

## **TECHNICAL SPECIFICATIONS**

**SECTION 01010  
SUMMARY OF WORK**

**PART I – GENERAL**

**1.01    INTENT OF THE WORK**

The Work of this Contract involves rehabilitation, maintenance, and repair of the gate structure and right abutment of the Macallen Dam, located in Newmarket, New Hampshire. The purpose of the work is to bring the Dam into better compliance with NHDES Dam Bureau’s discharge capacity requirements and to address the dam safety and spillway capacity deficiencies identified in a Letter of Deficiency (LOD) issued by the NHDES Dam Bureau, dated September 27, 2010. The Dam and associated structures are owned, operated, and maintained by the Town of Newmarket, New Hampshire (Owner); however, additional stakeholders and abutters have input through the Owner as to the performance of the Work. Provisions within the Contract Drawings and Specifications are intended to ensure the Work complies with the input of said stakeholders and abutters. Upon completion of the Work of this contract, Macallen Dam shall be repaired in accordance with the Contract Drawings and Specifications provided as part of the Contract Documents.

The Contractor is referred to the Contract Drawings, which, along with these Specifications, define the requirements of the Work.

**1.02    LOCATION OF THE WORK**

Macallen Dam is located immediately downstream (south) of Veteran’s Bridge (North Main Street) within downtown Newmarket, New Hampshire.

The map location of the Project is as follows:

<i>Latitude</i>	<i>Longitude</i>
43.0814	70.9345

The location of the work is shown on the locus map contained on the Cover Sheet, Site Locus, and Index of Drawings Plan of the Contract Document set. The left abutment retaining wall and concrete crest gate structure are accessible from an easement within a parking lot owned by Bryant Rock, LLC (6 Bay Road) and accessed from Bay Road. The right abutment retaining wall, fish ladder and stone masonry spillway structure are accessed from Penstock Way via a grass area immediately adjacent (north) of the Durham Book Exchange (53 Main Street) building.

The Contract Drawings and Specifications specifically delineate the limits of work, including staging and lay-down areas for the Contractor, as well as areas not to be disturbed. The Contractor shall be strictly monitored for compliance with these boundaries. Proper environmental and housekeeping procedures by the Contractor are of the highest priority, as required by the environmental permits secured for the work.

**1.03    DESCRIPTION OF THE SITE**

The Macallen Dam impounds the 480 acre-ft (under normal conditions) Lamprey River Reservoir which extends upstream approximately 2.5 miles along the Lamprey River and approximately 0.75

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up the Piscassic River. In accordance with NHDES Dam Safety Regulations, the Dam is classified as a high-hazard structure (Class C structure).

Macallen Dam is an approximately 150-foot-long stone block dam with a maximum height of 27-feet and assumed to have been founded on bedrock. The Dam was first constructed in 1887 with the original purpose of providing hydropower to the adjacent Mill buildings. The Dam consists of an approximately 70-foot-long granite masonry spillway with a concrete outlet structure along the left abutment consisting of three slide gates. Based on historical records, the concrete outlet structure was added in 1925. A denil-type fish ladder was added to the dam along the right abutment in the early 1970's. Each earthen abutment is confined by masonry training walls capped with concrete. Slightly upstream of the dam are remnants of timber cribbing filled with stone from a legacy dam.

### 1.04 GENERAL SCOPE OF THE WORK

The rehabilitation, maintenance, and repair work will, in general, consist of demolition of the existing concrete gate structure and installation of a pneumatically-actuated automatic crest gate at the same location (to the left of the existing spillway), repair of the left and right training walls with a slight increase in the height of the right abutment training wall, installation of a below ground vault structure associated with the new crest gate, and restoration of the grassed area adjacent to the right abutment.

The work required by the Contract Drawings and Specifications shall include furnishing all labor, skill, supervision, tools, construction plant, equipment and materials and performing all operations necessary for the proper completion of the Contract Work as shown on the Plans and Specifications, and as required by the Owner.

The Contractors shall also provide all materials, fuels, labor, and other items necessary for the protection of the Work from hot weather, cold weather, precipitation, surface water flow, groundwater, or other potentially adverse conditions which might cause harm to completed work or work underway. The Contractor shall be prepared to remove personnel, equipment, and materials from areas of potential inundation in the event of excessive flows and be prepared to restore any damage and resume work at the site.

Primary work items included as part of the Contract shall include, but not be limited to, the following:

- A. The proposed project work consists of rehabilitation of abutments and reconfiguration of the gate structure to address specific dam safety deficiencies. The Work will include work at the existing gate structure, the existing training walls, abutments, and adjacent areas. Rehabilitation features have been designed in accordance with the NHDES's current Dam Safety Regulations (Env-Wr 300-400) and standard dam engineering practices. To achieve the desired improvements, major components of the rehabilitation Work will include, but not be limited to, the following:
  - 1. Phased installation of approved cofferdam systems and other temporary water control measures, both surface and groundwater, for the Work as referenced in Section 01565 and the Contract Drawings.

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2. Saw-cutting and removal of the parapet and deteriorated concrete along the right abutment training wall and rehabilitation of the wall by filling of voids and re-facing with cast-in-place concrete.
3. Installation of additional riprap armoring along the slope of the upstream face of the right abutment training wall.
4. Installation of a Mechanically Stabilized Earth (MSE) retaining structure for raising of the right upstream embankment cutoff wall. Installation of concrete steps and davit crane for the fish ladder by installing a cast-in-place wall system along the existing fish ladder wall. Construction of a new low retaining wall westward from the fish ladder toward Penstock Way and north of the Durham Book Exchange Building in the form of a precast concrete gravity retaining wall system.
5. Regrading and raising of grade along the right embankment earthen area within the limits of the retaining walls and upstream slope.
6. Demolition and removal of the existing gate structure along the left abutment training wall, including associated gate systems. Some portions of the existing slide gates may be salvaged at the request of the Town. Partial demolition and rehabilitation of /additions to the associated gate structure concrete slab.
7. Repointing of the upstream granite block masonry training wall along the left abutment.
8. Procurement, installation, and commissioning of a pneumatically operated crest gate, including all associated operating and control equipment and systems. The crest gate construction will include installation of a below-grade gate operation vault structure along the left upstream embankment. The Contractor shall also be responsible for designing and installing appropriate electrical service interconnection and systems necessary for the operation of the crest gate and associated equipment.

### B. Site Access and Staging

1. Project Location: Access to the general project location is either via Bay Road or via Main Street in downtown Newmarket, New Hampshire. It should be noted that several public roads to the site may have geometric or load restrictions that may limit passage by certain vehicles, equipment, or trailers.
2. Site: The left abutment is accessible via an easement for access, maintenance, and repair of the dam which runs through the residential parking lot owned and operated by Bryant Rock, LLC. The right abutment is accessible via Penstock Way (off Main Street) to the grass abutment just north of the Durham Book Exchange building.
3. Work, Staging, Laydown and Stockpile Area: The Contract Drawings specifically delineate staging and lay-down areas for the Contractor, as well as areas not to be disturbed. The Contractor shall be strictly monitored for compliance with these boundaries. Proper environmental and housekeeping procedures by the Contractor

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are required. Additional supplemental staging, lay-down, or stockpile areas may be available for use at alternate locations designated by the Owner, however, if the Contractor feels additional staging or lay-down areas are required, the Contractor shall request an extension of the boundaries or request supplemental areas to the Owner in writing.

### 1.05 SPECIAL PROVISIONS OF THE WORK

The Contractor is hereby notified that the Work of this Contract involves construction on and around an existing dam. As such, a number of special provisions will be necessary for the successful completion of the Work. Such provisions shall include, but not be limited to the following:

#### A. Protection of Existing Property

During the performance, and up to the date of final acceptance, the Contractor must take all reasonable precautions to protect the property of the Owner and abutting residences/properties from loss, damage, and/or destruction resulting from the Contractors, and all Subcontractor's, operations under this Contract. A pre-construction survey shall be required prior to the start of work involving demolition or heavy equipment.

#### B. Sediment and Erosion Control

Sediment and erosion control measures shall be deployed during construction as required by environmental permits and otherwise depicted on the Contract Drawings. Such measures shall be deployed downstream of the dam.

The Contractor shall perform all work required to provide, install, maintain, and remove siltation and sediment control measures necessary to protect resource areas from siltation, sedimentation, or siltation damage or damage from other by-products of the Work including water control and dewatering operations.

#### C. Site Access Control

The Work of the Contract shall include all necessary measures to exclude pedestrians, recreational users, and unauthorized vehicles from the construction area. This shall include the provision of appropriate fencing, gates, signage, and flagmen, as needed. Such users shall also be protected from construction traffic in areas when construction vehicles are entering or exiting the job site.

### 1.06 CONTRACT DOCUMENTS

- A. The Contract documents consist of several major parts, including the Invitation to Bid, Bidder Experience and Reference Form, Form for Bid, Contractual Agreement and Signature Page, Insurance and Bond requirements, General Conditions, Contract Drawings and Technical Specifications (including Supplemental General Conditions and Special Conditions) and other related Documents. All information is contained in a single electronic volume.

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- B. The Supplemental General Conditions contains information in addition to the General Conditions which governs the work. The Special Conditions and the Specifications modify and supplement these with detailed requirements for the Work.
- C. The location and general character of the work are shown on the following Contract Drawings:

<u>Drawing No.</u>	<u>Title</u>
G-1	TITLE SHEET, SITE LOCUS AND INDEX OF DRAWINGS
G-2	GENERAL NOTES AND CONSTRUCTION SEQUENCE
G-3	EXISTING CONDITIONS OVERVIEW
G-4	EXISTING CONDITIONS & SUBSURFACE INVESTIGATIONS PLAN
G-5	EXISTING CONDITIONS SECTIONS
C-1	TEMPORARY SEDIMENT, EROSION, & WATER CONTROL PLAN
C-2	TEMPORARY WATER CONTROL PLAN PHASES
C-3	TEMPORARY SEDIMENT, EROSION, & WATER CONTROL DETAILS
C-4	DEMOLITION AND MODIFICATIONS PLAN
C-5	FINAL CONDITIONS PLAN
C-6	FINAL CONDITIONS SECTIONS (1 OF 2)
C-7	FINAL CONDITIONS SECTIONS (2 OF 2)
C-8	FINAL CONDITIONS ELEVATIONS (1 OF 2)
C-9	FINAL CONDITIONS ELEVATIONS (2 OF 2)
C-10	CONSTRUCTION DETAILS (1 OF 3)
C-11	CONSTRUCTION DETAILS (2 OF 3)
C-12	CONSTRUCTION DETAILS (3 OF 3)
S-1	STRUCTURAL NOTES AND SPECIFICATIONS
S-2	STRUCTURAL DEMOLITION PLAN - EXISTING OUTLET STRUCTURE
S-3	STRUCTURAL DEMOLITION SECTIONS - EXISTING OUTLET STRUCTURE
S-4	STRUCTURAL PROPOSED PLAN VIEW – GATE STRUCTURE
S-5	STRUCTURAL PROPOSED PLAN VIEW – RIGHT ABUTMENT
S-6	STRUCTURAL PROPOSED SECTIONS – NEW GATE STRUCTURE
S-7	STRUCTURAL ABUTMENT DETAILS – WEST ABUTMENT
S-8	STRUCTURAL ABUTMENT DETAILS – WEST ABUTMENT
S-9	STRUCTURAL ABUTMENT DETAILS – EAST ABUTMENT
S-10	CONTROL VAULT SOE & FOUNDATION PLAN & NOTES
S-11	CONTROL VAULT SOE & FOUNDATION SECTION
E-1	SCHEMATIC MECHANICAL, PIPING, CONDUIT PLAN AND DETAIL
*18-2133-100	SPILLWAY PLAN VIEW COVER SHEET
*18-2133-101	SPILLWAY PLAN VIEW
*18-2133-102	PLAN VIEW MAIN ANCHOR LAYOUT AND SPACING
*18-2133-110	SECTION ELEVATION
*18-2133-111	ELEVATION SURFACE FEATURES
*18-2133-112	ABUTMENT PLATE INSTALLATION
*18-2134-004	MECHANICAL VAULT

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- \* Included as part of the contract bid, the Contractor shall coordinate with their pneumatic crest gate manufacturer to develop additional final design/installation drawings for Owner/Engineer review and approval.

The work shall be constructed in accordance with said Contract Drawings, the technical specifications, and such further working and detailed plans as may be furnished from time to time by the Engineer. Details shown on the plans are indicative of the type of work required and are subject to revision, alteration, modification and variation. Said revision, alteration, modification and/or variation, though desirable with respect to improving upon the original intent of the work scope, shall nevertheless be considered incidental to the overall cost of the work. Such incidental revisions, alterations, modifications and/or variations that are desirable in opinion of the Project Owner or Engineer, on account of conditions encountered or for other reasons, shall not be considered a variation of the terms of this contract and the assent of any surety of the bond accompanying this contract to such revisions, alterations, modifications or variations shall not be required.

Figured plan dimensions are to prevail over scaled dimensions. All elevations on the plans are referenced to North American Vertical Datum of 1988 (NAVD88) in units of feet, unless otherwise so noted. All things which in the opinion of the Engineer may be fairly inferred from the plans are to be executed by the Contractor as part of the contract, and the Project Owner and/or Engineer shall be the sole judge as to whether the detail plans conform to the general plans.

Plans, calculations, estimates of quantities, and any statement made in the Information for Contractor or otherwise as to the condition under which the work is to be performed, are not guaranteed by the Project Owner or the Engineer to be correct, or to be a complete representation of all existing data on the conditions affecting the work, and the Contractor agrees that he/she has made his own examinations and will make no claim for damages on account of any error or omission in any plans, calculations, estimates of quantities, or any statements made in the Information for Bidders or otherwise as to the conditions under which the work is to be performed. Additionally, Contractor shall report such discrepancy, error, or omission to the Project Owner and Engineer in writing as soon as it comes to his knowledge, and before proceeding with work relating to such discrepancy, error or omission.

Any correction or modification of the plans or specifications may be made by the Engineer when necessary, in his/her opinion, for the proper fulfillment of their purpose or for their proper interpretation.

Any references herein and elsewhere to the various items of work refer to the Numbered Items in the Proposal.

### 1.07 DESCRIPTION OF PARTIES REFERENCED IN SPECIFICATIONS

- A. In all cases within the Contract Documents, references to the “Owner” shall be taken to mean the “The Town of Newmarket”.
- B. References to the “Contractor” within the Contract Documents and Technical Specifications shall mean the entity legally contracted by The Town of Newmarket to perform and complete the work of this Contract.

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- C. References to the “Resident Engineer” within the Contract Documents and Technical Specifications shall mean the engineering firm contracted by The Town of Newmarket to provide observation and monitoring services during construction or The Town of Newmarket employee or employees assigned to observe and monitor the work of the Contractor at the project site.
- D. References to the “Designer Engineer”, the “Design Consultant”, “Engineer”, “Owner’s Representative”, or the “Consultant” within the Contract Documents and Technical Specifications shall mean the engineering firm contracted by The Town of Newmarket to design the project. The “Design Engineer” and “Consultant” is GZA GeoEnvironmental, Inc. of Norwood, Massachusetts, however, at the bid stage of the project, the Owner has yet to enter into an official contract with GZA GeoEnvironmental, Inc. to provide follow on engineering services during the construction phase of the project, which includes attending project meetings and review of contractor submittals for conformance to the Contract Documents.

### **PART 2 – PRODUCTS**

This Section Not Used

### **PART 3 - EXECUTION**

This Section Not Used

### **PART 4 – MEASUREMENT AND PAYMENT**

No measurement shall be made of any work performed under this section. No separate payment shall be made for any work performed under this section. The cost of any work done, or facilities provided under this section shall be included under other pay items within the Contract.

**\*\*\*END OF SECTION\*\*\***

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**SECTION 01050  
FIELD ENGINEERING**

**PART 1 - GENERAL**

**1.01    DESCRIPTION**

- A.     The Contractor shall establish lines and grades and layout all work for the project.
- B.     The Contractor shall be responsible for establishing elevations, temporary benchmarks, baselines, levels, reference marks, batter boards, etc.
- C.     The Contractor shall locate and protect survey control and reference points provided by the Owner.
- D.     Additional control established by the Contractor within the project area shall be protected from disturbance.
- E.     Vertical control datum for this project shall be the North American Vertical Datum of 1988 (NAVD88).

**1.02    LINES, GRADES AND MEASUREMENTS**

- A.     The Contractor shall employ a Land Surveyor or Professional Engineer, licensed in the State of New Hampshire, to provide field engineering services. The Land Surveyor shall utilize recognized survey practices to establish elevations, lines, levels, reference marks, etc., needed by the Contractor during the progress of the Work, and to occasionally verify such marks.
- B.     The Contractor shall submit a certificate signed by the Land Surveyor or Professional Engineer registered in the State of New Hampshire verifying that the elevations and locations of the Work are in conformance with the Contract Documents.
- C.     The Resident Engineer or the Owner shall be permitted at all times to check the lines, elevations, reference marks, etc., set by the Contractor, who shall correct any errors in lines, elevations, reference marks, etc., disclosed by such check. Such a check shall not be construed to be an approval of the Contractor's work and shall not relieve or diminish in any way the responsibility of the Contractor for the accurate and satisfactory construction and completion of the entire Work.
- D.     The Contractor shall make, check, and be responsible for all measurements and dimensions necessary for the proper construction of and the prevention of mis-fittings in the Work.
- E.     The Contractor shall establish bench marks at a minimum separation of 50 feet along the proposed work area.
- F.     The Contractor shall provide personnel to assist the Resident Engineer with acquiring all measurements including lines, grades, etc. to ensure the Work conforms to Project Specifications and to verify the quantities measured for payment.

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- G. The Contractor shall maintain mark ups of Contract Drawings and provide as-built record drawings in accordance with Section 01055.

### **1.03 RELATED WORK SPECIFIED ELSEWHERE**

- A. The following is a list of related work items that shall be performed or furnished under other Sections of these Specifications as indicated.

- 1. As-Built Drawings – Section 01055

## **PART 2 – PRODUCTS**

This Section Not Used

## **PART 3 – EXECUTION**

This Section Not Used

## **PART 4 – MEASUREMENT AND PAYMENT**

No measurement shall be made of any work performed under this section. No separate payment shall be made for any work performed under this section. The cost of any work done or facilities provided under this section shall be included under other pay items within the Contract.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 01055  
AS-BUILT DRAWINGS**

**PART 1 - GENERAL**

1.01 SCOPE

- A. The Work of this Section shall include the ongoing preparation of As-Built Documents and Final Conditions Drawings by the Contractor to record progress and changes at the project site. The As-Built Documents and Final Conditions Drawings shall be continuously updated by the Contractor's on-site superintendent and his RLS.
- B. Provision of the services of a Registered Land Surveyor (RLS) in the State of New Hampshire to provide site layout, control points, temporary and permanent benchmarks, and other similar work specified under Section 01050 is included as part of the Bid Item for this Section.

1.02 REQUIREMENTS

- A. In addition to the requirements of the General Conditions, Contractor shall maintain and provide the Engineer with as-built documents as specified below.
- B. Maintenance of Documents:
  - 1. Maintain in clean, dry, legible condition complete sets of the following: Contract Drawings, Specifications, Addenda, approved Shop Drawings, Samples, Photographs, Change Orders, other modifications of Contract Documents, Test Records, Field Orders, and all other documents pertinent to Contractor's Work. The drawings shall be neatly and clearly marked in color during construction to record all variations made during construction.
  - 2. Provide files and racks for proper storage and easy access. File in accordance with filing format of Construction Specifications Institute (CSI), unless otherwise approved by the Engineer.
  - 3. Make documents available at all times for inspection by the Owner and Engineer.
  - 4. As-built documents shall not be used for any other purpose and shall not be removed from the Contractor's office without the Owner's approval.
- C. Recording:
  - 1. Keep as-built documents current. Drawings shall be updated at a minimum once per week.
  - 2. Do not permanently conceal any Work until required information has been recorded.
  - 3. Contract Drawings: Legibly mark to record actual construction.
  - 4. Subsurface conditions: Record information on sub-surface conditions encountered at the site, either on the Contract Drawings, on a separate exploration log, or a combination of both.
  - 5. Specifications and Addenda: Legibly mark up each Section,
  - 6. Shop Drawings: Maintain as record documents and legibly annotate drawings to record changes made after review.

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### **1.03 FINALCONDITIONS TOPOGRAPHIC SURVEY PLAN**

In addition to the requirements listed above, the Contractor shall provide a final conditions plan in the form of a surveyed topographic plan of the final conditions at the site at the conclusions of the work, with a similar level of detail as included in the “Existing Conditions” sheets of the Contract Drawings. Record drawing shall be prepared and stamped by a Registered Land Surveyor licensed in the State of New Hampshire. Particular attention shall be paid to the as-constructed elevations of the various structures installed or modified as a part of the Work of this Contract.

### **1.04 SUBMITTALS**

- A. Within five (5) days of Notice to Proceed, submit the resume and contact information of the State of New Hampshire Registered Land Surveyor performing construction and as-built survey at the site.
- B. At completion of Project, but before final payment, deliver three hard copies of the As-Built Drawings (marked up Contract Drawings + Contractor’s Final Conditions Topographic Survey Plan) including electronic versions (PDF and AutoCAD) of these documents including all other associated documents to the Owner.

### **1.04 RELATED WORK SPECIFIED ELSEWHERE**

- A. The following is a list of related work items that shall be performed or furnished under other Sections of these Specifications as indicated.

- 1. Field Engineering – Section 01050

## **PART 2 PRODUCTS**

This Section Not Used

## **PART 3 – EXECUTION**

### **3.01 “AS-BUILT” MARK UPS OF CONTRACT DRAWINGS**

The Contractor shall continuously mark up a set of the Contract Drawings based on the field changes and as-built conditions. The marked up set of Contract Drawings shall be available on site at all times. The Contractor shall bring the updated set to each construction meeting. A complete set of marked up Contract Drawings shall be provided to the Owner and Engineer at the completion of the project.

### **3.02 “AS-BUILT” FINAL CONDITIONS PLAN**

- A. The Contractor shall engage a licensed State of New Hampshire land surveyor to prepare a topographic “as built” survey plan of the site after the completion of all work which will result in permanent changes to the site and/or its grades. Do not show temporary structures on the “as built”.

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- B. The “As Built” Final Conditions Plan shall be substantially similar to the base map shown in the Contract Drawings in that it shall use the same horizontal and vertical datums, provide the same contour intervals, and show (at minimum) the same features. The limits of all work performed and all materials placed under the work of this contract shall be shown on the “As Built” plan. The plan shall, at minimum, show the same extents as the base plan and shall be extended if necessary to cover all work areas. The “As Built” plan shall be at the same or smaller scale as the base map. Property lines shall be established and shown as necessary.
- C. A draft of the “As Built” plan shall be submitted to the Owner. Upon acceptance, a final version, stamped by the surveyor, shall be submitted. Three plans with original stamps shall be provided, along with CADD files.

### **3.03 BENCHMARKS AND PROJECT MARKERS**

Permanent project benchmarks and/or survey control points set during performance of the work by the Contractor’s licensed land surveyor shall be shown on the final “As Built” plan.

## **PART 4 - MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 01060  
REGULATORY REQUIREMENTS**

**PART 1 - GENERAL**

**1.01    PERMITS AND LICENSES**

- A.    No portion of the Work within and/or adjacent to Lamprey River Reservoir and Macallen Dam, or adjacent to existing resource areas shall be begun until all necessary and required permits have been secured.
- B.    The following permits, notifications, and/or approvals have been applied for by the Owner and are expected to be issued prior to start of construction:
  - 1.    A Wetlands Bureau Permit Application as administered by the New Hampshire Department of Environmental Services – Wetlands Bureau under the provisions of RSA 482-A.
  - 2.    New Hampshire Department of Environmental Services (NHDES): Permit to Construct or Reconstruct a Dam, NHDES-W-02-001.

If not already attached herein to this Section, copies of those permits/approvals outstanding as of the bids due date will be forwarded to the Contractor by addendum after they have been issued by the permitting agencies. These permits/approvals are to be considered as part of the Contract Documents. The Contractor shall be responsible for adhering to the conditions stipulated in all permits/approvals. No Work shall begin until all required permits have been secured to cover the Work.

The Terms and Conditions which will accompany the required permits, licenses, and approvals still to be issued are not expected to deviate substantially from the requirements of these Contract Documents and the Technical Specifications. No additional payment shall be made for adherence to the terms and conditions of permits, licenses, and approvals yet to be issued for the Project. In the event that compliance with terms and conditions of a permit (applied for by the Owner) requires substantial additional work on the part of the Contractor, a Contract Amendment will be negotiated. No additional payment will be made in any event for compliance with permits obtained by the Contractor.

- C.    A temporary permit (local) may be required for field trailers or other temporary facilities and, if so, shall be obtained by Contractor. Copies of all required permits and licenses shall be forwarded to the Owner prior to the beginning of the Work. The Contractor shall be responsible for conducting his/her work in accordance to all provisions of said permits.
- D.    The Contractor shall procure all other required permits and licenses (except for those to be obtained by the Engineer or Owner as stated herein), pay all charges, fees and taxes and shall give all notices necessary and incidental to the due and lawful prosecution of the work under this Contract. The cost thereof shall be included in the prices bid for the various items specified herein for the work of this Contract. Copies of all required permits and licenses shall be filed with the Resident Engineer prior to the beginning of the work.

- E. **The disturbance area at the site will be less than one acre in total and therefore not under the jurisdiction of the NPDES general construction permit process. Regardless of the need for a SWPPP under the NPDES permit, the Contractor shall be responsible for developing a site-specific sediment and erosion control plan which shall be submitted to the Owner. The Contractor's plan shall incorporate the requirements of this Section and the controls and BMPs shown on the Contract Drawings and other applicable Specifications; however, it shall be understood that these measures called for in the specifications and on the plans represent the MINIMUM acceptable level of sediment and erosion control. The Contractor's plan shall be designed to account for the anticipated work plan, construction sequence, and anticipated level of disturbance. Cost for this item shall be included under applicable payment items herein these specifications.**

1.02 ADHERENCE TO AUTHORIZATIONS, PERMIT AND LICENSE CONDITIONS AND REQUIREMENTS

The Contractor shall strictly adhere to all conditions and requirements set forth in the authorizations, permits, licenses, etc. issued in relation to the Work of this Contract. The Contractor shall undertake all incidental work necessary to meet the conditions and requirements of the authorizations, permits and licenses and shall perform the Work of the Contract in accord with said conditions and requirements. The cost thereof shall be included in the prices bid for the various items specified herein for the work of this Contract.

The Contractor shall be solely responsible for monitoring and complying with the conditions and requirements of all authorizations, permits and licenses. The Contractor shall solely be responsible for any and all penalties, sanctions, and fines that result from non-compliance with the conditions and requirements of all authorizations, permits and licenses. Neither the Owner, its Resident Engineer, nor its Engineer will be held responsible for any penalties which result from Contractor violations of the conditions and requirements of authorizations, permits and licenses.

No additional payment will be made for compliance with the conditions and requirements of the authorizations, permits, variances, or approvals.

Copies of all permits shall be maintained at the site by the Contractor during the Work.

1.03 AIR, SOIL, AND WATER POLLUTION AND NOISE CONTROL

The Contractor shall comply with the applicable local, state, and federal regulations pertaining to Open Burning, and Dust, Odor, Construction and Demolition; and his/her attention is called to applicable Enforcement Provisions in regard to these and other pertinent and applicable regulations. The Contractor shall comply with the provisions of the Clean Air Act of 1970, 42USC, Sections 1857- 1857f.

A Sediment and Erosion Control plan and notes are included within the Contract Drawings. The information contained in the plans, specifications, and notes may be used as the basis for the preparation of any sediment and erosion control plan, but shall be considered the **MINIMUM** acceptable measures. The final content and responsibility for implementation are the Contractor's alone.

