NUMBER:	47164-C, E
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

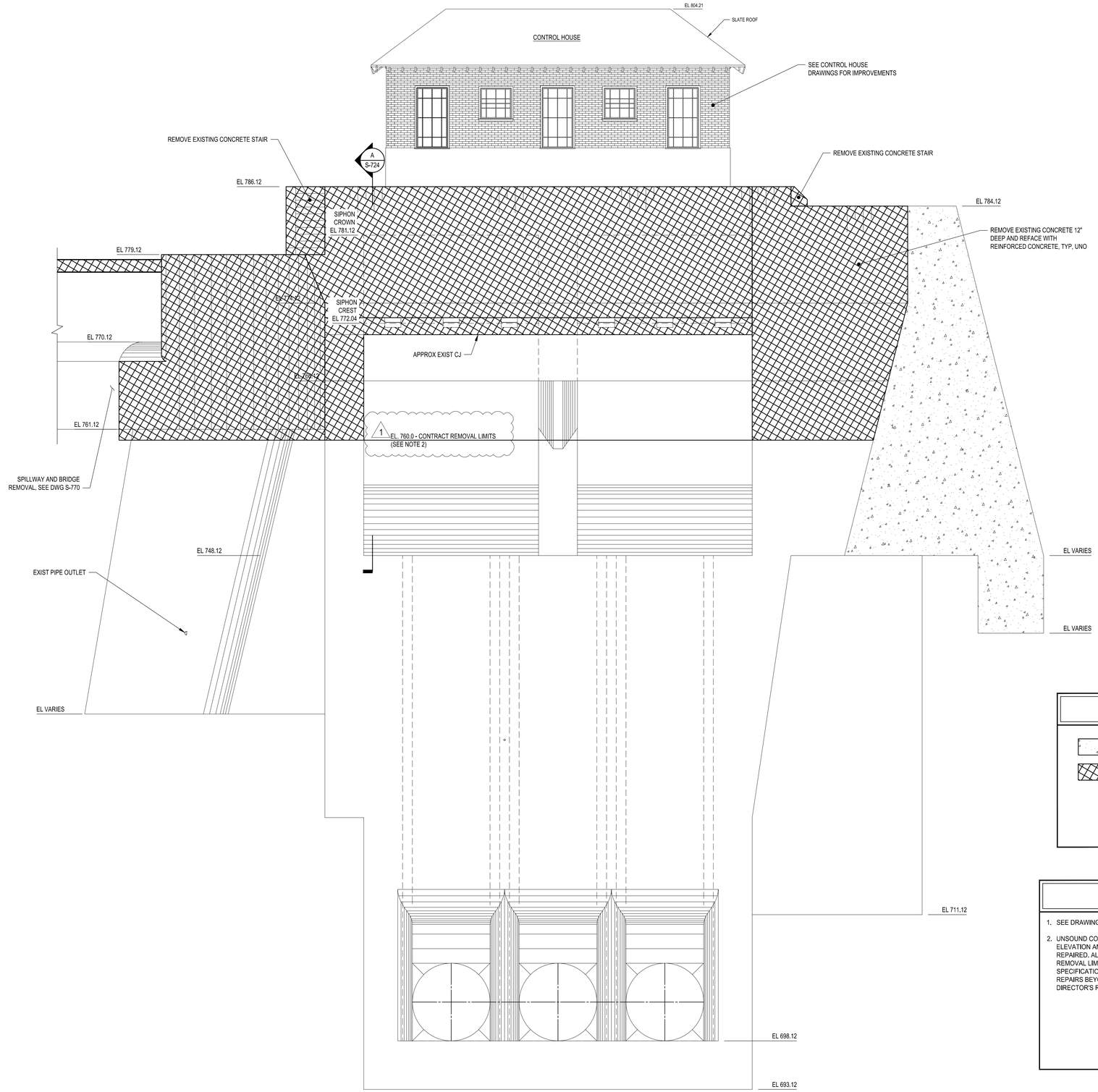
SHEET TITLE:

OUTLET STRUCTURE GENERAL ARRANGEMENT SECTION – 4

DRAWING NUMBER: S-714

SHEET 62 OF 148

Aug 26,2026 - 9:22am
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-714.dwg
36x24 PLOT SHEET



2 UPSTREAM ELEVATION

SCALE: 3/16" = 1'-0"

LEGEND

- EXISTING CONCRETE (SECTION)
- REMOVALS 12" DEEP, UNO

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. UNSOUND CONCRETE MAY BE ENCOUNTERED BELOW THE SPECIFIED REMOVAL LIMIT ELEVATION AND MAY BE ORDERED BY THE DIRECTOR'S REPRESENTATIVE TO BE REPAIRED. ALL CONCRETE REPAIR WORK PERFORMED BELOW THE SPECIFIED REMOVAL LIMIT WILL BE DIRECTED AND AUTHORIZED IN ACCORDANCE WITH SPECIFICATION SECTION 012100 - ALLOWANCES. DO NOT PERFORM ANY CONCRETE REPAIRS BEYOND THE LIMITS SPECIFIED HEREIN WITHOUT AUTHORIZATION FROM THE DIRECTOR'S REPRESENTATIVE.

4' 0 4' 8' 12'

3/16" = 1'-0"

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

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STATE OF NEW YORK · JOSHUA MICHAEL RUPP · No. 085538 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS
MARK	DATE	DESCRIPTION

PROJECT NUMBER:	47164-C
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE:

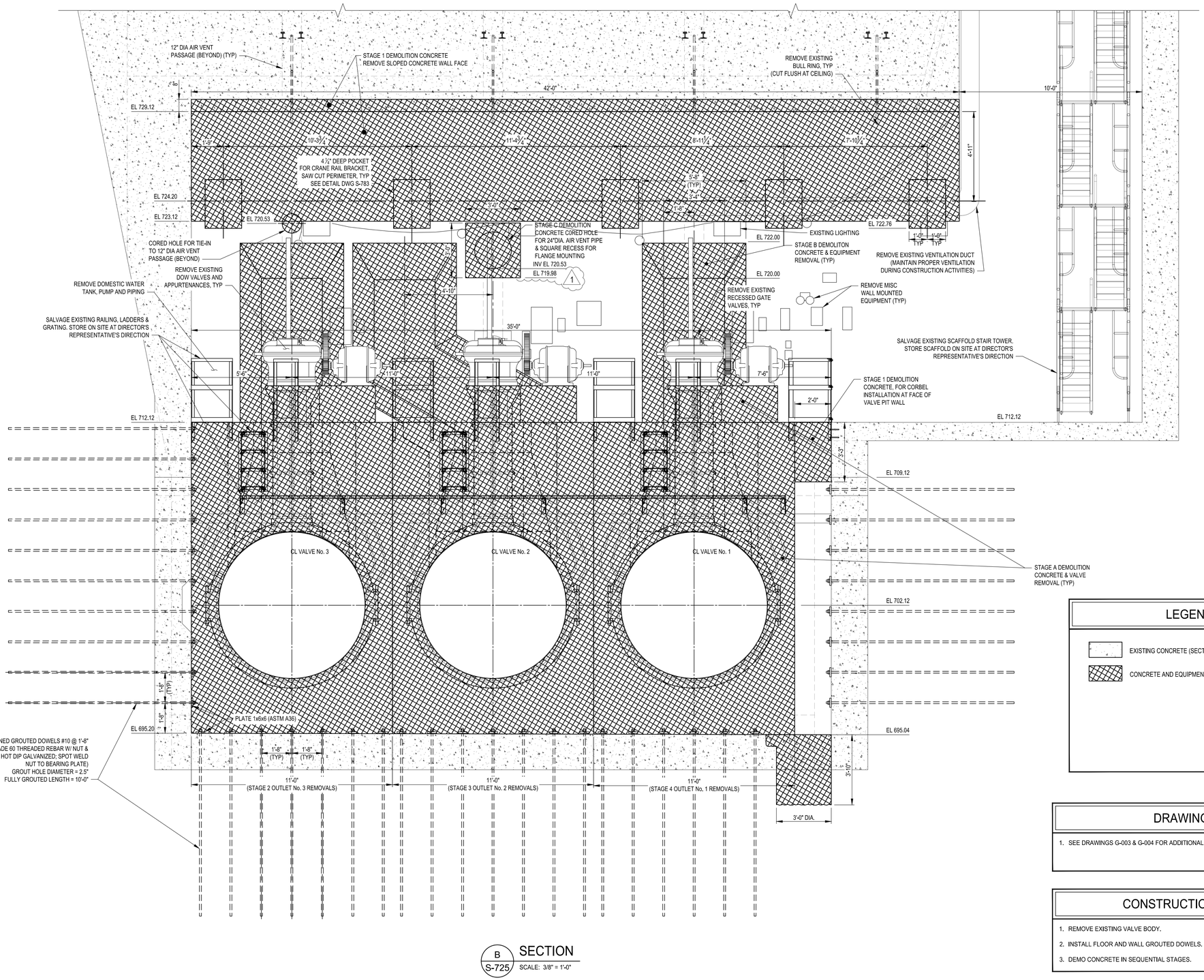
OUTLET STRUCTURE REMOVALS UPSTREAM ELEVATION

DRAWING NUMBER: S-721

SHEET 65 OF 148

Aug 25,2026 - 1:10pm
I:\OGS\015890.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-721.dwg

36x24 PLOT SHEET



B / S-725 SECTION
SCALE: 3/8" = 1'-0"

LEGEND

- EXISTING CONCRETE (SECTION)
- CONCRETE AND EQUIPMENT REMOVAL

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.

CONSTRUCTION SEQUENCE

1. REMOVE EXISTING VALVE BODY.
2. INSTALL FLOOR AND WALL GROUTED DOWELS.
3. DEMO CONCRETE IN SEQUENTIAL STAGES.

2' 0 2' 4' 6'
3/8" = 1'-0"

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

Colliers Engineering & Design
280 East Broad Street
Suite 200
Rochester, NY 14604
Phone: 585.232.5135
COLLIERS ENGINEERING & DESIGN CT, P.C.
www.colliersengineering.com

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STATE OF NEW YORK · JOSHUA MICHAEL RUPP · No. 085538 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8, HADLEY, NY, SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

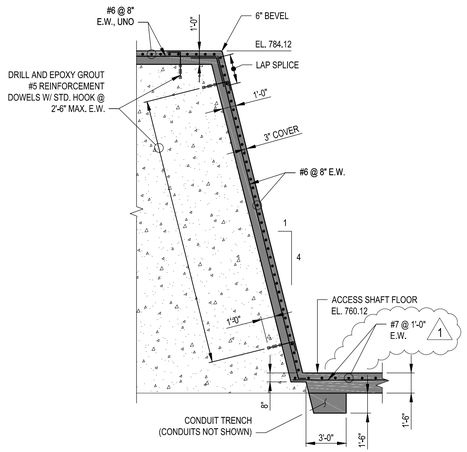
SHEET TITLE:

OUTLET STRUCTURE REMOVALS SECTION – 2

DRAWING NUMBER: S-728

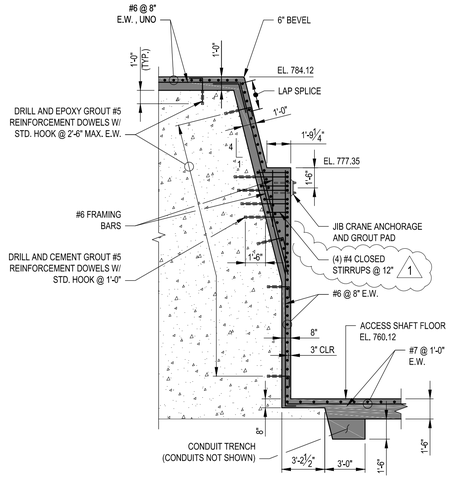
SHEET 72 OF 148

Aug 26 2026 - 8:40am
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-728.dwg
36x24 PLOT SHEET



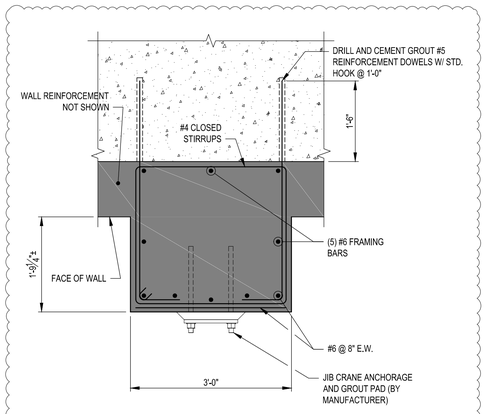
1 / S-730 TYPICAL SECTION - OUTLET STRUCTURE RECONSTRUCTION

SCALE: 3/16" = 1'-0"



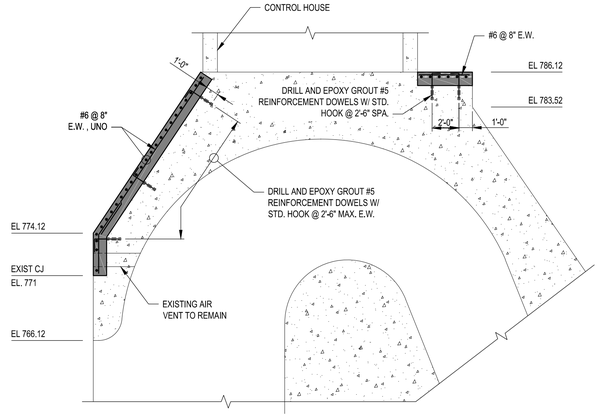
2 / S-730 SECTION - OUTLET STRUCTURE RECONSTRUCTION AT JIB CRANE

SCALE: 3/16" = 1'-0"



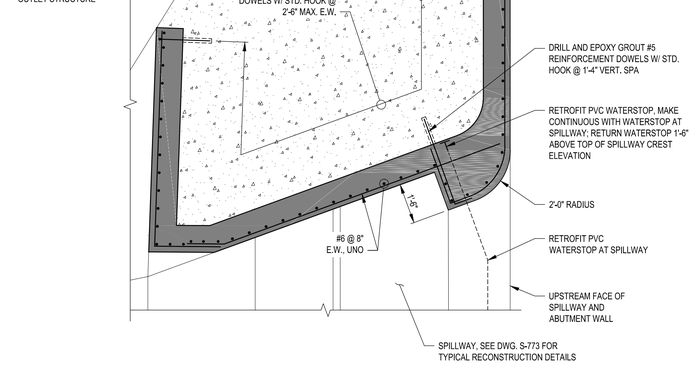
1 / 3 / S-730 DETAIL - PLAN VIEW OF JIB CRANE RECONSTRUCTION

SCALE: 3/4" = 1'-0"



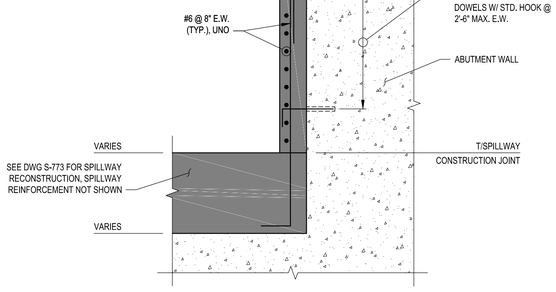
4 / S-730 SECTION - CONTROL HOUSE

SCALE: 3/16" = 1'-0"



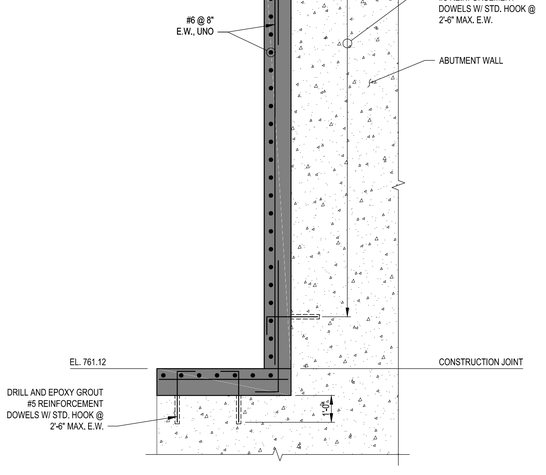
5 / S-730 SECTIONAL PLAN - SPILLWAY ABUTMENT WALL RECONSTRICTION

SCALE: 3/8" = 1'-0"



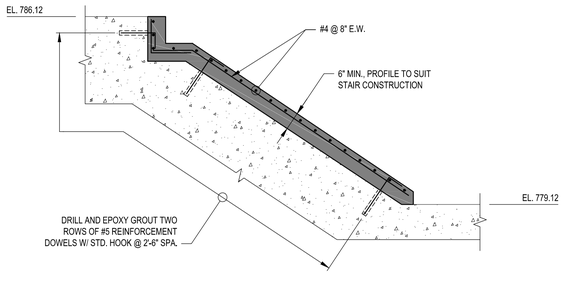
6 / S-730 SECTION - SPILLWAY ABUTMENT RECONSTRICTION

SCALE: 3/8" = 1'-0"



7 / S-730 SECTION - EAST WALL RECONSTRICTION

SCALE: 3/8" = 1'-0"



8 / S-730 DETAIL - CONCRETE OVERLAY AT BRIDGE DECK ACCESS STAIR

SCALE: 3/8" = 1'-0"

LEGEND

- EXISTING CONCRETE (SECTION)
- LIMITS OF CONCRETE PLACEMENT

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.

1' 0 1' 2' 3'
3/4" = 1'-0"

2' 0 2' 4' 6'
3/8" = 1'-0"

4' 0 4' 8' 12'
3/16" = 1'-0"

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

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STATE OF NEW YORK · JOSHUA MICHAEL PECK · No. 085538 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

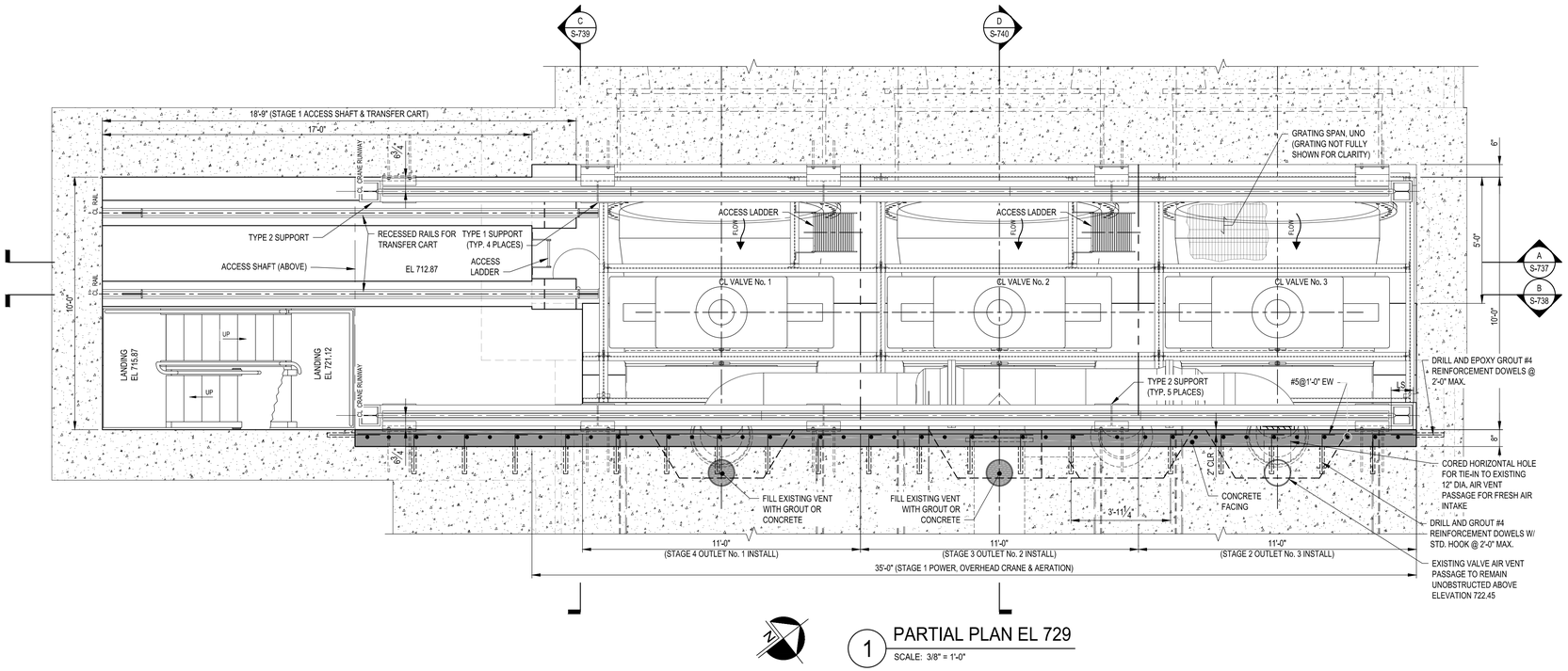
PROJECT NUMBER:	47164-C
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE: OUTLET STRUCTURE REINFORCEMENT SECTIONS AND DETAILS

DRAWING NUMBER: S-734

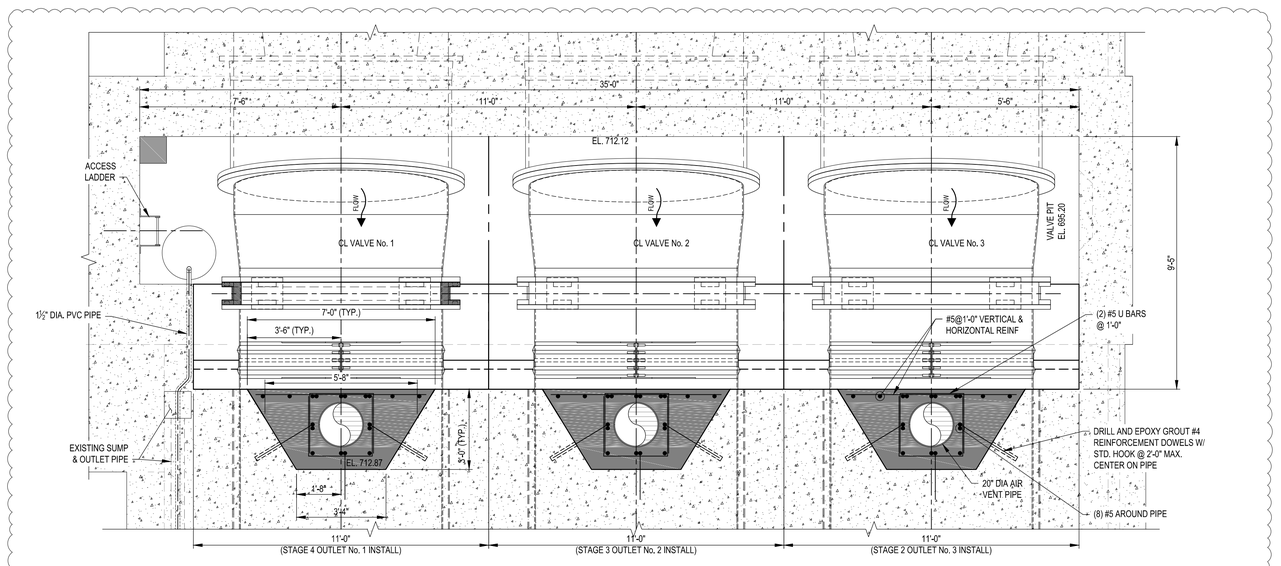
SHEET 78 OF 148

Aug 26,2026 - 8:44am
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-734.dwg
36x24 PLOT SHEET



1 PARTIAL PLAN EL 729

SCALE: 3/8" = 1'-0"



1 2 PARTIAL PLAN EL 707

SCALE: 3/8" = 1'-0"

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. GEOEMTRY OF BONNETED KNIFE GATE VALVE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING FORMALLY SUBMITTED CUT SHEET FROM MANUFACTURER.
3. GEOMETRY OF 24" DIAMETER AIR VENT VALVE AND FLANGES SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING FORMAL SUBMITTED CUT SHEETS FROM MANUFACTURER.
4. GEOMETRY OF HPU SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING FORMAL SUBMITTED CUT SHEET FROM MANUFACTURER.