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The work of this contract is being conducted within and adjacent to Lamprey River Reservoir at the Owner's Macallen Dam site. Macallen Dam and its surrounding wetlands is a sensitive water resource which provides habitat for fish and other wildlife. The Contractor shall take every precaution to prevent the chemical contamination of soil, groundwater, and River water caused by spilling or leaking of oil, hazardous material, or other chemicals and materials used in the construction operation. The Contractor shall be especially careful not to discharge or spill any oil, grout, concrete, or other contaminants in or onto the waters adjacent to and/or within work areas.

Clean-up of such spills, leaks or other contamination shall be undertaken immediately by the Contractor. The clean-up work shall be done to the satisfaction of the Resident Engineer and Owner. All spills, leaks, or other contamination shall be immediately reported to both the Resident Engineer and Owner. In the event that such a spill or leak is not cleaned up by the Contractor, the Owner reserves the right to have the spill or leak cleaned up by its own forces or by others and the expense of such removal and disposal will be charged to the Contractor.

### 1.05 SPILL PREVENTION CONTROL AND COUNTERMEASURES PLAN

The Contractor shall provide the Owner, five (5) working days prior to the commencement of work, a written spill prevention control and countermeasures plan/emergency action plan. This plan shall include, at a minimum, (1) a plan for containing anticipated construction materials to prevent possible spills; (2) telephone numbers of key management personnel including local and state public safety agencies; (3) an inventory of spill mitigation equipment such as sorbent booms, etc. which are to be kept on site; and (4) standard procedures for containing possible spills.

### 1.06 HEALTH AND SAFETY

The Contractor shall be responsible for complying with all local, state, and Federal laws, codes, ordinances, rules, requirements, standards, regulations, and orders governing workplace and site health and safety. Health and Safety on the project site shall be the sole responsibility of the Contractor. The Contractor shall be responsible for monitoring the health and safety practices of his own personnel and those of all sub-contractors present on the site. The Contractor shall be responsible for knowledge of and compliance with all relevant OSHA regulations, as well as all other Federal, state, and local laws, ordinances, codes, and regulations pertaining to health and safety.

A general and a site-specific Health and Safety plan must be in place prior to the Start of the Work. The Contractor is hereby notified that Owner shall place the utmost importance on the proper planning, execution and adherence to the safety plan and all required general safety procedures. Review of this plan by Owner and/or Engineer in no way implies acceptance of responsibility for job site safety by the Owner and/or Engineer. The Contractor shall be solely responsible for job site safety.

The site-specific Health and Safety Plan shall specifically address fall protection, water safety, and traffic safety, as well as all other areas deemed necessary by the Contractor.

Neither the professional activities of Owner, its Resident Engineer, or its Engineer, nor the presence of the Owner, its Resident Engineer, or its Engineer's employees and/or subcontractors will be construed by any party to imply that the Owner, its Resident Engineer, or its Engineer has any responsibility for any Contractor's methods of work performance, procedures, superintendence, sequencing of operations, or safety in, on or about the project site. With respect to site safety, the



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Owner will be responsible solely for the on-site activities of its own employees and this responsibility will not be construed to relieve the Contractor from his obligations to maintain a safe project site.

### **1.07 SUBMITTALS**

The Contractor shall submit the following documents a minimum of five (5) days prior to the start of work:

1. All applicable permit/approval applications requested to perform the Work at the site. Copies of all approved permit/approval documentation shall be submitted to the Owner and the Consultant as they are received.
2. Spill Prevention Control and Countermeasures Plan
3. Health and Safety Plan - **FOR INFORMATION ONLY**

### **PART 2 - PRODUCTS**

Not used

### **PART 3 - EXECUTION**

Not used

### **PART 4 - MEASUREMENT AND PAYMENT**

No measurement shall be made of any work performed under this section. No separate payment shall be made for any work performed under this section. The cost of any work done or facilities provided under this section shall be included under other pay items within the Contract.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 01200**  
**PROJECT COORDINATION AND MEETINGS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. The Contractor shall be required to attend meetings prior to and during execution of the Work, or as necessary to facilitate the smooth and orderly execution of the Work. All meetings shall be held at a location designated by the Owner.
- B. The Contractor shall conduct daily site safety briefings as necessary for Contractor and Subcontractor employees working the site, in compliance with OSHA rules.
- C. All meetings with the Owner (or its representative) shall be attended by the Contractor's Superintendent and other personnel having authority to legally bind Contractor to issues discussed and resolved during the meetings. The Contractor's subcontractor(s) may also be required to attend such meetings. Subcontractor attendance shall be at the discretion of the Resident Engineer and/or the Owner.
- D. Formal meetings that require attendance by the Contractor are as follows:
  - 1. Pre-construction Conference
  - 2. Pre-construction Conservation Commission Meeting
  - 3. Weekly Progress and Coordination Meetings
  - 4. Final walkthroughs by Conservation Commissions or other regulatory bodies
  - 5. 'Punchlist' Meeting
  - 6. Closeout (Final Acceptance) Meeting
  - 7. Other Special Meetings

Such meetings may be scheduled before/after one or both of the project Phases.

- E. The Contractor shall be required to attend all meetings ordered or requested by representatives of regulatory agencies with jurisdiction over the site or any aspect of the work being performed at the site, either by the Contractor or others. Some meetings may be after hours.

**1.02 PRE-CONSTRUCTION CONFERENCE**

- A. The Contractor shall not commence Work at the Site until a pre-construction conference has been held at the Site or another mutually agreed on location at which representatives of the Contractor, Owner, and Engineer are present. The pre-construction conference(s) will be arranged by the Owner and is intended to establish lines of communication between the parties involved, establish project schedules, discuss proposed performance methods, and coordinate Work to be performed by subcontractors. The time and place of the pre-construction conference(s) shall be determined after the Contract has been executed by the Contractor and the Owner.

**1.03 REGULATORY MEETINGS**

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- A. The Contractor shall not commence Work at the Site until required meetings with all regulatory agencies have been completed. Such meetings will be held at the Site or another mutually agreed on location at which representatives of the Contractor, Owner, Engineer, and regulators are present. These meetings will be arranged by the Owner and are intended to establish lines of communication between the parties involved, establish project schedules, discuss proposed work to be performed, and restoration expectations. The time and place of the Regulatory meeting(s) shall be determined after the Contract has been executed by the Contractor and the Owner. A minimum of two such pre-construction regulatory meetings shall be assumed.
- B. Separate pre-completion meetings with Regulators, as per permit conditions, shall also be required. The Contractor shall attend all such meetings and correct all issues noted.

### 1.04 PROGRESS MEETINGS

- A. The Contractor and all Subcontractors shall be required to attend such Progress Meeting as deemed necessary by the Owner, Engineer, and/or Resident Engineer at the work site. The purpose of these meetings is to coordinate the efforts of all Contractors and to update the Owner, Engineer, and Resident Engineer with respect to progress, and resolve outstanding issues.
- B. **Meetings will be held at a time to be determined by the Owner and/or its Resident Engineer. These meetings shall generally be held once per week and shall be mandatory.**
- C. The Contractor shall be prepared to discuss progress, **planned resolutions to problems** and anticipated problems that could delay timely completion of the work. The Contractor shall bring to each meeting: updated schedule, daily work summaries, safety meeting minutes, weekly progress reports, and other pertinent information as requested by the Owner and/or its Engineer.
- D. The Engineer representative will record the meeting minutes and distribute them to the Contractor, Subcontractors, and attendees.
- E. The Contractor shall bring to each meeting for review a set of marked “as built” drawings showing any changes or deletions to the design.
- F. The Owner or Engineer may waive the Progress Meetings individually if appropriate.

### 1.05 PUNCHLIST MEETING

Upon substantial completion of the project, the Contractor shall attend a “punch list” meeting with the Resident Engineer and Owner. The purpose of this meeting shall be to discuss and list all items which require additional attention or work by the Contractor prior to final acceptance. A “punch list” memo will be produced by the Owner following this meeting and provided to the Contractor.

### 1.06 CLOSEOUT (FINAL ACCEPTANCE) MEETING

Upon resolution of all items listed on the “punch list”, the Contractor shall meet with the Owner and its Resident Engineer at the project site to verify completion such that the Owner can issue final

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acceptance. At this meeting the Contractor shall provide to the Owner all outstanding documentation, records, spares, maintenance items, or other information and materials.

### **1.07 SPECIAL MEETINGS**

- A. From time to time, the Contractor shall be required to attend Special Meetings on site as requested by the Resident Engineer and/or the Owner. The purpose of these meetings is to address Contractor and/or his Subcontractor's performance, schedule, change orders, modifications, alternatives, substitutions, safety, payment or other issues as they relate to the Work.
- B. Special meetings may also address issues regarding permits and permit conditions. The Contractor is referenced to the Permits issued by the various regulatory agencies for information regarding specific meeting requirements. Unscheduled meetings may also take place as part of site inspections or to deal with compliance issues.
- C. Some meetings may be scheduled after normal business hours for the purpose of permitting participation by stakeholders. Such meetings shall be at no additional cost to the Owner.

### **1.08 JOB SITE ADMINISTRATION**

- A. The Contractor shall keep a competent and authorized supervisory representative at the project location during all working hours who shall act as the agent of the Contractor. The supervisory representative's responsibilities shall include ensuring all issues/questions raised by the Engineer are addressed in a timely fashion.
- B. The supervisory representative shall be a competent, English-speaking superintendent capable of reading and thoroughly understanding the Drawings and Specifications, with full authority to fulfill the Contractor's duties and responsibilities on the job. If, in the opinion of the Owner, the supervisory representative, or any of his successors is incompetent, or otherwise not satisfactory, then the Contractor shall replace him upon written request by the Owner.
- C. The Contractor shall only employ competent workmen on the job who have received training applicable to the nature and extent of the work they are employed to perform. Whenever the Owner notifies the Contractor in writing that, in its opinion, any workman on the job, whether employed by the Contractor or any of his subcontractors, is incompetent, unfaithful, disorderly, or otherwise unsatisfactory, such workman shall be discharged from the contract Work and shall not be employed on it, except with the written consent of the Owner.

### **1.09 SUBMITTALS**

- A. Within five (5) days of the Notice to Proceed, the Contractor shall submit the names and contact information for the following persons involved with the Work of the Contract. Contact information shall include cell phone and home phone numbers and an e-mail address.
  - 1. Owner of Chief Executive of Prime Contracting Company
  - 2. Contractor's Project Manager
  - 3. Contractor's Site Superintendent
  - 4. Contractor's Safety Officer
  - 5. Contractor's Environmental Compliance Responsible Party

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### **PART 2 - PRODUCTS**

This Section Not Used

### **PART 3 - EXECUTION**

This Section Not Used

### **PART 4 - MEASUREMENT AND PAYMENT**

No measurement shall be made of any work performed under this section. No separate payment shall be made for any work performed under this section. The cost of any work done or facilities provided under this section shall be included under other pay items within the Contract.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 01300  
SUBMITTALS**

**PART 1 – GENERAL**

**1.01 DESCRIPTION**

- A. This section specifies the general requirements and procedures for preparing and transmitting data to the Consultant/Engineer and the Owner for information or review. Required submittals are specified herein as well as under applicable sections of the Contract Specifications.

**1.02 CONTRACTOR'S DRAWINGS**

- A. The Contract Drawings and these Specifications show the general arrangement and such details as are necessary to provide a description of the work to be performed.
- B. The Contractor shall prepare shop and working drawings, for temporary and permanent work as required under the applicable sections of the Contract Specifications, complete with all relevant calculations, descriptions, technical and performance data, as necessary to adequately perform the work. The Contractor shall take responsibility for such drawings and for the safe and successful construction of the work.
- C. Shop drawings shall be presented in a clear and thorough manner, drawn to scale, complete with respect to dimensions, design criteria, materials of construction, and like information to enable Consultant to review information as required.
- D. Sheet size: 8-1/2" x 11" or larger, as required. Typically, significant shop drawings shall be 24" x 36".

**1.03 CONSTRUCTION PROGRESS SCHEDULES**

- A. Submit three (3) copies of overall project schedule no later than five (5) working days after Notice to Proceed.
- B. The overall project schedule shall be prepared in Gantt chart format. The schedule shall identify all major work items or activities, including material procurement, and shall provide an estimate of start date, duration, completion date, and float (if any) for each item or activity. The schedule shall identify dependencies among work items or activities and project milestones.
- C. Submit revised schedules with each Application for Payment, identifying changes since the previous version, and indicating status of all work items or activities.

**1.04 SAMPLES**

- A. Submit samples as necessary and as stipulated within each individual section of these Specifications to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices.
- B. Any samples shall be clearly identified as to material, manufacturer, any pertinent catalog numbers, and use for which intended, and shall be of sufficient size and quantity to clearly illustrate

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

functional characteristics of item, with integrally related parts and attachment devices.

### **1.05 RELATED WORK SPECIFIED ELSEWHERE**

Required submittals are listed under the relevant Section of the Contract and Specifications. It shall be the Contractor's responsibility to read each Section and provide the submittal required therein.

### **1.06 CONTRACTOR RESPONSIBILITIES**

- A. Review shop drawings and samples prior to submission.
- B. Determine and verify:
  - 1. Field measurements.
  - 2. Field construction criteria.
  - 3. Catalog numbers and similar data.
  - 4. Conformance to specifications.
- C. Coordinate each submittal with requirements of work and of Contract Documents.
- D. Notify the Engineer and Owner in writing, at time of submission, of any deviations in submittals from requirements of Contract Documents. Any such deviations permitted by Owner will require modifications to the Contract Documents.
- E. Begin no fabrication or work which requires submittals until submittals have been approved by the Owner.

### **1.07 SUBMISSION REQUIREMENTS**

- A. Make submittals to the Owner promptly in accordance with approved schedule and in such sequence as to cause no delay in work. Allow ten (10) working days following receipt of submittal or resubmittal for review.
- B. At a minimum, submittals shall be provided to the Owner and to the Engineer.
- C. Shop Drawings: Shop Drawings shall be submitted as necessary to the Owner and/or the Engineer for review and comment for the limited purpose of checking for conformance with information given in the design concept expressed in the Contract Documents. Shop drawings shall be presented in a clear and thorough manner, complete with respect to dimensions, design criteria, materials of construction, and the like information to enable the Bureau and/or Engineer to review information as required. Sheet size shall be 8-1/2" x 11" or larger.
- D. In general, electronic (\*.pdf) format submissions are acceptable in lieu of multiple paper copies. Requirements for the number of copies may be contained in the specific Specification sections. Additional copies may be required as per the Supplementary General Conditions.
- E. In addition, submittals shall contain:
  - 1. Date and number of submission.
  - 2. Project title and number.
  - 3. Names of:

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- a. Contractor
- b. Manufacturer/Supplier
4. Identification of product, with specification section number.
5. Field dimensions, clearly identified as such.
6. Relation to adjacent or critical features of work or materials.
7. Applicable standards, such as ASTM or other applicable federal or state regulations.
8. Identification of deviations from Contract Documents.
9. Identification of revisions on re-submittals.
10. Calculations and drawings certified and stamped by a Professional Engineer licensed in the Commonwealth of Massachusetts, if required.

Each submittal shall be numbered. The numbering system shall utilize the Section number to which the submittal pertains and then a sequential number designating the order of the submittal for that Section. For instance, the first submittal applying to Earthwork shall be numbered as 02200-1. The second submittal applying to Earthwork shall be numbered as 02200-2.

- F. Resubmission Requirements: Make any corrections, additions and/or changes in submittals required by the Owner and re-submit revised editions. Revised submittals shall be designated with a revision number. For instance, the first revision to the second Earthwork submittal shall be numbered as 02200-2 rev. 1.

### 1.08 CERTIFICATES

- A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor.
- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certificates as appropriate.
- C. Certificates may be recent or previous test results on material or Product but must be acceptable to the Owner.

### 1.09 DISTRIBUTION

- A. The Contractor will distribute submittals to concerned parties as appropriate. Promptly report any inability to comply with revisions. At a minimum, the submittals shall be provided to the Owner, and the Engineer.

### 1.10 ENGINEER DUTIES

- A. The Engineer will review submittals only for general conformance to design concept of project and compliance with information given in Contract Documents. Review shall not extend to means, methods, sequences, techniques or procedures of performing the Work or to safety precautions or program incident thereto. Review of a separate item as such will not indicate approval of assembly in which item functions.
- B. The Engineer will return submittals to the Owner with the Engineer's written opinion as to the general conformance of the submittal with the Contract Documents. The Owner will then return the submittal to the Contractor for distribution or for resubmission, if required by the Contract Documents and/or due to the Engineer's opinion of their non-compliance and/or incompleteness. The Engineer will respond to all submittals within ten (10) working days from the date of receipt.



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Re-submittals required as a result of Engineer's review and comment shall be re-submitted promptly by the Contractor. Work shall not commence until all submittals related to it are submitted and accepted

- C. The Engineer's review of submittals shall not relieve Contractor from responsibility for any deviations from Contract Documents unless Contractor has, in writing, called attention to such deviation at time of submission and has received written concurrence pursuant to Contract Documents to specific deviation, nor shall any concurrence in submittals.

### 1.11 OWNER DUTIES

- A. The Owner will receive comments from the Engineer and return the submittal to the Contractor.
- B. The Owner will have the final authority to judge the adequacy of the Contractor's submittal and shall have final authority for approval or rejection.

### 1.12 ANTICIPATED SUBMITTALS PRIOR TO INITIATION OF WORK

The following is a listing of the submittals anticipated under the Specification sections herein. All of the following submittals shall be made within five (5) working days after the Notice to Proceed and or at least 10 days prior to the initiation of relevant work, unless stricter requirements are specified in the respective Specification sections.

Refer to individual Specification sections for further details regarding the content of each submittal, or other submittals not itemized below but required as per the Contract Specifications, to be provided prior to the initiation of work.

<b>Specification Section</b>	<b>General Submittal Description</b>	<b>Submission Schedule</b>
01055	Registered Land Surveyor Credentials	Within 5 days of NTP
01055	Draft and Final As-Built Drawings	At completion of project, prior to final payment
01060	Applicable Permit Approvals obtained by Contractor	>5 days prior to start of Work
01060	Spill Prevention Control and Countermeasures Plan	>5 days prior to start of Work
01060	Site Specific Health and Safety Plan	>5 days prior to start of Work
01200	Contact Information for Contractor Staff	Within 5 days of NTP
01200	Project Schedule and Schedule Updates	Within 5 days of NTP, weekly updates
01436	Pre-Construction Survey	Within 15 days of NTP
01436	Vibration and Movement Monitoring Plan	>15 days prior to start of Work
01436	Post-Construction Survey	At completion of project, prior to final payment
01500	Description of Temporary Facilities	>10 days prior to bringing facilities on-site
01560	Temporary Sedimentation and Erosion Control Plan	>10 days prior to start of on-site Work
01565	Temporary Surface Water Control Plan	>10 days prior to start of Work
01565	Temporary Dewatering and Groundwater Control Plan	>10 days prior to start of dewatering work

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Specification Section	General Submittal Description	Submission Schedule
01565	Flood Contingency Plan	>10 days prior to start of Work
01570	Temporary Site Access and Traffic Control Plan	>10 days prior to start of Work
01740	Site Restoration Methods and Materials (as needed)	>10 days prior to start of related Work
02065	Demolition Work Plan	>10 days prior to start of Work
02065	Disposal Facility Information	>10 days prior to start of Work
02065	Temporary Earth Support Plans (if necessary)	>10 days prior to start of related Work
02110	Clearing, Grubbing, and Stripping Plan	>10 days prior to start of Work
02170	Temporary Cofferdam Work Plan	>14 days prior to start of Work
02170	Flood Control Plan	>14 days prior to start of Work
02200	Sieve Results for On-Site and Off-Site Materials	>10 days prior to start of related Work
02200	Test Pit and Vault SOE Work Plan	>10 days prior to start of related Work
02200	Earthwork Work Plan	>10 days prior to start of related Work
02200	Source of Imported Off-Site Fill	>10 days prior to start of related Work
02200	Temporary Earth Support Plans (if necessary)	>10 days prior to start of related Work
02200	Soil Disposal Location (off-site)	>10 days prior to start of related Work
02200	Independent Materials Testing Laboratory Information	Within 2 weeks of NTP, but >10 days prior to start of related Work
02270	Proposed Quarry and Stone Information	2 weeks prior to delivery of stone material to the site
02270	Gradations of Proposed Stone and Riprap	2 weeks prior to delivery of stone material to the site
02444	Chain Link Fence and Gate Product Data, Installation Procedures, Details and Work Plan	>10 days prior to start of Work
02525	Bituminous Asphalt Plant Information, Testing, Schedule and Methods, and Layout	>10 days prior to start of Work
02525	Bituminous Asphalt Test Results	Maximum of 10 days following paving
02832	Contractor Qualifications demonstrating experience with Retaining Wall Design	2 weeks prior to delivery of material to the site
02832	MSE Wall Design Calculations, Shop Drawings, Product Info and Samples, and Manufacturer Standards	2 weeks prior to delivery of material to the site
02832	Precast Gravity Wall Design Calculations, Shop Drawings, Product Info and Samples, and Manufacturer Standards	2 weeks prior to delivery of material to the site
02930	Product Information for Revegetation	>10 days prior to start of related Work

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Specification Section	General Submittal Description	Submission Schedule
02930	Soil Chemistry Test Results for On-Site and Off-Site Loam/Topsoil	>10 days prior to start of related Work
03300	Rebar Certifications and Shop Drawings	> 14 days prior to beginning or relevant work
03300	Concrete Mix Design, Testing, Certifications, Product Data	> 14 days prior to beginning or relevant work
03300	Concrete General Procedures	2 weeks prior to start of work involving concrete
03305	Concrete Independent Testing Service Qualifications, Experience, and Certifications	>10 days prior to start of related Work
03346	Concrete Finishing, Curing and Repair Product Data and Procedures	>10 days prior to start of related Work
03346	Contractor Qualifications demonstrating experience with Concrete Flatwork Finish	>10 days prior to start of related Work
03605	Precast Vault Structure Shop Drawings, Product Data, and Materials	>10 days prior to start of fabrication
04510	Contractor Qualifications demonstrating experience with Repointing Masonry	> 10 days prior to beginning or relevant work
04510	Repointing Masonry Work Plan	> 10 days prior to beginning or relevant work
05730	Aluminum Handrail and Railing Product Data, Shop Drawings, and Installation Procedures	>10 days prior to start of Work
11288	Pneumatic Gate Structural Calculations, Shop Drawings, Anchor Bolt Plan, Installation and Procedure Plan, and Manufacturer Warranty	2 weeks prior to final release for fabrication of pneumatic crest gate to manufacturer
14321	Portable Crane and Hoist Shop Drawings, Details and Manufacturer's Product Data	>10 days prior to start of related Work
16100	Site Electrical Circuit Diagrams and Plans, Shop Drawings, and Product Data,	2 weeks prior to start of work
16100	Contractor Qualifications demonstrating experience with Electrical Design and Installation	2 weeks prior to start of work
16550	Lighting Product Data and Components	>10 days prior to ordering materials

### 1.13 SUBMITTALS DURING THE PERFORMANCE OF THE WORK

- A. During the performance of the Work, the Contractor shall submit progress reports, as requested by the Owner or Engineer. Progress reports shall be submitted at the beginning of (or before) progress meetings (Section 01200 - Project Coordination and Meetings). Such reports shall contain:
1. A summary of Work activities occurring during the period covered by the report.
  2. The type of materials and/or major equipment being installed by the Contractor and the total number of employees working in each category on that particular day.

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3. The names of the subcontractors working and the type of materials and/or major equipment being installed by each together with the total number of employees working for each subcontractor on that particular day.
4. The excavation, compaction, and other equipment being used by the Contractor and each subcontractor.
5. A discussion of problems encountered and corrective actions taken.

### 1.14 REVIEW OF SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- A. The review of shop drawings, data and samples will be done by the Engineer for general conformance with the design concept and Contract Documents. They shall not be construed:
  1. as permitting any departure from the Contract requirements;
  2. as relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;
  3. as approving departures from details furnished by the Engineer, except as otherwise provided herein.
- B. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.
- C. If the shop drawings, data or samples as submitted describe variations and show a departure from the Contract requirements which the Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or Contract Time, the Engineer may return the reviewed drawings without noting an exception.
- D. Submittals will be returned to the Contractor under one of the following codes:

Code 1 – “REVIEWED” – This code is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment material for manufacture.

Code 2 – “REVIEWED AS NOTED” – This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.

Code 3 – “REVIEWED AS NOTED/RESUBMISSION REQUIRED” - This combination of codes is assigned when a confirmation of the notations and comments IS required by the Contractor. The Contractor may, at his own risk, release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the Engineer within 15 calendar days of the date of the Engineer’s transmittal requiring the confirmation.

Code 4 – “REVISE AND RESUBMIT” - This combination of codes is assigned when notations and comments are extensive enough to require a re-submittal of the package. This

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re-submittal is to address all comments, omissions and non-conforming items that were noted. Re-submittal is to be received by the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the re-submittal.

Code 5 – “REJECTED”- This code is assigned when the submittal does not meet the intent of the Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different product to meet the intent Contract Documents.

Code 6 – “COMMENTS ATTACHED” – This code is assigned where there are comments attached to the returned submittal which provide additional data to aid the Contractor.

Code 7 – “RECEIPT ACKNOWLEDGED” - This code is assigned to acknowledge receipt of a submittal that is not subject to the Engineer's review and approval; and, is being filed for informational purposes only.

Codes 1 through 5 designate the status of the reviewed submittal with Code 6 showing there has been an attachment of additional data.

- E. Re-submittals will be handled in the same manner as first submittals. On re-submittals the Contractor shall identify all revisions made to the submittals, either in writing on the letter of transmittal or on the shop drawings by use of revision triangles or other similar methods. The re-submittal shall clearly respond to each comment made by the Engineer on the previous submission. Additionally, the Contractor shall direct specific attention to any revisions made other than the corrections requested by the Engineer on previous submissions.
- F. Partial submittals may not be reviewed at the discretion of the Engineer; the Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Contractor and will be considered "REJECTED" until resubmitted. The Engineer may at his option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.
- G. Repetitive Review
  - 1. Re-submissions of shop drawings and other submittals will be reviewed no more than once at the Owner's expense. At the Owner's discretion, all subsequent reviews will be performed at times convenient to the Engineer and at the Contractor's expense, based on the Engineer's then prevailing rates. The Contractor shall reimburse the Owner for all such fees invoiced to the by the Engineer. Submittals are required until approved.
  - 2. Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Time.
- H. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the Engineer at least 7 working days prior to release for manufacture.
- I. When the shop drawings have been completed to the satisfaction of the Owner/Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

### 1.15 SUBSTITUTIONS

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Whenever a product, material or item of equipment is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, followed by the phrase “or equivalent” or “or equal,” the specific item mentioned shall be the basis upon which bids are to be prepared, and shall be understood as establishing the type, function, dimension, appearance and quality desired. Other manufacturer's or vendor's products not named will be considered as substitutions, provided the required information is submitted in the manner set forth in this section and provided the substitution will not require substantial revision to the Contract Documents.

- A. For Products specified only by reference standard, select product meeting that standard, by any manufacturer.
- B. For Products specified by naming several products or manufacturers, select any one of products and manufacturers named which complies with Specifications.
- C. For Products specified by naming one or more products or manufacturers and stating “or equivalent” or “or equal,” submit a request as for substitutions, for any product or manufacturer which is not specifically named.
- D. For Products specified by naming only one product and manufacturer, there is no option and no substitution will be allowed.
- E. Submit separate request for each substitution. Support each request with:
  - 1. Itemized comparison of the proposed substitution with product specified; List significant variations. Substitution shall not change design intent and shall perform equal to that specified.
  - 2. Accurate cost data comparing proposed substitution with product specified.
    - a. Amount of any net change to Contract Sum.
- F. Substitutions will not be considered for acceptance when:
  - 1. They are indicated or implied on shop drawings or product data submittals without a formal request from Contractor.
  - 2. They are requested directly by a subcontractor or supplier.
  - 3. Acceptance will require substantial revision of Contract Documents.
- G. In making formal request for substitution, Contractor represents that:
  - 1. He/she has investigated proposed product and has determined that it is equal to or superior in all respects to that specified.
  - 2. He/she will provide same warranties or bonds for substitution as for product specified.
  - 3. He/she will coordinate installation of accepted substitution into the Work and will make such changes as may be required for the Work to be complete in all respects.
  - 4. He/she waives claims for additional costs caused by substitution which may subsequently become apparent.
  - 5. Cost data is complete and includes related costs under his Contract, but not:

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

- a. Costs under separate contracts.
- b. Engineer's costs for redesign or revision of Contract Documents.