LEGEND

EXISTING CONCRETE (SECTION)

LIMITS OF CONCRETE PLACEMENT

2' 0 2' 4' 6'

3/8" = 1'-0"

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CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

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REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

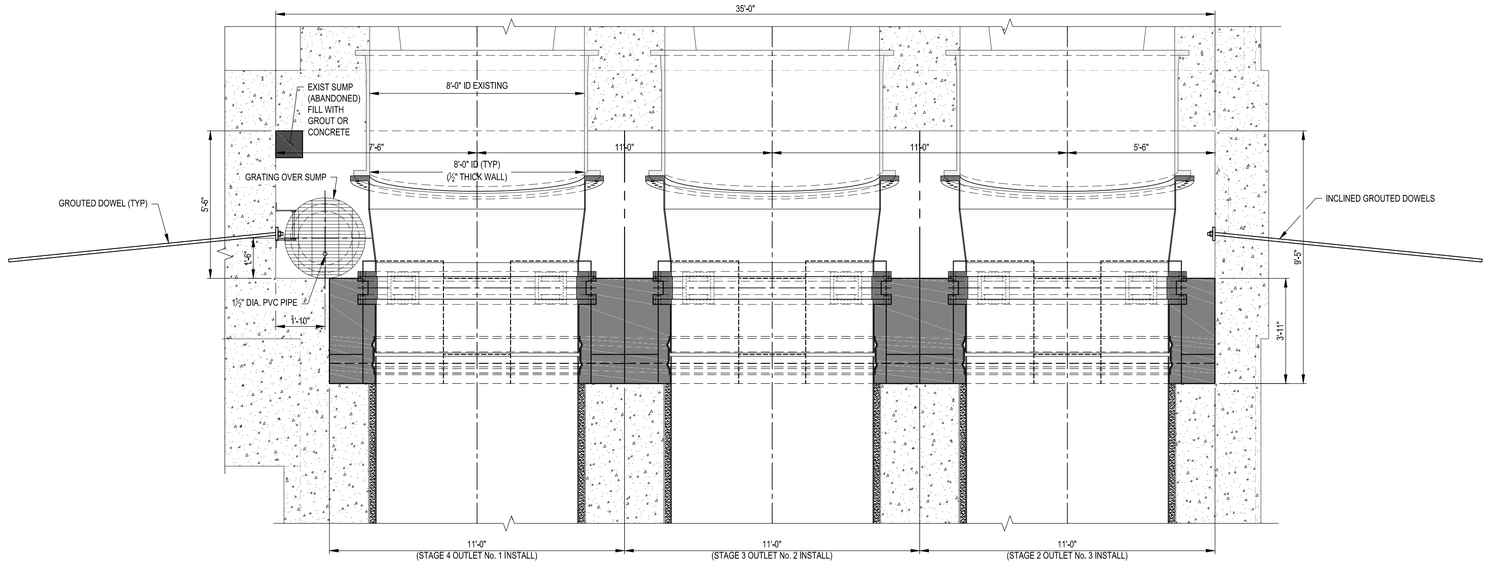
SHEET TITLE: OUTLET STRUCTURE REINFORCEMENT PLANS AT EL 729 & EL 707

DRAWING NUMBER: S-735

SHEET 79 OF 148

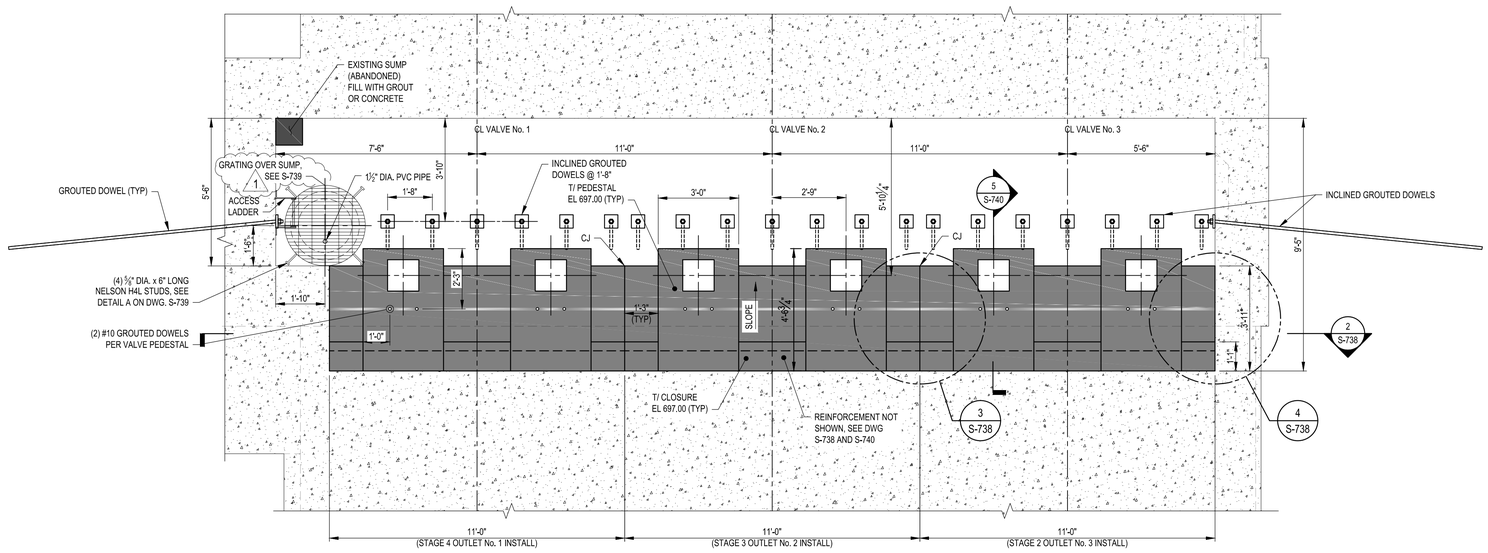
Aug 26,2026 - 8:48am
I:\QGS\015996\00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-735.dwg

36x24 PLOT SHEET



1 PARTIAL PLAN EL 702.12

SCALE: 3/8" = 1'-0"



2 PARTIAL PLAN EL 697.25

SCALE: 3/8" = 1'-0"

LEGEND

- EXISTING CONCRETE (SECTION)
- LIMITS OF CONCRETE PLACEMENT

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. GEOMETRY OF 15TON OVERHEAD CRANE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING OFFICIAL CUT SHEET FROM MANUFACTURER.
3. GEOMETRY OF BONNETED KNIFE GATE VALVE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING OFFICIAL CUT SHEET FROM MANUFACTURER.

2' 0 2' 4' 6'

3/8" = 1'-0"

Aug 25,2026 - 11:54am
I:\QGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-736.dwg

36x24 PLOT SHEET

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DESIGN & CONSTRUCTION

CONSULTANT

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LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

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BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

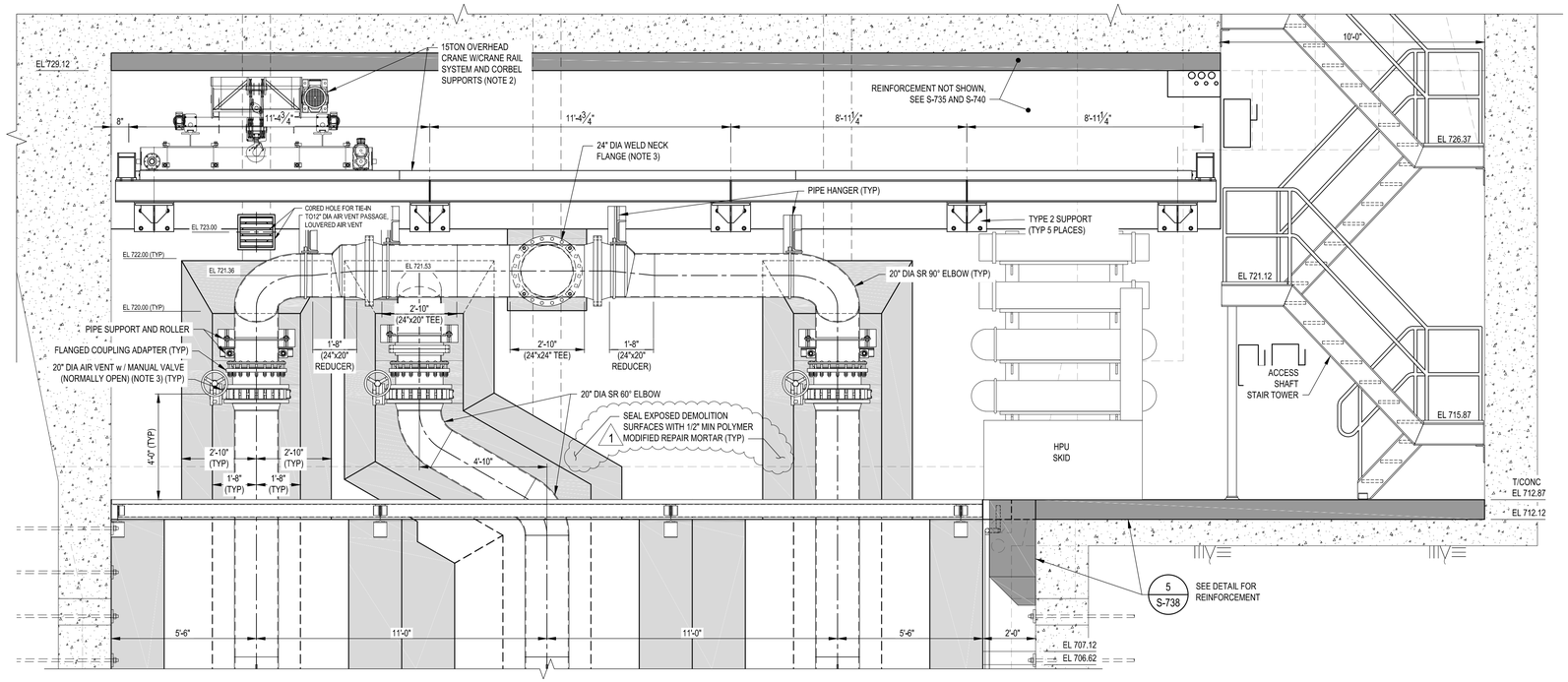
SHEET TITLE:

OUTLET STRUCTURE REINFORCEMENT PLANS AT EL 702.12 & 697.25

DRAWING NUMBER:

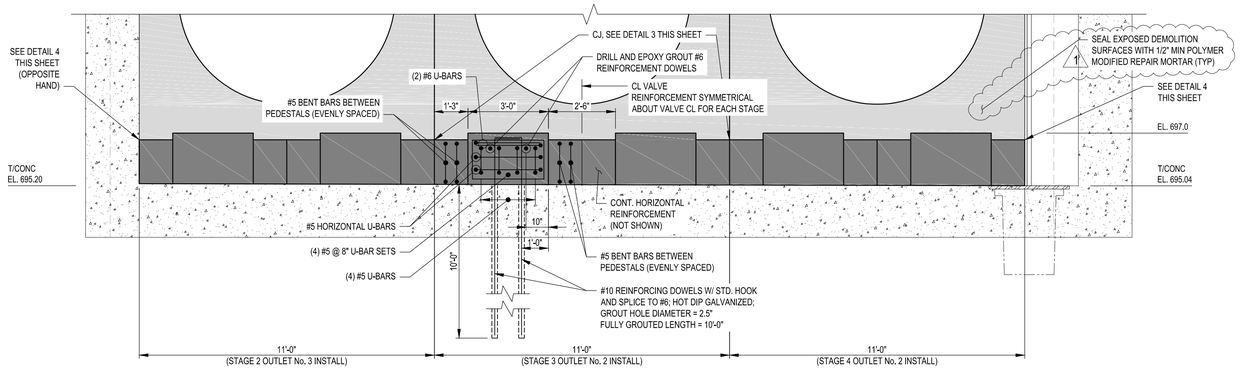
S-736

SHEET 80 OF 148



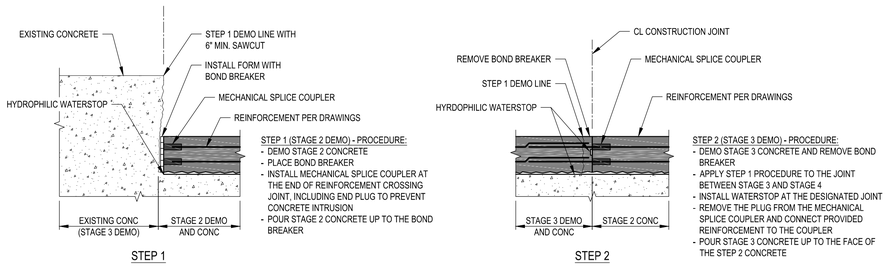
B / S-735 SECTION - REINFORCEMENT IN OUTLET STRUCTURE

SCALE: 3/8" = 1'-0"



2 / S-736 SECTION - REINFORCEMENT IN VALVE PEDESTAL AND CONCRETE CLOSURE

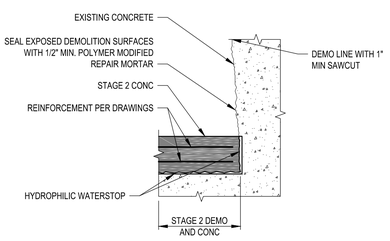
SCALE: 3/8" = 1'-0"



3 / S-735 TYPICAL DETAIL - PLAN VIEW OF JOINT BETWEEN CONSTRUCTION STAGES

SCALE: N.T.S.

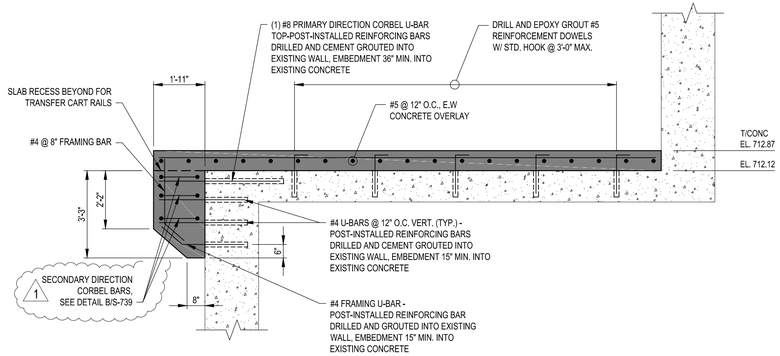
NOTE: FOLLOW THE SAME PROCEDURES FOR THE OTHER STAGES.



4 / S-735 TYPICAL DETAIL - PLAN VIEW OF JOINT AT OUTER EDGE OF CONSTRUCTION STAGE

SCALE: N.T.S.

NOTE: OPPOSITE HAND SIMILAR.



5 / S-738 SECTION - REINFORCEMENT IN CORBEL AND TRANSFER CART SLAB

SCALE: 3/8" = 1'-0"

NOTES:
1. CLEAR COVER FOR CORBEL BARS IS 3 INCHES UNLESS NOTED OTHERWISE.
2. EXISTING CONCRETE SURFACE SHALL BE INTENTIONALLY ROUGHENED 1/4" AMPLITUDE AND SHALL BE CLEAN AND FREE OF LAITANCE.

LEGEND

- EXISTING CONCRETE (SECTION)
- LIMITS OF CONCRETE PLACEMENT
- 1 POLYMER MODIFIED REPAIR MORTAR SURFACING

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. GEOMETRY OF 15TON OVERHEAD CRANE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.
3. GEOMETRY OF 24" DIAMETER AIR VENT VALVE AND FLANGES SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING FORMAL SUBMITTED VALVE CUT SHEETS FROM MANUFACTURER.

2' 0 2' 4' 6'

3/8" = 1'-0"

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CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE: OUTLET STRUCTURE REINFORCEMENT SECTION – 2

DRAWING NUMBER: S-738

SHEET 82 OF 148

Aug 26,2026 - 3:50pm
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-738.dwg

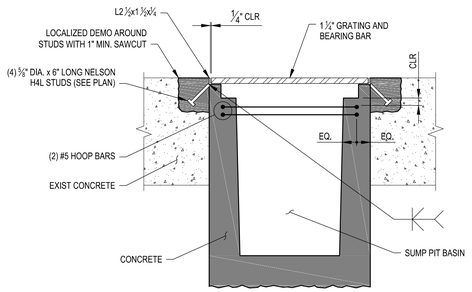
36x24 PLOT SHEET

DRAWING NOTES

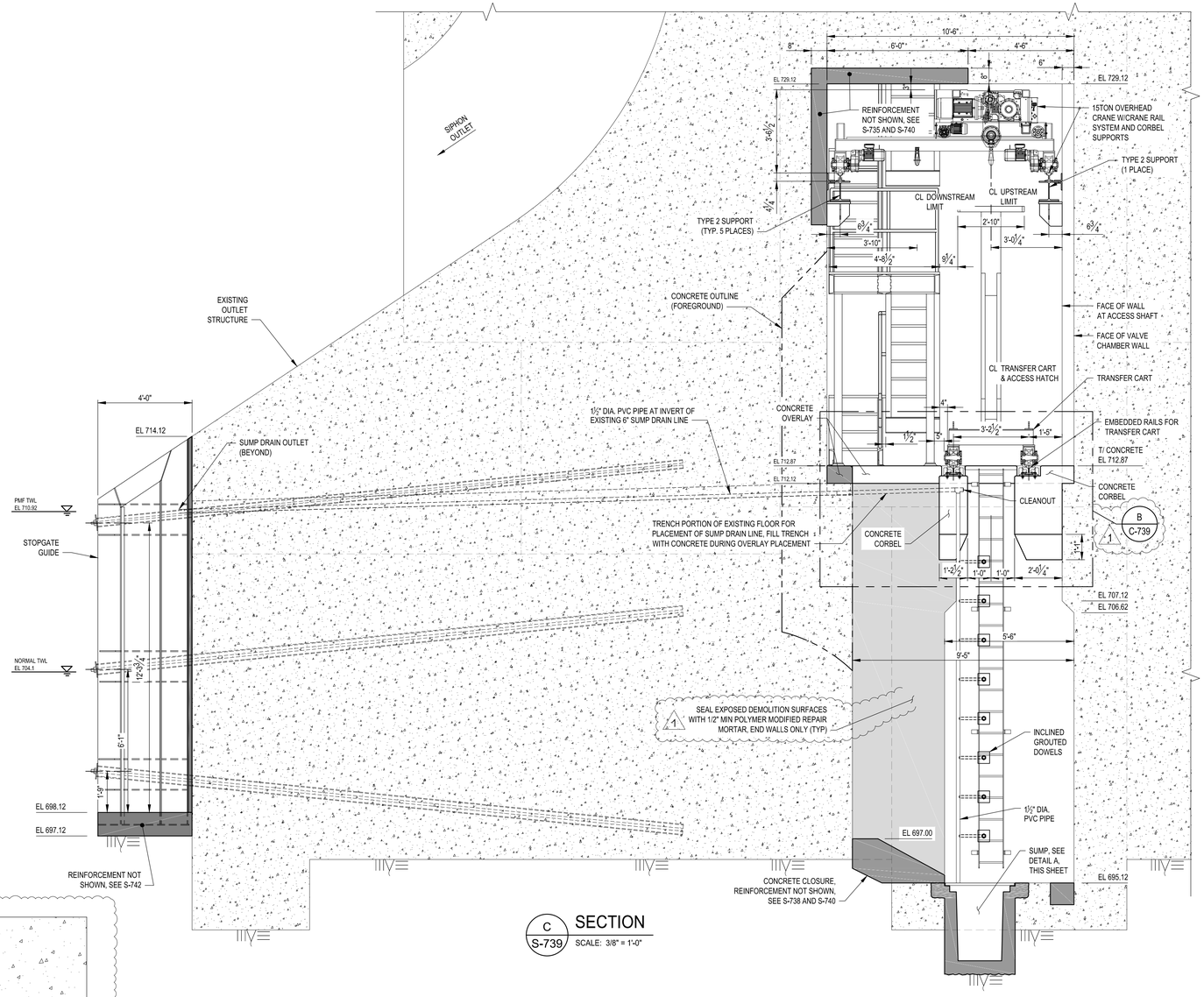
1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. GEOMETRY OF 15TON OVERHEAD CRANE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.

LEGEND

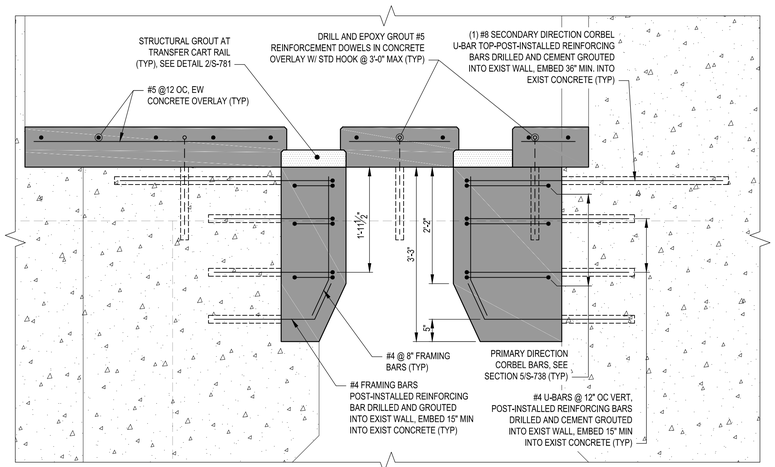
- EXISTING CONCRETE (SECTION)
- LIMITS OF CONCRETE PLACEMENT
- 1 POLYMER MODIFIED REPAIR MORTAR SURFACING
- 1 STRUCTURAL GROUT



A S-739 SUMP PIT BASIN DETAIL
SCALE: 3/4" = 1'-0"



C S-739 SECTION
SCALE: 3/8" = 1'-0"



1 B S-739 DETAIL - REINFORCEMENT IN CORBEL AND TRANSFER CART SLAB
SCALE: 3/4" = 1'-0"

NOTES:
1. CLEAR COVER FOR CORBEL BARS IS 3 INCHES UNLESS NOTED OTHERWISE.
2. EXISTING CONCRETE SURFACE SHALL BE INTENTIONALLY ROUGHENED 1/4" AMPLITUDE AND SHALL BE CLEAN AND FREE OF LAITANCE.

2' 0 2' 4' 6'
3/8" = 1'-0"

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DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

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280 East Broad Street
Suite 200
Rochester, NY 14604
Phone: 585.232.5135
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www.colliersengineering.com

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STATE OF NEW YORK · JOSHUA MICHAEL RUPP · No. 085538 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE:

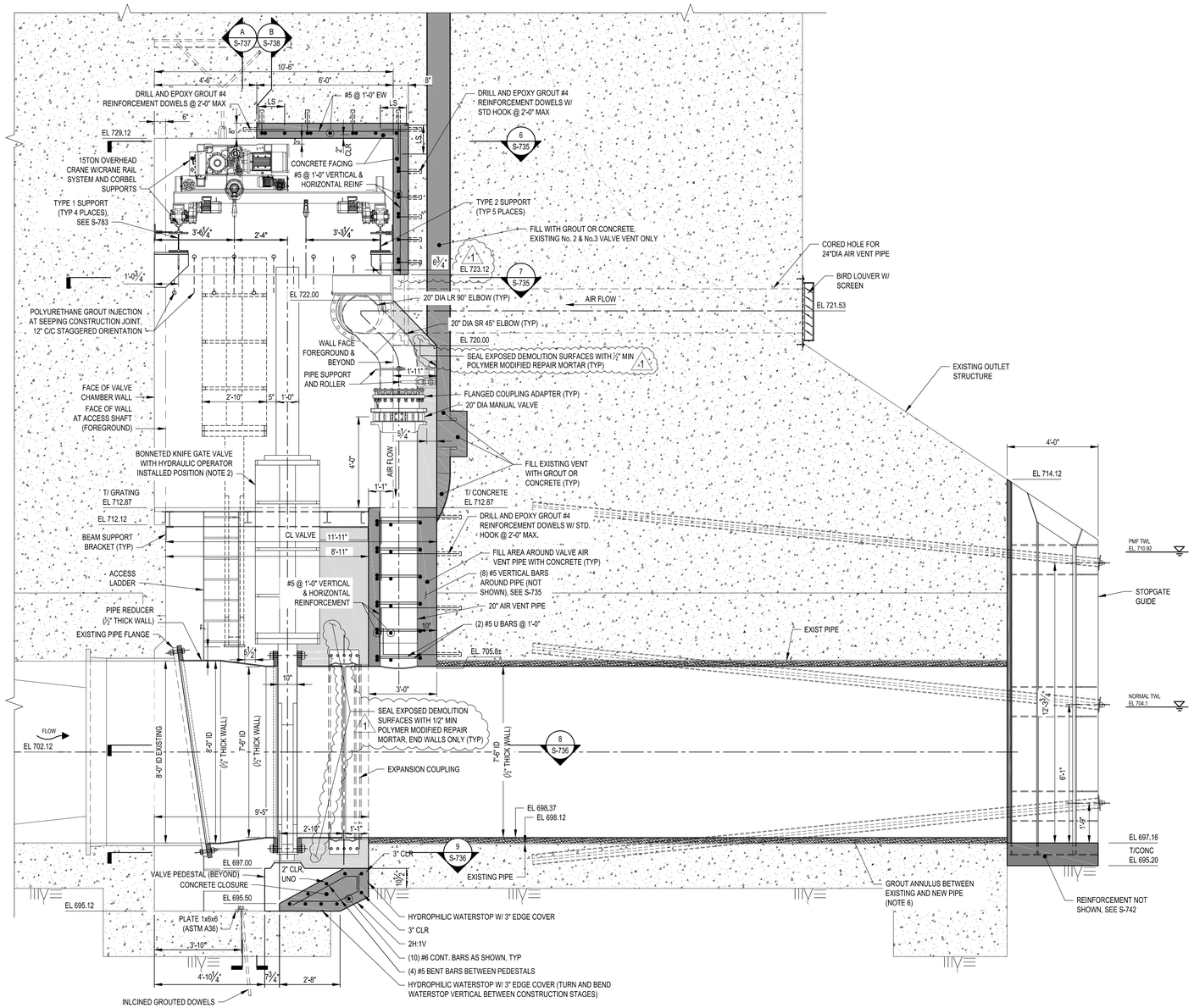
OUTLET STRUCTURE REINFORCEMENT SECTION – 3

DRAWING NUMBER: S-739

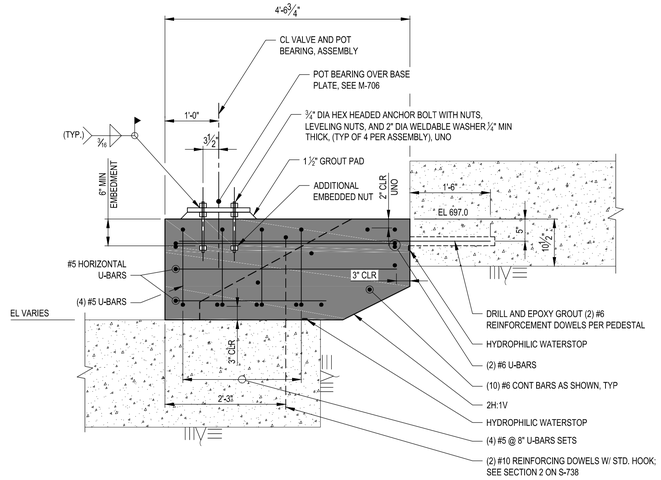
SHEET 83 OF 148

Aug 26, 2026 - 3:54pm
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-738.dwg

36x24 PLOT SHEET



D S-735 SECTION
REINFORCEMENT AT CONCRETE CLOSURE SECTION
SCALE: 3/8" = 1'-0"



5 S-736 SECTION - REINFORCEMENT AT VALVE PEDESTAL
SECTION AND POT BEARING ANCHORAGE
SCALE: 3/4" = 1'-0"

1' 0 1' 2' 3'
3/4" = 1'-0"

2' 0 2' 4' 6'
3/8" = 1'-0"

LEGEND

- EXISTING CONCRETE (SECTION)
- LIMITS OF CONCRETE PLACEMENT
- 1 POLYMER MODIFIED REPAIR MORTAR SURFACING

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. GEOMETRY OF 15TON OVERHEAD CRANE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.
3. GEOMETRY OF BONNETED KNIFE GATE VALVE SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED VALVE CUT SHEET FROM MANUFACTURER.
4. GEOMETRY OF 20" DIAMETER AIR VENT VALVE AND FLANGES SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED VALVE CUT SHEETS FROM MANUFACTURER.
5. GEOMETRY OF FLANGED COUPLING ADAPTER SHOWN ON THIS SHEET IS APPROXIMATE. ACTUAL GEOMETRY PENDING SUBMITTED CUT SHEET FROM MANUFACTURER.
6. MAXIMUM PERMITTED GROUT LIFT HEIGHT BETWEEN THE EXISTING PIPE AND THE PROVIDED STEEL PIPE SHALL COMPLY WITH TABLE 1. CONFIRM THAT EACH LIFT HAS FULLY CURED BEFORE PLACING THE NEXT LIFT.

TABLE 1. MAXIMUM GROUT LIFT HEIGHTS

LIFT NUMBER	MAXIMUM LIFT HEIGHT
1ST	9"
2ND	20"
3RD+	NO RESTRICTION

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STATE OF NEW YORK · JOSHUA MICHAEL RUSH · No. 085538 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

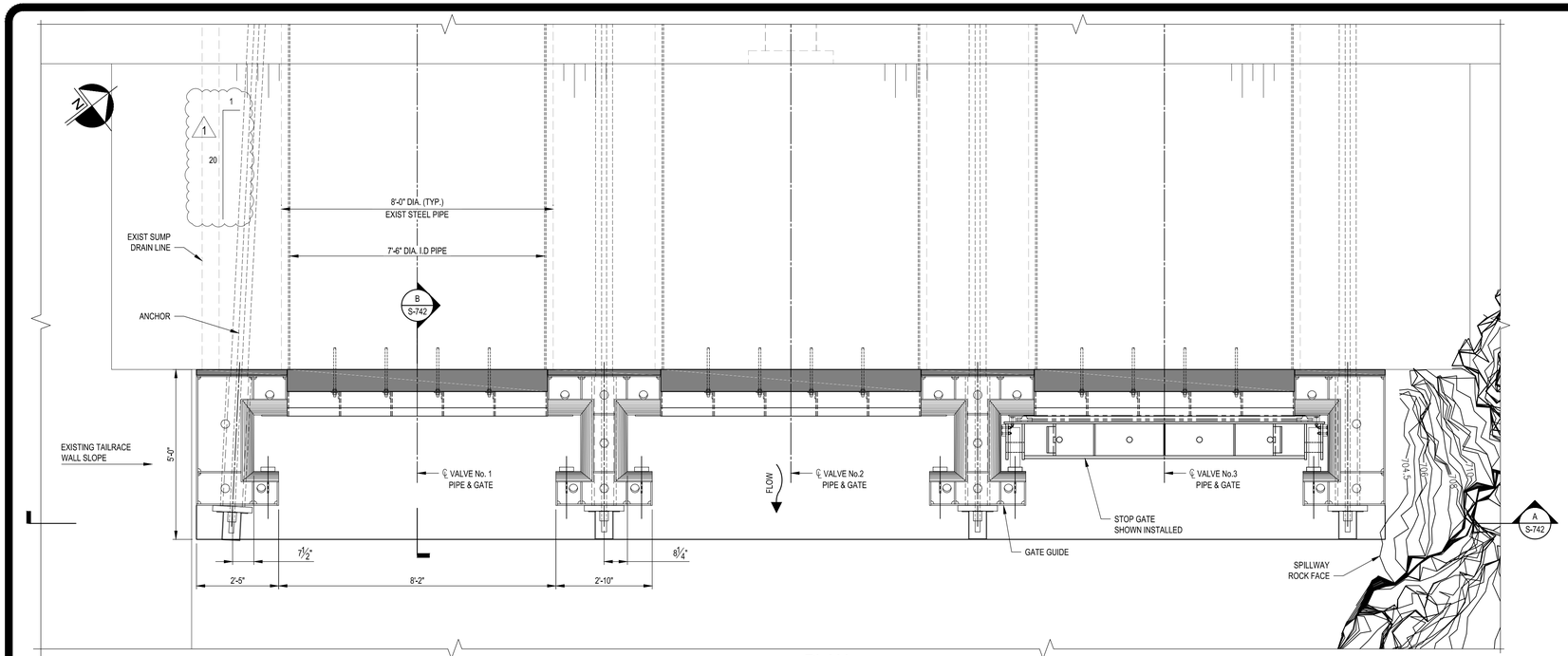
SHEET TITLE:

OUTLET STRUCTURE REINFORCEMENT SECTION – 4

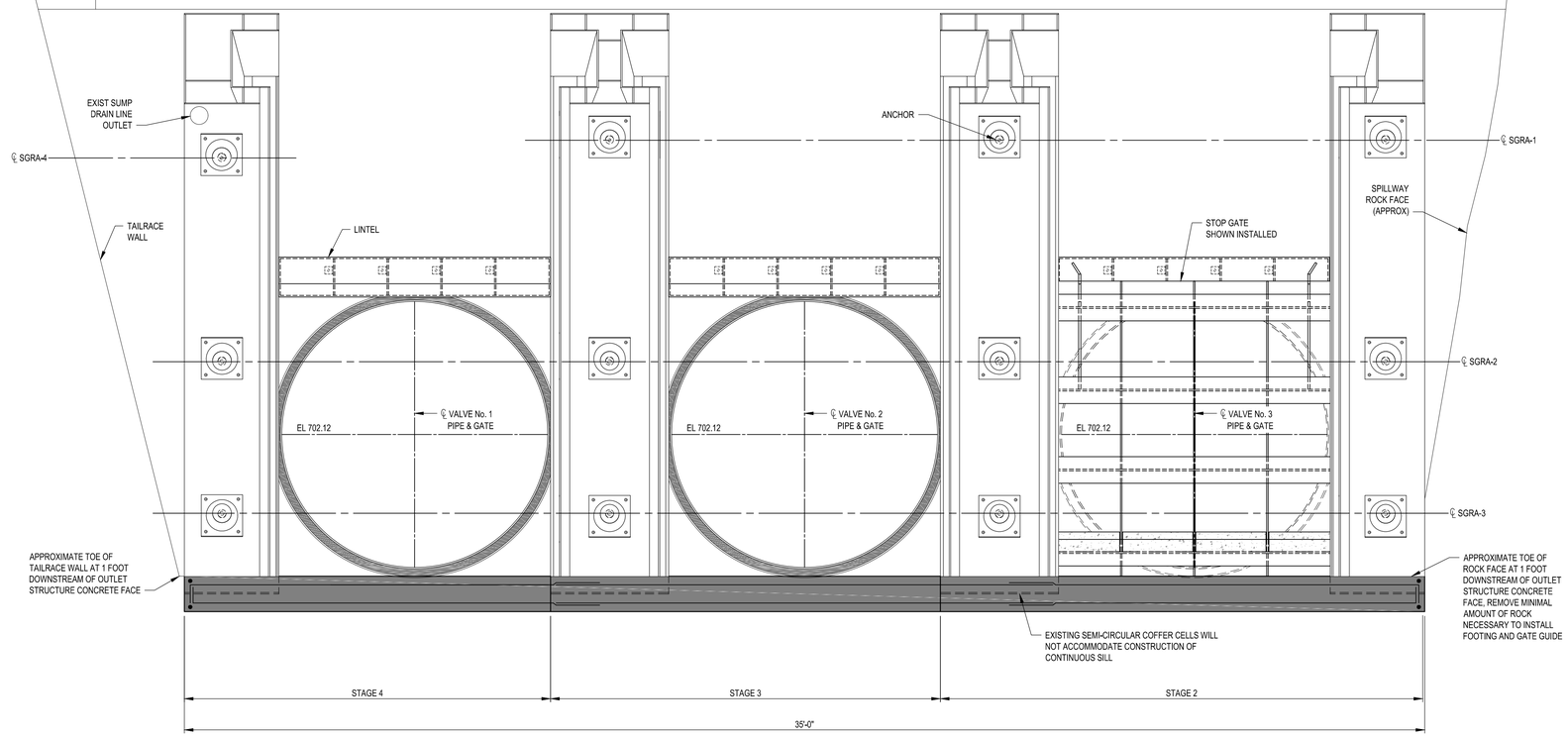
DRAWING NUMBER: S-740

SHEET 84 OF 148

Aug 26,2026 - 9:24am
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-740.dwg
36x24 PLOT SHEET



1 PLAN
SCALE: 1/2" = 1'-0"



A ELEVATION
SCALE: 1/2" = 1'-0"

B SECTION
SCALE: 1/2" = 1'-0"

LEGEND

EXISTING CONCRETE (SECTION)

LIMITS OF CONCRETE PLACEMENT

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. PROVIDE THREE (3) SETS OF PREFABRICATED STOP GATE GUIDES ANCHORED TO THE OUTLET STRUCTURE. PROVIDE ONE (1) STOP GATE WITH SUPPORT FRAME FOR STORAGE WHEN NOT IN USE.
3. STOPGATE & GATE GUIDE DESIGNS ARE CONCEPTUAL. REFER TO SPECIFICATIONS FOR DESIGN SCOPE.
4. ROCK SCALING WILL BE REQUIRED TO FACILITATE INSTALLATION OF THE ROCK ANCHORS.

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STATE OF NEW YORK
JOSHUA MICHAEL DEPP
No. 085538
LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES:
04/30/2028

CONTRACT:
CONSTRUCTION

TITLE:
PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM
NYS DAM ID #205-0415

LOCATION:
233 COUNTY ROUTE 8
HADLEY, NY
SARATOGA COUNTY

CLIENT:
NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

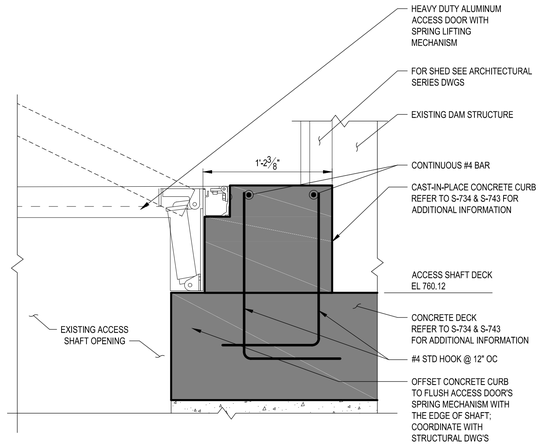
SHEET TITLE:
OUTLET STRUCTURE REINFORCEMENT STOP GATE GUIDES DETAILS

DRAWING NUMBER:
S-742

SHEET 85 OF 148

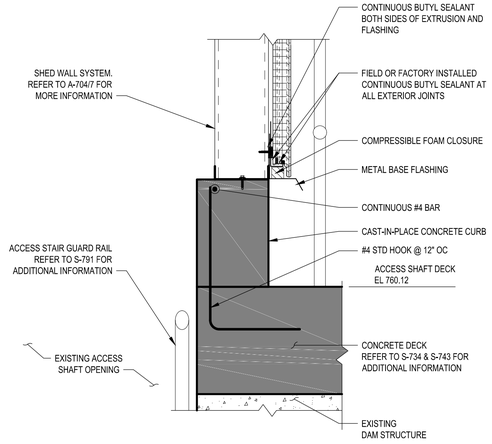
Aug 25, 2026 - 10:29am
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-742.dwg

36x24 PLOT SHEET



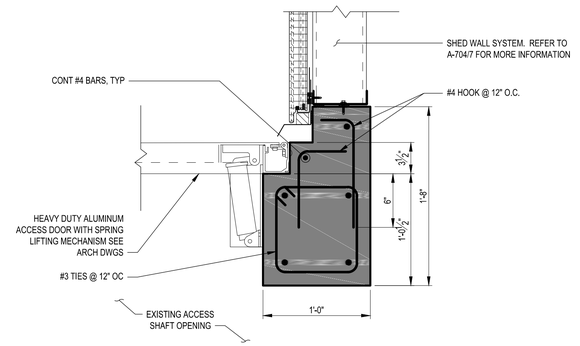
1 ACCESS SHAFT CURB SECTION DETAIL

SCALE: 1-1/2" = 1'-0"



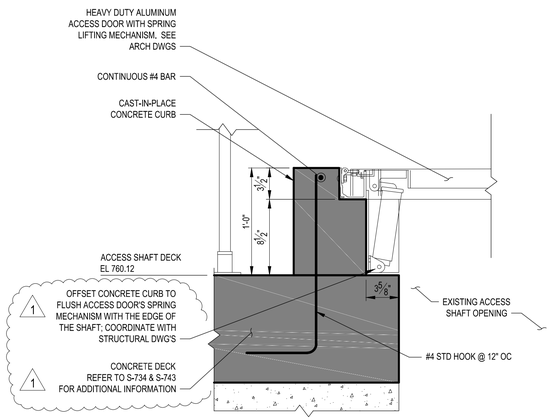
2 ACCESS SHED WALL & CURB SECTION DETAIL

SCALE: 1-1/2" = 1'-0"



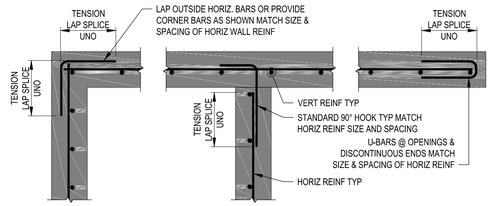
1 3 ACCESS SHAFT CENTER BEAM SECTION DETAIL

SCALE: 1-1/2" = 1'-0"



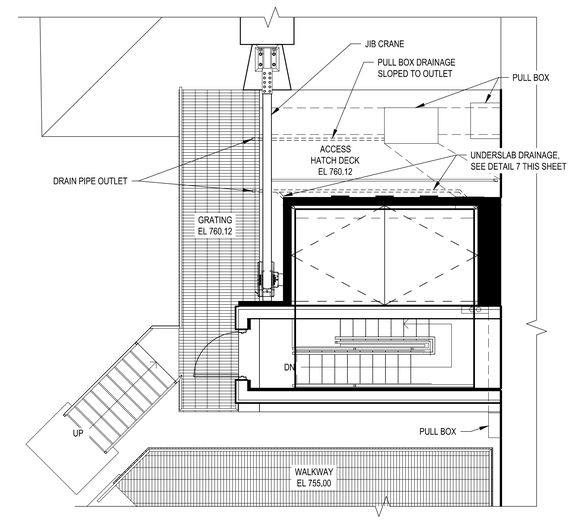
4 ACCESS SHAFT CURB SECTION DETAIL - B

SCALE: 1-1/2" = 1'-0"



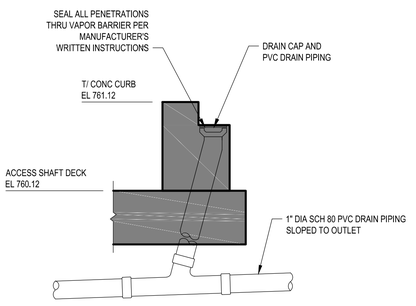
5 CONCRETE WALL REINFORCING

SCALE: 3/4" = 1'-0"



6 ACCESS SHAFT PLATFORM AT SHED

SCALE: 1/4" = 1'-0"



7 TYPICAL DRAIN THRU SLAB-ON-GRADE DETAIL

SCALE: NO SCALE

LEGEND

EXISTING CONCRETE (SECTION)

LIMITS OF CONCRETE PLACEMENT

DRAWING NOTES

1. SEE DRAWINGS G-003, G-004 & A-702 FOR ADDITIONAL NOTES.

4' 0 4' 8'
1/4" = 1'-0"

1' 0 1' 2' 3'
3/4" = 1'-0"

1' 6" 0 1'
1 1/2" = 1'-0"

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STATE OF NEW YORK · JOSHUA MICHAEL MOSS · No. 085538 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C
DESIGNED BY:	-
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

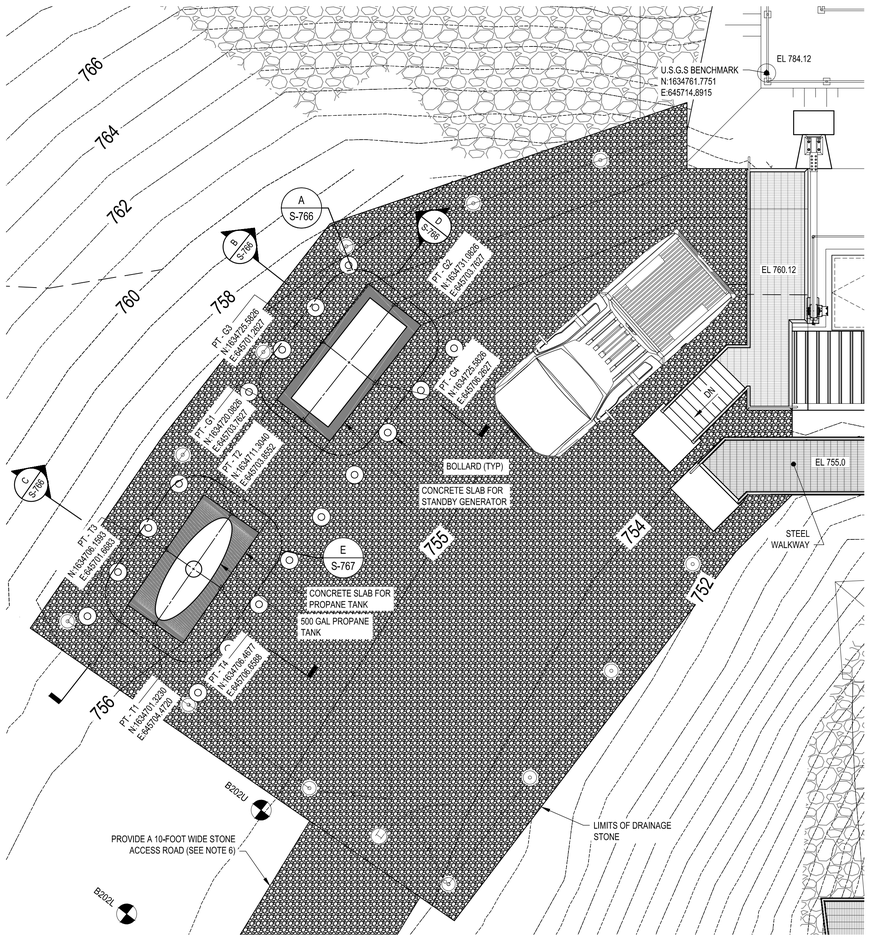
SHEET TITLE: OUTLET STRUCTURE REINFORCEMENT ACCESS SHAFT DECK – 2

DRAWING NUMBER: S-744

SHEET 87 OF 148

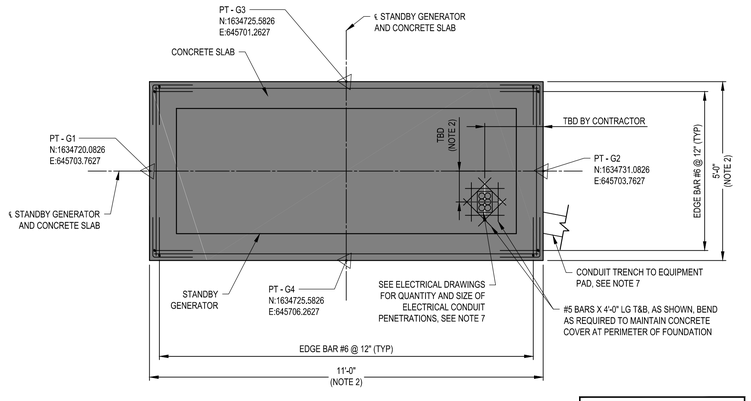
Aug 25,2026 - 11:50am
I:\OGS\47164.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-744.dwg

36x24 PLOT SHEET



STANDBY GENERATOR & PROPANE TANK FOUNDATIONS PLAN

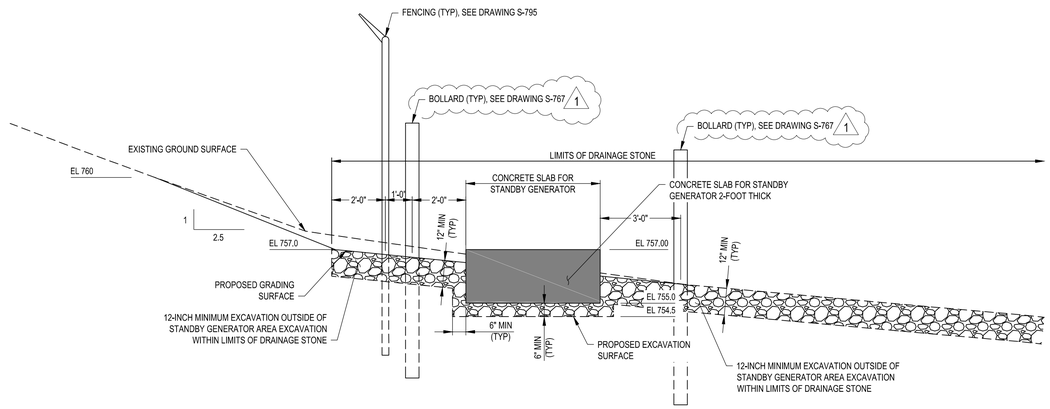
1 — SCALE: 3/16" = 1'-0"



STANDBY GENERATOR EXCAVATION AND FINAL GRADING SECTION

B S-766 — SCALE: 3/8" = 1'-0"

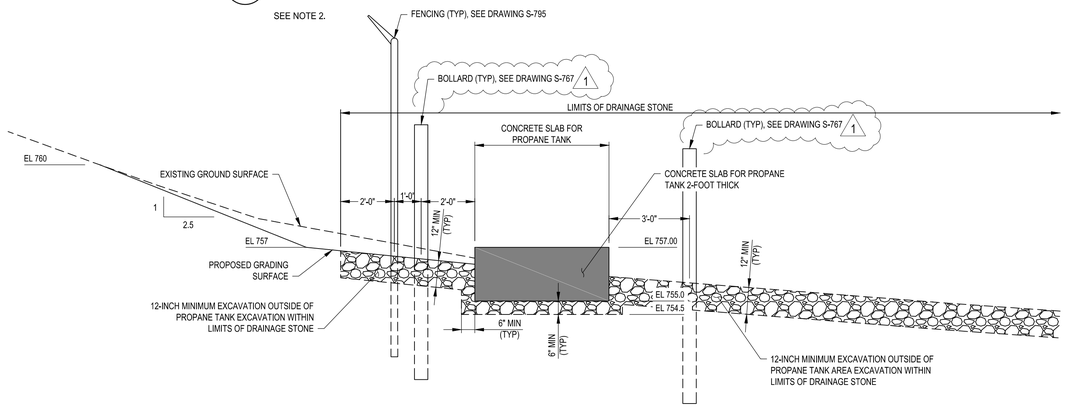
SEE NOTE 2.