### **PART 2 – PRODUCTS**

This Section Not Used

### **PART 3 - EXECUTION**

This Section Not used.

### **PART 4 - MEASUREMENT AND PAYMENT**

No measurement shall be made of any work performed under this section. No separate payment shall be made for any work performed under this section. The cost of any work done or facilities provided under this section shall be included under other pay items within the Contract.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 01436**  
**VIBRATION AND MOVEMENT LIMITS AND MONITORING**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

- A. The work of this Section includes providing and protecting vibration and movement monitoring equipment, benchmarks, deformation monitoring points, crack monitors, and other monitoring equipment that are existing or installed as required by the Contract Documents. Vibration monitoring, crack gauge monitoring and deformation monitoring will be critical in monitoring the response of the buildings adjacent to the work at 4 Bay Road (Lamprey Falls LLC), 6 Bay Road (Bryant Rock LLC), and 53 Main Street (Durham Book Exchange), monitoring of the underground propane tanks adjacent to the work, and assessing the Contractor performance during the rehabilitation work at Macallen Dam.
- B. Pre-construction and post-construction inspection surveys of existing conditions of each dams and other existing structures, utilities, and facilities within 150 feet of the proposed Work or as otherwise directed by the Engineer or Owner. Narrated color videos and/or captioned photographs of existing conditions, performed by an independent specialist specializing in similar work, shall be incorporated into the pre- and post-construction surveys.
- C. The Contractor shall notify the Resident Engineer, Engineer, and the Owner prior to conducting any vibration producing activity and prior to conducting appropriate monitoring at nearby structures in accordance with the plan prepared by the Contractor's independent specialist and approved by the Engineer.
- D. The Contractor shall engage an independent specialist to provide and install settlement and/or deformation monitoring points and crack monitors on or in existing structures, including, the manhole rims of the underground propane tanks. The Contractor shall also set up seismographs between the concrete outlet structure work and the 6 Bay Road (Bryant Rock LLC) residential structure, the 4 Bay Road (Lamprey Falls LLC) structure, the 53 Main Street (Durham Book Exchange) structure, the underground propane tanks, and any additional structures and/or utilities requested by the Resident Engineer, Engineer, and/or Owner.
- E. The work specified under this Section includes conducting all activities on the project in such a manner that damage is prevented to the dam, adjacent structures, facilities, utilities, equipment, property and work; and such that ground vibrations and ground and structure displacements are consistently maintained below the maximum levels as specified within this Section.

**1.02 EXISTING CONDITIONS**

- A. The Contractor's attention is called to the fact that the project is a dam site. A higher standard of construction practices and quality is required for work on and around a dam. Typical construction practices may require modification or adjustment to meet dam construction standards. In addition, additional care is required since the consequences of construction mishaps could extend beyond the project site were a dam failure to result. Special care and precautions shall be undertaken to protect the dam, as well as other structures and utilities, within and nearby the Work.



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- B. The Contractor's attention is called to the fact that 4 Bay Road (Lamprey Falls LLC) and 6 Bay Road (Bryant Rock LLC) structures are located adjacent to the existing gate outlet structure, which is to be demolished and reconstructed.
- C. The Contractor shall review the historic drawings of the dam to be fully informed on all existing conditions and limitations as they apply to this work and its relation to other construction work.
- D. Cracks in the dam and adjacent structures that require crack gauge monitoring will be mutually identified by the Contractor, Engineer and the Owner during the preconstruction survey.

### **1.03 RELATED WORK**

- A. Submittals – Section 01300
- B. Site Restoration – Section 01725
- C. Saw Cutting, Dismantling, Demolition, and Removal of Existing Structures – Section 02065
- D. Earthwork – Section 02200

### **1.04 SUBMITTALS**

- A. Pre- and Post-Construction Surveys
  - 1. Within 15 days of Notice to Proceed, submit the qualifications and professional resumes of the Registered Professional Engineer(s) that will perform the pre- and post-construction inspection at the site. Include a list of projects that includes project name; location; date(s); names and current contact information for owner, engineer and general contractor.
  - 2. Submit Draft Reports for the pre- and post-construction surveys to the Owner:
    - a. Original, plus three (3) copies of the pre-construction survey report for each building, with captioned photographs and narrated videos shall be submitted. The Contractor shall retain one (1) additional copy for their records.
    - b. Make any changes or corrections to the Draft Report required by the Owner or the Engineer.
    - c. Draft pre-construction survey reports shall be submitted 14 days before any construction related activity within one hundred feet (100') of a structure or facility designated to be surveyed, but no later than within 60 days of Notice to Proceed.
  - 3. Submit Final Reports for the pre- and post-construction surveys to the Owner:
    - a. After review, submit five (5) copies of the approved report; four copies and the original. The Contractor shall retain one (1) additional copy for their records.
- B. Vibration and Movement Monitoring

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1. No less than 15 days prior to beginning of construction work at Macallen Dam, submit qualifications for the independent specialist whose services have been selected by the Contractor for performing the vibration and movement monitoring work demonstrating at least 5 similar assignments completed successfully during the last 5 years.
2. Submit a monitoring plan prepared by the independent specialist prior to starting this work at Macallen Dam. The monitoring plan shall include proposed locations of deformation monitoring points (DMPs), surface monitoring points (SMPs), crack monitors, and seismographs; reading schedules; threshold and limiting values.
3. Shop drawings and manufacturer's data for the following:
  - a. Seismographs.
  - b. Crack monitors, providing material properties including coefficient of thermal expansion.
  - c. Epoxy adhesive to be used to install crack monitors.
  - d. Deformation and Surface Monitoring Points.
4. Submit samples of crack monitor, crack measuring scale, and crack movement recording form.
5. Within 5 days of installing DMPs, SMPs, and crack gages, provide drawings showing plan locations, nearby features and a graphic scale. For crack gages, DMPs, and SMPs on the dam and adjacent structures, provide elevation sketches showing distances above existing grades, dam features, descriptions of mounting surfaces and graphical scales.
6. Submit the results of deformation and surface monitoring, crack monitors, and vibration monitoring in the format and at a frequency as specified herein.
7. Prepare and submit a response plan if Threshold or Limiting values are exceeded in a format and at a frequency as specified herein.
8. Submit at least 30 days before instrumentation removal, a detailed step-by-step procedure for post-construction instrumentation removal and associated restoration.

### 1.05 QUALITY ASSURANCE

#### A. Qualifications

1. Vibration monitoring shall be conducted by persons trained in the use of a seismograph and records shall be analyzed and results reported by persons familiar with analyzing and reporting the frequency content of a seismograph record. Vibration monitoring shall be performed during demolition of the gate outlet structure, installation of the support of excavation components associated with the new gate operating vault structure, and earthwork along the right embankment and

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

any other construction activities within 150 feet of adjacent structures and the underground propane tanks.

2. Persons responsible for pre-construction surveys shall be Professional Engineers, registered in the State of New Hampshire, and shall have had a minimum of 5 years of professional experience in structural evaluation and conditions surveys.
3. Deformation point survey readings shall be made by a Land Surveyor licensed in the State of New Hampshire.

### 1.06 MOVEMENT AND VIBRATION LIMITS

- A. The Contractor shall limit vibrations from construction operations to prevent damage to the existing dam, new work, adjacent structure, facility, utility or other feature near the site. The Contractor or his independent specialist is solely responsible to determine the limiting and maximum vibration values tolerable at each facility.

1. The Threshold maximum peak particle velocities are:

<u>Frequency (Hz)</u>	<u>Max. Peak Particle Velocity (inch/sec.)</u>
Over 40	1.0
30 to 40	0.75
20 to 30	0.5
Less than 20	0.25

2. The Limiting maximum peak particle velocities are:

<u>Frequency (Hz)</u>	<u>Max. Peak Particle Velocity (inch/sec.)</u>
Over 40	2.0
30 to 40	1.5
20 to 30	1.0
Less than 20	0.5

- B. Maximum movements at DMPs and SMPs installed on the dam, training walls, or adjacent structures shall not exceed the following as a result of demolition and reconstruction of the outlet structure, excavation, or other activities of the Contractor:

1. Threshold limit, total maximum displacement of 0.1 inch; and
2. Limiting value, total maximum displacement of 0.15 inch.

- C. Maximum new crack width or increase in existing crack width along the dam, training walls, or adjacent structures shall not exceed the following as a result of the construction activities of the Contractor:

1. Threshold limit, maximum crack opening of 0.006 inch; and

2. Limiting value, maximum crack opening of 0.008 inch.

## **PART 2 PRODUCTS**

### **2.01 CRACK MONITORS**

- A. Crack monitors shall consist of two overlapping plexiglass acrylic plates. The bottom plate shall be white with a black two-way measurement grid in millimeters. The upper plate shall be clear with red crosshairs. The measurement grid shall be such that it allows readings to the nearest 0.01 inch (0.25 mm) and can accommodate movements of 0.75 inch (20 mm) along the length of the monitor and 0.4 inch (10 mm) across the width.
- B. Provide crack monitor with removable tape to hold cross hairs in position centered on measurement grid until monitor is securely installed.
- C. Provide two component gel-type fast-setting epoxy for installation of crack monitors. The epoxy shall have a minimum lap shear strength of 2000 psi and shall be formulated for the placement conditions.
- D. Provide a minimum of two crack width scales capable of measuring cracks to the nearest 0.10 millimeter (4 mils).
- E. Provide recording sheets supplied by the manufacturer and designed to facilitate recording of movement of the crack monitors.

### **2.02 DEFORMATION MONITORING POINTS (DMPs) & SURFACE MONITORING POINTS (SMPs)**

- A. Type 1 monitoring points shall consist of either a 2-inch long “PK” masonry nails with identification tags or an inscribed marking identified with survey marking paint. The identification tags for “PK” nails shall be 1.5 inches in diameter and 3/32-inch-thick with a punched number for identification. Type 1 monitoring points shall typically be installed into paved surfaces or on manhole rims.
- B. Type 2 Monitoring points shall consist of 3/8-inch (0.375”) diameter by minimum two-inch (2”) long, stainless steel, socket head cap screws ASTM A307-UNC with stainless steel washers, screwed into 3/8-inch (0.375”) machine screw anchors such as Concrete Machine Screw Anchors from Concrete Fastening Systems of Cleveland, Ohio, or an approved equal. Where removal and patching are not required after construction, the bolts may be installed with epoxy or polyester adhesive in lieu of tamp-in screw anchors. Type 2 Monitoring points shall typically be installed into vertical surfaces of buildings and structures.
- C. Type 3 Monitoring points shall consist of 3/8-inch (0.375”) diameter by two-inch (2”) long punch-marked stainless-steel round-head bolts screwed into a 3/8-inch (0.375”) machine screw anchors such as a Concrete Machine Screw Anchor from Concrete Fastening Systems of Cleveland, Ohio, or an approved equal. Where removal and patching are not required after construction, the bolts may be installed with epoxy or polyester adhesive in lieu of tamp-in screw anchors. Type 3 Monitoring points shall typically be installed into horizontal surfaces of buildings and structures.

**2.03    VIBRATION MONITORING INSTRUMENTATION**

- A.    Provide seismographs for full time use on the Macallen Dam during construction operations which have been calibrated within the previous 12 months prior to the start of construction, to a standard, which is traceable to the National Bureau of Standards. Required characteristics of seismographs are listed below:
  - 1.    Measure the three mutually perpendicular components of particle velocity in directions vertical, radial and perpendicular to the vibration source.
  - 2.    Measure and display the maximum peak particle velocity component.
  - 3.    Furnish a permanent record of a velocity/time waveform, on a strip chart or from magnetic tape.
  - 4.    Have a flat velocity frequency response with a minimum broad band of 2 Hz to 200 Hz with a tolerance equal to or better than plus or minus 10 percent.
  - 5.    Seismographs shall be capable of recording vibration levels from 0.02 to 10 inches per second.
  - 6.    Seismographs shall have the capability for real-time data generation and review.

**PART 3 - EXECUTION**

**3.01    GENERAL**

- A.    In addition to that specified herein, the Contractor may install and monitor instrumentation he/she deems necessary to ensure performance of the Work in accordance with the Contract Documents.
- B.    The intent of the monitoring program is intended to provide pre-construction baseline data for comparison with construction data and post-construction data to determine whether any utilities, facilities, or structures have been adversely affected by construction activities, and to provide warning of pending conditions that could require remedial measures or alternative construction approaches.
- C.    No work shall be conducted by the Contractor that may result in vibrations or deformation/settlement, as determined by the Owner or Engineer, until all instrumentation has been installed, initialized, and a series of suitable baseline readings have been recorded.
- D.    The Contractor shall:
  - 1.    Provide components of instrumentation to be installed during construction.
  - 2.    Install instruments
  - 3.    Collect baseline readings.

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4. Protect and maintain all instruments, including any existing instruments or benchmarks shown on the Contract Drawings.
  5. Collect, reduce and plot data from both the new instruments installed as part of this contract and existing instruments identified on the Contract Drawings.
  6. Implement remedial measures based on interpretations of the monitoring program data by the Engineer, at no additional cost to the Owner, as required.
  7. Remove instruments at the end of the construction and restore the site of instrumentation locations unless otherwise directed by the Resident Engineer, Engineer or Owner.
- E. The Engineer may provide, install and monitor additional instrumentation at the sites as an independent check of the Contractor's supplied instrumentation. The Contractor shall not rely upon any instrumentation supplied or installed by the Engineer to satisfy the requirements of this Section. The Contractor shall coordinate their Work with the Engineer and provide safe access by the Engineer at all times.

### **3.02 PRE-CONSTRUCTION SURVEY**

- A. Prior to starting work, the Contractor, the Engineer, the Resident Engineer, and the Owner shall make a joint inspection of the existing structures within 150 ft of the work area, specifically portions of the 6 Bay Road (Bryant Rock LLC) residential structure, the 4 Bay Road (Lamprey Falls LLC) structure, and the 53 Main Street (Durham Book Exchange) structure, which fall within the 150 ft of the work area, as well as the underground propane tanks, to examine and document their present conditions.
- B. The survey shall consist of a description of interior and exterior conditions. Descriptions shall locate cracks, damage or other defects existing and shall include information to make it possible to determine the effect, if any, of the construction operations on the defect. Where significant cracks or damage exists, or for defects too complicated to describe in words, photographs shall be taken and made part of the record. Photographs shall be taken to record any cracks or other evidence of structural distress in the structure. Crack monitor locations shall be identified during the pre-construction survey.
- C. Baseline survey readings of structure elevations, monitoring point plan location, crack location documentation, and the placement of crack monitors shall be performed prior to the start of construction activity. All readings shall be referenced to one benchmark, sufficiently remote as to be unaffected by any construction activity.
- D. The Contractor shall prepare a report for each structure documenting all pre-existing conditions, verified by the photographs, and signed by the personnel participating in the investigation and, if practicable, by the Owner, whether or not they are present at the examinations.

### **3.03 CRACK MONITORING INSTRUMENTATION**

- A. Crack monitors shall be installed at existing cracks or construction joints at Macallen Dam and on existing structure within 150 ft of the work area, specifically portions of the 6 Bay Road (Bryant Rock LLC) residential structure, the 4 Bay Road (Lamprey Falls LLC)

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structure, and the 53 Main Street (Durham Book Exchange) structure. The actual location of Crack Monitors will be mutually agreed upon by the Owner, the Contractor, and the Engineer after the Pre-Construction Survey. Additional crack monitors shall be provided by the Contractor at the request of the Resident Engineer during the performance of the work. Installation shall follow the manufacturer's recommendations and the following requirements.

- B. Crack gauges shall be installed prior to construction and at least three rounds of baseline readings shall be obtained prior the start of construction.
- C. Install crack monitor parallel with the axis of the member, not perpendicular to the crack. On walls, install the long axis of the crack monitor horizontally. Verify that the red crosshairs are in the zero position prior to installation.
- D. Install crack monitors with epoxy adhesive. Clean the concrete or masonry surface to bare and sound material removing any paint or other substance that may interfere with proper bonding of the epoxy adhesive.
- E. After the epoxy adhesive has cured the manufacturer's recommended time period, remove the tape holding the two plates of the monitor in position.
- F. Mark each crack monitor with a reference number, in coordination with the Engineer, with paint or other permanent marking. Record the number and location on a plan of the structure including the elevation.
- G. Record the crack width at the time of crack monitor installation to the nearest 0.10 millimeter (4 mils) on the crack monitor sheet. Record the ambient temperature on the crack monitor sheet.
- H. The Contractor must protect the crack gauge during construction. Crack gauges shall be replaced if damaged.

### 3.04 VIBRATION MONITORING

- A. The Contractor shall monitor peak particle velocities using a minimum of two seismographs operated by personnel trained in their use during all construction activities where vibrations may be generated having the potential to cause damage to existing structures or features. Continuous vibration monitoring will be specifically required during demolition of the gate outlet structure and earthwork along the right embankment at Macallen Dam. Seismograph locations shall be mutually agreed upon by the Engineer, Resident Engineer and the Contractor.
- B. During demolition of the gate outlet structure and installation of the vault SOE, at least one seismograph shall be located between the work and the structure at 4 Bay Road (Lamprey Falls LLC) and at least one seismograph shall be located between the work and the underground propane tanks while the demolition is occurring. The Contractor shall make allowances for the seismographs to be moved closer to/away from the existing structure as the work progresses and the conditions warrant such action.
- C. During earthwork and construction along the right abutment, at least one seismograph shall be located between the work and the structure at 53 Main Street (Durham Book Exchange)

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while the work is occurring. The Contractor shall make allowances for the seismographs to be moved closer to/away from the existing structure as the work progresses and the conditions warrant such action.

- D. The Resident Engineer or the Engineer may direct that additional vibration monitoring be performed elsewhere at Macallen Dam, during operations other than demolition of the gate outlet structure (e.g. rock or boulder excavation) if conditions warrant such action.

### **3.05 DEFORMATION AND SURFACE MONITORING**

- A. A minimum of ten (10) DMPs (Type 3) shall be provided prior to the start of work at the left abutment wall. The DMPs shall be installed on the structures at 4 Bay Road (Lamprey Falls LLC) and 6 Bay Road (Bryant Rock LLC). Locations shall be proposed by the Contractor and approved by the Resident Engineer prior to the start of work.
- B. A minimum of ten (10) DMPs (Type 3) shall be provided prior to the start of work at the right abutment wall. The DMPs shall be installed on the structures at 53 Main Street (Durham Book Exchange). Locations shall be proposed by the Contractor and approved by the Resident Engineer prior to the start of work.
- C. A minimum of three (3) SMPs (Type 1) shall be provided prior to the start of work at the left abutment wall. The SMPs shall be installed on each manhole rim for each underground propane tank, as identified on the Contract Drawings.
- D. The Contractor shall document the as-installed location with a scaled sketch showing the installed location of each SMP and DMP.
- E. Additional SMPs and DMPs may be requested by the Resident Engineer or Engineer.

### **3.06 MONITORING FREQUENCY**

- A. Vibration monitoring shall be performed continuously during all demolition and construction activities at the Macallen Dam. Continuous monitoring may be automated provided that notification alerts are sent electronically to the Owner and Engineer.
- B. Deformation, surface, and crack monitoring shall be performed weekly when construction activities are outside 100 feet from a monitored structure, and daily when within 100 feet of a monitored structure.
- C. When construction activities are within 20 feet of a monitored structure, crack monitoring and deformation monitoring may be conducted several times during the day, as directed by the Engineer and/or Resident Engineer or the Contractors independent specialist.

### **3.07 REPORTING REQUIRMENTS**

- A. The Contractor must submit reports of vibration, surface, and deformation monitoring to the Owner by the end of the next day after monitoring has been performed. Reports shall include cumulative data for deformation and crack monitoring readings, in order to illustrate possible trends in data.



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- B. The Contractor shall be notify the Owner and Engineer immediately if any vibration, surface, deformation, or crack monitor readings exceed the Threshold or Limiting values specified herein.

### **3.08 INSTRUMENTATION RESPONSE ACTIONS**

- A. If the Threshold limits of vibration, crack width, or movement are exceeded, the Contractor shall alter their activities to prevent the Limiting values from being exceeded. The Contractor shall submit to the Owner, within 24 hours of the exceedance, a submittal indicating the activity causing the exceedance and the steps the Contractor has taken and will take to prevent further exceedances of the Threshold limit.
- B. If the Limiting values of vibration, crack width, or movement are exceeded, all work by the Contractor in the vicinity of the exceedance shall stop immediately until a meeting takes place between the Contractor, the Owner and the Engineer to assess the cause of the exceedance. The Contractor shall prepare and submit to the Owner a description of the activity that caused the exceedance and the steps/modifications the Contractor will take to prevent further exceedances of the Limiting value that was exceeded. No work in the vicinity of the exceedance shall be restarted until the submittal is reviewed and approved by the Owner and the Engineer.
- C. The Contractor shall be completely responsible for repairing all damages resulting from vibrations and deformation caused due to the construction operations and shall, as a minimum, take whatever measures are necessary to maintain vibrations and deformations within the specified limits. Modifications to construction methods required to meet these requirements shall be undertaken at no additional cost to the Owner.

### **3.09 POST-CONSTRUCTION SURVEY**

- A. Within 30 days after completion of all work at Macallen Dam, perform an examination similar to the pre-construction survey. The post-construction survey and inspection shall include all areas and items inspected in the pre-construction survey, and shall also include properties, buildings, sites, and structures where written or verbal complaints of damage have been received, or damage claims have been filed. A minimum of 72-hour notice shall be given to the Owner, Resident Engineer, Engineer and all interested parties so that they may be present during final examination.
- B. The post-construction survey shall include all areas included in the pre-construction survey, with photographs and videos taken from the same viewpoints, plus areas of where additional damage or distress is noted or where complaints of such have been received by the Owner, Engineer or Contractor.
- C. Records of the final examination shall be distributed in the same manner as the original pre-construction survey

**PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 01500**  
**TEMPORARY FACILITIES & CONTROLS**

**PART 1 - GENERAL**

1.01 SCOPE

- A. This Section includes requirements for temporary facilities and controls including, but not necessarily limited to, sanitary facilities, utilities, drinking water, temporary field offices, and working hours.
- B. All temporary facilities required by the Contractor as specified herein and elsewhere within the Contract Documents shall be furnished by the Contractor, and shall meet all federal, state and local codes and requirements for such temporary installations. All temporary facilities shall be provided and maintained so as not to create fire or safety hazards. Costs necessary to satisfy all requirements specified herein shall be borne by the Contractor. All temporary facilities shall be entirely removed upon completion of the work and the site shall be left in a clean condition to the satisfaction of the Engineer.
- C. Possible contractor staging areas are located as shown on the Contract Drawings. Additional supplemental staging areas may be available for use at alternate locations upon written request to the Owner. The locations of all temporary facilities described must be approved by the Owner, Engineer, and Resident Engineer.
- D. The Contractor shall be responsible for installing, providing, maintaining, and decommissioning all utility service to any temporary field offices. The cost of all utilities shall be considered incidental to the Unit Cost of this item.
- E. The Contractor shall provide the Resident Engineer, Owner, and Engineer with access to and use of all temporary facilities and services provided by the Contractor.
- F. The Work of this Section shall also include the fabrication, provision, installation, and removal of Project Signs (Project Description Sign and any other signage required by regulatory agencies), as specified by the Owner.

1.02 TEMPORARY OFFICES FOR CONTRACTOR AND RESIDENT ENGINEER

- A. A temporary field office is not required.
- B. The Contractor may place his own temporary field office trailer on the project site, within the limits of construction access or at an approved supplemental location. Such a trailer must conform to all applicable local, state, and federal standards.
- C. Additional temporary storage in the form of locked box-type containers if/as required shall be provided by the Contractor. Placement and location of storage containers shall be subject to the approval of the Owner. The Contractor is solely responsible for securing all equipment and materials for use in the work.

1.03 TEMPORARY ELECTRICITY

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- A. The Contractor shall determine the nearest service at each location in relation to obtaining electrical service required for construction facilities and temporary controls (or for that matter for use to operate construction equipment necessary to perform the work.)
- B. Temporary electricity, with separate meter, for light and power shall be provided and maintained by the Contractor. Temporary on-site generators may only be used to provide emergency back-up electricity to the Site. Temporary lighting and wiring shall be installed in accordance with all local, state, and federal regulations.
- C. Power Service Characteristics: as required for the Work.
- D. The Contractor shall provide power outlets for construction operations, with branch wiring and distribution boxes. Provide flexible power cords as required.
- E. The Contractor shall provide main service disconnect and overcurrent protection at convenient locations.
- F. The Contractor shall maintain electrical service, provide routine repairs and inspect electrical service on a regular basis.
- G. Ground fault circuit interrupters shall be required on all electrical equipment.

### 1.04 TELEPHONE AND INTERNET SERVICE

- A. The Contractor is not required to maintain his own temporary “land-line” phone service but may elect to do so. If telephone service is provided, all applicable local, state, and federal standards and codes must be obeyed.
- B. A working phone connection **MUST** be maintained by the Contractor at the site such that the site may be reached at all times during business hours. A cellular phone is acceptable, provided reception is consistent and adequate.
- C. The Contractor **MUST** provide his Superintendent with equipment that allows for e-mails to be sent and received at the site for the duration of the project.

### 1.05 TEMPORARY WATER SERVICE

- A. The Contractor is responsible for providing all materials equipment, labor and incidentals necessary to collect and transport water to work zones as needed in accordance with all applicable local, state, and federal policies and procedures. Such materials include but are not limited to water meters, appropriate check valves and flow meters required by the Owner. All charges, tariffs, and fees, as applicable, for the use of temporary water service shall be borne by the Contractor at no additional cost to the Owner. The Contractor is responsible for coordinating with the Owner to arrange for the provision of water from their system, if available.
- B. The Contractor shall furnish drinking water with suitable containers and cups for use of workers. Drinking water dispensers shall be conveniently located where Work is in progress, but outside of the Work Zones.

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### **1.06 TEMPORARY SANITARY FACILITIES**

- A. The Contractor shall provide temporary sanitary facilities at the site outside of the Work Zone to be used by the Contractor. The Contractor shall maintain these facilities in a clean and sanitary condition and in such a manner as required or approved by the Engineer. These conveniences shall be maintained at all times without nuisance. Upon completion of the Work, the sanitary facilities shall be removed by the Contractor from the premises, leaving the premises clean.

### **1.07 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES**

- A. The Contractor may elect to install temporary lighting to illuminate the worksite for work after dark. However, the Contractor is subject to all local and state work ordinances and must file appropriate applications and receive acceptance prior to performing work outside of the approved window. The use of temporary lighting for work after dark shall be only with prior approval of the Owner and shall NOT result in objectionable conditions for project abutters.
- B. Ground circuit interrupters shall be required on all lighting equipment.
- C. Provide guard cages or tempered glass enclosures where temporary lighting may be exposed to breakage. Provide exterior fixtures where temporary lighting may be exposed to moisture.

### **1.08 TEMPORARY BARRIERS, PROTECTION, AND TRAFFIC CONTROL**

- A. The Contractor shall provide temporary fencing or barriers to prevent unauthorized entry to construction, staging, and storage areas, to delineate temporary contractor staging areas, to delineate access from temporary staging areas to the work zones, and to protect the existing dam and appurtenances, adjacent properties and the public from damage from construction operations. Additional temporary fencing or barriers may be required on the site, as determined by the Owner, Resident Engineer, and/or Engineer, and shall be included in the lump sum price bid for under this Section.
- B. Traffic controls or signage on paved public roads shall conform to NHDOT Standard Specifications for Road and Bridge Construction. Flagmen shall be provided as needed to maintain traffic on the road. The Contractor shall submit any plan for traffic controls necessary on paved public roads to the Owner for approval a minimum of 10 days prior to the work. At a minimum, signs notifying the public of construction activities and/or trucks entering the roadway shall be placed on North Main Street, Penstock Way, and Bay Road approaching the site.
- C. The Contractor shall provide protection for existing infrastructure, roadways, parking areas and existing utilities, and replace those damaged during construction at no additional cost.
- D. The Contractor shall protect non-owned vehicular traffic, stored materials, site and structures from damage and shall replace same if damaged during construction at no additional cost.