PROPANE TANK EXCAVATION AND FINAL GRADING SECTION

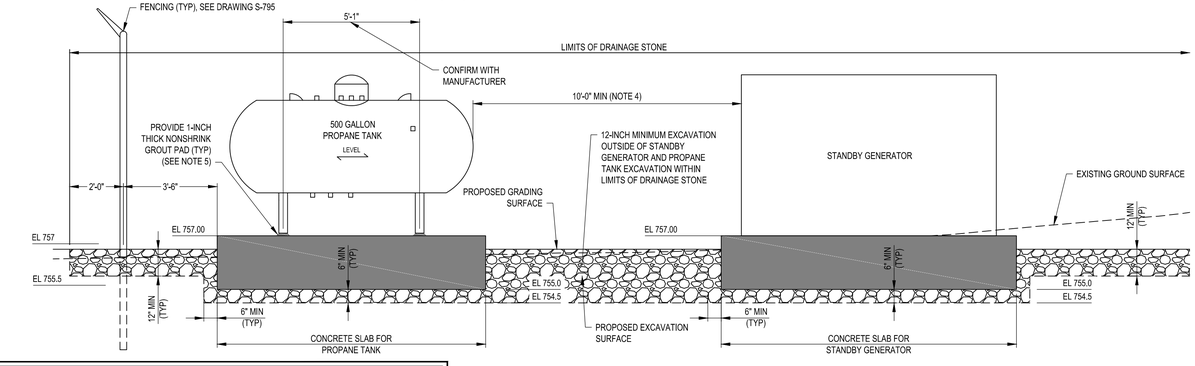
C S-766 — SCALE: 3/8" = 1'-0"

SEE NOTE 2.



PROPANE TANK & STANDBY GENERATOR FINAL GRADING SECTION

D S-766 — SCALE: 3/8" = 1'-0"



STANDBY GENERATOR CONCRETE SLAB PLAN

A S-766 — SCALE: 1/2" = 1'-0"

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. FINAL DIMENSIONS TO BE VERIFIED BY DIRECTOR'S REPRESENTATIVE PENDING EQUIPMENT APPROVAL.
3. GROUNDING TO BE PROVIDED BY ELECTRICAL CONTRACTOR, REFER TO DRAWING SERIES E-700 FOR DETAILS.
4. VERIFY THAT PROPANE TANK FOUNDATION COORDINATES PROVIDE AT LEAST 10 FEET CLEARANCE BETWEEN THE PROPANE TANK AND GENERATOR CABINET. IF NOT, SUBMIT PROPOSED CHANGES TO THE DIRECTOR'S REPRESENTATIVE FOR APPROVAL BEFORE PROCEEDING WITH CONSTRUCTION.
5. PROVIDE HEADED STAINLESS STEEL ANCHOR RODS WITH A MINIMUM EMBEDMENT OF 12 INCHES, AND NONSHRINK GROUT PADS IN ACCORDANCE WITH APPROVED EQUIPMENT DETAILS.
6. PROVIDE A 10-FOOT WIDE STONE ACCESS ROAD ALONG THE SAME ALIGNMENT AS THE UNPAVED ACCESS ROAD TO COUNTY ROUTE #8. SEE DRAWING S-767 FOR A STANDBY GENERATOR AND PROPANE TANK ACCESS ROAD IMPROVEMENTS TYPICAL SECTION.
7. INSTALLATION OF CONDUIT PROVIDED BY ELECTRICAL CONTRACTOR. REFER TO DRAWING SERIES E-700 FOR DETAILS. REFER TO DRAWING SERIES E-700 FOR DETAILS. EXCAVATION AND BACKFILL OF CONDUIT PROVIDED BY CONSTRUCTION CONTRACTOR. THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.
8. STANDBY GENERATOR AND PROPANE TANK AND PIPING AND DEVICES BETWEEN STANDBY GENERATOR AND PROPANE TANK PROVIDED BY ELECTRICAL CONTRACTOR, REFER TO DRAWING SERIES E-700 FOR DETAILS. EXCAVATION AND BACKFILL AND FOUNDATIONS FOR THE PROPANE TANK AND STANDBY GENERATOR PROVIDED BY CONSTRUCTION CONTRACTOR, THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.

LEGEND

- CONCRETE
- NONSHRINK GROUT
- RIPRAP
- DRAINAGE STONE

4' 0 4' 8' 12' — 3/16" = 1'-0"

2' 0 2' 4' 6' — 3/8" = 1'-0"

2' 0 2' 4' — 1/2" = 1'-0"

Aug 25,2026 - 1:42pm
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-766.dwg

36x24 PLOT SHEET

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

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STATE OF NEW YORK — JOSHUA MICHAEL RICE — No. 085538 — LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

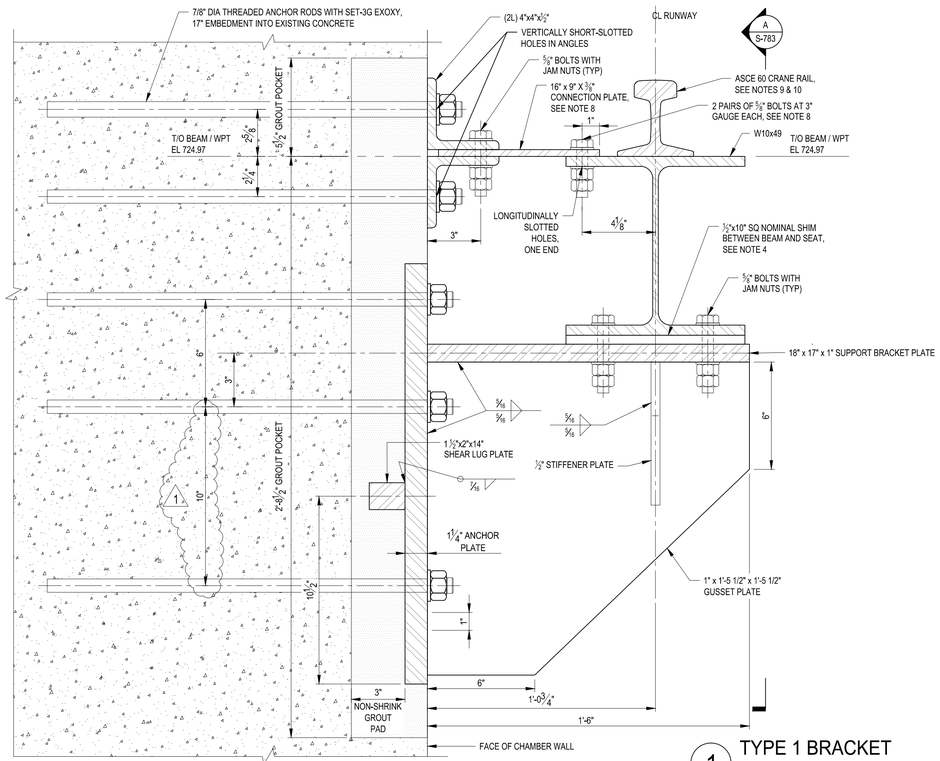
MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C, E
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE: STANDBY GENERATOR & PROPANE TANK FOUNDATION DETAILS

DRAWING NUMBER: S-766

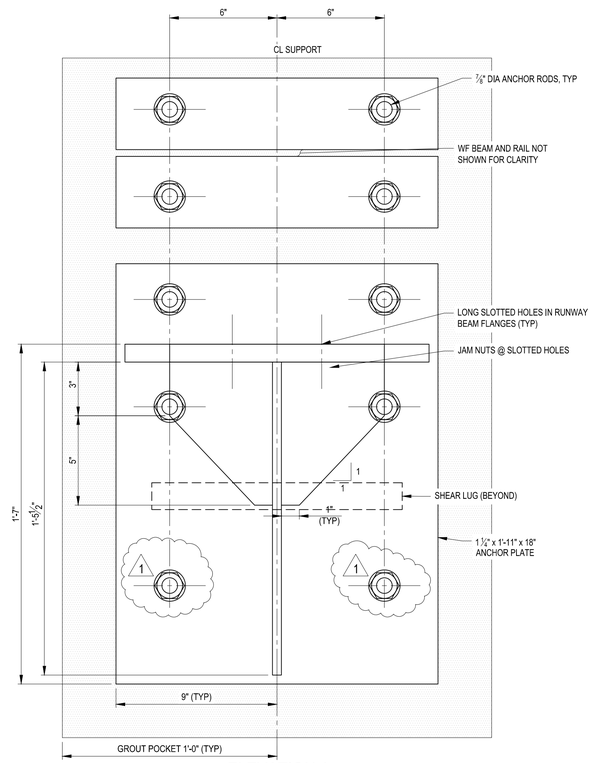
SHEET 98 OF 148



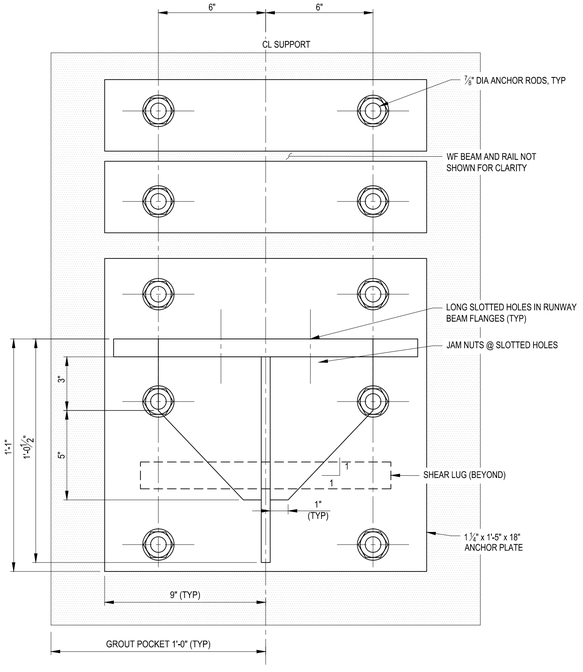
SECTION

1 TYPE 1 BRACKET (QTY 4 UPSTREAM)

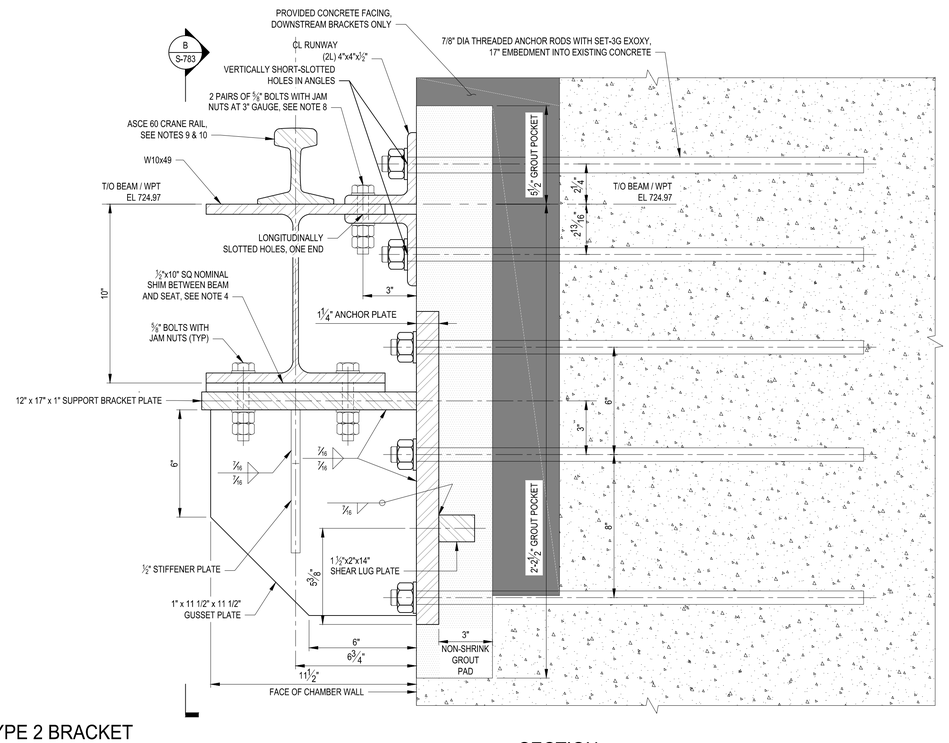
SCALE: 3" = 1'-0"



ELEVATION A (W10 NOT SHOWN)



ELEVATION B (W10 NOT SHOWN)



SECTION

2 TYPE 2 BRACKET (QTY 5 DOWNSTREAM , QTY 1 UPSTREAM)

SCALE: 3" = 1'-0"

LEGEND

- EXISTING CONCRETE (SECTION)
- LIMITS OF CONCRETE PLACEMENT
- LIMITS OF STRUCTURAL GROUT PLACEMENT

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. STAINLESS STEEL ANCHOR RODS, NUTS, AND WASHERS CONFORMING TO ASTM A193, GRADE B8, AND ASTM A194, GRADE 8.
3. PROVIDE 1/2" GAP TYPICAL BETWEEN ADJACENT SECTIONS OF RAIL BEAM. LIMIT GAPS BETWEEN RAIL ENDS TO 1/16" MAXIMUM.
4. FIELD MEASURE AFTER INSTALLATION AND ADJUST SHIM THICKNESS AS NEEDED TO MEET THE DESIGN ELEVATION AND TOLERANCE LIMITATIONS FOR THE CRANE RUNWAY.
5. FOR BOLTING AT SLIDING ENDS, DRAW NUTS SNUG TIGHT, LOOSEN THEM APPROXIMATELY 1/3 TURN, AND LOCK THEM WITH JAM NUT TO PROVIDE A JOINT THAT IS IN CONTACT BUT FREE TO SLIDE.
6. BOLTS IN STANDARD HOLES SHALL BE LEFT SNUG-TIGHT FOR ERECTION AND ALIGNMENT AND FULLY TIGHTENED AFTER FINAL POSITION OF THE CRANE RUNWAY BEAM IS CONFIRMED.
7. PROVIDE ADJUSTABLE CRANE RAIL CLIPS SUCH AS GANTRAIL OR GANTREX RAILLOK, OR APPROVED EQUIVALENT, DESIGNED FOR THE 15 KIP VERTICAL WHEEL LOAD AND 3 KIP HORIZONTAL WHEEL LOAD, INSTALLED IN PAIRS AT MAXIMUM 24" OC ALONG EACH RAIL AND WITHIN 6" OF EACH END. PROVIDE TWO PAIRS OF RAIL CLIPS AT EACH RAIL SPLICE.
8. PROVIDE TWO CONNECTION PLATE OR ANGLE BOLTS AT EACH END OF EACH RUNWAY BEAM. COPE CONNECTION PLATE OR ANGLES AT OUTERMOST ENDS OF CRANE RUNWAY TO ACCOMMODATE RAIL CLIP INSTALLATION.
9. LOCATE RAIL JOINTS SO THAT JOINTS ON OPPOSITE RUNWAYS ARE STAGGERED.
10. PROVIDE STANDARD FOUR-BOLT RAIL SPLICES AT ALL RAIL JOINTS.
11. ADHESIVE ANCHORS FOR EMBEDS: BASIS OF DESIGN SIMPSON STRONG-TIE SET-3G EPOXY WITH ASTM A193 B7 THREADED ROD, DESIGNED PER ACI 318-25 CHAPTER 17 USING ICC-ES ESR-4057. DESIGN ASSUMES CRACKED NORMAL-WEIGHT CONCRETE f'c = 2500 PSI, "OR APPROVED EQUIVALENT" ADHESIVE SYSTEMS MUST PROVIDE EQUAL OR GREATER BOND STRENGTH FOR SAME CONDITIONS IN A CURRENT ICC-ES (OR EQUIVALENT) REPORT AND BE SUBMITTED TO DIRECTOR'S REPRESENTATIVE FOR APPROVAL.
12. NON-SHRINK GROUT: PROVIDE NON-METALLIC, NON-SHRINK, CEMENTITIOUS GROUT CONFORMING TO ASTM C1107, WITH A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 5,000 PSI. PLACED AND CURED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

6" 3" 0 6"

3" = 1'-0"

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

Colliers Engineering & Design

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STATE OF NEW YORK · JOSHUA MICHAEL RICE · No. 085538 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 04/30/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM #4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

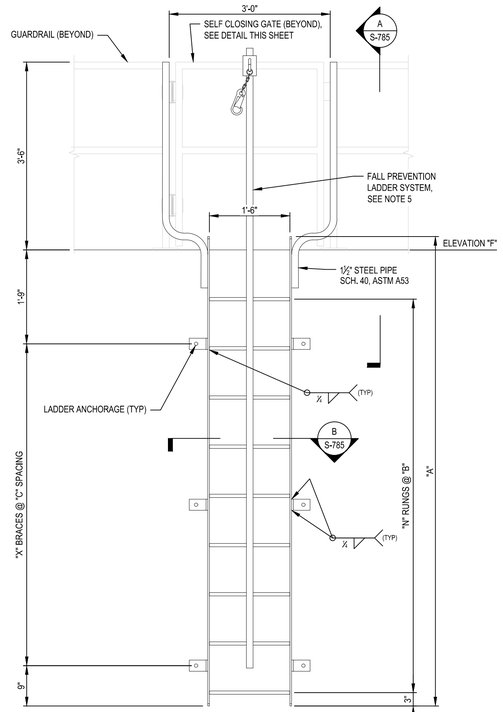
SHEET TITLE: METALS DETAILS – 3

DRAWING NUMBER: S-783

SHEET 110 OF 148

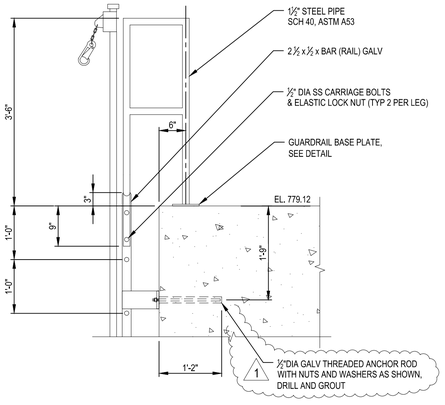
Aug 25,2026 - 1:28pm
I:\OGS\47164 Rehab Conklingville Dam\4.0 Dwgs\4.6 WR\02.0 Working DWGS\47164S-783.dwg

36x24 PLOT SHEET



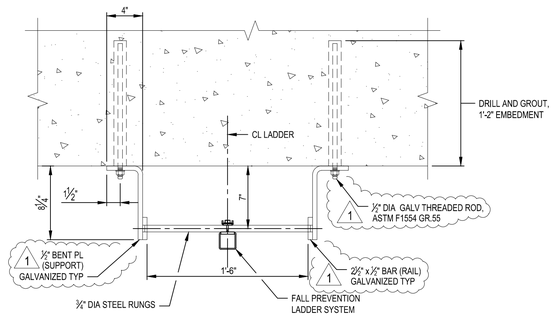
1 LADDER ELEVATION - TYPE 1

SCALE: ¾" = 1'-0"



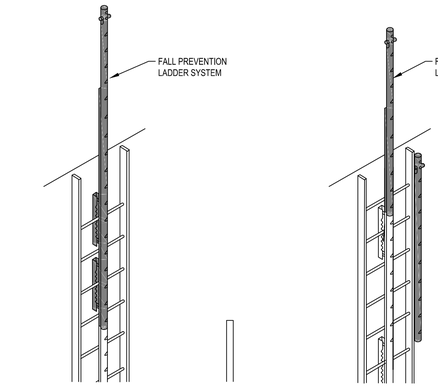
A SECTION - TYPE 1 RAILING

SCALE: ¾" = 1'-0"



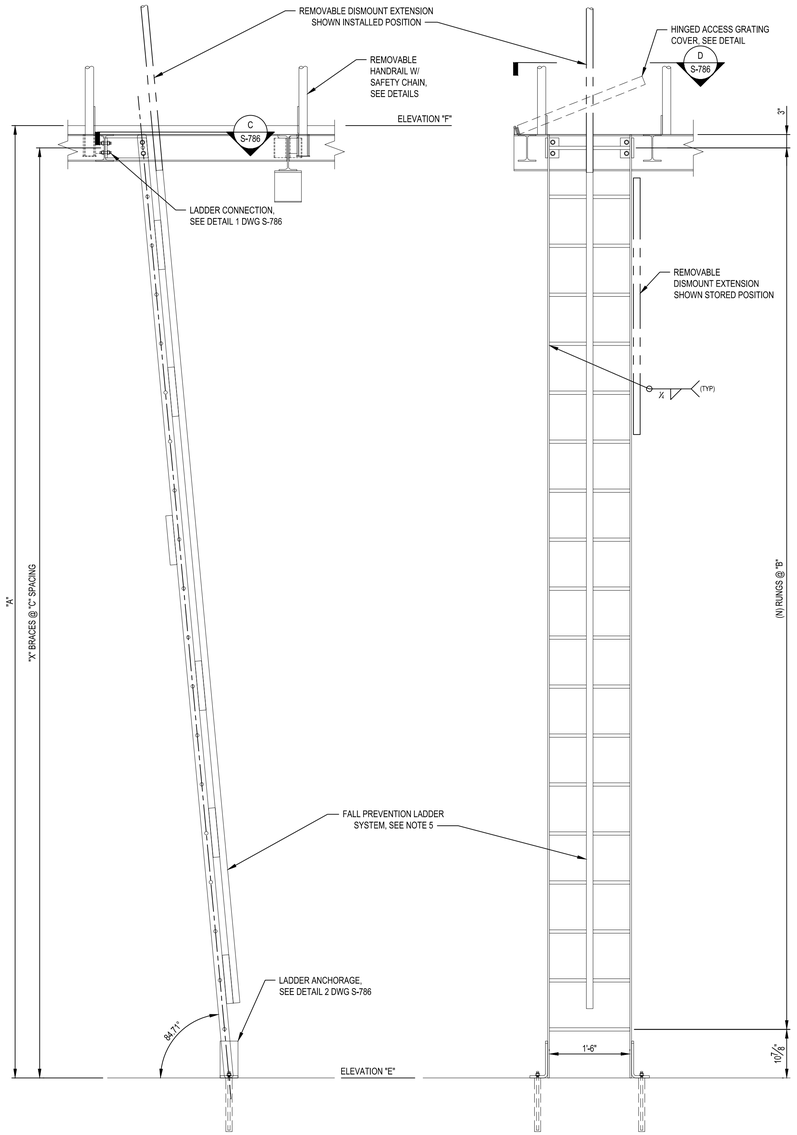
B LADDER SECTION - TYPE 1 & 2

SCALE: 1½" = 1'-0"



2 LADDER ELEVATION - TYPE 2

SCALE: ¾" = 1'-0"



3 LADDER ELEVATIONS - TYPE 3

SCALE: ¾" = 1'-0"

1' 0 1' 2' 3'
3/4" = 1'-0"

1' 6" 0 1'
1 1/2" = 1'-0"

DRAWING NOTES

1. SEE DRAWINGS G-003 & G-004 FOR ADDITIONAL NOTES.
2. FIELD VERIFY ALL RAILING DIMENSIONS PRIOR TO FABRICATION.
3. ALL LADDER RUNGS, ANGLES, LADDER MOUNTING PLATES AND STEEL PIPE TO BE GALVANIZED.
4. STAINLESS STEEL ANCHOR RODS, BOLTS, ELASTIC NUTS, AND WASHERS CONFORMING TO ASTM A193, GRADE B8, AND ASTM A194, GRADE 8.
5. FALL PREVENTION SAFETY DEVICE SHALL BE MILLER SAF-T-CLIMB LADDER SYSTEM WITH DISMOUNT EXTENSION OPTIONS, OR APPROVED EQUAL.

LADDER SCHEDULE

TYPE	NO. REQ'D	DIMENSION			ELEVATION		NO. BRACES (X)	NO. RUNGS (N)	MATERIAL	RAILING
		A	B	C	E	F				
1	1	8'-9"	0'-11"	3'-0"	770.12	779.12	3	9	GALV. STEEL	WALK-THRU
2	1	17'-2"	0'-11"	4'-0"	695.12	712.87	5	19	GALV. STEEL	-
3	2	17'-9"	0'-11"	17'-4"	695.20	712.87	2	19	GALV. STEEL	REMOVABLE

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0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C
DESIGNED BY:	RCP
DRAWN BY:	MDI
FIELD CHECK:	-
APPROVED:	JMR

SHEET TITLE:

METALS DETAILS – 5

DRAWING NUMBER: S-785

SHEET 112 OF 148

Aug 25, 2026 - 1:36pm
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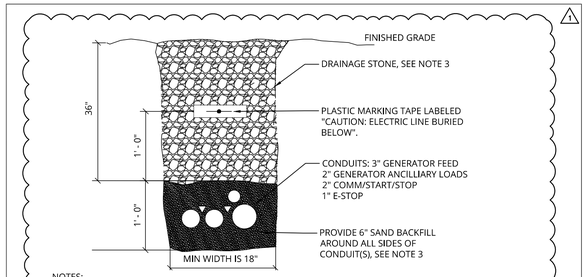
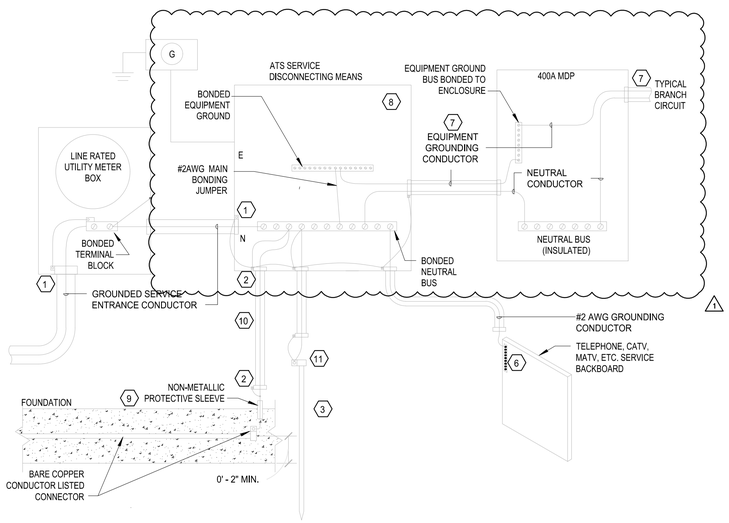
36x24 PLOT SHEET



NOTES:
1. PROVIDE 2" MIN. OF SPACE BETWEEN CONDUITS.
2. PROVIDE CONDUIT SPACERS AND RACKS FOR STACKING CONDUITS.
3. EXCAVATION, BACKFILL, AND MATERIAL PLACEMENT OF CONDUIT PROVIDED BY CONSTRUCTION CONTRACTOR IN ACCORDANCE WITH SECTIONS 310000 AND 310001 OF THE TECHNICAL SPECIFICATIONS. CONDUIT AND CONDUCTORS PROVIDED BY ELECTRICAL CONTRACTOR. THROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.

1 BURIED CONDUIT DETAIL



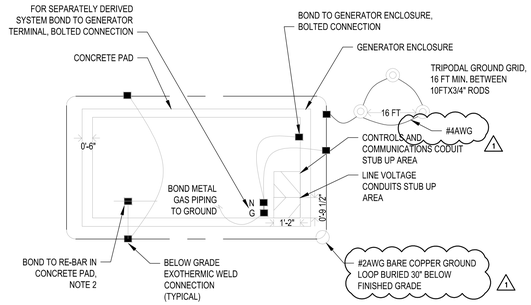
GENERAL NOTES:

A. FOR CLARITY, PHASE CONDUCTORS ARE NOT SHOWN.

NOTES: (#)

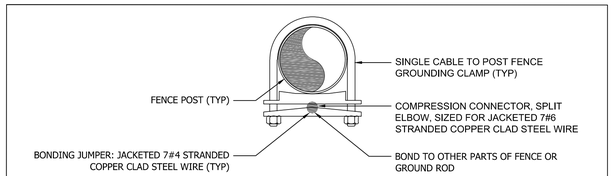
1. ALL METAL CONDUITS ENCLOSING ANY SERVICE CONDUCTORS SHALL BE FITTED WITH A BONDING BUSHING. SUPPLY SIDE BONDING JUMPER, SIZE PER TABLE 250.102(C)(1).
2. ALL METAL CONDUITS ENCLOSING ANY GROUNDING ELECTRODE CONDUCTOR SHALL BE FITTED WITH A BONDING BUSHING AT EACH END. SIZE SUPPLY SIDE BONDING JUMPER PER TABLE 250.102(C)(1).
3. TRI-PODAL GROUND GRID ESTABLISHED OUTSIDE OUTLET STRUCTURE NEAR GENERATOR. #4AWG GEC WILL BE RUN FROM ATS NEUTRAL BAR TO TRI-PODAL GROUND GRID
4. NOT USED.
5. IF STRUCTURAL STEEL MEMBER IS AVAILABLE, BOND IT TO THE SERVICE USING A UL LISTED IRREVERSIBLE CLAMP OR WELDED LUG.
6. BOND TO EXISTING TELECOMM EQUIPMENT GROUND BAR. REFER TO FLOOR PLANS FOR LOCATION.
7. ALL BRANCH CIRCUIT AND FEEDER CONDUITS ARE TO HAVE AN INSULATED EQUIPMENT GROUNDING CONDUCTOR REGARDLESS OF THE CONDUIT MATERIAL.
8. NOT USED.
9. PROVIDE A #4AWG GROUNDING ELECTRODE CONDUCTOR ENCASED IN AT LEAST 2-INCHES OF CONCRETE AND LOCATED IN THE DIRECT BURY TRENCH. BOND UFER GROUND TO STRUCTURAL REBAR. EXTEND GEC TO EXTERIOR TRI-PODAL GROUND GRID AND BOND TO GROUND ROD.
10. WHERE A GROUNDING ELECTRODE CONDUCTOR IS SPECIFIED ELSEWHERE IN THE DRAWINGS, THAT SIZE SHALL APPLY TO ALL GROUNDING ELECTRODE CONDUCTORS SHOWN ON THIS DETAIL.
11. FOR GROUNDING ELECTRODE CONDUCTOR CONNECTIONS, PROVIDE NON-REVERSING PERMANENT LUGS OR EXOTHERMIC WELDS.

2 SERVICE ENTRANCE GROUNDING DETAIL

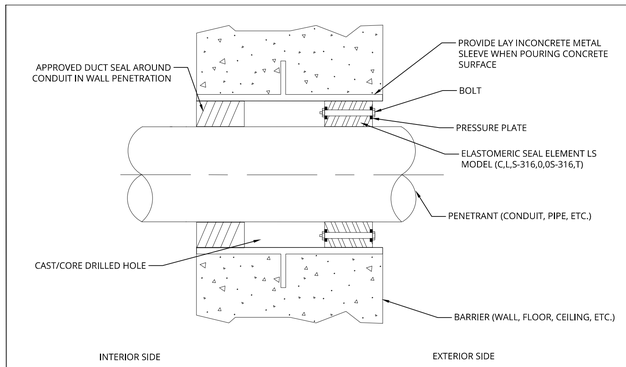


NOTES:
1. REFER TO DRAWING S-766 FOR CONCRETE PAD CONSTRUCTION. COORDINATE STUB-UP LOCATION WITH MANUFATURER'S INSTRUCTIONS AND CONSTRUCTION CONCTRACTOR.
2. #2AWG BARE STRANDED COPPER WIRE EXOTHERMICALLY BONDED TO REBAR AND AVAILABLE FOR EXOTHERMIC WELDING TO COPPER GROUND RING.
3. REFER TO SITE SURVEY FOR SOIL COMPOSITION. AT LEAST 8FT OF COPPER ROD MUST BE IN CONTACT WITH SOIL.
4. PROVIDE RESISTANCE TESTING TO ENSURE GROUND RESISTANCE IS NO LARGER THAT 5 OHMS. 1

3 GENERATOR PAD GROUNDING DETAIL



7 FENCE POST GROUNDING DETAIL

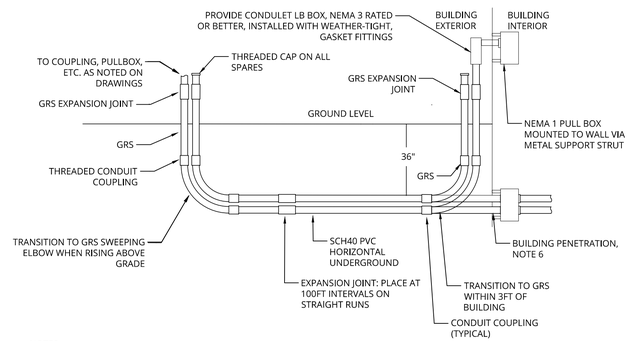


LS MODEL	SEAL ELEMENT	BOLTS/NUTS	PRESSURE PLATE
C	EPDM (BLACK)	ZINC DICHROMATE/ORGANIC COATED CARBON STEEL BOLT	REINFORCED NYLON POLYMER
L	EPDM (BLUE)	ZINC DICHROMATE/ORGANIC COATED CARBON STEEL BOLT	REINFORCED NYLON POLYMER
(C,L,O)+S-316	(SEE MODEL OPTIONS)	316 STAINLESS STEEL	REINFORCED NYLON POLYMER

SLEEVE MODEL	DESCRIPTION	MATERIAL
CS	CENTURY-LINE SLEEVE	HDPE
WS	STEEL WALL SLEEVE	STEEL

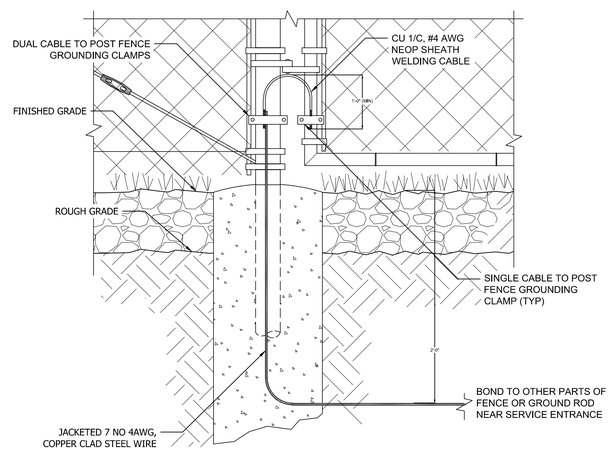
NOTES:
1. LINKSEAL PRODUCT SHOULD BE INSTALLED PRIOR TO DUCTSEAL.
2. PRIOR TO INSTALLING DUCTSEAL, MAKE SURE THERE IS MINIMAL MOISTURE AND DEBRIS INSIDE CORE PENETRATION.
3. PROVIDE LINKSEAL PRODUCT WITH A NITRILE SEAL ELEMENT WHEN THE SEALWILL COME IN CONTACT WITH OIL AND/OR HYDROCARBONS.

5 WALL PENETRATION CONDUIT SEAL DETAIL



NOTES:
1. WRAP ALL JOINTS 100% WATERTIGHT.
2. COORDINATE WITH BURIED CONDUIT DETAIL.
3. CONDUIT PENETRATION AND ABOVE GROUND SHALL BE GALVANIZED RIGID STEEL (GRS)
4. CONDUIT RUNNING HORIZONTAL BELOW GROUND SHALL BE SCHEDULE 40 PVC.
5. PROVIDE GROUNDING AND BONDING TO ANY METALLIC RACEWAY INSIDE ELECTRICAL BOXES.
6. PROVIDE CONDUIT SEALS IN BUILDING CMU WALLS AND FOUNDATIONS ACCORDING TO DETAIL 5 ON THIS SHEET.

4 BURIED CONDUIT TRANSITION DETAIL



NOTES:
1. BONDING JUMPERS ARE REQUIRED ON EACH SIDE WHERE OVERHEAD CONDUCTORS CROSS.
2. GATES MUST BE BONDED TO THE GATE SUPPORT POST
3. EACH GATE SUPPORT POST MUST BE BONDED TO THE GROUND ELECTRODE SYSTEM
4. BOND ACROSS FENCE OPENINGS VIA BURIED BONDING JUMPER
5. BARBED WIRE STRANDS ABOVE THE FENCE MUST BE BONDED TO THE GROUND ELECTRODE SYSTEM VIA FENCE FABRIC GROUNDING CLAMPS.

6 FENCE GROUNDING OVERALL DETAIL

Aug 27,2026 - 8:51am
I:\OGS\015996\0\0 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.9 Elec\47164E-501.dwg
36x24 PLOT SHEET

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

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STATE OF NEW YORK · JOSHUA ROBERT DOORES · No. 107015 · LICENSED PROFESSIONAL ENGINEER

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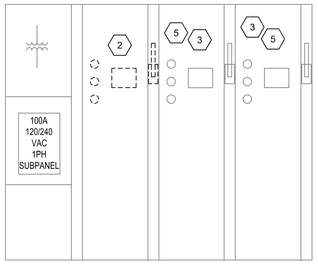
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C, E
DESIGNED BY:	JRD
DRAWN BY:	SMC
FIELD CHECK:	-
APPROVED:	JRD

SHEET TITLE: ELECTRICAL DETAILS

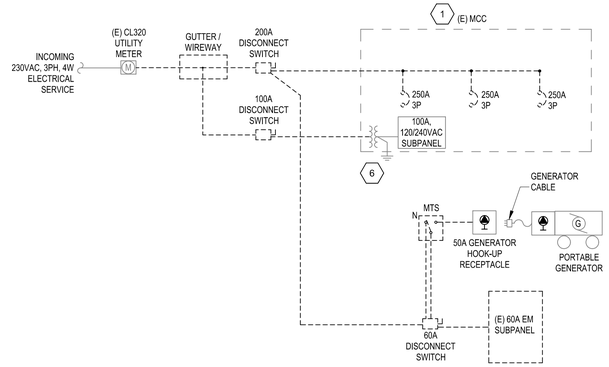
DRAWING NUMBER: E-501

SHEET 134 OF 148



3 MCC EXTERIOR REMOVALS

SCALE: N.T.S.

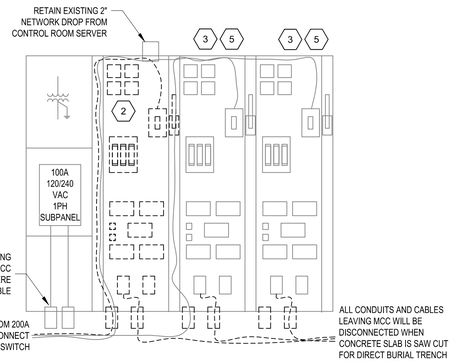


1 ONELINE DIAGRAM - REMOVALS

SCALE: N.T.S.

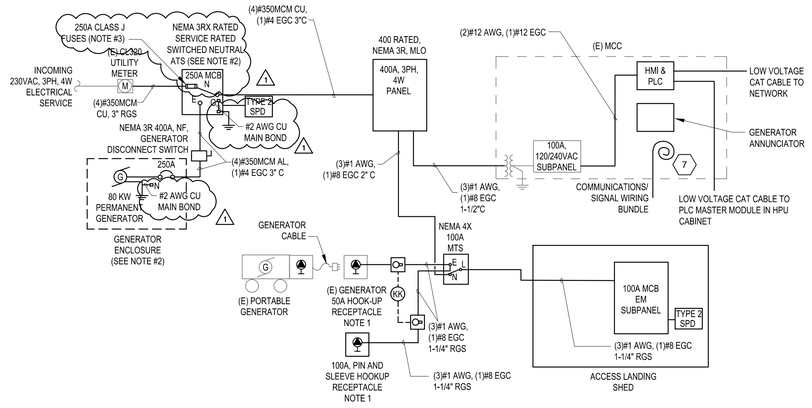
KEYNOTES

1. RETAIN MCC TRANSFORMER, SUBPANEL AND ENCLOSURE FOR MODIFICATION AND REUSE WITH HYDRAULIC PRESSURE UNIT (HPU) POWER AND CONTROLS. REFER TO DETAIL #3 AND #4 ON THIS SHEET FOR REMOVALS INSIDE THE MCC.
2. DISCONNECT AND REMOVE ALL POWER AND CONTROLS CONDUCTORS AND DEVICES LOCATED INSIDE THE MCC RELATED TO THE OUTLET VALVE TO BE REMOVED AND REPLACED.
3. RETAIN ALL EQUIPMENT, DEVICES, CABLES, ETC ON EXTERIOR AND INTERIOR OF MCC CABINET SECTION FOR TWO OUTLET VALVES. TWO VALVES MUST BE OPERATIONAL THROUGHOUT THE ENTIRETY OF PROJECT. PROVIDE A PATCH SOOW CABLE FOR POWER, 3/C + GND, #1AWG, 200FT LONG AND ROUTE FROM MCC CABINET OUTPUT TERMINALS TO BE USED TO POWER THE VALVE MOTORS. THIS CABLE SHALL SERVE AS A MEANS TO MANUALLY OPERATE ONE (1) OUTLET VALVE AS REQUIRED DURING REMOVALS AND RECONSTRUCTION PHASE.
4. HMI AND OTHER ASSOCIATED DEVICES WILL BE PROVIDED BY THE HPU INSTALLER UNDER THE C-CONTRACT, INCLUDING THE MODIFICATIONS TO EXISTING MCC ENCLOSURE.
5. ONCE OUTLET VALVE OPERATIONS HAVE BEEN MOVED OVER TO THE HPU CONTROL, THE UPPER CONTROL MCC CAN REMOVE THE VALVE STARTERS, RELAYS, CONTACTS, ETC.
6. CONFIRM GROUNDING AND BONDING OF MCC SUBPANEL TRANSFORMER, RETAIN GROUNDING WIRES AND ENSURE THEY ARE CONNECTED TO A CODE COMPLIANT ELECTRODE.
7. PROVIDE (2) #18AWG TWISTED PAIRS FOR FUTURE ANALOG CONTROL SIGNALS, (5) #18AWG WIRE PAIRS FOR FUTURE DISCRETE CONTROL SIGNALS, AND (4) CAT 6 CABLES FOR DIGITAL COMMUNICATIONS. LEAVE SPARES COILED, CAPPED, AND LABELED INSIDE MCC.



4 MCC INTERIOR REMOVALS

SCALE: N.T.S.

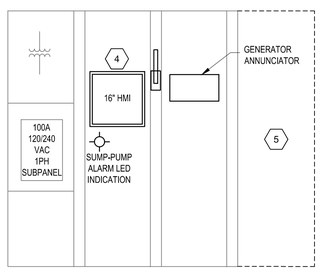


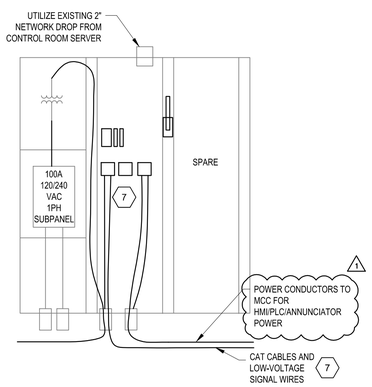
2 ONELINE DIAGRAM - IMPROVEMENTS

SCALE: N.T.S.

NOTES:

1. PROVIDE TWO (2) ROTARY STYLE FUSED, MOTOR DISCONNECT SWITCHES IN NON-METALLIC ENCLOSURES THAT ARE INTERLOCKED WITH ONE ANOTHER VIA A KIRK-KEY. BOTH DISCONNECT SWITCHES CANNOT BE CLOSED AT THE SAME TIME.
2. NEUTRAL TO GROUND BOND FOR THE UTILITY WILL OCCUR INSIDE THE AUTOMATIC TRANSFER SWITCH. NEUTRAL TO GROUND BOND FOR THE PERMANENT GENERATOR WILL OCCUR INSIDE THE GENERATOR ENCLOSURE THE GENERATOR NEUTRAL WILL BE INSULATED FROM THE TRANSFER SWITCH ENCLOSURE.
3. THE SERVICE ENTRANCE TRANSFER SWITCH SHALL HAVE A SHORT-CIRCUIT CURRENT RATING (SCCR) OF NOT LESS THAN 100,000 AMPS SYMMETRICAL RMS AT 240VAC, ACHIEVED VIA INTEGRATION WITH SPECIFIC MANUFACTURER-APPROVED, CURRENT LIMITING CLASS J UPSTREAM OVER CURRENT PROTECTIVE DEVICES.





5 MCC IMPROVEMENTS PLAN

SCALE: N.T.S.