### **1.09 SEDIMENTATION AND EROSION CONTROL**

- A. The Contractor shall provide sedimentation and erosion control in accordance with Section 01560.

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### **1.10 DUST CONTROL**

- A. The Contractor shall control dust on the dam, excavation and fill areas, stockpiles, staging areas and all other areas of the Site. Means of control shall be subject to the approval of the Engineer and be in accordance with local, state and federal permits, policies and procedures.

### **1.11 PROTECTION OF INSTALLED WORK AND EXCAVATIONS**

- A. The Contractor shall protect installed work and excavations and provide special protection where necessary.
- B. The Contractor shall provide temporary and removable protection for equipment and open excavations, and control activity in the immediate work area to minimize damage.

### **1.12 SECURITY**

- A. The Contractor shall be responsible for providing and maintaining security for protection of his work, equipment, supplies and employees and shall be responsible for protecting same from unauthorized entry, vandalism, or theft.

### **1.13 SITE ACCESS AND TRAFFIC**

- A. Maintain existing roads and driveways accessing the site and thoroughfares to serve existing property tenants public rights-of-way, as well as the construction area. Provide for all necessary temporary traffic control including, but not limited to, temporary signage, barriers, flagmen, and/or police details. Extend and relocate traffic controls as Work progresses providing detours as necessary for unimpeded traffic flow.
- B. At no time shall equipment or materials be operated or stored within public roadways. Should there be an occasion that traffic on nearby roadways has to be temporarily impacted due to ongoing work, the Contractor shall employ a police detail or flagman as appropriate and as allowed by the Owner.
- D. Provide and maintain access to fire hydrants, free of obstructions.
- E. The Contractor is responsible for site area reconnaissance as necessary to determine if there are any local access, weight or size limitations with respect to specialized construction equipment to be used in the work.

### **1.14 PROTECTION OF WORK FROM HEAT AND COLD AND WEATHER RELATED EFFECTS**

- A. In the event that hot or cold temperatures occur during construction, the Contractor shall take all measures and provide all necessary items to protect the Work of the project. This includes provisions for proper curing of concrete, grout and/or mortar (if any).
- B. The Contractor shall provide all such temporary facilities needed to protect completed and on-going work and on-site materials from inclement weather, including rain, heat, snow, and cold. This shall include, but not be limited to, the provision of covers, shelters, heaters, etc. The use of rigid barriers for weather protection shall be used as required and as directed by the Engineer.

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- C. Temporary heating units shall have been tested and labeled by UL, FM, or other recognized association related to the type of fuel being used and maintain reasonable temperatures within the temporary enclosures.
- D. The Contractor shall be responsible for maintaining and/or restoring access and appropriate working conditions at the site in the event of inclement weather. This shall include, but not be limited to, providing for plowing and ice removal in the event of snow and freezing temperatures.
- E. The Contractor shall be responsible for all necessary snow and ice removal to allow access to and work at the Site. Snow plowed or removed by the Contractor may not be disposed of in the Lamprey River or any other waterway or wetland resource area.

### **1.15 REMOVAL OF TEMPORARY FACILITIES AND CONTROLS**

- A. The Contractor shall remove temporary equipment, facilities, and materials after completion and acceptance of work at the Site. Lawfully dispose of all waste, trash, and other debris generated during the Work of the Contract.
- B. The Contractor shall clean and repair damage caused by installation or use of temporary facilities and controls at no additional cost to the Owner.
- C. Restore existing and permanent facilities used during construction to original or better condition at no additional cost to the Owner.

### **1.16 TEMPORARY FIRE PROTECTION**

- A. All operations on respective site premises shall be so performed that no fire hazards are created or are permitted to exist. If the Contract Work involves a fire hazard, sufficient firefighting equipment with trained, capable operators shall be in the area to contain any fire until the local fire department arrives. The Contractor shall make sure that persons employed directly or indirectly by the Contractor, while on the site premises, comply with all pertinent local, state and federal fire regulations. The Contractor shall have a procedure for properly addressing any burning activity that begins to get out of control. The Contractor shall be responsible for compliance by personnel of his organization for their cooperation in fire prevention, fire reporting and protective measures to minimize loss.
- B. Provide portable UL rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide portable UL rated Class ABC dry chemical extinguishers or a combination of NFPA recommended Classes for the exposure. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.
- C. No burning of material shall be allowed.

### **1.17 MISCELLANEOUS REQUIREMENTS**

- A. The Contractor shall provide temporary medical and first-aid supplies at the work site, adequately equipped, maintained and located, to serve the needs of the workmen and employees of the Contractor, subcontractors and assigned contractors.

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- B. The Contractor shall provide all necessary temporary signage around the work site.

### **1.19 SUBMITTALS**

- A. No later than ten (10) calendar days prior to bringing the facilities on site, the Contractor shall develop and submit a submittal which describes the temporary facilities and services to be provided to the Owner.
- B. No later than ten (10) calendar days prior to bringing the facilities on site, the Contractor shall develop and submit a description of the temporary facilities and services to be used by the Contractor, including the location of laydown/storage areas, fueling areas, fencing, proposed temporary office trailer, and any other temporary facilities.

## **PART 2 - PRODUCTS**

### **2.01 EQUIPMENT**

- A. The Contractor shall provide all necessary equipment related to the requirements of this Section such that the work of the Contract can be conducted in accordance with the applicable Contract Documents.
- B. All temporary equipment, facilities, and controls shall be clean and in good working order.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. The Contractor shall sweep and clean as necessary to maintain neat, orderly work areas.
- B. The Contractor shall furnish all materials and perform all work necessary, including excavation and backfill. No disturbance will be allowed in areas outside those indicated on the plans, without prior approval from the Owner. The Contractor will be responsible for repairing all cuts made for temporary utilities and for the removal of temporary utilities and post-removal restoration.

### **3.02 MAINTENANCE AND SERVICING**

- A. The Contractor shall furnish full maintenance and service for all Temporary Facilities and Controls. Trash, garbage and other wastes shall be lawfully, properly, and satisfactorily disposed of by the Contractor at regular intervals.

## **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\*\*\* END OF SECTION \*\*\***



## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

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**SECTION 01560**  
**TEMPORARY EROSION AND SEDIMENTATION CONTROLS**

**PART 1 - GENERAL**

**1.01    DESCRIPTION**

- A.     The Contractor shall furnish all labor, materials and equipment and shall perform all work required to install, maintain, and remove erosion, sedimentation, and siltation control measures to protect the site, and upstream and downstream wetlands, water bodies, streams, and drainage structures from siltation and sedimentation damage and accumulation or damage from other byproducts of the work during this Contract, as specified herein and as directed by the Owner or Engineer.
- B.     Erosion control measures are used to prevent the displacement of soil. Such measures may include, but not be limited to, grading, erosion control matting, plastic coverings, mulching, temporary seeding, riprap, check dams, cross tracking, and other items intended to stabilize soil material and/or reduce the erosive potential of water.
- C.     Sedimentation and siltation control measures are used to prevent the movement and transport of soil particles offsite or into water bodies. Sedimentation and siltation control measures may include, but not be limited to, use of sedimentation basins, filtration dams, siltation sumps, silt fences, turbidity curtains, construction entrances and other items as necessary to contain sediment and other deleterious material produced from excavation and filling, dewatering, and related contract operations.
- D.     The Work shall also include all work necessary to continually clean and maintain and promptly repair/replace all erosion, sedimentation, and siltation measures as needed to sustain their intended function and operability.
- E.     It is the intent of this Section that the Contractor shall be responsible for the use of all Best Management Practices (BMPs), both structural and operational, to reduce, to the greatest extent possible, the erosion and transport of soil and sediment. The Contractor shall be responsible for implementing all measures which are both prudent under good construction practices and required under local, state, and Federal regulations and law. The Contractor shall also be responsible for all monitoring, maintenance, and repair of all BMPs utilized. In the event of the failure of sediment and erosion control BMPs, the Contractor shall be responsible, at no additional cost to the Owner, for all work necessary to mitigate and correct the situation, including, but not limited to, the removal of transported sediment.
- F.     The Contractor shall be responsible for monitoring, maintenance, and repair of BMPs at the site. The work of this Section shall include sediment and erosion control both upslope and downslope of the work area, as well as in and around all disturbed areas, including staging and laydown areas.
- G.     The Contractor will be required to furnish and operate the required facilities to contain, collect, and treat excess fluid, grout, concrete, etc. associated with the masonry repairs and concrete work (Sections 03300, 03346, and 04510). The sedimentation controls for these operations, which are submittal items under each of the cited technical specifications, shall also be

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included in the Contractor's overall Temporary Sedimentation and Erosion Control Plan for the project which is to be submitted under this Section.

### **1.02 SCOPE OF WORK**

- A. The scope of the Work of this Section shall include the installation of compost filter socks, turbidity curtains, and sand bags, and other required erosion control measures, as shown on the Contract Drawings, and as needed elsewhere. This work shall also include the monitoring, cleaning, maintenance, and repair/replacement of all installed silt fences, compost tubes, sand bags and other siltation and water control/handling devices as well as proper removal and disposal of same after final stabilization of the site .
- B. General work covered and paid for under this Section shall include the installation of all other sediment and erosion control BMPs, as shown on the Contract Drawings, and as needed elsewhere. This work shall also include the monitoring, cleaning, maintenance, and repair of all installed sediment and erosion control BMPs and disposal of same fencing after final stabilization of the site. General work covered and paid for under this Section shall also include all other work, including recordkeeping and reporting, necessary to meet the conditions of the Contract Documents, Permits, Approvals, Licenses issued for the project and all relevant codes, rules, regulations, laws and ordinances applicable to sediment and erosion control.
- C. In-water sedimentation controls for this project have been envisioned to consist of turbidity curtain downstream of the dam. However, the Contractor may use whichever method is compatible with his or her construction methods and sequence of work. Adequacy of the in-water sedimentation controls shall be judged by the Resident Engineer based on observed performance and shall be adjusted or supplemented by the Contractor as necessary to achieve the goals of this Section.

### **1.03 SPECIAL CONDITIONS**

- A. All work shall comply with all codes, rules, regulations, laws and ordinances and executed in conformance with any permits, licenses etc., as issued by the Town of Newmarket, State of New Hampshire Department of Environmental Services (NHDES), the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency (EPA) and all other authorities having jurisdiction within the project areas. All work necessary to make site preparation comply with such requirements shall be provided without additional cost to the Owner.
- B. Copies of all permits and licenses listed under Section 01060 will be forwarded to the Contractor prior to the beginning of the work, if not otherwise provided in this Document. The Contractor shall be responsible for conducting his/her work in accordance to all provisions of said permits.
- C. The Contractor shall procure all other required permits and licenses, (except for those to be obtained by the Owner as stated herein), pay all charges, fees and taxes and shall give all notices necessary and incidental to the due and lawful prosecution of the work under this Contract. The cost thereof shall be included in the prices bid for the various items specified herein for the work of this Contract. Copies of all required permits and licenses shall be filed with the Owner prior to the beginning of the work.

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- D. The disturbance area at the site is likely to be less than one acre in total and therefore not under the jurisdiction of the NPDES general construction permit process. Regardless of the need for a SWPPP under the NPDES permit, the Contractor shall be responsible for developing a site-specific sediment and erosion control plan which shall be submitted to the Owner. The Contractor's plan shall incorporate the requirements of this Section and the controls and BMPs shown on the Contract Drawings; however, it shall be understood that these measures called for in the specifications and on the plans represent the MINIMUM acceptable level of sediment and erosion control. The Contractor's plan shall be designed to account for the anticipated work plan, construction sequence, and anticipated level of disturbance.
- E. No work of any type in any area shall commence until sedimentation control measures are in place to the satisfaction of the Owner, the Engineer and permitting agencies/representatives having jurisdiction.

### **1.04 IMPLEMENTATION**

- A. The Contractor shall familiarize himself with the nature of work to be performed. The Contractor shall be responsible for scheduling his submittals and/or meetings, if required, with the applicable regulatory agencies.
- B. Measures may include, but not be limited to, the following:
- Silt fences and/or turbidity curtains
  - Stabilized construction entrances
  - Sand bags
  - Placement and operation of pumped water filtration bags/Sediment settling tanks
  - Temporary cofferdams
  - Filling and stabilizing of erosion gullies with gravel
  - Application of weed-free straw (or other) mulch
  - Track-roughening of slopes to slow runoff flow
  - Temporary ditches and swales to divert drainage flow
  - Energy dissipaters for pipe, culvert, and hose discharge points

### **1.05 LOCATION AND STORAGE OF MATERIALS**

- A. No materials shall be dispersed or stockpiled in any areas beyond authorized the limits of disturbance, except in areas specifically designated for spoil disposal. No excavated materials or materials to be used in backfilling shall be deposited within fifty (50') of any spillways and related areas, watercourses, open water bodies, or wetland areas, or drainage facilities unless appropriate and approved measures are specifically taken to protect the adjacent resource area. Materials rejected for use in the Work shall be removed and disposed of as soon as practical to do so. Adequate protective measures shall be taken to prevent the erosion of stockpiled and/or placed materials and resultant sedimentation of adjacent spillways and related areas, watercourses, wetland areas or drainage facilities, during the course of performing the work. These include containing stockpiles using compost filter socks and covering the stockpiles with 20-mil poly plastic sheeting overnight and in advance of forecast rainfall as directed by the Engineer.

### **1.06 PROTECTION OF THE IMPOUNDMENT AND RELATED WATER RESOURCES**

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

- A. The Contractor shall employ Best Management Practices (BMP's) throughout the conduct of the work of this Contract and ensure that impact to Lamprey River Impoundment, Lamprey and Piscassic Rivers, and any surrounding wetlands is minimized.
- B. The Contractor shall not store or discharge fuel oil, sewage, septic water or other deleterious substances into streams, lakes, reservoirs, groundwater supplies or wetlands areas. The storage of fuel oil and refueling of equipment shall be restricted to designated areas with appropriate spill prevention and control measures (Submitted under Section 01060) approved by the Engineer, the Owner and regulatory agencies. Machinery shall not be refueled or washed within 100 feet of any resource area. The storage area shall be located on an asphalt paved surface away from catch basins and other drainage structures. Portable secondary containment shall be provided, and sorbent material are to be placed around the perimeter of the fueling area.
- C. Any spillage of deleterious substance (fuel oil, sewage, septic waste, etc.) shall be reported to the Resident Engineer, the Owner, and appropriate regulatory agency, by the Contractor and appropriate measures taken, (at costs solely borne by the Contractor) as determined by the regulatory agency, to contain and to clean up the affected areas.
- D. Any water that is pumped or bailed from the excavations shall be conveyed by conduit or hose to approved points of discharge. Water shall be filtered through approved discharge area erosion controls, sedimentation barriers, and/or pumped water filtration bags, constructed in such a manner so as to minimize velocities of discharge and to contain silt. Sedimentation barriers shall be cleaned and/or replaced periodically to ensure effective control and protection of wetlands and water resource areas.
- E. The general sediment control performance standard is outlined in the New Hampshire Surface Water Quality Regulations (Env-Wq 1700). The Lamprey River is considered Class B waters. These regulations state the following regarding discharges into freshwater waterways. The Contractor shall ensure that temporary erosion and sediments controls are adequate to ensure compliance with these regulations, or other more stringent regulations, as needed.

*Solids – Class B waters shall contain no slicks, odors, or surface floating solids that would impair any existing or designated use, unless naturally occurring.*

*Color and Turbidity – Class B waters shall contain no color in such concentrations that would impair any existing or designated uses, unless naturally occurring. Class B waters shall not exceed naturally occurring conditions by more than 10 NTUs.*

### 1.07 RELATED WORK SPECIFIED ELSEWHERE

- A. The following is a list of related work items that shall be performed or furnished under other Sections of these Specifications as indicated.
  - 1. Regulatory Requirements: Section 01060
  - 2. Submittals: Section 01300
  - 3. Temporary Water Control: Section 01565
  - 4. Site Restoration: Section 01725

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5. Saw Cutting, Dismantling, Demolition, and Removal of Existing Structures: Section 02065.
6. Temporary Cofferdam: Section 02170
7. Earthwork: Section 02200
8. Stone and RipRap: Section 02270
9. Loaming, Seeding and Revegetation: Section 02930
10. Cast-In-Place Concrete: Section 03300
11. Masonry Repair: Section 04400

### **1.08 SUBMITTALS**

The Contractor shall complete and submit to the Owner all of the following submittal items consistent with submittal requirements prior to beginning any work on the Contract. All submittals shall be made within fifteen (15) working days after the Notice of Contract Award and prior to the Start of Work unless otherwise noted.

- A. A written plan detailing the methods and layout of BMPs proposed to handle stormwater and contain sediments, soils, and debris at the Site must be submitted to the Owner for review and approval prior to proceeding with the Work. If required by Permit, the plan shall also be submitted to NHDES or the Town of Newmarket.
  1. No work shall begin until the pollution, water, and erosion control schedules and plans have been approved by the Owner.
  2. If conditions change during construction, the Contractor shall revise the plan and resubmit to the Engineer for review and approval.
- B. The methods and materials for proposed construction of individual BMP's, including compost filter tubes, sedimentation control barriers shall be submitted to the Engineer for review and approval prior to proceeding with the work of this Section.
- C. The written plan shall detail the phasing of the installation and removal of the proposed BMPs, including which ones are to be left in place.
- D. Submit a chemical and oil spill prevention and cleanup plan to be implemented by the Contractor in the event of any actual or suspected spill of any chemical, petroleum product, or waste water.

## **PART 2 - PRODUCTS**

### **2.01 TEMPORARY GRASS SEED**

- A. Grass seed for temporary erosion control shall be Annual Ryegrass applied at a minimum rate of 2 pounds per 1,000 SF. Erosion control blankets should be used as required.

### **2.02 PUMPED WATER FILTER BAG**

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- A. Pumped water filter bags used as sedimentation control and filtration of water generated from dewatering activities shall be a Dirtbag® pumped sediment control device(s) (Model 53 or 55) as detailed on the Drawings or approved equivalent. The Dirtbag® pumped-silt control system is marketed by ACF Environmental, Inc., Richmond, Virginia.
- B. The Dirtbag® shall be a nonwoven geotextile bag which is sewn with a double needle matching using a high strength thread. Seams shall have an average width strength per ASTM D-4884 as follows: Dirtbag® 53 ASTM D-4884 60 lb./in, Dirtbag® 55 ASTM D-4884 100 lb./in.
- C. Each standard Dirtbag® has a fill spout large enough to accommodate a 4" discharge hose. Attached are straps to secure the hose and prevent pumped water from escaping without being filtered.
- D. The geotextile fabric shall be nonwoven fabric with the following properties:

<b>Properties</b>	<b>Test Method</b>	<b>Units</b>	<b>Nonwoven</b>	
			<b><u>53</u></b>	<b><u>55</u></b>
Weight	ASTM D-3776	Oz/yd.	8	10
Grab Tensile	ASTM D-4632	Lbs.	203	250
Puncture	ASTM D-4833	Lbs.	130	165
Flow Rate	ASTM D-4491	Gal/Min/Ft <sup>2</sup>	80	70
Permittivity	ASTM D-4491	Sec. <sup>-1</sup>	1.5	1.3
Mullen Burst	ASTM D-3786	Lbs./in <sup>2</sup>	400	550
UV Resistant	ASTM D-4355	%	70	70
AOS % Retained	ASTM D-4751	%	100	100

### 2.03 HAY BALES / STRAW BALES

- A. Neither hay bales nor straw bales shall be used for this work.

### 2.04 COMPOST FILTER SOCKS

- A. Compost filled filter socks for use as a sedimentation control device shall be 24" minimum diameter by 10 feet long SiltSoxx as manufactured by Filtrexx International, LLC of Grafton, Ohio, or approved equivalent. The sock shall be designed to provide intimate contact with the ground surface to prevent blowouts or undermining. At the same time the sock shall allow water to flow through the compost, minimizing overtopping, slowing high water flow velocities, and intercepting and stopping silt movement.
- B. Stakes for affixing compost filter socks in place shall be wooden, 2" square by a minimum of 36" long. Stakes shall be installed in accordance with SiltSoxx manufacturer's instructions.

### 2.05 SILT FENCE

- A. If used, siltation fence shall be "Envirofence" as manufactured by Mirafi Inc. Charlotte, North Carolina or approved equal. Stakes for anchoring the silt fence shall be one-inch by one-inch

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(1" x 1") construction grade timber. If necessary, the Contractor shall provide a backing of wire mesh to provide stability to the silt fence fabric against blow over or knock down.

### **2.06 TURBIDITY CURTAIN**

- A. A pre-assembled medium duty system consisting of a geotextile curtain, flotation system, bottom weight and anchorage or securing mechanism shall be furnished suitable for use in waters subject to wind, waves, and currents.
  - 1. Downstream turbidity curtain shall be Triton Type 3 Permeable Silt Barrier or approved equal.
  - 2. Upstream turbidity curtain shall be Triton Type 2 Permeable Silt Barrier or approved equal.
- B. The flotation system shall be closed cell polystyrene and shall be sufficient freeboard to prevent overtopping.
- C. Hardware such as stakes, ballast chain, connection bolts, reinforcement, tension cables and other shall be galvanized, stainless steel, aluminum or otherwise corrosion resistant. The ballast chain shall be sufficient to maintain the curtain in a vertical position.
- D. The length of turbidity curtain shall be selected to provide no greater than 1-foot of separation between the bottom of the channel and the bottom of the curtain.

### **2.07 SANDBAGS**

- A. For sandbag product requirements refer to Section 01565.

### **2.08 SOIL MATERIAL**

- A. Soil material for use in sediment and erosion control measures shall conform to the specifications set out in Section 02200 – Earthwork. In general, all soil material must be clean, stable, and free of silt, clay, and organics.

### **2.09 STABILIZED CONSTRUCTION SITE ENTRANCE**

- A. A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.
- B. Stabilized Construction Entrances shall be as shown on the Contract Drawings, and meet the minimum requirements of the NHDOT Standard Specifications for Stabilized Construction Entrances.
- C. Construct features to channel runoff away from the road and towards sediment and erosion BMPs.
- D. Inspect and clean as needed to maintain efficiency.
- E. Remove and properly dispose of all material prior to site stabilization.



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### **2.10 OTHER MATERIALS**

- A. Other materials required for completion of the work in this Section shall be of adequate quality and construction such that intended performance is satisfied.

## **PART 3 - EXECUTION**

### **3.01 FLOOD FLOWS**

- A. The Contractor is advised that flows of the Lamprey River and water levels of the Lamprey River Reservoir may vary substantially due to climatic and seasonal conditions and they shall be responsible for controlling and handling ground and/or surface water regardless of the volume of water and regardless of whether this flow is due to flood waters from storms. Refer to Section 01565 for requirements of temporary water control and Section 01566 for additional information on the site's hydrology.

### **3.02 SEDIMENTATION, EROSION AND TURBIDITY CONTROL**

- A. The Contractor shall take every precaution to minimize and control erosion and turbidity within the project limits. These precautions shall be subject to approval by the Resident Engineer who will be at the site to observe critical portions of the work. Sedimentation, erosion and turbidity control precautions shall include, but not necessary be limited to, the following:
  - 1. Stockpiles of excavated materials as well as exposed cut and fill slopes will be kept to minimum gradients whenever possible. If these surfaces are to be exposed for more than two weeks, or are subject to heavy rainfall, they will be treated with straw, mulch, netting, grass seed or combination of the above to slow down the rate of surface run-off and to reduce the volume of suspended solids in the runoff water.
  - 2. Compost Filter Socks shall be staked in place down gradient from all exposed borrow areas or materials storage areas in order to reduce the amount of suspended solids in runoff water as generally depicted on the Drawings. The exact location of the erosion barriers will be determined in the field, as work progresses.
  - 3. Compost Filter Socks shall be installed with wooden stakes in accordance with manufacturer's directions and as shown on the Drawings.
  - 4. The regulatory agencies listed hereinbefore reserve the right to determine the adequacy of the erosion control measures during construction. All inadequate devices, as determined by these governmental bodies or their agents, shall be replaced with devices deemed adequate, at the Contractor's expense.

### **3.03 GENERAL SEDIMENT AND EROSION CONTROL PLAN AND CONSTRUCTION SEQUENCE**

Creating a project specific construction sequence with respect to proper handling of water, sediment and erosion control particularly during work at the concrete outlet structure, right and left abutments, and throughout construction and rehabilitation is of high importance. Final details for

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

such shall be determined by the Contractor as part of their means and methods. However, the Contractor responsible for the construction will be contractually obligated to fulfill all applicable provisions of the all Permits and the Contract Drawings and Specifications.

A Temporary Sediment, Erosion & Water Control Plan has been included as **Drawing C-1**. An anticipated construction sequence is included on **Drawing G-2** and an anticipated phased sequencing for temporary water control is included on **Drawing C-2**. Construction period Best Management Practices (BMPs) including erosion control barriers shall be used to mitigate against the erosion and discharge of on-site sediment.

It is envisioned the right abutment phase of work would begin by installation of a temporary supersack cofferdam and placing of a crushed stone work pad from the right upstream abutment up to but not including the fish ladder to allow for construction activities including installation of protective riprap in front of the right abutment and rehabilitation of the right abutment wall.

It is envisioned the left abutment phase of work (which may be done concurrently with right abutment phase of work above) would begin by a phased installation of a temporary supersack cofferdam to allow for placement of an upstream concrete apron followed by installation of a Portadam (or other approved cofferdam) from the left edge of the spillway to the left abutment wall encompassing the outlet structure to isolate the work area. A temporary by-pass flow system may be necessary to be positioned through or around the cofferdam during flood flows.

Once all construction work is complete and permanent water control systems tested and commissioned, the Contractor shall be required to disassemble all cofferdams and temporary BMPs and begin site restoration, including the conversion of the site access roadway into a permanent gravel access roadway as per the Drawings. The disturbed areas shall be restored and disturbed vegetated areas shall be re-seeded as explained in other specification sections applicable to that work.

### 3.04 INITIAL CONSTRUCTION ACTIVITIES AND PRELIMINARY DRAINAGE CONTROL

- A. The Contract Drawings show the deployment of silt fence, compost filter sock/silt fence, sandbag, and construction entrances. The limits of these controls have been established based on ground conditions, anticipated flow through the spillway area, and expected water surface elevation at the start of construction. Prior to the installation of any sedimentation barrier, the Contractor, Owner, Resident Engineer, and Engineer shall meet on site to discuss conditions. Any adjustments to the configuration shown on the Contract Drawings shall be discussed at that time and mutually agreed upon. The Contractor should expect the possibility that sedimentation controls may be installed and/or removed in the wet.
- B. Prior to beginning any dewatering, clearing, stockpiling, excavation or filling, the Contractor shall perform the following sequence of implementation of sedimentation and siltation control measures.
  - 1. Perform all necessary work to install all anticipated sedimentation barriers including but not necessarily limited to silt fences, stabilized construction entrances, and other items as necessary. Provide all necessary sedimentation and siltation control measures as required by the Resident Engineer, the Owner and regulatory agencies, to minimize sedimentation or siltation from occurring beyond the immediate limits of work.

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2. In addition to initial sedimentation and siltation control set-up measures, take additional steps as necessary to minimize sedimentation and siltation within work areas and eliminate sedimentation and siltation outside of work areas throughout the conduct of the Work at no additional cost to the Owner.
  3. Following initial setup of sediment and erosion controls, the site shall be inspected by the Owner, Resident Engineer, and Engineer. No work can continue until the Erosion controls meet the approval of the Owner and applicable regulatory agencies.
  4. Damaged or loose siltation fence or other control measures shall be replaced as necessary to maintain their function of controlling sedimentation and siltation.
- C. Remove any accumulation of silt or soil build-up behind silt fences or sand bags, as it occurs. Remove accumulations of silt and soil build-up from siltation sumps, sedimentation basins and silt traps as necessary to properly maintain their function.
- D. Following periodic cleaning of all sedimentation controls and upon completion of the use of the controls, the accumulated sediment shall be allowed to dry prior to transporting to lawful off-site upland disposal locations.
- E. The Contractor shall repair any damage resulting from sedimentation or siltation during any optional subsurface exploration program or related activities and restore property to its prior condition at no additional cost to the Owner.

### **3.05 ADDITIONAL EROSION AND SEDIMENTATION CONTROLS**

- A. The Resident Engineer shall make periodic inspections of the site and shall advise the Contractor of the need for additional erosion and sedimentation controls necessary to meet the performance standards of this Section. Representatives of the Owner and of regulatory agencies may also make inspections.
- B. Additional erosion and sedimentation control necessary to deal with transient conditions on the sites, such as following the placement of topsoil but prior to the establishment of grass cover, shall be provided by the Contractor as needed and at no additional cost to the Owner.
- A. Additional erosion and sedimentation controls may be necessary to deal with the cutting fluids, concrete debris, grout, concrete, and bonding agent required for the concrete surface repairs of the dam and diversion structure.

### **3.06 INSPECTION AND MAINTENANCE**

- A. Throughout the entire duration of the Contract (including periods when no actual site work is being conducted), the Contractor shall perform weekly inspections of erosion and sediment control installations. Additional inspections shall be required immediately after each rain event exceeding one-half (0.5 inch). The Contractor shall develop a checklist to assist with periodic inspection and maintenance and shall keep completed copies of the checklist for each inspection on file along with the Sediment and Erosion Control Plan.
- B. Throughout the entire duration of the Contract (including periods when no actual site work is being conducted), the Contractor shall repair any damage resulting from sedimentation or

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erosion during construction and/or construction related activities and restore property to its prior condition at no additional cost to the Owner.

- C. Throughout the entire duration of the Contract (including periods when no actual site work is being conducted), the Contractor shall take such steps as are necessary to maintain the sediment and erosion controls in good working order, including repair or replacing controls and cleaning or removing sediment from controls.
- D. The site entrance(s) shall be maintained in a condition that will prevent tracking or flow of mud onto public right-of-way. All materials spilled, dropped, washed, or tracked from vehicles onto public roadways or into on-site or off-site storm drains must be removed immediately.
- E. In the event of inclement weather, the Contractor shall protect the sites and materials from damage or injury from the weather. If, in the opinion of the Owner or its Resident Engineer, any portion of the Work or materials has been damaged by reason of failure on the part of the Contractor to so protect the Work, such Work and materials shall be removed and replaced with new materials and Work to the satisfaction of the Owner. Weather protection shall include all activities necessary to prevent the spread of sediment from wind, runoff, erosion, and other causes.

### **3.07 REMOVAL AND CLEANUP**

- A. After the sites has been fully stabilized against erosion and upon the approval of the Resident Engineer, remove sediment control devices and accumulated silt. Legally dispose of off-site (and off-watershed) all accumulated silt and all sedimentation and siltation control devices such as, but not limited to siltation fencing, sand bags, and other related products. On-site disposal of clean sediments in upland area shall be allowed only with the express approval of the Owner.

## **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 01565  
TEMPORARY WATER CONTROL**

Part A of this Section describes Temporary Surface Water Control.

Part B of this Section describes Temporary Construction Dewatering and Groundwater Control.

Temporary Cofferdams are covered under Section 02170.

**PART A – TEMPORARY SURFACE WATER CONTROL**

**PART 1 - GENERAL**

**1.01     DESCRIPTION**

- A.     This section specifies the removal and control of water in the work area in order to permit all excavation, construction, installations, and repairs to be performed in the dry. Water control shall be provided such that the Work of the Contract can proceed unhindered by water and flow into or through the work area. Water control shall also extend to all provisions necessary to control water in and from the Lamprey River (upstream and downstream) and surface drainage from upland areas from flowing into, disrupting, and damaging the work area. All work shall be performed in accordance with the plans and specifications and to the satisfaction of the Owner. Water control is of the utmost importance.
- B.     It should be noted that since the Work involves less than a total of one acre of soil disturbance, clearing, grading and excavation, a Phase II National Pollution Elimination Discharge System (NPDES) construction permit is not expected to be required for this project. However, if it is determined that this expectation is incorrect and/or the NHDES Stormwater Regulations have undergone a change since the issuance of these Contract Documents and a NPDES is required after all, securing of such including all supporting documentation per NPDES requirements shall be the Contractor's responsibility.
- C.     During normal operation conditions, the impoundment of the Lamprey River is controlled by the fixed crest spillway and the existing concrete outlet structure left of the spillway and along the left abutment training wall by three timber slide gates. During normal conditions, the slide gates are left closed and water from the Lamprey River passes over the granite masonry spillway in an uncontrolled manner. During a storm event or for lowering of the impoundment, the slide gates are opened, and water is allowed to flow through the outlet structure. It is the Contractor's responsibility for the control of water in and around the work areas, especially during the sequenced installation of temporary cofferdams, rehabilitation work at the existing outlet structure and installation of new gate structure, masonry and concrete repairs on left and right abutment training walls and placing of riprap along the right abutment. The Contractor shall be responsible for requesting in advance that the Town's authorized staff be present to operate the slide gates during water control operations. The Town will attempt to assist the Contractor with water control through its operations of the flood control system; however, in the event of potential flooding, the Contractor shall have an approved Flood Contingency Plan, as described herein.
- D.     The Contractor shall be responsible for determining the need for and the means and methods of implementing water control during the work of the Contract, except as specifically stated herein and in other Sections and on the Contract Drawings. The Resident Engineer will

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monitor conditions at the site and the effects of water levels and flows on the Work. If, in the Resident Engineer's opinion, the presence of water has the potential to create a deleterious effect on the Work, then the Contractor shall take immediate measures to control such water to the satisfaction of the Resident Engineer at no additional cost to the Owner.

- E. The control of surface water shall consist of installing such provisions, as needed, to divert, reduce, or stop water which may be flowing into, on, or through the work site. The need for control of surface water may change over the course of the project depending on the work underway, as well as rainfall/runoff conditions encountered, which may change the level of the Lamprey River upstream of the dam. Pumping, siphoning, and/or other methods may be required for certain activities.
- F. Temporary cofferdams will be necessary for completion of the Work of this Contract. Temporary water control shall act in concert with the temporary cofferdams. The temporary cofferdams shall be necessary at upstream of the existing outlet structure and upstream of the right abutment wall, as seen on the Contract Drawings. The temporary cofferdams upstream of the right abutment wall and upstream of the existing outlet structure shall be sand-filled "Supersacks" which (when filled) measure approximately 3-feet-square by 3-feet high, or similar approved water control device. Design and implementation of temporary water control cofferdams shall be subject to the Engineer's approval and shall be in accordance with Section 02170. All cofferdams shall be installed and operated in coordination with the Work of this Section.
- G. Temporary construction dewatering systems to control seepage and groundwater will be necessary for completion of the Work of this Contract. The temporary construction dewatering systems shall be provided and paid for under this Section of the work as discussed in Part B. Temporary surface water control shall act in concert with the temporary construction dewatering systems.
- H. The Contractor shall take all necessary precautions during construction to provide and maintain proper equipment and facilities to remove promptly and dispose of properly, all water entering work areas and keep work areas dry, as necessary. The Contractor shall implement such temporary surface water control measures as necessary to maintain the water level such that all work, where judged necessary, proceeds in the dry. Temporary water control work may include, but shall not be limited to diversion pipes, channels, swales, pumps, siphons, culverts, temporary cofferdams, etc.
- I. Water control measures shall be in operation as needed until all work within those areas of the work zone subject to interference by surface water is complete and accepted by the Owner.
- J. The Contractor shall remove all channeled, pumped, diverted, or siphoned surface water away from the work area, and provide sedimentation control and recharge in accordance with all applicable local codes and laws. All water which is discharged by water control measures shall be passed through appropriate and adequate sediment and/or filtration measures such that the effluent meets the standards specified in Section 01560 – Sedimentation and Erosion Control and those provided below. Water diverted or pumped by the Contractor shall be discharged back into the Lamprey River downstream of temporary cofferdams and shall maintain water quality standards. Adequate provision for erosion control at the discharge point(s) shall be provided as part of the Work of this Section.

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- K. All temporary surface water control work shall be coordinated with temporary sedimentation and erosion control work as specified under Section 01560 and temporary cofferdam work as specified under Section 02170.
- L. The Contractor shall prepare and implement a Flood Emergency/Response Plan subject to review by the Engineer and Owner describing the measures to be implemented in the case of potential flooding of the work areas.

### **1.02 SCOPE**

- A. The Work of this Section includes the furnishing of all labor, equipment, supplies, materials and utilities required for the operation, maintenance, and supervision of efforts to control surface water on and around the Site such that all construction within this Contract can proceed unhindered by water and flow into or through the work area, including bypass systems (if necessary). The Work of this Section further includes the furnishing of all labor, equipment, supplies, materials and utilities required for the operation, maintenance, and supervision of efforts to maintain the quality of surface water collected and discharged by the surface water control systems.

### **1.03 ADHERENCE TO REGULATORY CONDITIONS**

- A. All work shall comply with all codes, rules, regulations, laws and ordinances and executed in conformance with any permits, licenses etc., as issued by the State of New Hampshire Department of Environmental Services (DES), the U.S. Army Corps of Engineers (USACE), and all other authorities having jurisdiction within the project areas. All work necessary to make the work site comply with such requirements shall be provided without additional cost to the Owner.
- B. Copies of all permits and licenses listed under Sections 01060 are included in the Contract Documents or will be forwarded to the Contractor prior to the beginning of the work. The Contractor shall be responsible for conducting his/her work in accordance to all provisions of said permits.
- C. The Contractor shall procure all other required permits and licenses, (except for those to be obtained by the Owner as stated herein), pay all charges, fees and taxes and shall give all notices necessary and incidental to the due and lawful prosecution of the work under this Contract. The cost thereof shall be included in the prices bid for the various items specified herein for the work of this Contract. Copies of all required permits and licenses shall be filed with the Owner prior to the beginning of the work.
- D. The Contractor shall be responsible for complying with all orders and permit conditions of regulatory agencies for the installation, maintenance, and removal of all erosion and sedimentation control measures.
- E. No work of any type in any area shall commence until sedimentation control measures are in place to the satisfaction of the Owner and its Resident Engineer.

### **1.04 RELATED WORK**

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- A. The following is a list of related work items that shall be performed or furnished under other sections of these specifications as indicated:
  - 1. Regulatory Requirements – Section 01060
  - 2. Temporary Erosion and Sedimentation Control – See Section 01560
  - 3. Hydrologic and Hydraulic Information – See Section 01566
  - 4. Subsurface Conditions – See Section 01567
  - 5. Temporary Cofferdam – Section 02170

### **1.05 GENERAL DEWATERING AND WATER CONTROL WORK**

- A. The Contractor shall implement surface water control measures as necessary such that all work, including excavations, proceeds in the dry.
- B. The Contractor shall take such steps as are necessary to control the leakage of water through the temporary cofferdams such that said leakage will not interfere with the Work of the Contract.
- C. The Contractor shall take all reasonable and prudent precautions during construction to provide and maintain proper equipment and facilities to remove promptly and dispose of properly, all water entering work areas and keep such areas dry so as to obtain a satisfactory undisturbed subgrade condition.
- D. Dewatering measures (and cofferdams) shall be in operation until all work below normal river elevations are complete and accepted by the Owner and Engineer.
- E. Shallow sumps may be required for surface water collection. Sumps shall be surrounded by suitable filter material. Pumping shall be continuous as necessary to maintain the work in the dry.

### **1.06 SUBMITTALS**

- A. Not less than ten (10) days prior to the scheduled start of work, the Contractor shall submit his proposed method of controlling surface water and maintaining dry conditions, to the Owner for review. The submittal shall include as a minimum the following items:
  - 1. The Contractor's proposed design, sequence of operation, maintenance and supervision of the surface water and control systems, as needed for each phase of the work, and coordination with temporary groundwater control and the temporary cofferdams.
  - 2. Design of temporary cofferdams shall be submitted under Section 02170.
  - 3. The Contractor's proposed contingency plan for additional surface water measures for all systems in the event of system failure – monitoring, instrumentation, on-call repair, etc.
  - 4. Scheduling requirements with regard to Sedimentation Control, groundwater control, and temporary cofferdam installation.



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- B. Not less than ten (10) days prior to the scheduled start of work, the Contractor shall submit a Flood Contingency Plan for review for potential storm emergency conditions (i.e. anticipated heavy rainfall). The plan must address the proposed construction sequence and include contingency plans to respond to a high flow event that could flood the work area and provisions for emergency demobilization. The submittal shall include as a minimum the following items:
1. A brief description of the water control/by-pass/diversion systems which will be utilized at the site, if any.
  2. A description of the sequencing of the work with respect to the Town's standard procedures for operating the flood control system.
  3. A description of measures for removing equipment and materials from the work area and stabilizing exposed portions of the embankment or foundation which might be subject to erosion from surface water flow.
  4. A description of measures to protect completed and incomplete work.
  5. Evaluation of available site hydrology and hydraulics relative to activation of the Storm Emergency/ Response Plan.
  6. Monitoring procedures, data sources (USGS and NWS websites), and record keeping.
  7. Proposed Action Thresholds (forecast and actual).
  8. Potential Contingency Actions (such as sand bags, supersacks, backfilling and pumping, work areas evacuation, etc.)
  9. Communication procedures.
  10. A brief description on emergency demobilization procedures.

### **1.07 ANTICIPATED IMPOUNDMENT LEVELS AND INFLOWS**

- A. The Contractor shall abide by the conditions of all relevant permits issued to the Project which pertain to Water Control. The Contractor alone shall be responsible for meeting the conditions of the permits and shall be held accountable for penalties as a result of violations of permit conditions.
- B. Lamprey River water surface elevations will be influenced by rainfall, inflows, evaporation, and other climatic conditions beyond the control of Owner. The Owner makes no guarantees regarding the Lamprey River water surface elevation at the start of construction, nor that the existing outlet works have sufficient capacity to control the fluctuation of the Lamprey River water level.
- C. In the event that dry conditions lead to naturally low levels in the upstream impoundment, the Contractor will NOT be required to take steps to raise the water level beyond what would occur naturally.

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- D. The Contractor is hereby made aware that the Owner has little if any control over inflows into the Lamprey River. Major rainfall events may cause the level of the Lamprey River and impoundment to rise and lead to potential inundation of the work site. In the event of uncontrolled increases in the Lamprey River level, the Contractor shall undertake measures to protect existing structures and new work, including but not necessarily limited to by-passing, pumping or siphoning of water upstream of the cofferdams in order to maintain the level in the Lamprey River Reservoir within specified levels.
- E. Historic records available regarding the level in the impoundment and flows in the Lamprey River are presented in Section 01566 – Hydrologic and Hydraulic Information.
- F. Hydrologic and climatological data presented by the Engineer, such as impoundment levels and river flows are presented in Section 01565. This data is presented **FOR INFORMATION ONLY**. It is the responsibility of the Contractor to make all inferences and conclusions regarding possible flow rates and lake levels during the Work of this Contract

### 1.08 MAXIMUM WATER CONTROL DISCHARGE RATE

- A. The total flow rate from all Contractor water control operations shall be such that significant downstream erosion, flooding, or other damage is avoided, in the opinion of the Resident Engineer, Owner, or regulatory authority. The Contractor's water control plan shall not lead to an increase in downstream flood impacts.

### 1.09 BYPASS FLOWS

- A. During outlet structure modification or other work, the Contractor has the option to bypass surface water around or through the coffer-dammed portion of the Site to lower the impoundment to specified levels and discharge such water downstream of the spillway.
- B. The Contractor has the option to install, operate, and maintain a system which withdraws surface water from the upstream impoundment, pipes it around or through the coffer-dammed portion of the Work area, and discharges the flow downstream of the spillway before the downstream turbidity curtain. Such a system may use a siphon system, pumps, or other mechanisms to bypass flow around or through the work site. Cutting of open channels shall not be allowed.
- C. Intake for the bypass system shall be from a location where good quality surface water is present and no sediment and/or debris will be entrained.
- D. The Contractor shall monitor the system daily to ensure flow is continuing and shall keep a daily record of bypass flow discharge rate.
- E. If pumps are used, they shall be not create a noise nuisance and they shall be provided with sufficient backup and redundancy to provide adequate protection for the Work.

### 1.10 DISCHARGE OF WATER

- A. Water discharged from any dewatering system in which water is collected and pumped shall be treated in such a manner as to meet the water quality performance standards listed herein

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and all other water quality standards contained in law, regulations, and permits. In the event of conflict, the most stringent standard shall apply.

- B. The general performance standard for discharge of effluent into state waters is outlined in the New Hampshire Surface Water Quality Regulations (Env-Wq 1700). The Lamprey River is considered Class B waters. These regulations state the following regarding discharges into freshwater waterways. The Contractor shall ensure that discharged water is compliant with these regulations, or other more stringent regulations, as needed:

*Solids – Class B waters shall contain no slicks, odors, or surface floating solids that would impair any existing or designated use, unless naturally occurring.*

*Color and Turbidity – Class B waters shall contain no color in such concentrations that would impair any existing or designated uses, unless naturally occurring. Class B waters shall not exceed naturally occurring conditions by more than 10 NTUs.*

The Contractor is reminded to adhere to all provisions and conditions regarding the discharge of water and general water control contained in all standards, permits, and licenses. In particular, specific guidelines (if any) regarding Total Suspended Solids (TSS), Oil and Grease, and pH in discharge water should be adhered to.

- C. In the event that any one of these or other water quality standards is violated, discharge from the dewatering system shall cease immediately and shall not resume until the issue is corrected.

### 1.11 PROTECTION OF WORK FROM FLOOD CONDITIONS

- A. The Contractor shall take all such precautions necessary to protect the site and the Works of this Contract, either completed or incomplete, from flood waters and flows which would either damage the Work or the site or cause a delay to the Work.
- B. In the event of significant natural flooding, the Contractor may need to actively release water from the Lamprey River impoundment via River by-pass through or around the temporary cofferdam, pumping or siphoning depending upon the stage of construction. If extensive flooding is expected, the Contractor shall implement his/her Flood Contingency Plan in conjunction with the Resident Engineer to release water from the impoundment at the maximum rate allowed to drawdown the impoundment in advance of the storm (within the allowable limits). The release of water shall not exceed the discharge rates described above or elsewhere in the contract documents including the related permits. All water releases shall be coordinated with Resident Engineer.
- C. In the event that the Lamprey River level rises such that the work area will become inundated despite Contractor efforts to actively release water from the impoundment, the Contractor shall implement the emergency demobilization provisions of his/her Flood Contingency Plan. If it is necessary to demobilize from the work area, the Contractor shall cease work in that area and remove all equipment and materials to the satisfaction of the Owner. The Contractor shall secure the site and make all efforts to protect completed and incomplete work. Mobilization back into the work area will be at the direction of the Owner. **Such mobilizations and demobilizations (if required) shall be completed at no additional cost to the Owner.**

## PART 2 - PRODUCTS

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### 2.01 DIVERSION BARRIER / MINOR COFFERDAM MATERIALS

- A. Temporary Construction Cofferdams at the work site shall be provided as per Section 02170 – Temporary Cofferdams. All other diversions barriers and cofferdams shall be provided by the Contractor, at his discretion, under the Work of this Section.
- B. All materials used in the construction of cofferdams or diversion barriers, shall be clean and free of substances or materials which might lead to contamination of the River, impoundment, wetland resource areas, or other water courses.
- C. Loose soil material will NOT be an acceptable material for the construction of cofferdams or diversion barriers.

### 2.02 SANDBAGS

- A. Sand bags shall be a polypropylene, polyethylene, or polyamide woven material, with a minimum unit weight of four ounces per square yard, a Mullen burst strength exceeding 300 psi in conformance with ASTM D3786, and a minimum ultraviolet stability of 70% at 1000 hours in conformance with the requirements of ASTM designation D4355. Burlap sand bags shall not be allowed.
- B. Individual sand bags (filled) shall have a length of 18 inches, a width of 12 inches, a thickness of 3 inches, and a mass of approximately 33 lb. Bag dimensions are nominal and may vary based on locally available materials. Alternative bag sizes, such as “super sacks” shall be submitted for approval prior to deployment.
- C. Sand bags shall be filled with Off-Site Common Fill as set out in Section 02200 - Earthwork. On-site soil sources meeting the requirements of On-Site Common Fill may be used, as appropriate.
- D. The Contractor shall make provisions for the sand bags to be UV resistance. Sandbag berms may be wrapped in polyethylene sheets to provide additional containment capability and/or UV resistance when used as a part of temporary cofferdam system, under direction of the Resident Engineer.
- E. All sandbags shall be free of rips or tears which would lead to a loss of sand into the River, channel, or wetland resource areas, and bag openings shall be tied to prevent the same. Broken sandbags shall be removed and replaced.

### 2.03 PUMPS, HOSES, SIPHONS

- A. Pumps, hoses, or siphons used at the site shall be sized appropriately and shall be maintained in good working order by the Contractor.
- B. Pumps shall be sized appropriately by the Contractor and shall operate in a manner which does not create a nuisance to abutters (i.e. quietly and without significant exhaust).
- C. Secondary containment shall be provided as stipulated in permits for gasoline or diesel-powered pumping equipment. Fueling procedures shall be as per permit conditions.

2.04 PIPE

Pipes and fittings used for water control and/or diversions shall be sized appropriately and shall be in good condition without leaks or cracks. Pipe pressure ratings shall be adequate for static head loading when pressure flow is expected. Pipe joints shall be watertight and installed as per the manufacturer's recommendations.

**PART 3 - EXECUTION**

3.01 GENERAL SURFACE WATER CONTROLS

- A. This section defines the intent of surface water control work, but the Contractor shall ultimately be responsible for means and methods and compliance with the specification and Contract Drawings will be judged on performance criteria. The Contractor shall submit a water control plan to the Owner for review and may, at that time, propose alternative water control strategies. The Contractor's water control plan must however satisfy the terms and conditions of all permits issued to the project.
- B. It is anticipated that the temporary water control measures necessary to complete the work will require a phased sequencing. An anticipated construction sequence is included in **Drawing G-2** and an anticipated phased sequencing for temporary water control is included in **Drawing C-2**. Creating a project specific construction sequence with respect to water control is of high importance. Final details for such shall be determined by the Contractor as a part of their means and methods and shall be submitted for approval by the Owner and Engineer.
- C. If pumps or similar equipment is utilized, the Contractor shall maintain immediate access to back-up electrical generators, fuel, pumps, and related equipment and supplies with output capacity sufficient to maintain continuous operation of the water control systems in the event the original water control equipment or power source(s) which is in use becomes inoperable. The back-up generator, pumps and necessary equipment and supplies shall be capable of rapid deployment for replacement for the inoperable equipment.
- D. The Contractor shall take all reasonable and prudent precautions during construction to provide and maintain proper equipment and facilities to control and divert water. Extra vigilance in monitoring any cofferdam structure is vital since dislodgement of such a structure could cause injury to workers within.
- E. If necessary, water control systems shall be operated continuously during all construction specified herein. The operation time may include breaks, nights, weekends, holidays and other times when work is not otherwise being performed on the site.
- F. Surface water control in the site area shall account for the range of flow expected in the Lamprey River during the course of the Project. If needed, pumps, siphons, pipes, channels, etc. shall be sized appropriately. Any cofferdam / diversion barriers shall be constructed of such materials and to such extent that they will withstand the forces and pressures exerted by flows and depths of a reasonable expected magnitude. The cofferdams / diversion barriers shall be compatible with other dewatering, water control, and sedimentation control

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procedures. Dewatering equipment shall be provided as needed to remove water from the interior areas of cofferdams / diversion barriers.

- G. All cofferdams / diversion barriers constructed by the Contractor shall be completely removed upon the completion of the Project. All material shall be legally disposed of off-site at the Contractor's expense. No material shall be left within the Work area.
- H. The Contractor shall make provisions to remove any impediments or obstructions (e.g. debris, material, equipment, etc.) to flow through water conveyance structures expeditiously during the entire project period and in the event of a flood event which threatens to overwhelm the water control system or cause increased water levels which might lead to damage at the Dam, or other property upstream or downstream of the Dam.
- I. If deployed by the Contractor, pumps must be operated in such a way as to not disturb abutters (e.g. noise). Pump intakes shall be placed so as to reduce the potential for sediment entrainment and pump discharge points shall make provisions for reducing erosion potential through energy dissipation, riprap protection, etc.
- J. In general, the Contractor shall only work in the dry, unless approved otherwise by the Owner. If the Owner approves the Contractor to work in the wet, the work shall be performed such that the intent of the Work underway is not violated and the quality of the finished product is not reduced. The Resident Engineer will monitor conditions at the site and the effects of water surface levels and flows on the Work. If it is judged that the Contractor cannot appropriately complete the Work under the conditions present, the Owner or its Resident Engineer will notify the Contractor and the Contractor shall make provision for water control.
- K. The Contractor shall install and maintain temporary staff gages and/or measurement points as necessary to provide for water level measurement during construction. The Contractor shall record twice daily (am and pm) impoundment and channel water levels (in elevation based on Site Datum) on a daily basis. Water levels shall be recorded in a log and a copy provided to the Resident Engineer each day. The Contractor shall install a permanent staff gage adjacent to the water level sensor upstream of the new gate structure. All work and materials described in this paragraph shall be considered incidental to the Work of this Section.

### 3.02 SITE SPECIFIC SURFACE WATER CONTROL REQUIREMENTS

- A. Water control IS of the utmost importance during the Work of this Contract. The Work of this Contract has been designed to allow the upstream area of the existing concrete outlet structure to be isolated from the flow of the Lamprey River. The surface water control plan is intended to provide ongoing control throughout the Work of this Contract such that water levels upstream of the existing concrete outlet structure are not materially increased nor are downstream flows materially increased with respect to existing conditions.
- B. Direct discharge from the impoundment to the downstream river channel through temporary open channels shall NOT be allowed.
- C. In general, the Contractor may increase outflows during periods of dewatering and decrease outflows during such periods of the Work which require such actions. However, the Contractor shall ensure that the drawdown of the impoundment remains in compliance with

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the requirements set forth by New Hampshire Fish and Game Department (NHFG) in the drawdown letter dated February 22, 2019.

- D. In the event of pumping or siphoning, flow may be withdrawn from the impoundment until such time as the water surface is within one foot of the bottom of the impoundment. Flow withdrawn from the volume of water within one foot of the general impoundment bottom / top of sediment must be passed through an appropriate BMP prior to discharge.

### **3.05 BY-PASS OF SURFACE WATER**

- A. If surface water is withdrawn from the impoundment upstream of the upstream cofferdam to lower impoundment levels, secure and mark the intake of the system and provide for protection against damage and entrainment of debris and sediment.
- B. Monitor flow during project and maintain proper function. The by-pass system must be in-place and functional prior to dewatering between the cofferdams.
- C. Discharge the bypass flow downstream of the downstream cofferdam but upstream of the turbidity curtain.