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

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STATE OF NEW YORK
JOSHUA ROBERT DOORES
LICENSED PROFESSIONAL ENGINEER
No. 107019

REGISTRATION EXPIRES: 01/31/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8
HADLEY, NY
SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM 4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-E
DESIGNED BY:	JRD
DRAWN BY:	SMC
FIELD CHECK:	-
APPROVED:	JRD

SHEET TITLE:

ONE LINE DIAGRAMS

DRAWING NUMBER:

E-601

SHEET 135 OF 148

Aug 27,2026 - 10:39am
I:\OGS\015996\0\NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.9 Elec\47164E-601.dwg
36x24 PLOT SHEET

MDP

LOCATION: ELECTRICAL ROOM | UL LISTED INTGR. EQUIP. SHORT CIRCUIT RATING: 22K SCCR
VOLTAGE: 240Δ/120V-3 PHASE-4 WIRE, WILD LEG 'B' | MAXIMUM AVAILABLE SHORT CIRCUIT CURRENT:
FED FROM: | MAIN CIRCUIT BREAKER: MLO
MOUNTING:WALL | MAIN BUS: 400A

	PHASE AMPS			BREAKER						BREAKER		PHASE AMPS			
LOAD DESCRIPTION & LOCATION	PH. A	PH. B	PH. C	POLES	AMPS	CKT.	PHASE	CKT.		AMPS	POLES	PH. A	PH. B	PH. C	LOAD DESCRIPTION & LOCATION
-	60.0					1	A	2				0.0			-
15T OVERHEAD CRANE		60.0		3	80	3	B	4		20	3		0.0		SPARE
-			60.0			5	C	6						0.0	-
SHED LIGHTING & POWER	5.0			1	20	7	A	8				2.2			-
JIB CRANE		23.0		2	40	9	B	10		20	3		2.2		ROOF VENTILATOR
-			23.0			11	C	12						2.2	-
GENSET BATT. CHARGER	12.0			1	20	13	A	14		20	1	12.0			GENSET VAPORIZER
WILD LEG		0.0				15	B	16					0.0		WILD LEG
EXTERIOR GFI RECEPTS			6.0	1	20	17	C	18		20	1			0.0	SPARE
SPARE	5.0			1	20	19	A	20		20	2	12.0			GENSET BLOCK HEATER
WILD LEG		0.0				21	B	22					12.0		-
SPARE			0.0	1	20	23	C	24		20	1			1.5	GENSET SHORE POWER
SPARE	0.0			1	20	25	A	26		20	1	0.0			SPARE
WILD LEG		0.0		1	20	27	B	28		100	2		66.2		EM SUBPANEL FEED
SPARE				1	20	29	C	30						63.1	-
MCC SUBPANEL FEED	70.0			2	100	31	A	32		20	1	0.0			SPARE
-		78.0				33	B	34							WILD LEG
						35	C	36							
						37	A	38							
						39	B	40							
						41	C	42							
TOTAL AMPS	152.0	161.0	89.0									26.2	80.4	66.8	TOTAL AMPS

	PH. A	PH. B	PH. C
TOTAL PH. AMPS	178.20	241.40	155.80
TOTAL PH. KVA	24.72	33.49	21.61
TOTAL KVA 3 PH.	79.82		

NOTES:

MCC SUBPANEL

LOCATION: | UL LISTED INTGR. EQUIP. SHORT CIRCUIT RATING: EXISTING
VOLTAGE: 240/120V-1 PHASE- 3 WIRE | MAXIMUM AVAILABLE SHORT CIRCUIT CURRENT:
FED FROM: MDP | MAIN CIRCUIT BREAKER: 100A MCB
MOUNTING: MCC | MAIN BUS: 100A

	PHASE AMP		BREAKER					BREAKER		PHASE AMPS		
LOAD DESCRIPTION & LOCATION	PH. A	PH. B	POLES	AMPS	CKT.	PHASE	CKT.	AMPS	POLES	PH. A	PH. B	LOAD DESCRIPTION & LOCATION
ELECTRIC WALL HEATER 1	12.0		2	20	1	A	2	20	2	12.0		ELECTRIC WALL HEATER 2
		12.0			3	B	4				12.0	
ELECTRIC WALL HEATER 3	12.0		2	20	5	A	6	20	2	12.0		ELECTRIC WALL HEATER 4
		12.0			7	B	8				12.0	
SPARE	0.0		1	20	9	A	10	20	1	9.0		CONTROL ROOM RECEPTACLES
AC UNIT		16.0	1	20	11	B	12	20	1		2.0	CONTROL ROOM LIGHTS
SPARE	2.0		1	20	13	A	14	20	1	15.0		NETWORK EQUIPMENT INVERTER
SITE WALLPACKS		4.0	1	20	15	B	16	20	1		0.0	SPARE
SITE POLE LIGHTS	4.0		1	20	17	A	18	20	1	0.0		SPARE
SPARE		0.0	1	20	19	B	20	20	1		0.0	SPARE
DO NOT USE	0.0				21	A	22			0.0		DO NOT USE
DO NOT USE		0.0			23	B	24				0.0	DO NOT USE
DO NOT USE	0.0				25	A	26			0.0		DO NOT USE
BLANK		0.0	1	20	27	B	28	20	1		0.0	BLANK
BLANK	0.0		1	20	29	A	30	20	1	0.0		BLANK
TOTAL AMPS	30.0	44.0								48.0	26.0	TOTAL AMPS

	PH. A	PH. B
TOTAL PH. AMPS	78.00	70.00
TOTAL PH. KVA	9.36	8.40
TOTAL KVA 1 PH.	17.76	

NOTES:

EM SUBPANEL

LOCATION: ELECTRICAL ROOM | UL LISTED INTGR. EQUIP. SHORT CIRCUIT RATING: 22K SCCR
VOLTAGE: 240/120V- 1 PHASE- 3 WIRE | MAXIMUM AVAILABLE SHORT CIRCUIT CURRENT:
FED FROM: MDP | MAIN CIRCUIT BREAKER: 60A
MOUNTING: WALL | MAIN BUS: 60A

	PHASE AMP		BREAKER					BREAKER		PHASE AMPS		
LOAD DESCRIPTION & LOCATION	PH. A	PH. B	POLES	AMPS	CKT.	PHASE	CKT.	AMPS	POLES	PH. A	PH. B	LOAD DESCRIPTION & LOCATION
HPU	40.0		2	80	1	A	2	20	1	3.0		LIGHTS - VALVE PIT
-		40.0		-	3	B	4	20	1		4.5	OUTLET PIT GFCI
SUMP PUMP	8.8		1	20	5	A	6	20	1	8.3		HPU CONTROL HEATER
HPU OIL HEATER		15.0	1	20	7	B	8	20	1		6.7	HPU POWER SUPPLY
SPARE	0.0		1	20	9	A	10	20	1	3.0		OUTLET PIT GFCI CKT 2
SPARE		0.0	1	20	11	B	12	20	1		0.0	SPARE
SPARE	0.0		1	20	13	A	14	20	1	0.0		SPARE
SPARE		0.0	1	20	15	B	16	20	1		0.0	SPARE
TOTAL AMPS	48.8	55.0								14.3	11.2	TOTAL AMPS

	PH. A	PH. B	PH. C
TOTAL PH. AMPS	63.10	66.20	
TOTAL PH. KVA	7.57	7.94	
TOTAL KVA 1 PH.	15.52		

NOTES:

LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	DESIGN MANUFACTURER	VOLTAGE	NOTES
L1	POLETOP LIGHTS	EVOLVE EPAM 01-0-06-A-40-A-1D-A-XX-BLCK-V1	120-277	MOUNTED ON 12' POLE, INTEGRAL PHOTO-EYE DAWN TILL DUSK CONTROL. WIRED TO DIGITAL ASTROCHRONOLOGIC TIME CLOCK
L2	WALL MOUNTED LIGHT W/ BATTERY BACKUP (CONTROL HOUSE/SHED)	BARRON WLZ2-CP (T3, 45W, 4000K)	120-277	RATED FOR NORMAL SWITCHING, NI-CAD BATTERY, W/ TEST, WITH INTEGRAL OCCUPANCY SENSING, SET FOR MANUAL ON OVERRIDE
L3	NOT USED	-	-	-
L4	WALL MOUNTED LIGHT FOR STAIRWELL W/ BATTERY (STAIR WELL)	BARRON WLZ2-CP (T3, 45W, 4000K)	120-277	RATED FOR NORMAL SWITCHING, NI-CAD BATTERY, W/ TEST, WITH INTEGRAL OCCUPANCY SENSING, SET FOR MANUAL ON OVERRIDE
L5	WALL MOUNTED LIGHT FOR VALVE CHAMBER W/ BATTERY (VALVE CHAMBER)	BARRON WLZ-CP (T4, 45W, 4000K)	120-277	RATED FOR NORMAL SWITCHING, NI-CAD BATTERY, W/ TEST, WITH INTEGRAL OCCUPANCY SENSING, SET FOR MANUAL ON OVERRIDE
L6	WALL MOUNTED LIGHT FOR VALVE CHAMBER W/O /BATTERY (VALVE CHAMBER)	BARRON WLZ-CP (T4, 45W, 4000K)	120-277	MANUAL ON SWITCH
L7	4FT CEILING MOUNTED VAPOR TIGHT (SHED INT.)	COLUMBIA LXEM-4-30-ML-RFA-ED-U	120-277	4' LINEAR TROFFER, 3000K, FROSTED LENSE, 0-10 DIMMING

LIGHTING SEQUENCE OF OPERATIONS:

1. SITE POLE LIGHTING: SITE POLES WILL HAVE INTEGRAL PHOTO-EYE AND BE TIED INTO A DIGITAL ASTROCHRONOLOGIC TIMER. OPERATING TMES WILL BE SET BY DIRECTOR'S REPRESENTATIVE.
2. SITE WALLPACKS AROUND CONTROL HOUSE AND ACCESS LANDING: FIXTURES WILL HAVE INTEGRAL OCCUPANCY SENSOR AND MANUAL ON/OFF SWITCH CONTROL. WHEN THE MANUAL SWITCH IS IN THE OFF POSITION, THE FIXTURES WILL OPERATE BASED ON OCCUPANCY DETECTION. WHEN THE MANUAL SWITCH IS IN THE ON POSITION, THE LIGHTS WILL STAY ON. LIGHTS DESIGNATED AS 'EM' SHALL HAVE BATTERY BACKUP WITH UL942 RELAY TO ALLOW FOR NORMAL SWITCHING.
3. VALVE CHAMBER WALLPACKS: FIXTURES WITHOUT BATTERY DESIGNATION WILL OPERATE VIA MANUAL ON/OFF SWITCH. FIXTURES WITH INTEGRAL BATTERY WILL ALSO HAVE INTEGRAL OCCUPANCY SENSOR AND MANUAL ON/OFF SWITCH CONTROL. WHEN THE MANUAL SWITCH IS IN THE OFF POSITION, THE FIXTURES WILL OPERATE BASED ON OCCUPANCY DETECTION. WHEN THE MANUAL SWITCH IS IN THE ON POSITION, THE LIGHTS WILL STAY ON. LIGHTS DESIGNATED AS 'EM' WILL HAVE BATTERY BACKUP WITH UL942 RELAY TO ALLOW FOR NORMAL SWITCHING.

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STATE OF NEW YORK · JOSHUA ROBERT DOORES · No. 107015 · LICENSED PROFESSIONAL ENGINEER
REGISTRATION EXPIRES: 01/31/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM 4
0	06/22/2026	BID DOCUMENTS

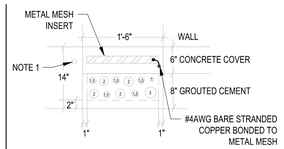
PROJECT NUMBER: 47164-E
DESIGNED BY: -
DRAWN BY: SMC
FIELD CHECK: -
APPROVED: JRD

SHEET TITLE: PANELBOARD SCHEDULES

DRAWING NUMBER: E-611

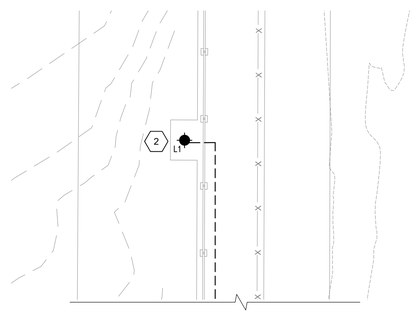
SHEET 136 OF 148

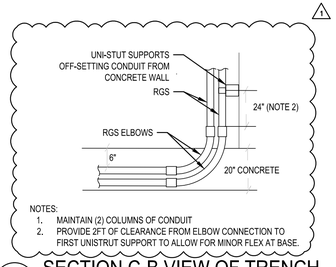
Aug 27,2026 - 11:11am
I:\OGS\01\5990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.9 Elec\47164E-611.dwg
36x24 PLOT SHEET



NOTES:
1. PROVIDE 3/4" PVC CONDUIT IN TOP 6" CONCRETE LAYER TO SERVE SITE LIGHTING POLES.

2 SECTION C-A VIEW OF TRENCH
SCALE: 3/4" = 1'-0"



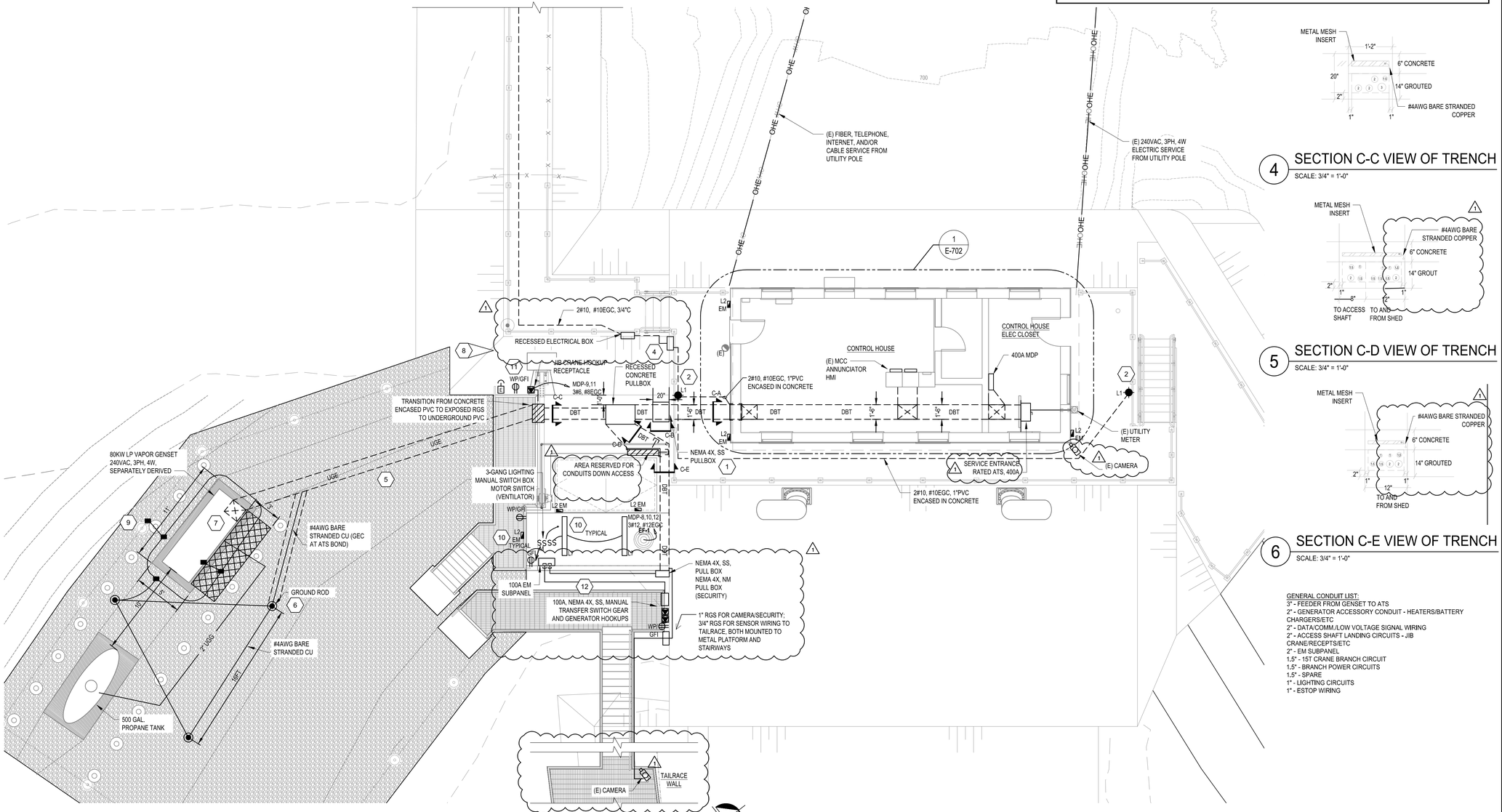


NOTES:
1. MAINTAIN (2) COLUMNS OF CONDUIT
2. PROVIDE 2FT OF CLEARANCE FROM ELBOW CONNECTION TO FIRST UNISTRUT SUPPORT TO ALLOW FOR MINOR FLEX AT BASE.

3 SECTION C-B VIEW OF TRENCH
SCALE: 3/4" = 1'-0"

KEYNOTES

1. DIRECT BURY CONDUITS SHALL PENETRATE VERTICAL WALL FACE AND LAND IN A 30"Lx24"Wx20"D NEMA 4X STAINLESS STEEL BOX. THE NEMA 4X BOX SHALL BE BOLTED TO STAINLESS STEEL UNISTRUT, WHICH IS THEN BOLTED TO THE CONCRETE WALL. UTILIZE ALL STAINLESS STEEL HARDWARE FOR MOUNTING.
2. PROVIDE LIGHT FIXTURE, POLE, POLE BASE PLATE, COVER, AND MOUNTING HARDWARE IN LOCATION SHOWN. COORDINATE MOUNTING HARDWARE WITH CONSTRUCTION CONTRACTOR RESPONSIBLE FOR CONCRETE BASE. PROVIDE BRANCH CIRCUIT WIRING AND CONDUIT ENCASED IN CONCRETE FROM MCC SUBPANEL. TIE TO LIGHTING CIRCUIT AS SHOWN. REFER TO DIRECT BURY TRENCH SECTIONS ON THIS SHEET AND ON E-702.
3. NOT USED
4. PROVIDE 36"Lx24"Wx30"D CONCRETE BOX IN EXISTING LANDING PAD AS A PULL POINT FOR CONDUCTORS GOING UP AND DOWN THE VERTICAL CONCRETE WALL. REFER TO SPECIFICATIONS.
5. EXCAVATION AND BACKFILL FOR BURIED PVC CONDUIT FOR STANDBY GENERATOR PROVIDED BY CONSTRUCTION CONTRACTOR. CONDUIT INSTALLATION PROVIDED BY ELECTRICAL CONTRACTOR. REFER TO BURIED CONDUIT DETAIL ON E-501. THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.
6. PROVIDE TRI-PODAL GROUND GRID AT GENERATOR ENCLOSURE. BOND GENERATOR NEUTRAL AND UTILITY NEUTRAL TO GROUND GRID. PROVIDE FULL GROUND SYSTEM PER GROUNDING DETAILS ON E-501.
7. COORDINATE CONDUIT SLEEVES AND STUBS THROUGH GENERATOR CONCRETE PAD WITH GENERATOR VENDOR AND CONSTRUCTION CONTRACTOR RESPONSIBLE FOR PAD. THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.TRANSITION TO RIGID STEEL CONDUIT FOR ELBOWS AND STUBS THROUGH CONCRETE.
8. COORDINATE ELECTRICAL DESIGN OF VERTICAL CONCRETE WALL AND LANDING BELOW WITH E-734 AND E-735.
9. PROVIDE FENCE BOND TO GROUNDING GRID. REFER TO FENCE POST GROUNDING DETAIL AND FENCE GROUNDING OVERALL DETAIL ON E-501.
10. PROVIDE LIGHT FIXTURE IN LOCATION SHOWN. REFER TO LUMINAIRE SCHEDULE ON SHEET E-611.
11. UNI-STRUT SUPPORT SYSTEM BOLTED TO METAL PLATFORM TO SUPPORT GENERATOR E-STOP, JIB CRANE NEMA RECEPTACLE W/ WEATHER PROOF COVER, AND GFCI RECEPTACLE WITH IN-USE WEATHER COVER.
12. UNI-STRUT SUPPORT SYSTEM BOLTED TO METAL PLATFORM TO SUPPORT MANUAL TRANSFER SWITCH, 50A RECEPTACLE AND DISCONNECT, AND 100A PIN AND SLEEVE RECEPTACLE AND DISCONNECT. DISCONNECT SWITCHES MUST BE KIRK-KEYED TOGETHER TO PREVENT BOTH SOURCES CONNECTED.



1 OUTLET STRUCTURE ELECTRICAL IMPROVEMENTS PLAN
SCALE: 3/16" = 1'-0"

4 SECTION C-C VIEW OF TRENCH
SCALE: 3/4" = 1'-0"

5 SECTION C-D VIEW OF TRENCH
SCALE: 3/4" = 1'-0"

6 SECTION C-E VIEW OF TRENCH
SCALE: 3/4" = 1'-0"

GENERAL CONDUIT LIST:
3" - FEEDER FROM GENSET TO ATS
2" - GENERATOR ACCESSORY CONDUIT - HEATERS/BATTERY CHARGERS/ETC
2" - DATA/COMM./LOW VOLTAGE SIGNAL WIRING
2" - ACCESS SHAFT LANDING CIRCUITS - JIB CRANE/RECEPTS/ETC
2" - EM SUBPANEL
1.5" - 15T CRANE BRANCH CIRCUIT
1.5" - BRANCH POWER CIRCUITS
1.5" - SPARE
1" - LIGHTING CIRCUITS
1" - ESTOP WIRING

4' 0 4' 8' 12'
3/16" = 1'-0"

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

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REGISTRATION EXPIRES: 01/31/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM 4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C, E
DESIGNED BY:	JRD
DRAWN BY:	SMC
FIELD CHECK:	-
APPROVED:	JRD

SHEET TITLE:

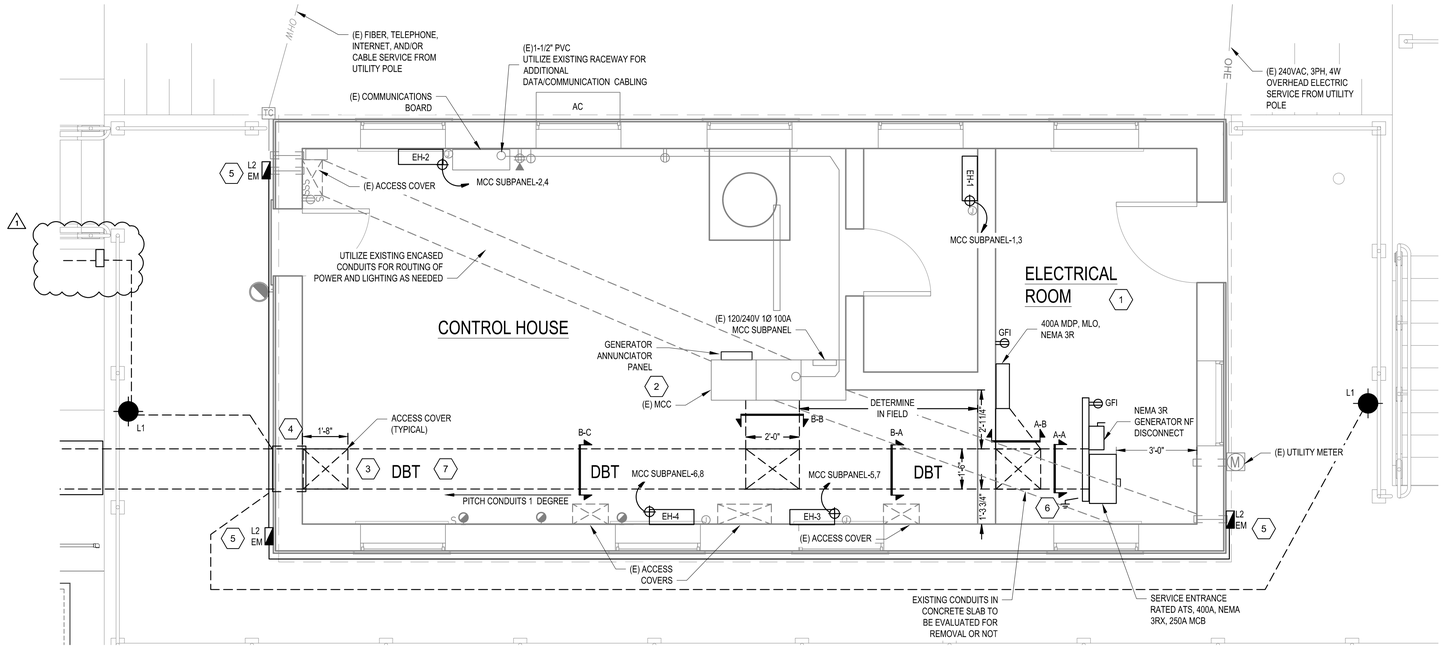
OUTLET STRUCTURE IMPROVEMENTS ELECTRICAL PLAN

DRAWING NUMBER: E-701

SHEET 137 OF 148

Aug 28,2026 - 9:30am
I:\QGS\015996\0.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.9 Elec\47164E-701.dwg

36x24 PLOT SHEET

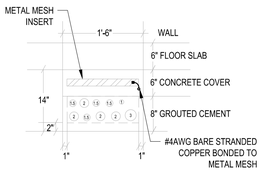


1 CONTROL HOUSE ELECTRICAL IMPROVEMENTS PLAN

SCALE: 3/8" = 1'-0"

KEYNOTES

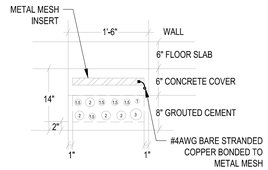
1. PROVIDE ELECTRICAL SERVICE ENTRANCE ATS, MDP, DISCONNECTS, ANNUNCIATOR, ETC ACCORDING TO ONE-LINE DIAGRAM ON E-601 AND SPECIFICATIONS. PROVIDE NEW UNI-STRUT SUPPORT STRUCTURE BOLTED TO THE FLOOR.
2. AS OUTLET VALVE STARTING CONTROLS ARE SWITCHED FROM THE MCC STARTER CABINETS TO THE HPU CONTROL ENCLOSURE IN THE OUTLET CHAMBER, THE MCC CABINET FARTHEST FROM MCC SUBPANEL CAN BE REMOVED. THE REMAINDER OF MCC CABINET SPACE WILL BE RETAINED FOR HMI, GENERATOR ANUNCIATOR, AND REMOTE CONTROLS. PROVIDE AN END COVER IF ONE CANNOT BE SALVAGED.
3. 18" WIDE X 20" DEEP TRENCH, INCLUDING ACCESS COVER PLATES, THROUGH CONTROL HOUSE AND EXTENDING OVER TO SURROUNDING WALKWAY IS PROVIDED BY THE CONSTRUCTION CONTRACTOR. ELECTRICAL CONTRACTOR WILL PROVIDE CONDUIT, SPACERS, FITTINGS, ADAPTERS, CONDUIT BODIES, ETC. INSIDE DIRECT BURY TRENCH ACCORDING TO CONDUIT SECTIONS ON THIS SHEET AND E-701. CONSTRUCTION CONTRACTOR TO BACKFILL WITH GROUT AND CONCRETE. THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.
4. PROVIDE DUCTSEAL INSIDE CONDUITS AT BUILDING EXTERIOR.
5. PROVIDE WALL MOUNTED EGRESS LIGHTING PER LIGHT FIXTURE SCHEDULE ON DRAWING E-611. RE-CONNECT TO EXISTING LIGHTING CIRCUIT.
6. PROVIDE #4AWG, BARE STRANDED COPPER, GROUNDED ELECTRODE CONDUCTOR IN DIRECT BURY TRENCH, BONDING TO EXISTING GEC FROM PREVIOUS SERVICE, AS WELL AS METAL MESH AND EXPOSED REBAR IN CONCRETE. EXTEND GEC THE ENTIRE RUN DOWN INTO SHAFT ACCESS LANDING AND FURTHER FROM THERE INTO THE EARTH. TERMINATE THE GEC AT THE TRI-PODAL GROUND GRID SHOWN ON E-701.
7. RE-DESIGN CONDUIT QUANTITIES, SIZES, ROUTING, ETC DUE TO EVOLVING FIELD AND JOB CONDITIONS. ALL RE-DESIGN SHALL MEET THE PROJECT SPECIFICATIONS AND THE REQUIREMENTS OF NEC.
8. ELECTRICAL EQUIPMENT SHOWN PROVIDED BY ELECTRICAL CONTRACTOR. THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.