**PART B – TEMPORARY CONSTRUCTION DEWATERING AND GROUNDWATER CONTROL**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. This section specifies the removal and control of groundwater and hydrostatic pressures in the work area in order to permit excavation, construction, installations, and repairs to be performed in the dry. The Contractor shall provide a dewatering system which is capable of controlling of water such that the excavation and/or backfilling operation can proceed unhindered by groundwater and flow into or through the work area. All work shall be performed in accordance with the plans and specifications and to the satisfaction of the Owner and its Resident Engineer.
- B. The Contractor is required to implement groundwater dewatering and control measures to maintain the groundwater level such that excavation work proceeds in the dry and subgrades remain stable against heave and boiling.
- C. The Contractor shall take all reasonable and prudent precautions during construction to provide and maintain proper equipment and facilities to remove promptly and dispose of properly, all groundwater entering work area and keep such areas dry so as to obtain a satisfactory undisturbed subgrade condition.
- D. Shallow sumps may be required to maintain the lowered groundwater level until work has been completed. Sumps shall be surrounded by suitable filter material. Well points may be required in place of or in addition to other dewatering techniques. Pumping shall be continuous as necessary to maintain the work in the dry.
- E. The Contractor shall remove all pumped water away from the work area, and provide sedimentation control and recharge in accordance with all applicable local codes and laws as well as the Sedimentation & Erosion Control and Surface Water Control Sections of the Contract Documents. All water which is discharged by dewatering measures shall be passed through appropriate and adequate sediment and/or filtration measures such that the effluent meets the standards set out in Section 01560 and those provided below. The Contractor shall discharge all dewatering and groundwater control effluent into the Lamprey River, provided that the Contractor meets the discharge water quality is appropriate with respect to turbidity, dissolved oxygen, pH, and other characteristics, as stated in any permit or relevant regulation. The Contractor shall be required to monitor discharge water quality and shall be required to provide the Owner with equipment to independently monitor water quality.
- F. Dewatering systems shall act in concert with surface water control systems, noted in Part A above, and with any temporary cofferdams erected.
- H. The Contractor is specifically informed that dewatering and ground water control efforts may be necessary for the excavation and installation of the precast concrete gate operator vault for the new gate.

1.02 SCOPE



## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

- A. The Work of this Section includes the furnishing of all labor, equipment, supplies, materials and utilities required for the operation, maintenance, and supervision of efforts to control surface water on and around the Site such that all construction within this Contract can proceed unhindered by groundwater and seepage flow into or through the work area, including within excavations, temporary cofferdams, and foundations. The Work of this Section further includes the furnishing of all labor, equipment, supplies, materials and utilities required for the operation, maintenance, monitoring, testing, and supervision of efforts to maintain the quality of groundwater collected and discharged by the groundwater control systems.

### **1.03 ADHERENCE TO REGULATORY CONDITIONS**

- A. See Part A for Regulatory Conditions.
- B. No dewatering work of any type in any area shall commence until sedimentation control measures are in place to the satisfaction of the Owner and its Resident Engineer.
- C. A Phase II National Pollution Elimination Discharge System (NPDES) general construction permit is not expected to be required for this project, however all temporary dewatering and water control measures must be installed and maintained in accordance with the approved Temporary Sediment and Erosion Control Plan as required by Section 01560.

### **1.04 RELATED WORK**

- A. See Part A for list of Related Work.

### **1.05 WATER QUALITY STANDARDS FOR DISCHARGE OF WATER FROM DEWATERING SYSTEM**

- A. See Part A for Discharge of Water requirements.

### **1.06 SUBMITTALS**

- A. Not less than ten (10) days prior to the scheduled start of work, the Contractor shall submit his proposed method of dewatering and maintaining dry conditions, to the Owner for review. The submittal shall include as a minimum the following items:
  - 1. The Contractor's proposed design, sequence of operation, maintenance and supervision of the dewatering system for the maintenance of groundwater levels as specified herein and as needed for the Contractor's operations. The submittal shall include a list of all equipment to be provided along with performance characteristics and installation methodologies.
  - 2. The Contractor's proposed contingency plan for groundwater control measures for all systems.
  - 3. Scheduling and sequencing requirements with regard to surface Water Control and Sedimentation Control.

## **PART 2 - PRODUCTS**

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

### **2.01 PUMPS, HOSES, SIPHONS**

- A. Pumps, hoses, or siphons used at the site shall be sized appropriately and shall be maintained in good working order by the Contractor.
- B. Pumps shall be sized appropriately by the Contractor and shall operate in a manner which does not create a nuisance to abutters (i.e. quietly and without significant exhaust).
- C. Secondary containment shall be provided for gasoline or diesel-powered pumping equipment.

### **2.02 PIPE**

Pipes used for water control and/or diversions shall be sized appropriately and shall be in good condition without leaks or cracks. Pipe pressure ratings shall be adequate for static head loading when pressure flow is expected. Pipe joints shall be watertight and installed as per the manufacturer's recommendations.

### **2.03 GEOTEXTILES**

Geotextiles used as part of the construction dewatering system shall provide for appropriate filtration capacity with respect to the site soils.

### **2.04 INTAKE SUMPS**

Intake sumps shall be filtered by crushed stone. Filter fabric may also be used.

### **2.05 DEWATERING BAGS**

Dewatering bags shall be made from permeable non-woven geotextile fabric. Bags shall be sized appropriately, the apparent opening size of the geotextile shall be suitable for the sediment grain size distribution, the bags shall be placed on a gravel bedding, and surrounded by a sediment barrier.

### **2.06 SOIL MATERIAL**

Soil and stone used as part of the construction dewatering system shall provide for appropriate filtration capacity with respect to the site soils. All such material shall be clean and free from contaminants and shall meet the requirements of the appropriate Section of these technical specifications.

## **PART 3 - EXECUTION**

### **3.01 GENERAL GROUNDWATER CONTROLS**

- A. The Contractor shall provide an on-site back-up electrical generator, pumps and related equipment and supplies on-site with output capacity sufficient to maintain continuous operation of the dewatering systems in the event the original dewatering equipment becomes inoperable or power source(s) is interrupted. The back-up generator, pumps and necessary equipment and supplies shall be connected to the operating system to the greatest degree possible prior to the start of all dewatering operations in such a manner to allow immediate replacement of the inoperable equipment. All electrical equipment shall be properly grounded and shall be provided with GFIs and meet all codes and requirements.

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

- B. Dewatering systems shall be operated continuously, and groundwater levels monitored and maintained at specified levels during all construction. The operation time is to include breaks, nights, weekends, holidays and other times (including during storm events) when work is not otherwise being performed on the site. Appropriate alarm systems (autodialer, etc.) shall be provided to provide alert and notification in the event of water control system failure.
- C. Prior to dewatering, all sedimentation controls and dewatering treatment systems shall be in-place and operable. Prior to and during excavation, groundwater levels shall be lowered and maintained by the dewatering system submitted by the Contractor and approved by the Resident Engineer. Groundwater shall be maintained a minimum of one foot below the subgrade elevation in all work areas. Compliance of the dewatered levels with level specified herein shall be determined by visual observation of sumps, subgrades, etc.
- D. Where the Contractor proposes to remove groundwater from the bottom of the excavation by sumping as approved by the Resident Engineer, the sump shall be surrounded by a suitable filter to prevent removal of soil fines. Pumping from sumps which remove fines from the soil shall be immediately terminated and the dewatering method revised accordingly. If cloudy discharge water (i.e. flow containing fines) is observed, then pumping shall cease immediately. The pump discharge point shall be clearly visible to facilitate observation and inspection.
- E. Geotextiles and filter soils which are used to control boiling or piping must be sized appropriately and placed to extent and depths as are necessary to control transport of soil and prevent loss of subgrade material.
- F. All pumped water shall be discharged in accordance with Section 01560 and the requirements specified in Part A above as applicable. **In the event that discharge water is found to not meet water quality standards, discharge must immediately cease and may not resume until the problem is corrected and discharge water may be verified to meet standards.**
- G. If applicable, all requirements of relevant regulatory agencies shall be satisfied.
- H. The Contractor may stage his dewatering plan such that dewatering and groundwater control is limited to areas where work is or soon will be occurring. At the request of the Contractor, Groundwater control may cease only when the Owner and Engineer are satisfied that groundwater will no longer affect the Work of the Contract or the integrity of the structure in the area.
- I. Groundwater levels in excavations shall be maintained below the working surface so that work can be conducted “in-the-dry.”

### 3.02 GENERAL WATER CONTROL METHODOLOGY LIMITATIONS

In order to maintain the quality of dewatering and water control effluent and to prevent the discharge of unacceptable quantities of sediment, the following minimum restrictions shall be observed:

- A. When sumps are required, the intake must be placed within a perforated pipe and the annular space between the pipe and the sump pit (as well as the bottom of the pit) must be filled with

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

crushed stone. Filter fabric may also be used, if necessary. Note that any crushed stone installed for the purpose of dewatering may not be left in place following dewatering activities unless specifically approved by the Resident Engineer.

- B. Discharge water may be passed through “Silt socks,” “Dirt Bags,” or other appropriate filtration devices which mitigate turbidity delivered to receiving waters. These devices should have a supplemental perimeter line of turbidity curtains and/or linear sedimentation barriers.
- C. Discharge may also be passed through a temporary sedimentation tank sized appropriately for the flow rate.

## **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \*END OF SECTION\* \* \***

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**SECTION 01566**  
**HYDRAULIC AND HYDROLOGIC DATA**  
*(for information only)*

**PART 1 - GENERAL**

**1.01 PURPOSE AND INTENT OF DATA**

The Engineer has compiled the data contained herein regarding certain hydraulic and hydrologic information pertaining to the Macallen Dam and its watershed associated with the Project site, along with data on climate in the area. This information is presented **FOR INFORMATION ONLY**. Neither the Owner nor the Engineer makes any assurances as to the accuracy of the information depicted in this section. The Contractor is responsible for making his own assumptions, interpretations, and conclusions based on the data presented herein. The Contractor may, at their own expense, make additional investigations to confirm the information presented herein.

**1.02 STREAM FLOW DATA FOR MACALLEN DAM**

The impoundment associated with the Macallen Dam site reaches approximately 2.5 miles up the Lamprey River and approximately 0.75 miles up the Piscassic River. The Lamprey River drainage area at the Macallen Dam is approximately 211 square miles. The U.S. Geological Survey (USGS) operates a gage on the Lamprey River, at the start the dam's impoundment immediately upstream of Packers Falls, in Durham, NH, which is approximately 2.5 miles upstream of the Macallen Dam site. Data from this gage may be useful as a surrogate for data regarding the Lamprey River at the dam site, provided appropriate scaling factors are applied. The Contractor shall be aware that the USGS reports the gage datum to be 38.28 feet above National Geodetic Vertical Datum of 1929 (NGVD29) datum and elevations herein and specified elsewhere are reported in North American Vertical Datum of 1988 (NAVD88) and appropriate conversions should be applied. The gage number is 01073500, and data from the gage is available via the internet at:

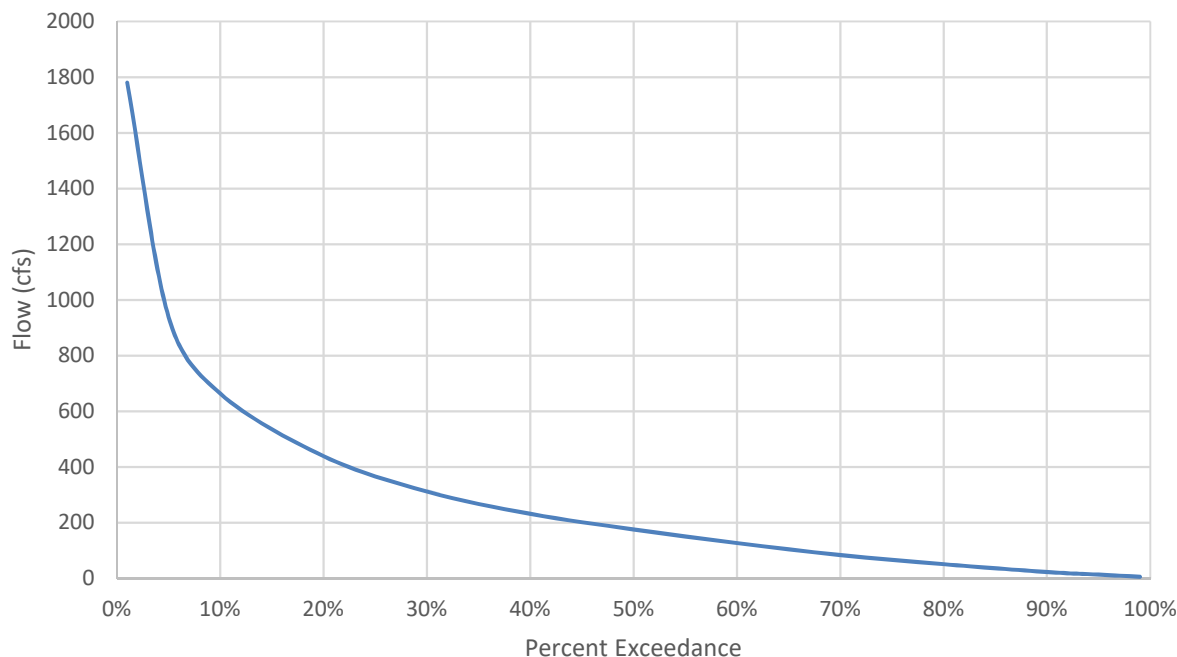
[https://waterdata.usgs.gov/nwis/inventory?agency\\_code=USGS&site\\_no=01073500](https://waterdata.usgs.gov/nwis/inventory?agency_code=USGS&site_no=01073500)

The drainage area associated with this gage is approximately 185 square miles. The Piscassic River / Folletts Brook are tributaries to the Lamprey River which meet the river downstream of the gage. Peak flow statistics associated with the gage is here:

<https://streamstatsags.cr.usgs.gov/gagepages/html/01073500.htm>

The Engineer on behalf of the Owner has, as a part of their studies and analyses, estimated hydrologic and hydraulic characteristics regarding the Lamprey River, watershed, and hydraulic control structures. A portion of this information is summarized below. This hydrologic information is presented for informational purposes only. No warranty, expressed or implied, is made on the accuracy of the information herein. The Contractor is responsible for making his or her own interpretation of possible precipitation and/or resultant flow conditions, and responsible for all such decisions which may affect Contractor's water control and construction methods or associated cost of construction. This includes developing hydraulic computations to estimate resultant water surface elevation in the Lamprey River. The information below represents analysis of data using standard statistical methods and are provided for reference only. The Contractor shall independently verify flow information. The flow duration curve was estimated using water level data from gage number 01073500 based on years 1934 to 2019. Actual conditions may differ from those presented in **Table 1** below.

## Macallen Dam – Abutments and Outlet Structure Rehabilitation



**Figure 1: Annual Flow Duration Curve of Lamprey River at Macallen Dam**  
**\*Scaled from USGS Gage 01073500 (1934 to 2019)**

**Table 1: Statistics of Monthly Mean Streamflow Data**  
**(\*\*\*Not representative of potential flood flows\*\*\*)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean (cfs)	331	360	725	809	427	236	112	86	82	163	316	395
Max. (cfs)	3,224	5,210	7,266	8,572	9,230	5,003	3,606	2,492	3,344	7,346	2,181	2,696
Min. (cfs)	28	36	45	102	51	12	2	2	2	3	10	12

*\* Estimated monthly flow information presented above was obtained from Table 7.1.1-2 of the Final Feasibility Report, Dam Feasibility and Impact Analysis, Macallen Dam, Newmarket, NH prepared by Gomez and Sullivan Engineers, P.C. dated July 2014*

### 1.03 RAINFALL DATA

The following rainfall data provided below is the monthly average precipitation for Newmarket, NH, as listed on the Weather Channel website:

<https://weather.com/weather/monthly/1/USNH0165:1:US>

**Table 2: Monthly Average Precipitation  
Newmarket, NH**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precip (in)	2.8	3.1	4.1	4.3	4.0	3.9	4.2	3.5	3.8	4.4	4.5	3.4

### 1.03 FLOOD FLOWS

The information on flows and water surface elevations provided below was obtained from the Gomez and Sullivan Engineers (GSE) Final Design Flood Analysis Memorandum, dated August 23, 2016, and approved by New Hampshire Department of Environmental Services (NHDES). This hydrologic information is presented for informational purposes only. No warranty, expressed or implied, is made on the accuracy of the information herein.

**Table 3: Flood Flow Frequency Information at Macallen Dam**

Storm Return Period (years)	Approximate Peak Inflow (cfs)	Source
10-year	4,320	FEMA Preliminary Flood Insurance Study for Rockingham County, NH (February 2016)
100-year	9,824	GSE Design Flow Memorandum (August 2016)

### 1.05 GROUNDWATER LEVEL DATA

Site specific groundwater data is available for the site on the boring and test pit logs provide in Section 01567 – Subsurface Explorations Technical Data. The Contractor shall make his/her own assumptions regarding groundwater levels and flows based on site conditions. The Contractor shall be prepared to manage, handle and control groundwater in accordance with the requirements of Section 01565 – Temporary Dewatering and Water Control.

It should also be noted that fluctuations in groundwater levels will occur due to variations in season, rainfall, site features, and other factors different from those existing at the time of the explorations and measurements.

## **PART 2 – PRODUCTS**

Not Used

## **PART 3 - EXECUTION**

Not Used

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

### **PART 4 - MEASUREMENT AND PAYMENT**

No measurement shall be made of any work performed under this section. No separate payment shall be made for any work performed under this section. The cost of any work done or facilities provided under this section shall be included under other pay items within the Contract.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 01567**  
**SUBSURFACE EXPLORATIONS TECHNICAL DATA**  
*(for information only)*

**PART 1 – GENERAL**

1.01 SUBSURFACE INFORMATION

- A. The available subsurface information is appended herein to the end of this Section.

1.02 SUBSURFACE INFORMATION LIMITATIONS

- A. The Owner has had a limited number of test explorations performed at the site for the purpose of obtaining general knowledge about subsurface conditions.
- B. Factual subsurface information in the form of test pit and boring logs within the embankments of Macallen Dam and elsewhere within site limits are appended herewith. Contract Drawings include the approximate locations of the borings. The logs describe subsurface conditions encountered at the exploration locations at the time explorations were made. This information should be taken as approximate and conceptual. No warranties, expressed or implied, are made as to accuracy of subsurface information provided herein.
- C. Strata or material between the exploration locations are likely not continuous. The stratification on the logs represents approximate boundaries between soil types. Actual soil transitions are more gradual.
- D. Water level readings have been observed in the explorations at times and under conditions stated on the logs. Fluctuations in the level of the groundwater will occur due to variations in reservoir level, rainfall, temperature and season.
- E. The boring logs and test pit logs are presented for informational purposes only. The Contractor shall make his own interpretation of subsurface conditions which may affect methods or cost of construction. Bidders may, and upon approval by the Owner, conduct additional subsurface test borings at the site, at no additional expense to the Owner.

**PART 2 - PRODUCTS**

This Section Not Used

**PART 3 - EXECUTION**

This Section Not Used

**PART 4 – MEASUREMENT AND PAYMENT**

No measurement shall be made of any work performed under this section. No separate payment shall be made for any work performed under this section. The cost of any work done or facilities provided under this section shall be included under other pay items within the Contract.

\* \* \* **END OF SECTION** \* \* \*

**Subsurface Conditions**  
**(Historic Boring Information)**

**R. W. Gillespie & Associates, Inc.**

**APPENDIX A**

**EXPLORATION LOGS**

Geotechnical Investigation  
Selectwoods Building  
Newmarket, New Hampshire

# BORING LOG B-1

Project: Selectwoods Building  
Location: New Market, New Hampshire

Client: Chinburg Builders

Project No. 235-848

Approximate Surface Elevation: 33'  
Ground Water Depth: 10'

Date: 13 January 2003

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
0			S-1	Silty Sand, loose, moist, coarse to fine sand, some silt, little to trace gravel, brown.	15	6 6 2 1	8		
				-FILL-					
5			S-2	Clayey Silt, loose, moist then wet, silt and clay with trace to little fine sand and gravel, occasional cobble, brick, gray.	24	2 2 3 3	5		
				-FILL-					
10			S-3	Sandy Silt, loose, wet, medium to fine sand, little clay, little to trace gravel, occasional cobble, gray.	10	2 2 8 18	10		
				-FILL-					
15			S-4		6	2 4 6 3	10		
20			S-5	GRAVELLY SAND WITH SILT (SM); dense, wet, coarse to fine sand, some to little gravel, little silt. -GLACIAL TILL-	22	19 15 18 20	33		
25				BEDROCK Hard, fresh, light gray, fine grain GNEISS with close to moderate spaced, moderately dipping, smooth, fresh to discolored, closed joints. Recovery = 96%, RQD = 65% Depth per ft. Time per min 24.0 - 25.0 4.50 25.0 - 26.0 3.75 26.0 - 27.0 3.50 27.0 - 28.0 4.00 28.0 - 29.0 4.50 Recovery = 100%, RQD = 65% Depth per ft. Time per min. 29.0 - 30.0 4.00					
30									
35									

# BORING LOG B-1

Project: Selectwoods Building  
Location: New Market, New Hampshire

Approximate Surface Elevation: 33'  
Ground Water Depth: 10'

Client: Chinburg Builders

Date: 13 January 2003

Project No. 235-848

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
				30.0 - 31.0 4.50					
				31.0 - 32.0 5.00					
				32.0 - 33.0 6.00					
				33.0 - 34.0 6.00					
40				Bottom of Exploration at 34': terminated 10.5' into bedrock.					
45									
50									
55									
60									
65									
70									

# BORING LOG B-2

Project: Selectwoods Building  
Location: New Market, New Hampshire

Approximate Surface Elevation: 33'  
Ground Water Depth: NFGWE

Client: Chinburg Builders

Date: 13 January 2003

Project No. 235-848

DEPTH, FT.	SYMBOL	SAMPLES SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
0		S-1	Silty Sand, loose, moist, coarse to fine sand and silt, trace gravel, brown.	24	2 7 6 6	13		
			-FILL-					
			SILTY LEAN CLAY (CL); hard, moist, olive brown. Pocket Penetrometer: Undrain Shear Strength, Su = 3.5 ksf.					
-2.5			-GLACIOMARINE DEPOSIT-					
5		S-2	Becomes varved with thin sand partings.	6	7 2/1"	49+		
			BEDROCK Fresh, hard, light gray, fine grain, GNISS with close to moderate spaced, moderately dipping, smooth, fresh to discolored closed joints, except top foot has open jointing infilled with silty clay. Recovery + 99%, RQD = 96%		40/ 0"			
-7.5			Depth per ft      Time per min 6.0 - 7.0          4.50 7.0 - 8.0          3.00 8.0 - 9.0          4.00 9.0 - 10.0        4.00 10.0 - 11.0       5.00					
10			Bottom of Exploration at 11'					
-12.5								
15								
-17.5								



**Subsurface Conditions**  
**(2018 GZA Subsurface Exploration)**



# TEST BORING LOG



**GZA**  
**GeoEnvironmental, Inc.**  
*Engineers and Scientists*

**Town of Newmarket, NH**  
**Macallen Dam**  
**Newmarket, New Hampshire**

**BORING NO.:** GZ-1  
**SHEET:** 1 of 1  
**PROJECT NO:** 01.0173346.10  
**REVIEWED BY:** CBN

<b>Drilling Co.:</b> New England Boring Contractors		<b>Type of Rig:</b> Truck Mounted		<b>Boring Location:</b> See Plan			<b>H. Datum:</b> NAD83	
<b>Foreman:</b> Pat Schofield		<b>Rig Model:</b> Mobile Drill B-48		<b>Ground Surface Elev. (ft.):</b> 31.8				
<b>Logged By:</b> Cody Gibb		<b>Drilling Method:</b> Drive and Wash		<b>Final Boring Depth (ft.):</b> 27				
				<b>Date Start - Finish:</b> 10/31/2018 - 10/31/2018			<b>V. Datum:</b> NAVD88	
<b>Auger/Casing Type:</b> HW		<b>Sampler Type:</b> Split Spoon		<b>Groundwater Depth (ft.)</b>				
<b>I.D./O.D. (in.):</b> 2-1/4"/4"		<b>I.D./O.D. (in.):</b> 1-3/8"/2"		<b>Date</b>	<b>Time</b>	<b>Water Depth</b>	<b>Casing</b>	<b>Stab. Time</b>
<b>Hammer Weight (lb.):</b> 300		<b>Sampler Hmr Wt (lb):</b> 140		10/31/18	1300	8	18	
<b>Hammer Fall (in.):</b> 24		<b>Sampler Hmr Fall (in):</b> 30						
<b>Other:</b> NX Core		<b>Other:</b> Auto Trip						

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
3		S-1	0-2	24	8	2 3 5 4	8	S-1: Loose, black, fine to coarse SAND, some Silt, trace Clay.				TOPSOIL	
4		S-2	2-4	24	12	3 2 2 3	4	S-2: Medium stiff, brown, Clayey SILT, little fine Sand.					
10		S-3	4-6	24	6	3 2 1 3	3	S-3: Soft, brown, Clayey SILT, trace fine Sand.					
5		S-4	6-8	24	5	4 5 4 3	9	S-4: Stiff, brown, Clayey SILT, some fine to medium Sand, little Gravel.					
7		S-5	8-10	24	8	8 2 2 5	4	S-5A: (Top 1") Medium stiff, brown, Clayey SILT, little fine Sand. S-5B: (Bottom 7") Medium stiff, gray, CLAY & SILT, little fine to coarse Sand, trace Gravel.				CLAYEY SILT (POSSIBLE FILL)	
10													
9													
20													
15		S-6	14-16	24	1	7 9 5 5	14	S-6: No recovery. (Wood Fragments stuck in tip of spoon.)	1				
45													
40													
30													
100													
4:07		C-1	18-23	60	47			C-1: Hard, light to dark gray, fresh to slightly fractured, fine to coarse grained, GNEISS.	2		18'		13.8'
4:01									3				
4:12													
4:48													
5:05													
5:50		C-2	23-27	48	45			C-2: Hard, light to dark gray, fresh to slightly fractured, fine to coarse grained, GNEISS.					
4:57													
7:11													
10:59													
								Bottom of boring at 27 feet.	4 5		27'		4.8'
30													

## REMARKS

1. Wood fragments stuck in tip of split spoon; possibly part of old shoring.
2. Casing and rollerbit refusal at 18 feet below ground surface (bgs).
3. Rock casing performed with NX size double tube core barrel. Core rate in units of minutes per foot. RQD = Rock Quality Designation.
4. Core C-2 four feet in length. Core barrel jammed at 27 feet bgs.
5. Upon completion, boring backfilled with spoils and 1/2 bag of grout and bentonite.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

**Boring No.:**  
**GZ-1**

# TEST BORING LOG



**GZA**  
**GeoEnvironmental, Inc.**  
*Engineers and Scientists*

**Town of Newmarket, NH**  
**Macallen Dam**  
**Newmarket, New Hampshire**

**BORING NO.:** GZ-P1  
**SHEET:** 1 of 1  
**PROJECT NO:** 01.0173346.10  
**REVIEWED BY:** CBN

<b>Drilling Co.:</b> New England Boring Contractors		<b>Type of Rig:</b> Truck Mounted		<b>Boring Location:</b> See Plan			<b>H. Datum:</b> NAD83	
<b>Foreman:</b> Pat Schofield		<b>Rig Model:</b> Mobile Drill B-48		<b>Ground Surface Elev. (ft.):</b> 32				
<b>Logged By:</b> Cody Gibb		<b>Drilling Method:</b> Drive and Wash		<b>Final Boring Depth (ft.):</b> 2.2				
				<b>Date Start - Finish:</b> 10/31/2018 - 10/31/2018			<b>V. Datum:</b> NAVD88	
<b>Auger/Casing Type:</b> HW		<b>Sampler Type:</b> NA		<b>Groundwater Depth (ft.)</b>				
<b>I.D./O.D.(in):</b> 4"		<b>I.D./O.D. (in.):</b>		<b>Date</b>	<b>Time</b>	<b>Water Depth</b>	<b>Casing</b>	<b>Stab. Time</b>
<b>Hammer Weight (lb.):</b> 300		<b>Sampler Hmr Wt (lb):</b>		Not encountered				
<b>Hammer Fall (in.):</b> 24		<b>Sampler Hmr Fall (in):</b>						
<b>Other:</b> Safety Hammer		<b>Other:</b>						

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
	10							Black, fine to coarse SAND and SILT.	1				
	100							Bottom of boring at 2.2 feet.	2				
									3				
									4				
5													
10													
15													
20													
25													
30													

- REMARKS**
- GZ-P1 was drilled as a probe. No samples were taken. The probe was advanced with 4-inch diameter casing and rotary wash drilling methods to refusal.
  - Black, fine to coarse Sand and Silt was visually observed in casing spoils.
  - Casing refusal at 2.2 feet below ground surface on possible Granite based on visual observation.
  - Upon completion, borehole backfilled with spoils and grout.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

**Boring No.:**  
**GZ-P1**

## TEST BORING LOG



**GZA**  
**GeoEnvironmental, Inc.**  
*Engineers and Scientists*

Town of Newmarket, NH  
 Macallen Dam  
 Newmarket, New Hampshire

**BORING NO.:** GZ-P2  
**SHEET:** 1 of 1  
**PROJECT NO:** 01.0173346.10  
**REVIEWED BY:** CBN

<b>Drilling Co.:</b> New England Boring Contractors <b>Foreman:</b> Pat Schofield <b>Logged By:</b> Cody Gibb	<b>Type of Rig:</b> Truck Mounted <b>Rig Model:</b> Mobile Drill B-48 <b>Drilling Method:</b> Drive and Wash	<b>Boring Location:</b> See Plan <b>Ground Surface Elev. (ft.):</b> 32 <b>Final Boring Depth (ft.):</b> 16 <b>Date Start - Finish:</b> 10/31/2018 - 10/31/2018	<b>H. Datum:</b> NAD83  <b>V. Datum:</b> NAVD88																				
<b>Auger/Casing Type:</b> HW <b>I.D./O.D.(in):</b> 4" <b>Hammer Weight (lb.):</b> 300 <b>Hammer Fall (in.):</b> 24 <b>Other:</b> Safety Hammer	<b>Sampler Type:</b> NA <b>I.D./O.D. (in.):</b> <b>Sampler Hmr Wt (lb):</b> <b>Sampler Hmr Fall (in):</b> <b>Other:</b>	<b>Groundwater Depth (ft.)</b>																					
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%;">Date</th> <th style="width: 25%;">Time</th> <th style="width: 25%;">Water Depth</th> <th style="width: 25%;">Casing</th> <th style="width: 25%;">Stab. Time</th> </tr> <tr> <td colspan="5" style="text-align: center;">Not encountered</td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table>	Date	Time	Water Depth	Casing	Stab. Time	Not encountered															
Date	Time	Water Depth	Casing	Stab. Time																			
Not encountered																							

Depth (ft)	Casing Blows/ Core Rate	Sample					Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)						
5	5						(Blind drill return from approximately 1 to 16'.) Brown, SILT & CLAY, little to trace, fine to coarse Sand.	1				
	6							2				
	5											
	7											
	10											
	10											
	8											
	10											
	20											
	10											
10	12											
	12											
	25											
	20											
	30											
	100											
							Bottom of boring at 16 feet.	3				
20												
25												
30												

- REMARKS

1. GZ-P2 was drilled as a probe. No samples were taken. The probe was advanced with 4-inch diameter casing and rotary wash drilling methods to refusal.
  2. Brown, Silty Clay and Sand was observed in wash water.
  3. Casing and rollerbit refusal on possible Bedrock based on rock fragments in wash water return and core at boring GZ-4.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

**Boring No.:**  
**GZ-P2**



**GZA**  
**GeoEnvironmental, Inc.**  
Engineers/Scientists

**Macallen Dam Rehabilitation**

Town of Newmarket

Newmarket

New Hampshire

Test Pit No.

TP-1

Page No.

1 of 1

File No.

01.0173346.10

Checked By:

CBN

GZA Rep.

Cody Gibb

Contractor

**Excavation Equipment**

New England Boring Contractors, Inc.

Date

11/2/2018

Weather

Rain 40-50° F

Operator

Make

Kubota

Model

KX057-4

Capacity

~0.2c.y.

Reach

20 ft.

Ground Elev.

31± (NAVD88)

Time Started

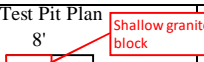
0800

Time Completed

0910

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0'	Dark brown to black SILT, some fine to coarse SAND. [TOPSOIL]			E	0	
1'	Black fine to coarse SAND, some Silt, trace Clay [FILL]			E	0	
2'	Brown CLAYEY SILT, little fine Sand. [CLAYEY SILT - POSSIBLE FILL]			E	0	1
3'				E	0	
4'				E	0	
5'				E	0	
6'				E	0	2
6'	Bottom of Test Pit at 6 feet.					
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

**Notes:** 1. Shallow granite block encountered 2-feet 2-inches below ground surface on the northwest side of TP-1. Limit of block extends approximately 4-feet from west side and approximately 5-feet from north side of TP-1. See Test Pit Plan.  
2. Vertical concrete parapet wall is present in upper 5.5-feet, bearing on a granite block wall below. The granite block wall extends about 6-feet beyond the concrete section. No apparent batter observed.

<div>Test Pit Plan</div> <div></div> <div>Volume = 11.5 cu. yd.</div>	<div>Boulder Class</div> <table><tr><th>Letter Designation</th><th>Size Range Classification</th></tr><tr><td>A</td><td>6" - 17"</td></tr><tr><td>B</td><td>18" - 36"</td></tr><tr><td>C</td><td>36" and Larger</td></tr></table> <div>Excavation Effort</div> <div>E-----Easy</div> <div>M-----Moderate</div> <div>D-----Difficult</div>	Letter Designation	Size Range Classification	A	6" - 17"	B	18" - 36"	C	36" and Larger	<div>Proportions Used</div> <table><tr><td>TRACE (TR.)</td><td>0 - 10%</td></tr><tr><td>LITTLE (LL)</td><td>10 - 20%</td></tr><tr><td>SOME (SO.)</td><td>20 - 35%</td></tr><tr><td>AND</td><td>35 - 50%</td></tr></table>	TRACE (TR.)	0 - 10%	LITTLE (LL)	10 - 20%	SOME (SO.)	20 - 35%	AND	35 - 50%	<div>Abbreviations</div> <div>F = Fine</div> <div>M = Medium</div> <div>C = Coarse</div> <div>V = Very</div> <div>F/M = Fine to medium</div> <div>F/C = Fine to coarse</div> <div>GR = Gray</div> <div>BN = Brown</div> <div>YEL = Yellow</div>	GROUNDWATER	
		Letter Designation	Size Range Classification																		
		A	6" - 17"																		
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AND	35 - 50%																				
( ) Encountered																					
( ) Not Encountered																					
Elapsed Time to Reading (Hours)	Depth to Groundwater																				

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.



**GZA**  
**GeoEnvironmental, Inc.**  
Engineers/Scientists

Macallen Dam Rehabilitation

Town of Newmarket

Newmarket

New Hampshire

Test Pit No.

TP-2

Page No.

1 of 1

File No.

01.0173346.10

Checked By:

CBN

GZA Rep.

Cody Gibb

Contractor

Excavation Equipment

New England Boring Contractors, Inc.

Date

11/2/2018

Weather

Rain 40-50° F

Operator

Make

Kubota

Model

KX057-4

Capacity

~0.2c.y.

Reach

20 ft.

Ground Elev.

28± (NAVD88)

Time Started

1030

Time Completed

1200

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/Class	Note No.
0'	Dark brown to black SILT, some f-c SAND. [TOPSOIL]			E	A/6	1
1'	Brown f-c SAND, some Silt, little Clay, trace Cobbles [FILL]			E	0	
2'				E	0	
3'				E	0	
4'				E	0	
5'				E	0	
6'	Bottom of Test Pit at 6-feet.			E	0	
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

**Notes:** 1. Wall consists of approximately 4-foot high concrete wall bearing on a larger granite block wall below. The granite block wall extends approximately 5-feet beyond the back of the concrete section. No apparent batter observed at back of masonry wall.

<div>Test Pit Plan</div> <div><div>8'</div><div><div></div><div></div></div><div>8'</div><div>NORTH</div></div> <div>Volume = 14.8 cu. yd.</div>	<div>Boulder Class</div> <div><div>Letter Designation</div><div>Size Range Classification</div></div> <div><div>A</div><div>6" - 17"</div></div> <div><div>B</div><div>18" - 36"</div></div> <div><div>C</div><div>36" and Larger</div></div> <div><div>Excavation Effort</div><div>E-----Easy</div></div> <div><div>M-----Moderate</div></div> <div><div>D-----Difficult</div></div>	<div>Proportions Used</div> <div><div>TRACE (TR.)</div><div>0 - 10%</div></div> <div><div>LITTLE (LL)</div><div>10 - 20%</div></div> <div><div>SOME (SO.)</div><div>20 - 35%</div></div> <div><div>AND</div><div>35 - 50%</div></div>	<div>Abbreviations</div> <div><div>F = Fine</div><div>M = Medium</div><div>C = Coarse</div><div>V = Very</div><div>F/M = Fine to medium</div><div>F/C = Fine to coarse</div><div>GR = Gray</div><div>BN = Brown</div><div>YEL = Yellow</div></div>	<div>GROUNDWATER</div> <div><div>( ) Encountered</div><div>( ) Not Encountered</div></div> <div><div>Elapsed Time to Reading (Hours)</div><div>Depth to Groundwater</div></div> <div><div></div><div></div></div> <div><div></div><div></div></div>

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.



**GZA**  
**GeoEnvironmental, Inc.**  
Engineers/Scientists

# Macallen Dam Rehabilitation

Town of Newmarket

Newmarket

New Hampshire

Test Pit No.

TP-3

Page No.

1 of 1

File No.

01.0173346.10

Checked By:

CBN

GZA Rep.

Cody Gibb

Contractor

## Excavation Equipment

New England Boring Contractors, Inc.

Date

11/2/2018

Weather

Rain 40-50° F

Operator

Make

Kubota

Model

KX057-4

Capacity

~0.2c.y.

Reach

20 ft.

Ground Elev.

28.5± (NAVD88)

Time Started

1230

Time Completed

1315

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/Class	Note No.
0'	Dark brown to black SILT, some f-c SAND. [TOPSOIL]			E	0	
1'	Brown f-c SAND, some Gravel, little Silt, little Clay, trace brick debris and other deleterious material [FILL]			E	0	
2'				E	0	
3'				E	0	
4'				E	0	1,2
5'				E	0	
6'				E	0	3,4
7'				E	0	
8'	Bottom of Test Pit at 8-feet.			E	0	
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

**Notes:**

1. Wall consists of approximately 4-foot high concrete wall bearing on a granite block wall below. The top of the granite block wall extends 2-feet horizontally from the back of the concrete wall.
2. Wall observed to step down 2-feet and out 2-feet to a depth of 8-feet below ground surface.
3. Top of existing pipe encountered at 6-feet ±0.2-feet below ground surface on the west side of TP-3. Brick observed directly overlying pipe.
4. Water encountered at 6-feet below ground surface. Observations made below 6-feet based on excavation effort, sound, and operator experience.

<div>Test Pit Plan</div> <div><div>8'</div><div>8'</div><div><div><div></div><div>Pipe</div></div></div><div>NORTH</div></div> <div>Volume = 15.4 cu. yd.</div>	<div>Boulder Class</div> <table><tr><th>Letter Designation</th><th>Size Range Classification</th></tr><tr><td>A</td><td>6" - 17"</td></tr><tr><td>B</td><td>18" - 36"</td></tr><tr><td>C</td><td>36" and Larger</td></tr></table> <div>Excavation Effort</div> <div>E-----Easy</div> <div>M-----Moderate</div> <div>D-----Difficult</div>	Letter Designation	Size Range Classification	A	6" - 17"	B	18" - 36"	C	36" and Larger	<div>Proportions Used</div> <table><tr><td>TRACE (TR.)</td><td>0 - 10%</td></tr><tr><td>LITTLE (LL.)</td><td>10 - 20%</td></tr><tr><td>SOME (SO.)</td><td>20 - 35%</td></tr><tr><td>AND</td><td>35 - 50%</td></tr></table>	TRACE (TR.)	0 - 10%	LITTLE (LL.)	10 - 20%	SOME (SO.)	20 - 35%	AND	35 - 50%	<div>Abbreviations</div> <div>F = Fine</div> <div>M = Medium</div> <div>C = Coarse</div> <div>V = Very</div> <div>F/M = Fine to medium</div> <div>F/C = Fine to coarse</div> <div>GR = Gray</div> <div>BN = Brown</div> <div>YEL = Yellow</div>	<div>GROUNDWATER</div> <div>( ) Encountered</div> <div>( ) Not Encountered</div> <div>Elapsed Time to Reading (Hours)</div> <div>Depth to Groundwater</div> <table><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>				
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Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

**SECTION 01570  
TEMPORARY ACCESS AND TRAFFIC CONTROL**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. The Contractor shall furnish all labor, materials and equipment and shall perform all work required to install, maintain, and remove temporary access and traffic control systems at the Project Site, including staging areas, parking areas, and public or private ways accessing the site.
- B. The Contractor shall coordinate with the Project Owner or the owners of properties through which the site will be accessed for the protection of traffic and pedestrians on existing roads, parking areas, and paths, which will be, interfered with by his/her operations. Where traffic is maintained, the work shall be so conducted and guarded so that there will be at all times a safe passageway for all.
- C. It is the intent of the Work of this Section that the Contractor shall take such steps as are necessary to:
- Protect the safety of pedestrians and traffic on public or private ways.
  - Protect the safety of personnel accessing the left and right abutments to conduct repairs, document work or any other construction related activities
  - Exclude the public from the job site for the safety of the public and security of the Contractor's work and equipment
- D. The Contractor, shall develop a plan to encompass any and all work related to temporary site access. This plan will act to restrict public access to the site, provide safe access to the repair areas on the Dam, and allow for Contractor, Resident Engineer, and Owner operations to be performed safely throughout the entirety of the site. The Contractor shall be responsible for providing and maintain all signage and access controls as necessary to provide safe access to all areas of the Site and to direct the public away from work areas.
- E. The Contractor will need to move equipment and material to and from the Project Site. The Contractor shall provide construction traffic control including, but not limited to, temporary signage, barriers, police detail, as required to protect the public safety. Conform to all requirements of State of New Hampshire, County, Town, or local laws and requirements for traffic control. Conformance with contract documents does not relieve the Contractor for responsibility for public safety. The Contractor is solely responsible for traffic control and for conformance with all traffic control regulations. Owner access roads to both the left and right abutment are not public ways, therefore it is not anticipated that a police detail will be needed. However, the Contractor will be responsible to determine the suitability of these roads for use as access and equipment/material transport. Any damage to access roads by the Contractor will be repaired at his/her own expense.
- F. The Contractor shall be responsible for obtaining all permits and approvals needed, if any, from municipal agencies relating to temporary traffic control. The Contractor shall

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

pay all charges, fees and taxes and shall give all notices necessary and incidental to the due and lawful prosecution of the work under this Contract.

- G. Proper signage and additional barriers shall be provided and maintained to provide notice of restricted areas, to inform the public of possible hazards, to direct the Contractor's forces to proper access routes, staging areas, and parking areas, and to provide all other relevant instructions or notices consistent with the Work of this Section.

### **1.02 SCOPE OF WORK**

- A. The scope of the Work of this Section shall include the provision and installation of Temporary Access Control Fencing, at locations determined by the Contractor and the Owner, and as needed elsewhere. This work shall also include the monitoring, maintenance, and repair of all installed fencing and the proper removal and disposal of fencing after completion of work at the site.
- B. General work covered and paid for under this Section shall include the provision and installation of all other General Temporary Site Access and Traffic Control Measures, as shown on the Contract Drawings, and as needed elsewhere. This work shall also include all necessary gates, barriers, locks, scaffolding, staging, matting, etc. needed for site access control. The Work shall also include the provision of all necessary temporary access and traffic control signage, including but not limited to signage and miscellaneous site work needed to establish or maintain site access on existing access roads. General work covered and paid for under this Section shall also include all other access and traffic control work necessary to meet the conditions of the Contract Documents, Permits, Approvals, Licenses issued for the project and all relevant codes, rules, regulations, laws and ordinances applicable.

### **1.03 CONSTRUCTION PARKING CONTROL**

- A. Contractor staging areas are designated on the Contract Drawings. These may be used for parking of construction equipment.
- B. The personal vehicles of the Contractor's personnel shall be parked in areas designated by the Owner. The Contractor shall not park in parking spaces reserved for residents of 4 Bay Road (Lamprey Falls LLC), 6 Bay Road (Bryant Rock, LLC), or 53 Main Street (Durham Book Exchange).
- C. Where temporary parking areas are constructed on areas that will be grassed, remove all open graded shoulder material used for temporary parking areas prior to final landscape grading for seeding.
- D. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, Owner's operations, and any public access parking areas.

### **1.04 ACCESS CONTROL FENCING**

The Contractor shall provide access control fencing to prevent unauthorized entry to construction areas, to delineate temporary contractor staging areas, and to protect existing facilities, adjacent properties, and the public from damage from construction operations. Temporary barriers may be



## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

required on the site, as determined by the Owner or its Resident Engineer, and shall be provided at no extra cost.

### **1.05 PROTECTION OF EXISTING FEATURES AND WORK**

- A. The Contractor shall provide protection for plants, trees, existing structures, and existing utilities, and replace those damaged during construction at no additional cost. It shall be the Contractor's sole responsibility to select the location and appropriate construction of all temporary barriers.
- B. The Contractor shall provide all appropriate protection for existing site utilities, overhead, at grade, and subsurface. The Contractor shall be responsible for repairing or replacing any utilities damaged during construction at no additional cost to the Owner.
- C. The Contractor shall be responsible for providing site security necessary to prevent theft and vandalism from the site, including from stored materials and the Resident Engineer's trailer. This may include lighting, security cameras, etc.
- D. The Contractor shall protect non-Contractor-owned vehicular traffic, stored materials, site and structures from damage and shall replace same if damaged during construction at no additional cost.

### **1.06 GENERAL ACCESS AND TRAFFIC CONTROL SIGNAGE**

The Contractor shall provide all necessary general access and traffic control signage necessary at the site, including signs indicating the area as a closed to the public, a hardhat area, etc. The Contractor shall also provide a general project information sign stating the project name, the Town, the contractor information and the Engineer.

### **1.07 ACCESS AND TRAFFIC CONTROL COORDINATION**

- A. As part of the general access and traffic control work, the Contractor shall make all necessary notifications to emergency and public services regarding work which might involve disruption to those services. Coordinate with such agencies and make accommodations as necessary.
- B. If requested by the Owner, the Contractor shall place a notice in the local newspaper regarding the start of the work, the access road closures, and any detours.

### **1.08 TEMPORARY SITE ACCESS**

- A. As part of the general site access control work, the Contractor shall be prepared to provide working platforms, scaffolding, ladders, ramps, cribbing, shoring, matting, and all other specialized support equipment required to ensure safe access of all personnel, equipment, and materials necessary for completion of the work of this Contract in accordance with the Specifications and Drawings.
- B. The Contractor shall specify intended methods for accessing each location for demolition, removal and construction along the existing outlet structure and rehabilitation work along each embankment wall as indicated on the Contract Drawings.

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

- C. All working platforms, scaffolding, ladders, ramps, cribbing, shoring, matting and any other specialized support equipment required for safe temporary site access shall be in compliance with the most up-to-date Occupational Safety and Health Administration (OSHA) regulations.

### **1.09 RELATED WORK**

- A. The following is a list of related work items that shall be performed or furnished under other sections of these specifications as indicated:
  - 1. Regulatory Requirements – Section 01060
  - 2. Temporary Facilities and Controls – Section 01500
  - 3. Site Restoration – Section 01740
  - 4. Mobilization and Demobilization – Section 01900
  - 5. Cast-In-Place Concrete – Section 03300
  - 6. Masonry Repair – Section 04400

### **1.10 SUBMITTALS**

- A. Not less than five (5) days prior to the scheduled start of work, the Contractor shall submit his proposed plan for temporary access and traffic control. The submittal shall include as a minimum the following items:
  - 1. General plan for accessing site and controlling traffic.
  - 2. Proposed access route(s) for each side of the dam.
  - 3. Schedule for access road closures or restrictions.
  - 4. Products to be used as signs and barriers.
  - 5. Content and configuration of signs.
  - 6. Means and content of public notification.
  - 7. Layout and location of signs and barriers.
  - 8. Parking plan.
  - 9. Plan for traffic entering/exiting Penstock Way and the parking lot accessed from Bay Road.
  - 10. Approvals from local authorities and railroad (if needed).
  - 11. The general information sign layout and information presented.
  - 12. If requested, newspaper ad text (in local paper) and copy of printed ad.

## **PART 2 - PRODUCTS**

### **2.01 PLASTIC MESH FENCING**

- A. Plastic Mesh Fencing, shall be highly visible (orange) extruded plastic flexible safety

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

barricade fencing or equivalent on metal support t-posts installed continuously (i.e., no gaps) around areas as needed and/or directed by the Owner or its Resident Engineer. Such fencing shall be a minimum of four feet high.

### **2.02 TRAFFIC CONTROL MATERIALS**

- A. All products used shall be in conformance with the latest edition of the New Hampshire DOT (NHDOT) Standard Specifications for Road and Bridge Construction.
- B. Temporary Traffic Control devices need not be new but must be in first class condition and acceptable to the Resident Engineer. Temporary Traffic Control devices not up to standards shall be removed from the site and replaced with acceptable products.
- C. In the event that traffic controls are needed after dark, appropriate lighted and/or reflective barriers, flashers, signals, etc. shall be provided.

### **2.03 SIGNAGE**

- A. Temporary traffic control signs on public ways and in parking lots shall conform to the requirements of the latest edition of the NHDOT Standard Specifications for Road and Bridge Construction .
- B. Other temporary access and traffic control signage shall be commercially printed, all-weather signs on stiff backing. Where appropriate signs shall conform to OSHA guidelines. In general, signs shall be a minimum of 4 square feet in area and shall utilize colors which are highly visible.
- C. All signage shall be firmly affixed to wooden or metal posts at an appropriate height. Signs may not be affixed to trees in a manner which will result in permanent damage.

### **2.04 LOCKS AND KEYS**

- A. The Contractor shall provide the Owner's Resident Engineer with two sets of keys, each, for any locks installed at the site, excepting the Contractor's own trailer. Additional sets of keys may be requested by the Owner in order to provide access to specific areas of the sites, for operations and maintenance personnel as needed.

## **PART 3 – EXECUTION**

### **3.01 GENERAL ACCESS CONTROL**

- A. The Contractor shall be responsible for preparing and executing a Temporary Site Access and Traffic Control Plan for the work site, access roads, parking lots, and traffic onto the site in accordance with the needs of the schedule and work plan. The plan shall be approved by the Owner and all relevant local authorities, as necessary. The Contractor is responsible for all necessary interaction, consultation, and coordination.
- B. The Contractor shall be responsible to extend and relocate access staging and traffic controls as Work progresses by removing or changing signage and barriers at the beginning and end of each work day and removing any and all staging equipment required for the work from

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

the construction areas upon completion, as required by the Plan. The Contractor shall also maintain existing roads, driveways, and paths accessing the site as well as the construction area.

- C. The Contractor shall be responsible for all work and materials, including temporary fill, steel road plates, etc., required to protect roadways, access roads, parking lots, sidewalks, overhead utilities, and buried underground structures or utilities beneath. Trees near the construction staging area shall be protected in accordance with the specifications. Additional tree protection shall be provided as needed at the Contractor's discretion. All protection measures shall be at the Contractor's sole expense.
- D. The Contractor shall provide appropriate safety equipment and training to all personnel assisting with Traffic Control and to all personnel who will drive vehicles onto the site.
- E. The Contractor is responsible for site security.
- F. The Contractor shall inspect and maintain the signage at the site including signage informing pedestrians of appropriate routes around the site and of areas of no access. Inspections shall take place at minimum weekly, or as directed by the Owner or Resident Engineer.
- G. Once construction has begun, the Contractor shall take all reasonable steps to exclude the public from the construction and staging areas, including fences, barriers, signs, etc. The Contractor shall insure that barriers are replaced each night and over weekends so that access to the site is restricted during non-work hours.
- H. The Contractor shall take such steps as are necessary to prevent the spilling of materials and liquids onto the paved surface of the roads and parking lots which extend from the dam. The Contractor shall be responsible for such actions as are necessary, including cleaning, sweeping, etc. as directed by the Resident Engineer, to keep these surfaces clean. Do NOT wash soil, sediment, or other material into surface water bodies, ditches, or storm drains.
- I. Upon completion of the work, the Contractor shall remove all items associated with the Temporary Site Access and Traffic Control Plan and restore any disturbed areas.

### **3.02 POLICE DETAILS AND FLAGGERS**

- A. The Contractor shall provide such police officers or flaggers, as may be deemed necessary, by the Resident Engineer or by the Owner, for the direction and control of traffic entering, passing through, and leaving the site of the work.

## **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

**SECTION 01740  
SITE RESTORATION**

**PART 1 - GENERAL**

1.01 SCOPE

- A. The work under this Section shall consist of all work and operations, including, but not limited to equipment, supplies, material, personnel, and incidentals to restore areas in and around the project site to pre-construction conditions.
- B. The intent of the Work of this Section is that areas which are disturbed as a result of the overall Work of this Contract, whether intentionally or unintentionally, planned or unplanned, are restored to at or better than their conditions prior to the start of work. The Scope of Work under this Section shall also include both significant and incidental work necessary to repair damage to the site beyond those areas shown as disturbed on the Project Plans. Areas to be restored shall include, but not be limited to, locations of trailers, laydown areas, construction access roads, adjacent private property used for access, etc. Facilities to be restored include paving, grassed areas, trees, and utilities, and any other property disturbed during Work activities. Additionally, restoration shall include public roadways, sidewalk, or private property areas, if disturbed. Areas of note that shall be restored are as follow: the landscaped area directly adjacent to the exiting gate structure along the left abutment and around the new subsurface gate operations vault structure; the flagpole adjacent to the existing gate structure shall be removed and replaced-in-kind; the 6-inch PVC irrigation intake pipe immediately upstream of the existing gate shall be removed and replaced-in-kind.
- C. It is the intent of the Contract that the Contractor avoid and minimize indirect construction impact to the maximum extent possible. To this end, the site and surrounding areas should be protected, as needed and as provided for under separate Sections of the Contract. The Contractor should also develop a plan to protect the site and inform and educate their forces regarding protective measures to be implemented. This Section covers the restoration of damage caused by unavoidable or inadvertent actions by the Contractor's forces, including all sub-contractors, material deliverers, and others under the Contractor's employ or authority. It is the intent of the Contract that the work of this Section be minimized to the extent possible by the Contractor's actions to avoid damage to the site and area.

1.02 DOCUMENTATION OF EXISTING CONDITIONS

- A. Prior to the start of work, the Contractor shall be responsible for documenting the pre-construction conditions of these and other areas which might be disturbed by the Work of the Contract. Documentation of pre-construction conditions shall be coordinated with the Pre-Construction Survey requirements set forth in Section 01436. This documentation shall be used to determine the extent to which post-construction site restoration shall be needed.
- B. Project Location: Access to the general and immediate project site location is via 6 Bay Road (Bryant Rock LLC.), a private condominium complex off Bay Road (a public paved roadway), and Penstock Way, a private paved roadway off Main Street (a public paved

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

roadway), both located in Newmarket, NH. Utilities may exist under these roadways and the temporary access roads to the work area.

- C. Staging, Laydown and Stockpile Area: The Contract Drawings specifically delineate staging and lay-down areas for the Contractor, as well as areas not to be disturbed. The Contractor shall be strictly monitored for compliance with these boundaries. Proper environmental and housekeeping procedures by the Contractor are required. Additional supplemental staging, lay-down, or stockpile areas may be available for use at alternate locations designated by the Owner, however, if the Contractor feels additional staging or lay-down areas are required, the Contractor shall request an extension of the boundaries or request supplemental areas to the Owner in writing.

### **1.03 PROTECTION OF EXISTING FEATURES**

The Contractor shall take such steps and measures as are necessary to protect the project site and adjacent areas from damage by construction activities and thereby minimize the extent of work to be done under this Section. Site protection shall be paid for under the Scope of other Sections.

### **1.04 RELATED SECTIONS**

- 1. Section 01500 – Temporary Facilities and Controls
- 2. Section 01565 – Sedimentation and Erosion Controls
- 3. Section 02200 – Earthwork
- 4. Section 02930 – Loaming and Seeding

### **1.05 SUBMITTALS**

- A. The Contractor shall submit a Pre- and Post-Construction Survey documentation in accordance with requirements of Section 01436, which shall also include any additional information required herein.
- B. The Contractor shall submit information, as needed, on site restoration methods and materials to be used in restoring site conditions.