2 SECTION B-A VIEW OF TRENCH

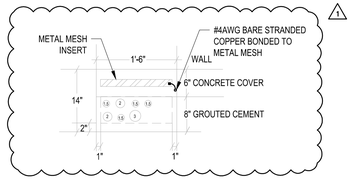
SCALE: 3/4" = 1'-0"

CONDUIT LIST:
3" - FEEDER FROM GENSET TO ATS
2" - GENERATOR ACCESSORY CONDUIT - HEATERS/BATTERY CHARGERS/ETC
2" - DATA/COMM./LOW VOLTAGE SIGNAL WIRING
2" - ACCESS SHAFT LANDING CIRCUITS - JIB CRANE/RECEPTS/ETC
2" - EM SUBPANEL
1.5" - 15T CRANE BRANCH CIRCUIT
1.5" - MCC SUBPANEL FEED
1.5" - BRANCH POWER CIRCUITS
1.5" - SPARE
1" - LIGHTING CIRCUITS



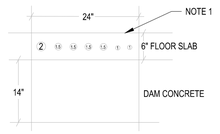
3 SECTION B-C VIEW OF TRENCH

SCALE: 3/4" = 1'-0"



4 SECTION A-B VIEW OF TRENCH

SCALE: 3/4" = 1'-0"

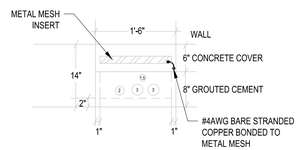


5 SECTION B-B VIEW OF TRENCH

SCALE: 3/4" = 1'-0"

NOTES:
1. DIRECT BURY CONDUITS TO AND FROM THE MCC IN THE TOP 6" COVER OF CONCRETE TO AVOID CUTTING THROUGH STRUCTURAL REBAR.

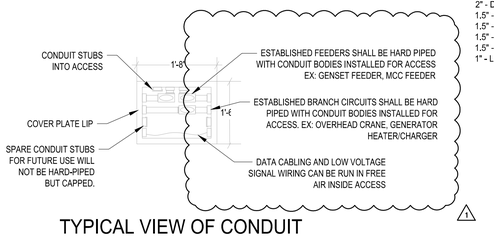
CONDUIT LIST:
2" - DATA/COMM./LOW VOLTAGE SIGNAL WIRING
1.5" - MCC SUBPANEL FEED
1.5" - BRANCH POWER CIRCUITS
1.5" - SPARE
1.5" - EXISTING CIRCUITS RE-ROUTED
1" - LIGHTING CIRCUITS



6 SECTION A-A VIEW OF TRENCH

SCALE: 3/4" = 1'-0"

CONDUIT LIST:
3" - FEEDER TO MDP FROM ATS
3" - FEEDER FROM GENSET TO ATS
2" - DATA/LOW VOLTAGE/GENSET START/STOP CONDUIT
1.5" - SPARE



7 TYPICAL VIEW OF CONDUIT & WIRING UNDER ACCESS COVER

SCALE: 3/4" = 1'-0"

NOTES:
1. CONDUITS SHOWN ARE SCHEMATIC AND NATURE AND DO NOT REPRESENT THE ACTUAL CONDUIT QUANTITIES AND SIZES REQUIRED FOR THIS WORK. THE INTENT IS TO SHOW CONDUIT BODIES ON ESTABLISHED CONDUIT RUNS.
2. MULTIPLE BRANCH CIRCUITS CAN BE CONSOLIDATED INTO A SINGLE PIPE AS LONG AS THE REQUIREMENTS OF THE NEC ARE MET.
3. CONDUITS INSIDE ACCESS AREAS WILL BE LABELLED.
4. PULL STRINGS WILL BE INCLUDED IN ALL SPARE CONDUITS.

2' 0 2' 4' 6'

3/8" = 1'-0"

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

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STATE OF NEW YORK
JOSHUA ROBERT DOORES
LICENSED PROFESSIONAL ENGINEER
No. 107010

REGISTRATION EXPIRES: 01/31/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

1	08/28/2026	ADDENDUM 4
0	06/22/2026	BID DOCUMENTS
MARK	DATE	DESCRIPTION

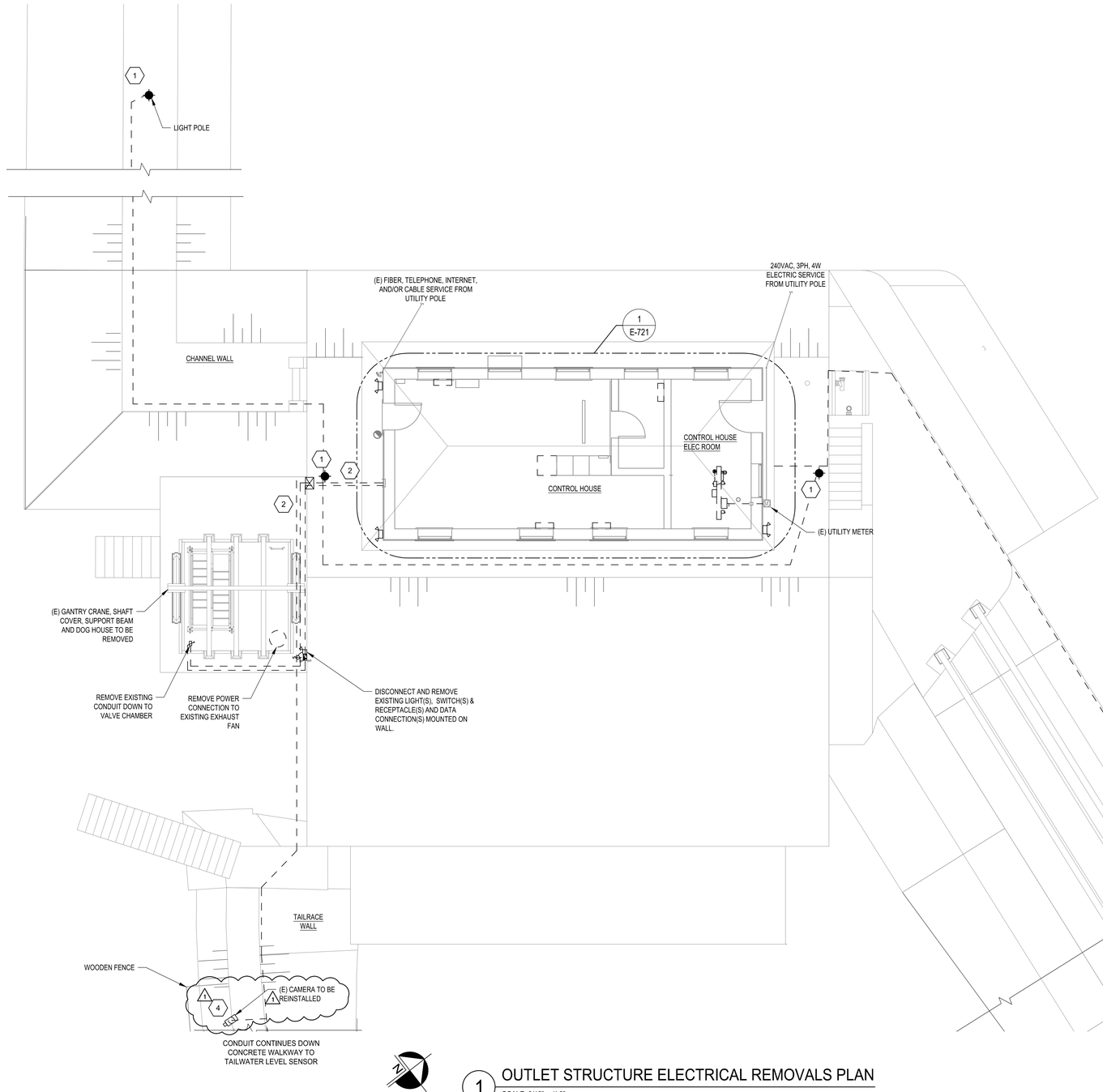
PROJECT NUMBER:	47164-C, E
DESIGNED BY:	JRD
DRAWN BY:	SMC
FIELD CHECK:	-
APPROVED:	JRD

SHEET TITLE: CONTROL HOUSE IMPROVEMENTS ELECTRICAL PLAN

DRAWING NUMBER: E-702

SHEET 138 OF 148

Aug 27,2026 - 12:35pm
I:\OGS\015996\0.0 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.9 Elec\47164E-702.dwg
36x24 PLOT SHEET



1 OUTLET STRUCTURE ELECTRICAL REMOVALS PLAN

SCALE: 3/16" = 1'-0"

KEYNOTES

1. DISCONNECT AND REMOVE ELECTRICAL CONNECTION TO LIGHT POLE THAT IS TO BE REMOVED AND REPLACED. FIELD VERIFY EXISTING CONDUIT ROUTING. DISCONNECT AND REMOVE BRANCH CIRCUIT WIRING AND CONDUIT BACK TO SOURCE.
2. REMOVE EXISTING EXPOSED CONDUIT FROM CONTROL HOUSE OVER TO LIGHT FIXTURE AND DOWN VERTICAL WALL AND PULL WIRING BACK TO SOURCE. RE-REOUT EXISTING TO REMAIN CIRCUITS ACCORDING TO CONDUIT SECTIONS ON RECONSTRUCTION PLANS.
3. EXISTING CAMERA ALONG THE SPILLWAY TO BE RELOCATED TO THE SOUTHEAST CORNER OF CONTROL HOUSE. CONFIRM WITH DIRECTOR'S REPRESENTATIVE THE EXACT LOCATION, CONDUIT ROUTING AND ORIENTATION OF RELOCATED CAMERA DURING CONSTRUCTION.
4. EXISTING CAMERA ALONG THE TAILRACE TO BE REINSTALLED ON NEW STEEL PLATFORM. CONFIRM WITH DIRECTOR'S REPRESENTATIVE THE EXACT LOCATION AND ORIENTATION OF RELOCATED CAMERA DURING CONSTRUCTION. NEW RACEWAY IS PROVIDED IN RECONSTRUCTION PLANS FOR RE-ROUTING OF LOW VOLTAGE AND DATA CABLES.
5. THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.

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DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

Colliers Engineering & Design

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STATE OF NEW YORK
JOSHUA ROBERT DOORES
LICENSED PROFESSIONAL ENGINEER
No. 107010

REGISTRATION EXPIRES: 01/31/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM 4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C, E
DESIGNED BY:	JRD
DRAWN BY:	SMC
FIELD CHECK:	-
APPROVED:	JRD

SHEET TITLE:

OUTLET STRUCTURE ELECTRICAL REMOVALS PLAN

DRAWING NUMBER: E-720

SHEET 139 OF 148

Aug 28 2026 - 9:31am
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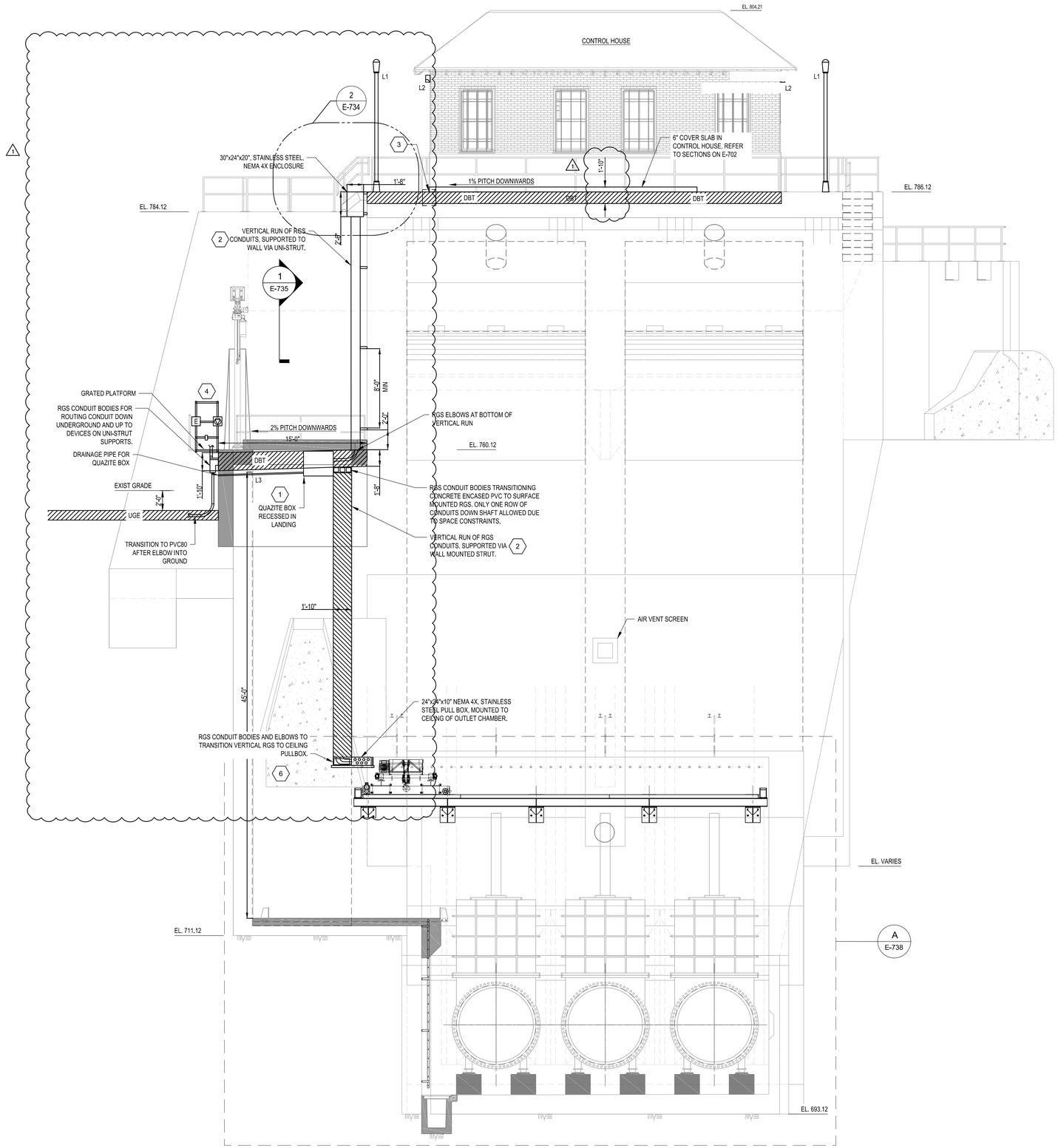
36x24 PLOT SHEET

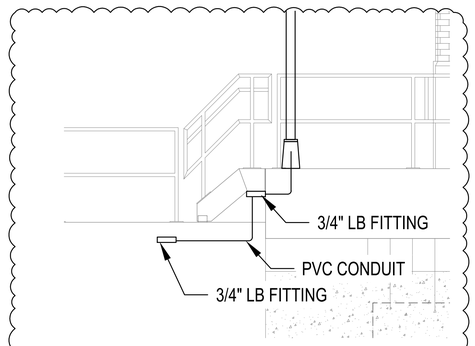


1 CONDUIT ROUTING PLAN - DOWNSTREAM ELEVATION

SCALE: 3/16" = 1'-0"

X KEYNOTES

1. PROVIDE 36"L x 24"W x 30"D QUAZITE CONCRETE BOX IN EXISTING CONCRETE LANDING TO BE USED FOR SPLICING AND PULLING OF CONDUCTORS AS NEEDED TO PROVIDE ALL THE BRANCH CIRCUITS NOTED IN THE DRAWING PACKAGE. BOX WILL COME WITH A DRAIN HOLE AND ELECTRICAL CONTRACTOR WILL PROVIDE A DRAIN PIPE FROM HOLE TO EDGE OF CONCRETE LANDING AS NOTED. MAINTAIN SEPARATION OF POWER WIRING AND COMMUNICATIONS CABLES INSIDE BOX.
2. PROVIDE AT LEAST 2 POINTS OF CONNECTION TO WALL VIA SUPPORTS, NEVER SPANNING MORE THAN 8FT BETWEEN SUPPORTS. RIGID GALVANIZED STEEL CONDUITS SHALL BE SUPPORTED WITH GALVANIZED STEEL STRUT AND MOUNTING HARDWARE.
3. DUCT SEAL INSIDE CONDUITS AT POINT WHERE CONDUITS PASS ACROSS BUILDING WALL.
4. PROVIDE UNI-STRUT SUPPORT STRUCTURE, BOLTED TO THE GRATED PLATFORM. MOUNT JIB CRANE RECEPTACLE WITH WEATHERPROOF COVER, GENERATOR E-STOP IN WEATHERPROOF COVER, AND MAINTENANCE GFI IN WEATHERPROOF COVER TO THE SUPPORT STRUCTURE. BRANCH CIRCUITS TO FEED THE EQUIPMENT SHALL BE ROUTED FROM UNDERNEATH THE GRATED PLATFORM WHERE THE ENCASED CONDUITS PENETRATE THE SIDEWALL OF THE CONCRETE LANDING.
5. THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.
6. 2"C FOR LOW VOLTAGE AND COMMS WIRING WILL NOT PENETRATE PULL BOXES AND WILL BE RUN SEPARATELY ALONGSIDE THE POWER CONDUITS.



2 ENLARGED LIGHTING CONDUIT ROUTING

SCALE: 3/8" = 1'-0"

NOTES:
1. AVOID TRENCHING THROUGH OR UNDER STAIRS BY ROUTING A SECTION OF THE LIGHTING BRANCH CIRCUIT AROUND THE STAIRS ON THE EXPOSED CONCRETE WALL AND THEN PENETRATING BACK INTO THE CONCRETE WALKWAY.

4' 0 4' 8' 12'

3/16" = 1'-0"

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DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

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STATE OF NEW YORK
JOSHUA ROBERT DOOBES
LICENSED PROFESSIONAL ENGINEER
No. 107019

REGISTRATION EXPIRES: 01/31/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM 4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C, E
DESIGNED BY:	JRD
DRAWN BY:	SMC
FIELD CHECK:	-
APPROVED:	JRD

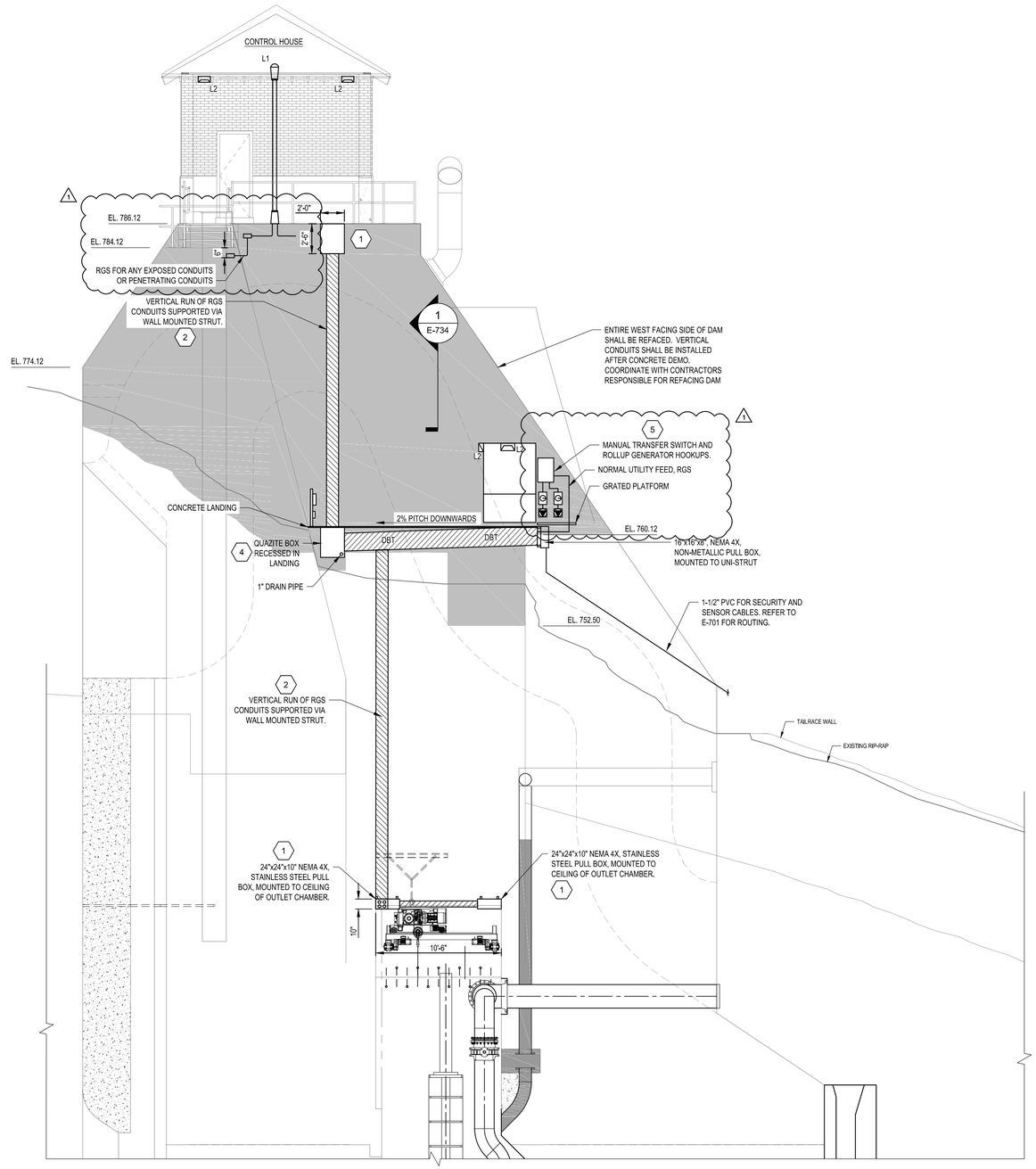
SHEET TITLE:

CONDUIT ROUTING PLAN – DOWNSTREAM ELEVATION

DRAWING NUMBER: E-734

SHEET 142 OF 148

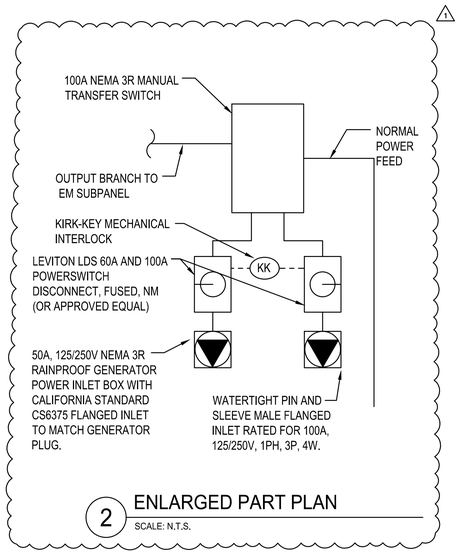
Aug 27 2026 - 8:02pm
I:\OGS\01\5990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.9 Elec\47164E-734.dwg
36x24 PLOT SHEET



1 WEST ELEVATION
SCALE: 3/16" = 1'-0"

KEYNOTES

1. STAINLESS STEEL ENCLOSURES AND RGS CONDUITS SHALL BE MOUNTED TO UNI-STRUT BOLTED TO CONCRETE WALL, ENCLOSURES SHALL NOT BE DIRECTLY MOUNTED TO WALL THEMSELVES.
2. PROVIDE AT LEAST 2 POINTS OF CONNECTION TO WALL VIA UNI-STRUT SUPPORTS, NEVER SPANNING MORE THAN 10 FT BETWEEN SUPPORTS. RIGID GALVANIZED STEEL CONDUITS SHALL BE SUPPORTED WITH GALVANIZED STEEL STRUT AND MOUNTING HARDWARE.
3. UNI-STRUT SUPPORT STRUCTURE MOUNTED TO GRATED PLATFORM WITH JIB CRANE RECEPTACLE, E-STOP, AND MAINTENANCE GFI. REFER TO E-734 AND ONE-LINE DIAGRAM FOR DETAILS.
4. 36"Lx24"Wx30"D QUAZITE CONCRETE BOX IN EXISTING CONCRETE LANDING AS A PULL POINT FOR CONDUCTORS GOING UP AND DOWN THE VERTICAL CONCRETE WALL.
5. PROVIDE STAINLESS STEEL, NEMA 4X MANUAL TRANSFER SWITCH, MOUNTED TO CONCRETE WALL VIA UNI-STRUT. PROVIDE DISCONNECT SWITCHES, 50A GENERATOR HOOKUP, AND 100A GENERATOR HOOKUP. REFER TO ENLARED DETAIL ON THIS SHEET FOR SPECIFICS.
6. THOROUGHLY COORDINATE THIS WORK BETWEEN CONTRACTORS.



2 ENLARGED PART PLAN
SCALE: N.T.S.

4' 0 4' 8' 12'
3/16" = 1'-0"

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DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

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STATE OF NEW YORK
JOSHUA ROBERT DOORES
LICENSED PROFESSIONAL ENGINEER
No. 107010

REGISTRATION EXPIRES: 01/31/2028

CONTRACT: CONSTRUCTION

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LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM 4
0	06/22/2026	BID DOCUMENTS

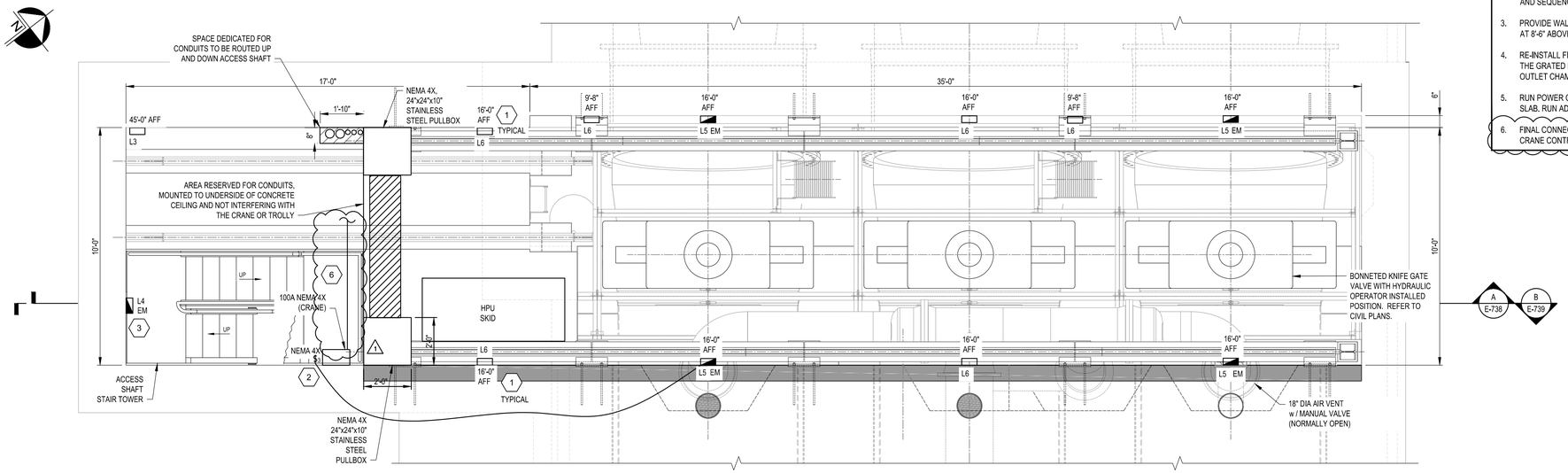
PROJECT NUMBER:	47164-C, E (1)
DESIGNED BY:	JRD
DRAWN BY:	SMC
FIELD CHECK:	-
APPROVED:	JRD

SHEET TITLE:
OUTLET STRUCTURE ELECTRICAL IMPROVEMENTS WEST ELEVATION

DRAWING NUMBER:
E-735

SHEET 143 OF 148

Aug 27,2026 - 8:05pm
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.0 Elec\47164E-735.dwg
36x24 PLOT SHEET

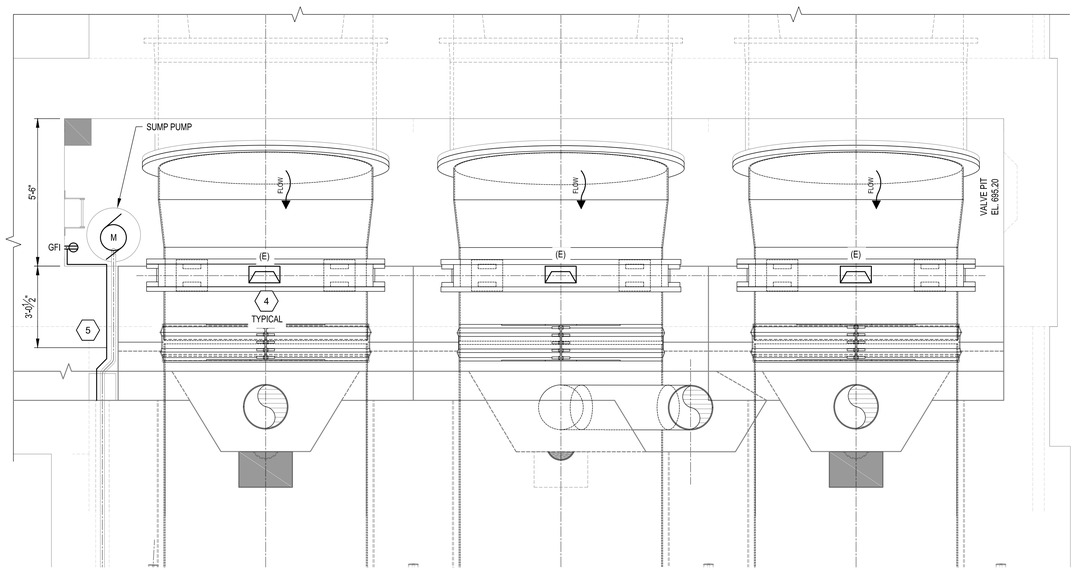


1 VALVE CHAMBER LANDING FLOOR PLAN

SCALE: 3/8" = 1'-0"

KEYNOTES

1. PROVIDE LIGHT FIXTURES AT ELEVATIONS INDICATED.
2. LIGHTING CONTROLS WILL BE VIA WALL MOUNTED 3-WAY LIGHT SWITCH AND BUILT-IN FIXTURE OCCUPANCY SENSORS. REFER TO LIGHTING SCHEDULE AND SEQUENCE OF OPERATIONS ON E-611.
3. PROVIDE WALL MOUNTED LIGHT FIXTURES, AS NOTED, IN THE STAIR TOWER, AT 8'-6" ABOVE EACH LANDING.
4. RE-INSTALL FIXTURES SAVED DURING DEMOLITION ON THE UNDERSIDE OF THE GRATED PLATFORM TO PROVIDE LIGHTING IN THE LOWER LEVEL OF THE OUTLET CHAMBER.
5. RUN POWER CONDUIT TO SUMP PUMP ENCASED IN THE CONCRETE FLOOR SLAB. RUN ADJACENT TO THE SUMP DISCHARGE PIPE.
6. FINAL CONNECTION FROM LOCAL DISCONNECT SWITCH TO 15-TON GANTRY CRANE CONTROL PANEL TO BE BY MACHINE INSTALLER.



2 LOWER LEVEL VALVE CHAMBER PLAN

SCALE: 3/8" = 1'-0"

2' 0 2' 4' 6'

3/8" = 1'-0"

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

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280 East Broad Street
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UNIFORM CODE STATEMENT:

TO THE BEST OF THE REGISTERED DESIGN PROFFESSIONAL'S KNOWLEDGE, BELIEF, AND PROFESSIONAL JUDGEMENT THESE PLANS AND/OR SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2025 UNIFORM CODE.

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STATE OF NEW YORK
JOSHUA ROBERT DOORES
No. 107010
LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 01/31/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM 4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C, E (1)
DESIGNED BY:	JRD
DRAWN BY:	SMC
FIELD CHECK:	-
APPROVED:	JRD

SHEET TITLE: OUTLET STRUCTURE ELECTRICAL IMPROVEMENTS PARTIAL PLANS

DRAWING NUMBER: E-737

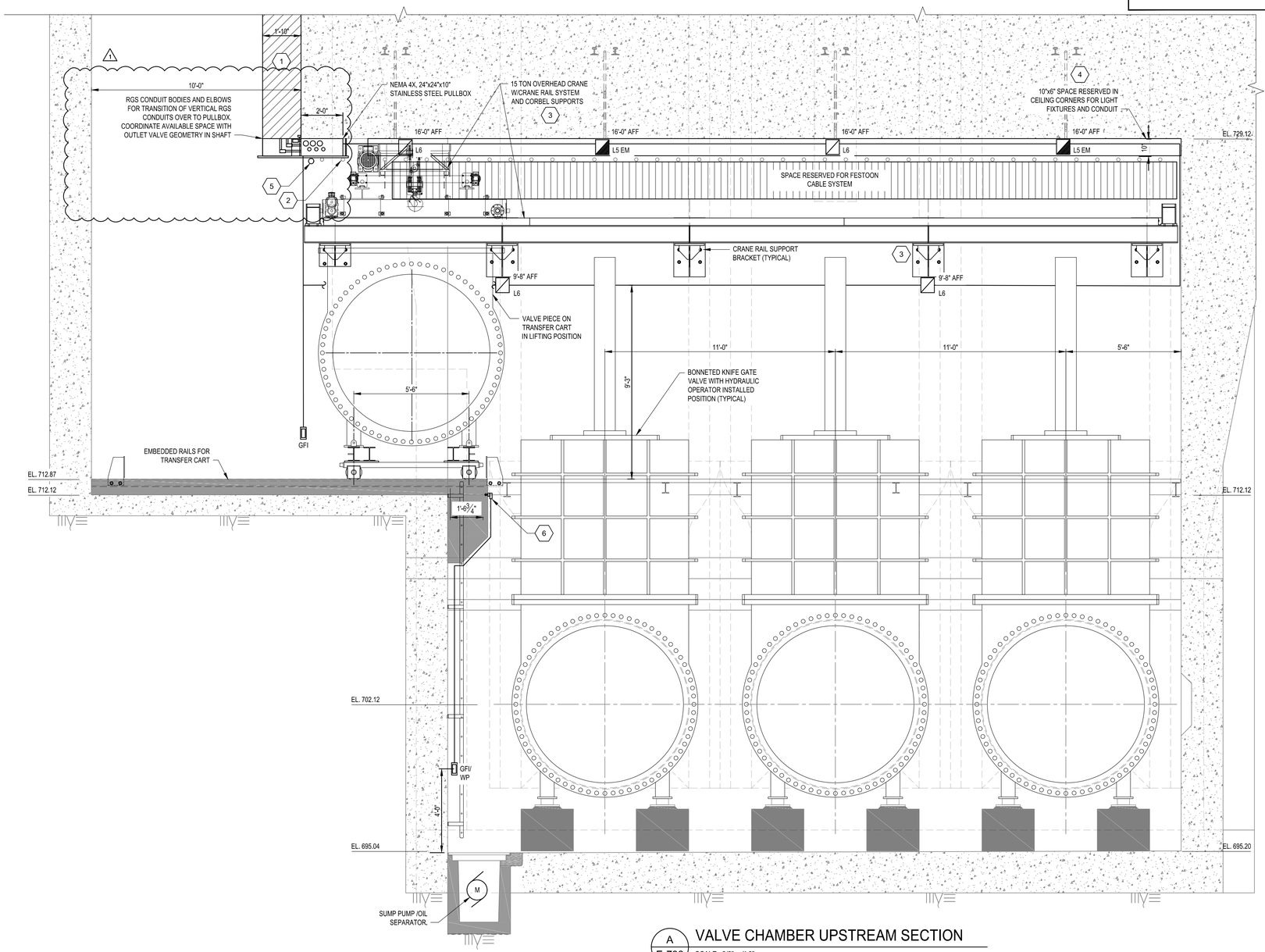
SHEET 144 OF 148

Aug 27,2026 - 8:05pm
I:\QGS\015996\0\NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.9 Elec\47164E-737.dwg

36x24 PLOT SHEET

KEYNOTES

1. SPACE RESERVED FOR VERTICAL RUN OF ELECTRICAL CONDUITS INTO OUTLET CHAMBER. ONLY ONE (1) ROW ALLOWED DUE TO SPACE CONSTRAINTS. CONDUITS FOLLOW VERICAL PATH TO STAINLESS STEEL WIREWAY AND FROM WIREWAY OVER TO STAINLESS STEEL PULLBOX.
2. PROVIDE THREADED RODS AND UNI-STRUTS TO PROPERLY MOUNT PULL BOXES TO CEILING SPACE. UTILIZE HARDWARE MATERIAL TO MATCH THE ELECTRICAL BOX. CONDUITS CAN ALSO BE MOUNTED TO UNDERSIDE OF UNI-STRUT MOUNTING HARDWARE
3. POWER SUPPLIED TO CRANE VIA FESTOON SYSTEM. REFER TO SPECIFICATIONS. PROVIDED DISCONNECT SWITCH IS LOCATED ON THE OTHER SIDE OF ROOM. REFER TO DRAWING E-739 FOR SPECIFIC LOCATION.
4. RESERVE SPACE IN THE CEILING AREA FOR ELECTRICAL LIGHT FIXTURES AND CONDUITS. COORDINATE WITH CONSTRUCTION CONTRACTOR.
5. LOW VOLTAGE / COMMUNICATIONS CABLES MUST BE RUN IN SEPARATE CONDUIT OR SEPARATE WIREWAY CHANNEL TO POWER WIRING. FOR THIS REASON, THE COMMUNICATIONS CONDUIT DOES NOT PENETRATE INTO THE STAINLESS STEEL PULLBOXES. IT CAN BE MOUNTED TO UNDERSIDE OF PULLBOX MOUNTING HARDWARE.
6. ENGAGE CONDUIT FEEDING SUMP PUMP GFI RECEPTACLE TO TRANSITION TO SURFACE MOUNT VIA CONDUIT BODY.



A / E-738 VALVE CHAMBER UPSTREAM SECTION
SCALE: 3/8" = 1'-0"

2' 0 2' 4' 6'
3/8" = 1'-0"

Aug 27,2026 - 8:07pm
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.9 Elec\47164E-738.dwg
36x24 PLOT SHEET

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

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STATE OF NEW YORK
JOSHUA ROBERT DOORES
LICENSED PROFESSIONAL ENGINEER
No. 107016

REGISTRATION EXPIRES: 01/31/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM 4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C, E (1)
DESIGNED BY:	JRD
DRAWN BY:	SMC
FIELD CHECK:	-
APPROVED:	JDR

SHEET TITLE:

OUTLET STRUCTURE TEMPORARY ELECTRICAL SECTION

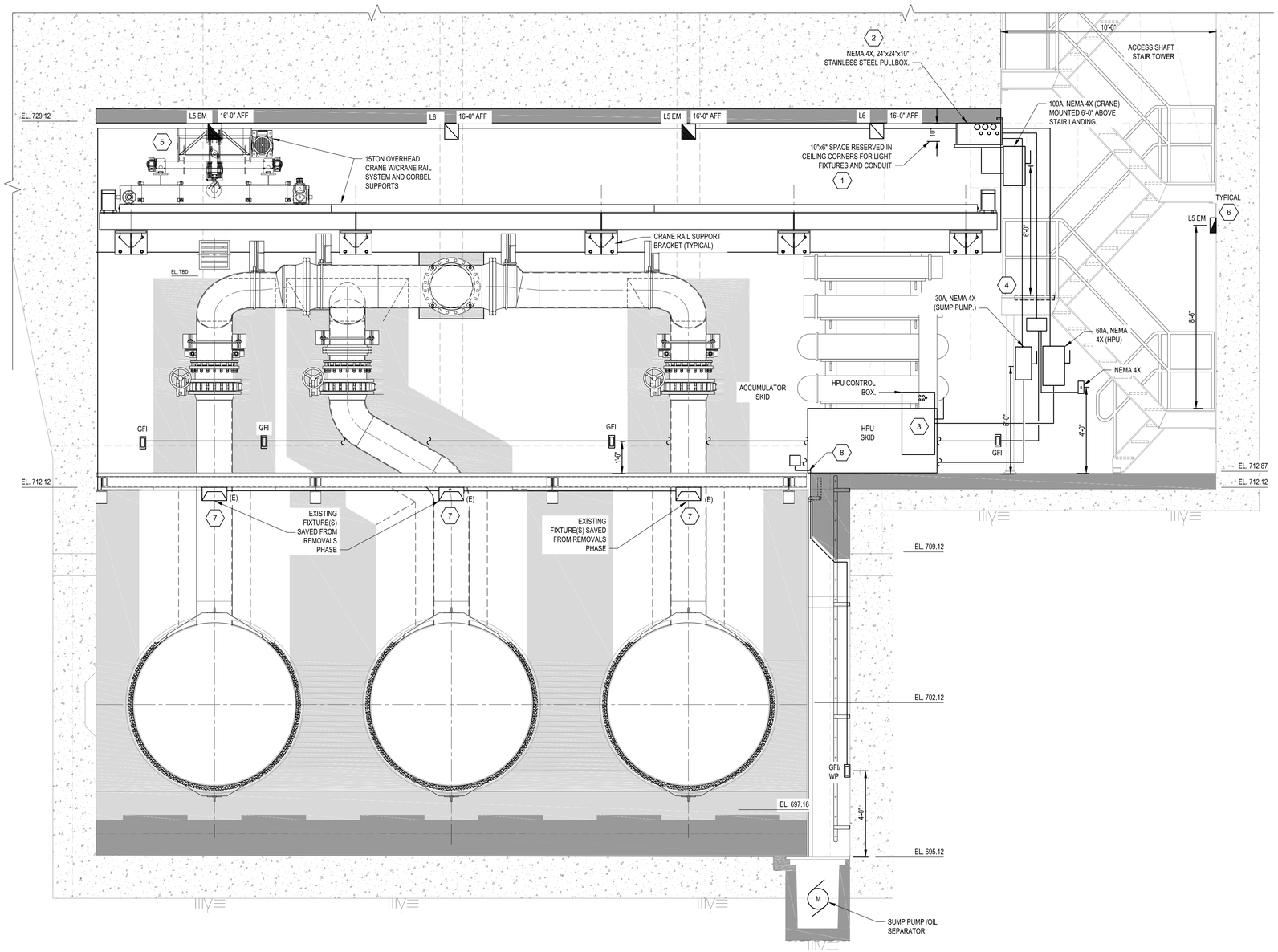
DRAWING NUMBER:

E-738

SHEET 145 OF 148

KEYNOTES

1. RUN ELECTRICAL CONDUITS AND LIGHT FIXTURES IN THE CEILING SPACE OF THE VALVE CHAMBER RESERVED FOR ELECTRICAL SO AS TO AVOID INTERFERING WITH CRANE OPERATION.
2. PROVIDE THREADED RODS AND UNI-STRUTS TO PROPERLY MOUNT PULL BOXES TO CEILING SPACE. UTILIZE HARDWARE MATERIAL TO MATCH THE ELECTRICAL BOX.
3. HPU CONTROL PANEL IS PROVIDED WITH THE HPU SKID. HPU CONTROL PANEL SHALL INCLUDE ROTARY DISCONNECT SWITCH, MOTOR STARTERS AND OVERLOADS, DISCRETE AND ANALOG OPERATOR CONTROLS, DEADFRONT COVER, PANEL HEATER, AND PLC FOR REMOTE COMMUNICATIONS AND CONTROLS AS DETAILED IN THE SPECIFICATIONS. PROVIDE SEPARATE LOCAL DISCONNECT SWITCH AND POWER AND CONTROLS WIRING TO CONTROL PANEL.
4. PROVIDE CUT OUT IN STAIR LANDING TO ALLOW FOR CONDUIT RUNS FROM PULLBOX DOWN WALL TO FEED HPU DISCONNECT, HPU 120VAC LOADS, SUMP PUMP DISCONNECT, AND 120VAC POWER AND LIGHTING LOADS IN OUTLET CHAMBER.
5. 15T CRANE POWERED OVER FESTOON SYSTEM AS SHOWN ON E-738.
6. PROVIDE A WALL MOUNTED EM LIGHT FIXTURE FOR EACH STAIR LANDING, 8'-6" ABOVE.
7. RE-INSTALL LIGHT FIXTURES SAVED DURING REMOVALS PHASE, MOUNTED TO UNDERSIDE OF GRATED WALKING PLATFORM, PROVIDE CONDUIT AND WIRING.
8. ENCASE CONDUIT UNDER CONCRETE IN ORDER TO ROUTE FROM WALL JUNCTION BOX OVER TO LOWER PIT AREA. THEN SURFACE MOUNT DOWN TO SUMP PUMP GFI.



A / E-739 VALVE CHAMBER DOWNSTREAM SECTION

SCALE: 3/8" = 1'-0"

2' 0 2' 4' 6'

3/8" = 1'-0"

NEW YORK STATE | Office of General Services | Department of Environmental Conservation

DESIGN & CONSTRUCTION

CONSULTANT

CERTIFICATE OF AUTHORIZATION #: 0020747

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STATE OF NEW YORK · JOSHUA ROBERT DOORES · No. 107010 · LICENSED PROFESSIONAL ENGINEER

REGISTRATION EXPIRES: 01/31/2028

CONTRACT: CONSTRUCTION

TITLE: PROVIDE FOUNDATION REMEDIATION AND CONCRETE REPAIR CONKLINGVILLE DAM NYS DAM ID #205-0415

LOCATION: 233 COUNTY ROUTE 8 HADLEY, NY SARATOGA COUNTY

CLIENT: NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BID DOCUMENTS

MARK	DATE	DESCRIPTION
1	08/28/2026	ADDENDUM 4
0	06/22/2026	BID DOCUMENTS

PROJECT NUMBER:	47164-C, E
DESIGNED BY:	JRD
DRAWN BY:	SMC
FIELD CHECK:	-
APPROVED:	JRD

SHEET TITLE:

VALVE CHAMBER ELECTRICAL IMPROVEMENTS PLAN – DOWNSTREAM

DRAWING NUMBER: E-739

SHEET 146 OF 148

Aug 27,2026 - 8:08pm
I:\OGS\015990.00 NYS OGS - 47164 Rehab Conklingville Dam\4.0 Dwgs\4.9 Elec\47164E-739.dwg

36x24 PLOT SHEET