## **PART 2 – PRODUCTS**

- A. Products used in Site Restoration shall meet the requirements of the applicable Section of the Contract Documents. If work similar to the nature of the necessary site restoration is not specified elsewhere in the Contract Documents, the applicable section of the State of New Hampshire Department of Transportation Standard Specifications for Road and Bridge Construction, shall control. Materials for restoration of utilities shall meet with the standards of the Owner or the utility to be restored.

## **PART 3 – EXECUTION**

### **3.01 GENERAL**

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

- A. The work required and services for site restoration shall be done in a safe workmanlike manner and shall conform to any pertinent local or state law, regulation or code. Good housekeeping consistent with safety shall be maintained. The Contractor shall be responsible for all necessary permits and approvals.

### **3.02 PRE AND POST-CONSTRUCTION SITE DOCUMENTATION**

- A. Prior to the start of work at the site, the Contractor shall coordinate with the Owner and Engineer to perform a pre-construction site walk for the purposes of documenting conditions prior to disturbance by the Contractor's forces and equipment. A representative from the Owner and/or Engineer shall accompany the Contractor during the site walk, but it shall be the Contractor's sole responsibility to properly document existing conditions in all areas which might be subject to disturbance. The Contractor shall utilize photographs, video, written descriptions, sketches, and any other means to document pre-construction conditions. If requested, the Contractor shall supply the Owner with one copy each of the documentation, including both hard copies and digital files, as appropriate. The Owner alone shall be empowered to make decisions about the pre-construction condition of areas not covered by the Contractor's documentation. This pre-construction site documentation should be coordinated with the pre-construction survey, as defined in Section 01436.
- B. At the completion of the work at the site, the Contractor shall coordinate with the Owner and Engineer to perform a post-construction site walk inspecting all areas included in the pre-construction site walk. The post-construction site walk shall be an examination similar to the pre-construction site walk and shall be coordinated with the post-construction survey, as defined in Section 01436.

### **3.03 RESTORATION METHODOLOGY**

- A. Means of Site Restoration shall meet the requirements of the applicable Section of the Contract Documents. If work similar to the nature of the necessary site restoration is not specified elsewhere in the Contract Documents, the applicable section of the State of New Hampshire Department of Transportation Standard Specifications for Road and Bridge Construction shall control. Proper sediment, erosion, and water control shall be provided, as needed, at no additional cost.

### **3.04 RESTORATION OF ROADS**

- A. The Contractor shall be required to repair any damage to roadways caused during the course of construction, in order to return the roads to pre-construction condition or better.
- B. Restoration of paved areas shall be done with similar materials and paving characteristics.
- C. The Owners shall determine the appropriateness of proposed restorations (e.g. spot patching, full depth repaving, etc.)

### **3.05 RESTORATION OF STAGING, LAYDOWN AND STOCKPILE AREA**

- A. The Contractor shall be prepared to repair any damage to the area which will be utilized as the staging, laydown/storage and stockpile area. These areas shall be restored to their pre-construction condition or better. Restoration is likely to include clean up to remove any/all materials, trash and debris resulting from its use during the work, as well as grading of the

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

site to smooth out any disturbances made during the work. The Contractor shall be required to repair any damage to these areas caused during the course of construction as well as the entrance areas where it meets the existing sidewalk and roadway, in order to return the area to pre-construction condition or better. The cost of restoration of these areas shall be factored into the cost presented for this Section on the Bid Form.

### 3.06 RESTORATION OF VEGETATED AREAS

- A. The Contractor shall be responsible for restoring all vegetated areas beyond the indicated limits of work disturbed during the work of this Contract. Restoration shall include, but not be limited to, loam placement, regrading, seeding, mulching, and maintenance. The intent is to restore damaged areas to pre-construction condition or better. Loaming, seeding, and revegetation of areas which are shown on the plans as being filled, excavated, or graded completed under Section 02930.
- B. The Contractor shall be responsible for restoration of the landscaped area immediately adjacent to the existing gate structure along the left abutment, specifically the areas disturbed during installation of the new concrete gate structure and around the subsurface gate operations vault.
- C. The Contractor shall be responsible for maintenance and care of all restored vegetated areas until establishment.

### 3.07 TREES

- A. The Contractor shall be responsible for pruning and other actions necessary to repair construction-related damage to trees which are shown to remain in place or are outside of the construction areas.
- B. The Contractor shall hire a certified arborist to perform restoration work on large trees, if judged necessary by the Owner.
- C. The Contractor shall protect all trees which might be damaged by the Work of the Contract. Protection shall include physical protection of the trunk and fencing to exclude disturbance inside the drip line perimeter.

### 3.06 OTHER AREAS OF NOTE

- A. The Contractor shall remove and replace-in-kind the 6-inch PVC irrigation intake pipe, which currently runs immediately upstream of the existing outlet structure. The new PVC irrigation intake shall run upstream of the new pneumatic gate structure and downstream of the pneumatic gate's water level sensor, as described in Section 11288.
- B. The Contractor shall remove and replace-in-kind the flagpole and associated footing adjacent to the existing gate structure upon completion of the installation of the new concrete gate structure.
- C. Additionally, the Contractor shall coordinate with the Owner and Engineer with regard to other items of note which may need removal/replacement-in-kind as a result of disturbance during the Work.



**PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 01900  
MOBILIZATION/DEMOBILIZATION**

**PART 1 - GENERAL**

1.01 SCOPE

- A. The work under this Section shall consist of the Contractor's preparatory work and operations, including, but not limited to transporting equipment, supplies, personnel and incidentals to and from the work site, and all other operations which must be performed or for costs which must be incurred prior to commencement of the work.
- B. Work under this Section shall also include all work, services, equipment and other incidental items, whether specifically mentioned herein or not, to perform similar tasks at the work site at the conclusion of the work, in order to restore the site to its intended condition and remove all items which are not a permanent part of the work from the site, and to leave the site in a clean and orderly manner as directed by the Resident Engineer.
- C. The work of this Section shall also include any potential work, labor, equipment, materials, labor, and other expenses necessary for emergency protection of, demobilization from, and remobilization to the project site in the event of heavy rains, increased flows, and/or high water levels which cause the inundation of the job site or other weather-related conditions which temporarily restrict access to the work area.
- D. The Work of this Section shall include all efforts and costs to provide general bonds, insurance, and permits required by the Contract and necessary for the Work, except as specifically noted elsewhere.
- E. The Work of this Section shall include all work and operations, including, but not limited to equipment, supplies, material, personnel, and incidentals to restore disturbed areas in and around the project site to pre-construction conditions, protection of existing structures and features at the site, as well as for site preparation, including dismantling, relocation, demolition, removal, and lawful off-site disposal of certain existing materials and structures at the site not otherwise covered by other Sections. The Work of the is Section shall also include the provision, installation, inspection, maintenance, and removal of all temporary facilities and controls necessary for the Contractor to successfully complete the Work of this Contract in accordance with the Plans, Specifications, Permits, and all applicable local, state, and Federal laws and regulations.

1.02 DEMOBILIZATION / REMOBILIZATION DUE TO INCLEMENT WEATHER

The Contractor is hereby notified that the Work of this Contract will take place in, on, and around Macallen Dam. Portions of this Work will require personnel and equipment to be located on or adjacent to the Dam, the upstream embankments, and in or near other areas typically subject to water flow. This work may require significant surface water and groundwater control efforts. Certain weather conditions (such as an extended period of heavy rainfall and/or a weather event such as a hurricane) could potentially inhibit proposed work.

**Responses to such events are the Contractor's responsibility and no extra payment shall be made unless otherwise specified herein.** The Contractor shall make provision for contingencies to deal with inclement weather. In the event of rising waters and increasing flow, the Contractor may be

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

required to act rapidly to protect the structure and the work, including removal of personnel and equipment from potentially affected areas and temporary placement of “super-sack” type sand bags to prevent inflow to the work area. The Contractor may have to demobilize from the potentially affected areas on a temporary basis. Prior to leaving the area, the Contractor shall take such steps as are necessary to protect completed work and work in progress and to remove all equipment and materials from potentially inundated areas. The Contractor shall be responsible for any loss or damage to his work, equipment, or material. **After water levels/flows have receded, the Contractor shall remobilize to the site. Such remobilizations and demobilizations (if required) shall be completed at no additional cost to the Owner, unless otherwise specified herein.** Remobilization will include all effort required to restart the Work.

To reduce the chance of high water levels / flows affecting the Work, the Contractor is urged to pay particular attention to weather forecasts for the area and to schedule work in vulnerable areas for periods which are anticipated to be relatively dry.

### 1.03 EXISTING CONDITIONS

Staging areas shall be decided in agreement with the Owner in locations shown on the Plans. The Contractor shall be responsible for marking and maintaining all existing structures and utilities within the staging area(s) and the work area before, during and after the course of work. Contractor responsibilities shall include notifying Dig Safe and all appropriate Town departments prior to commencing work.

The Contractor shall be prepared to provide working platforms/ramps, cribbing, shoring, matting, and all other specialized support equipment required to ensure safe access of all personnel, equipment and materials necessary for completion of the work of this Contract in accordance with the Specifications and Contract Drawings.

### 1.04 SCHEDULE AND SEQUENCE

- A. A suggested construction sequence is shown on the Contract Drawings. The construction sequence provided is not comprehensive and does not relieve the Contractor from responsibility for executing all required work as per the Contract Drawings and Specifications.
- B. Certain weather conditions (such as an extended period of very heavy rainfall and/or an abnormal weather event such as a hurricane) could cause a significant rise in the depth of water in the river and impoundment areas. Therefore, the Contractor shall establish his mobilization/demobilization bid price accordingly in order to maintain all necessary equipment to be able to rapidly demobilize from work areas if necessary. In the event of an emergency demobilization action the Contractor shall take all necessary measures to protect the work in progress and replace at his own expense all work, materials and equipment lost or damaged as a result of an emergency action.

### 1.04 RELATED SECTIONS

- 1. Section 01060 – Regulatory Requirements
- 2. Section 01500 – Temporary Facilities
- 3. Section 01740 – Site Restoration

Site restoration shall be performed and paid for under Section 01740. Site restoration work shall include restoration of impacts and damage to the site caused by construction activities.

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

### **PART 2 – PRODUCTS**

This Section Not Used

### **PART 3 – EXECUTION**

#### **3.01    GENERAL**

- A.     The work required and services for mobilization/demobilization shall be done in a safe workmanlike manner and shall conform to any pertinent local or state law, regulation or code. Good housekeeping consistent with safety shall be maintained.
- B.     No payment shall be made for any necessary demobilization and remobilization as stated above.

#### **3.02    PRE-CONSTRUCTION SITE MEETING**

A meeting with the Owner, the Engineer, and the Contractor will occur prior to the beginning of any rehabilitation work at the site, in accordance with Section 01200. During this meeting the Contractor will become familiar with the site, including working conditions, existing access road conditions, and access restrictions. During this meeting the final location of laydown and spoil disposal areas will be discussed, and confirmation that the appropriate notifications and clearances (i.e. DIG SAFE and the Owner's internal clearance as applicable) have been executed.

### **PART 4 - MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 02015  
DAM INSTRUMENTATION**

**PART 1 – GENERAL**

1.01 DESCRIPTION

- A. The Contractor shall install new permanent instrumentation at the dam, as specified below and shown on the Project Plans.
- B. The Contractor shall install an upstream staff gage to assist the Town in monitoring the water levels in the impoundment and outlet gate channel.
- C. The Contractor shall install a survey monument, which will be embedded on top of the dam.

1.02 SCOPE OF WORK

- A. Work of this Section shall include the furnishing of all materials, labor, equipment, incidentals, and all else necessary for installing and protecting one (1) new staff gages at the Dam at the following location: the upstream side of the new concrete gate left abutment. The exact location shall be determined by the Town. The staff gage shall be of durable material with highly visible marks and numbers. The gage shall be installed so as to indicate water surface elevations using the NAVD88 datum. The staff gage shall be incremented in feet and tenths of feet. The staff gage elevations shall be established and verified by the Contractor's Registered Land Surveyor.
- B. Instrumentation shall also include one or more survey monuments which shall be placed in a location on top of the Da,. The monument will consist of a stable base and an inscribed brass cap. The location and elevation of the monument shall be established by the Contractor's Registered Land Surveyor.

1.03 SUBMITTALS

- A. Five (5) days prior to purchase, Manufacturer's Cut Sheets on the staff gage.
- B. Five (5) days prior to purchase, Manufacturer's Cut Sheets of the survey monument (Brass cap), including proposed markings.
- C. Following installation, stamped documentation of instrumentation location and elevation from a Registered Land Surveyor (may be part of "as-built" plans).

**1.04 STORAGE OF INSTRUMENTS**

- A. All instrumentation and related materials, after receipt at the site and prior to installation, shall be stored in an indoor, clean, dry and secure storage space.

**PART 2 - PRODUCTS**

**2.01 STAFF GAGE**

- A. The Staff Gage shall consist of an iron frame coated with backed enamel. Staff sections shall be a minimum of 3.5 inches wide (unnumbered) and graduated with black marks in feet and tenths of feet. Individual number plates shall be attached adjacent to the un-numbered graduated gauge. Number plates shall be 2” by 3” enameled plates with black digits. Graduated gage and number plates shall be mechanically attached to the backing structure with stainless steel anchor bolts. Staff gage and figure plates shall be Ben Meadows Style “E” or approved equal.
- B. All fittings and anchors shall be stainless steel. Anchor adhesives shall be an approved epoxy compound or non-shrink mortar. Other anchor systems such as “Tapcon” concrete screws or equivalent may be acceptable with approval from the Department.

**2.02 SURVEY MONUMENT**

The survey monument shall consist of a standard 4-inch diameter survey brass cap. The cap shall be securely affixed to an existing concrete structure which has its footings below the frost line and is beyond the extent of the proper dam embankment. If no appropriate structure is available, the Contractor shall provide, at no additional cost, a stable base for the brass cap consisting of a concrete or stone column embedded a minimum of five feet below grade and backfilled with sand. The brass cap shall be stamped with the following information: 1) “Town Survey Monument”; 2) Date; 3) Elevation; 4) “NAVD88 Datum”

**PART 3 - EXECUTION**

**3.01 STAFF GAGE INSTALLATION**

- A. The Contractor shall install staff gages at the locations shown on the Contract Drawings and as directed by the Town. The Contractor shall consult with the Town and its Engineer prior to finalizing the location of the staff gages. The location shall be selected so as to facilitate visual readings from the left shore adjacent to the dam.

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

- B. The Contractor shall clean and prepare the surface of the concrete and/or masonry as needed prior to attaching the staff gage and numbers. The staff gage and numbers shall be mechanically attached flush against the headwall using stainless steel anchor bolts or concrete screws. Verticality of the gage shall be checked and maintained and verified by the RLS.
- C. The staff gage in the upstream impoundment shall extend from elevation 15.0' to elevation 33.0' feet. The Contractor's Registered Land Surveyor shall establish and verify elevations.
- D. The staff gage shall be labeled with elevations at one-foot (1') increments showing the actual elevations as per the project datum. The staff gage foot-markers shall be set at even (integer) foot elevations.

### **3.02 SURVEY MONUMENT INSTALLATION**

- A. The Contractor shall install survey monuments at the locations shown on the Contract Drawings or as directed by the Town. The Contractor shall consult with the Town and its Engineer prior to finalizing the location of the survey monuments. The location shall be selected so as to reduce the chance of settlement and disturbance.
- B. The Contractor shall prepare a base for the brass cap by either drilling into an existing structure such that the cap can be affixed with an approved epoxy or by fabricating and embedding a concrete or stone base.
- C. The location and elevation of the survey monument shall be established by the Contractor's RLS.
- D. The brass cap shall be stamped with the appropriate information and affixed to the approved base with epoxy.
- E. The RLS shall record the location (coordinates) and elevation of the monument on the As-Built Plans.

## **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\*\*\* END OF SECTION \*\*\***

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**SECTION 02065**  
**SAW CUTTING, DISMANTLING, DEMOLITION, AND REMOVAL OF EXISTING**  
**STRUCTURES**

**PART 1 – GENERAL**

1.01 DESCRIPTION

- A. This Section describes the general parameters and requirements for the saw cutting, dismantling, demolition, removal, and lawful off-site disposal of certain existing materials and structures at the Work Site.
- B. The Work of this Section shall include the demolition and legal off-site disposal of existing dam components, features and structures which are intended to be removed as part of the Work of the Contract.
- C. The Work of this Section shall include temporary removal, handling, and storage of existing structures which may be re-constructed at the same location or elsewhere as part of the final project configuration.
- D. The Contractor shall obtain all necessary permits, including local, state, and federal permits, coordinate all required inspections with appropriate agencies, and conduct all work in accordance with all local, state, and federal rules, regulations, and guidance.
- E. If necessary, the scope of this item shall also include all work, materials, labor, and other costs associated with the design, installation, and removal of any temporary earth support systems, rigging systems, containment systems, or other means and methods required during dismantling, demolition, and/or removal of existing dam features/structures.

1.02 SCOPE OF WORK

- A. The general scope of work shall be to prepare the Macallen Dam site for the dam safety rehabilitation project by removing certain existing structures and materials. Certain identified structures shall be demolished, dismantled and removed. Demolition, dismantling and removal shall be done in a manner which protects the existing dam, spillway, and abutments walls to remain, as well as adjacent facilities, structures and utilities. Refer to the Contract Drawings for the locations of structures to be demolished and removed. To achieve the desired improvements to the Dam, major components of the Work will include but not be limited to the following, and as shown on the Contract Drawings:
  - 1. Saw-cutting, removal and legal disposal of deteriorated concrete and parapet section of the right upstream abutment training wall. Parapet section extends to approximately Elev. 24.
  - 2. Demolition, removal and legal disposal of the top course of granite block of the existing stone masonry pier adjacent to the outlet structure to approximately Elev. 22.8.
  - 3. Demolition, removal and legal disposal of the entire existing gate outlet structure, upstream concrete piers, all associated equipment with the gate outlet, and the existing gate outlet structure concrete foundation to bedrock.



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4. Potential salvage of portions of the gate operators and equipment as required by the Town and transport to a location determined by the Town.
5. Demolition of existing ground level features around the new gate control vault.
6. Demolition of portions of the concrete slab downstream of the slide gates.
7. Removal of existing fencing on both sides. Fencing to be replaced on right abutment includes safety fence at entrance to the “parcel” and fencing to be replaced includes hand rail and railing along top left abutment.
8. Miscellaneous removal of debris, sediment and related material that would interfere with other aspects of the work.

### 1.03 GENERAL

- A. Demolition work shall be performed in accordance with all applicable local, state, and federal regulations. Based on current information, no hazardous materials are anticipated within structures to be demolished or dismantled or sediments to be removed.
- B. The removal and lawful disposal of all miscellaneous materials and debris at the job site, including timber, trash, wood chips, mulch, up to five (5) cubic yards of sediment, and other materials such as existing guardrails, handrails, fencing above grade shall be considered incidental to the other pay items in this or other Sections of the Work.

### 1.03 EXISTING CONDITIONS

- A. The Contractor’s attention is brought to the fact that the existing spillway (not modified by this project) and existing gate outlet structure (to be removed and replaced under this project) are the only existing usable water control/conveyance structures at the Dam. The Contractor shall not be allowed to utilize the existing fish ladder for water control purposes. As such, water control, sedimentation protection, and dewatering will be important in the demolition process, as will be the scheduling of the work. **The demolition of the existing gate outlet structure must be sequenced with the temporary cofferdam installation, temporary water control, and the construction of the new concrete abutment, slab, apron, and crest gate.**
- B. The Contractor’s attention is brought to the fact that the 4 Bay Road (Lamprey Falls LLC) structure, 6 Bay Road (Bryant Rock LLC) structure, and a set of three underground propane storage tanks are located adjacent to the existing gate outlet structure, which is to be demolished and reconstructed as part of the Work. Special care and precautions shall be undertaken to protect the portions existing dam to remain, as well as other structures and utilities adjacent to the Work. Refer to Section 01436 for additional information and requirements.
- C. The Contractor’s attention is brought to the fact that the Work of this Contract is located adjacent to Lamprey River. As such, the adjacent waterbodies and wetland resource areas shall be protected from the entry of demolition debris, dust, etc. into the River and any other nearby waterbodies and/or wetland resource areas.

### 1.04 DESIGN CRITERIA

- A. All excavations shall be performed in accordance with OSHA requirements. If support

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

structures are used by the Contractor to support the sides of excavations, the selection, design, and installation of the support system(s) shall be the responsibility of the Contractor with the exception of the subsurface vault excavation for the gate structure equipment.

- B. Debris resulting from demolition activities shall be segregated and recycled to the greatest extent possible. Salvage value accrues to the Contractor, except in cases where material is specifically reserved by the Owner. Material that the Owner does not specify becomes property of the Contractor.
- C. Material salvaged for the Owner by the Contractor shall be handled with care so as to not damage the material, to the extent possible. Material salvaged for the Owner shall be transported and placed in a storage location designated by the Owner, at no additional cost to the Owner.

### 1.05 PROJECT CONDITIONS

- A. Explosives: Blasting and use of explosives is not permitted.
- B. Burning: Burning on site is not permitted.
- C. Protection: The Contractor shall prevent injury to persons and damage to abutting property in conjunction with Sections 01436 and 01740. The Contractor shall further provide adequate shoring and bracing to prevent uncontrolled collapse and immediately repair damaged property to its condition prior to being damaged.
- D. The Contractor shall carefully examine the Contract Documents in their entirety for requirements that affect the work of this Section. Certain construction, systems, or equipment identified in the Contract Documents or by the Owner, Resident Engineer, or Engineer in the field shall remain in-place for future service and shall be protected.
- E. The Contractor shall not allow debris to be carried into the impoundment, or any portion of the River.
- F. The Contractor shall immediately repair, to the satisfaction of the Owner and Resident Engineer, any damage directly and indirectly caused by the Contractor's operations at no cost to the Owner.
- G. The Contractor shall remove and legally dispose of all clearing debris, demolition debris, and solid waste from the Site. No on-site disposal shall be allowed. On-site recycling or reuse of demolition debris, including brick, concrete, and asphalt, is not allowed, except where specifically authorized by the Contract Documents, Owner, or Resident Engineer.
- H. The Town **may** provide an alternate location to dispose of materials to be disposed or to be salvaged. The Contractor shall coordinate directly with the Town Facilities Manager to determine if off-site locations may be allowed for use by the Contractor.

### 1.06 RELATED WORK

- A. The following is a list of related work items that shall be performed or furnished under other Sections of these Specifications as indicated.

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

1. Vibration and Deformation Monitoring – Section 01436
2. Temporary Water Control: Section 01565
3. Site Restoration – Section 01740
4. Temporary Cofferdam: Section 02170
5. Earthwork: Section 02200

### **1.07 SUBMITTALS**

- A. The Contractor shall submit a plan detailing procedure, equipment, sequences of operations, and schedule to perform the saw-cutting, dismantling, demolition, removal, and disposal activities called for in this Work Item. The Work Plan shall include the name, contact information, and qualifications of any subcontractors assisting with or conducting the demolition. The submission shall also include procedures for the supporting of excavation sidewalls.
- B. Documentation of existing conditions shall be submitted under Sections 01436 and 01740. Documentation of the dismantling, removal, storage, and replacement work shall be submitted to the Owner.
- C. The Contractor shall submit information on the facility to which demolition debris will be taken for disposal. The disposal location and license documentation for the facility shall be provided to the Owner.

## **PART 2 - PRODUCTS**

This Section Not Used.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. No removal or demolition work shall begin until the existing conditions documentation work has been completed and the documentation package accepted by the Owner and Resident Engineer in accordance with Section 01436.
- B. No removal or demolition work shall begin until all necessary vibration and deformation monitoring equipment is in place and accepted by the Owner and Engineer in accordance with Section 01436.
- C. The Contractor shall determine means and methods for all demolition tasks specified and as shown in the Contract Drawings as part of the Work, subject to the restrictions contained in this specification and subject to approval by the Owner and its Engineer.
- D. Erect, and maintain temporary barriers and security devices including warning signs and lights, and similar measures, for protection of the Owner, Contractor's employees, all others, and existing improvements to remain.

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

- E. Protect existing landscaping materials, structures, and utilities not indicated to be demolished.
- F. The Contractor shall be responsible for providing power, water, and any other necessary materials or equipment for any saw-cutting activities. Provide appropriate health and safety protections for workers.
- G. Slurry created by demolition and saw-cutting shall be disposed of in an appropriate manner consistent with local, state, and federal rules and regulations. Slurry shall not be permitted from entering the River.
- H. Protect the portions of the concrete apron to remain as well as the adjacent stone and brick masonry structures that are not to be demolished. Contractor shall be responsible for repairing damage caused by their work activities and shall receive no additional compensation for necessary repairs.
- I. Take all steps necessary to prevent movement or settlement of adjacent structures and embankments.
- J. The Contractor shall coordinate the demolition of the existing gate outlet structure with the installation of the temporary cofferdam, water controls, and construction of the new concrete abutment wall, concrete slab and apron, and crest gate system. The Contractor shall maintain control of the River level at all times as per the approved water control plan as outlined in Section 01565.
- K. The Contractor shall lawfully dispose of demolition materials at an approved off-site location. The Town may provide an alternate location to dispose of materials to be disposed or to be salvaged. The Contractor shall coordinate directly with the Town Facilities Manager to determine if off-site locations may be allowed for use by the Contractor.

## **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 02110  
CLEARING, GRUBBING, AND STRIPPING**

**PART 1 - GENERAL**

1.01 SCOPE

- A. The Contractor shall furnish all labor, material, tools and equipment to perform all operations necessary to cut and clear trees and brush, remove surficial debris, grub up primary roots and surficial stones, clear the areas indicated in the Contract Drawings, and strip and stockpile organic topsoil prior to excavation work.
- B. The work shall consist of clearing, grubbing, removal, stockpiling, and lawful off-site disposal of all vegetation, roots, and surficial debris from proposed areas of construction within the Site boundaries as shown on the Contract Drawings.
- C. The work shall further consist of stripping the topsoil from all areas where excavations will be made, within the limits of where the grades are to be raised on the right embankment, and from all areas where access roads will be constructed or materials stockpiled and/or disposed of on-site. The stripped topsoil shall be segregated, stockpiled, and protected for later reuse at the site as topsoil material. It is the intent of the Contract that stripped topsoil be re-used on site to the maximum extent possible.
- D. The Contractor shall conduct work in a manner that preserves from injury or defacement of all vegetation and objects designated by the Owner or Engineer to remain.
- E. Prior to stripping topsoil, the Contractor and Engineer shall survey the areas to be stripped for the presence of invasive species. If invasive species are found in a particular area, topsoil from that area shall NOT be reused for re-vegetation purposes. Such topsoil may be disposed of lawfully off-site.
- F. Clearing, grubbing, and stripping shall be limited to only those areas inside the limits of work absolutely needed by the Contractor for his/her operations. If the implementation of the Work of the Contract does not require clearing, or grubbing, or stripping of some portion of the site area, and work can proceed in a neat and orderly fashion without any or all of these operations, then such operations will not be required by the Owner.

1.02 SCOPE OF WORK

The general scope of work under this Section shall be to furnish all labor, material, tools and equipment and perform all operations necessary to execute all work to clear, grub and strip the indicated areas of the Site. The Work shall include all effort necessary to prepare all areas on the site for further earthwork (excavation or embankment filling) or other construction. The Contractor shall clear, grub, and strip all areas where construction shall take place as shown on the Contract Drawings, as well as any other areas necessary for the work of the Contract (with approval from the Owner or its Resident Engineer).

Clearing and Grubbing shall encompass all Work necessary to remove all trees, vegetation, stumps, and roots from the dam embankment, upstream right embankment parapet wall, abutment areas, staging areas, and other necessary locations. Trees and vegetation outside the area of disturbance shall NOT be cleared, grubbed, or otherwise disturbed.

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

Stripping shall encompass all Work necessary to remove organic-containing topsoil from indicated and other necessary locations. **The typical minimum depth of stripping shall be six inches (6”).** This depth may be varied based on the extent of topsoil and root penetration. In particular, extra depth may be necessary in local areas within the right embankment area. This work shall include the stockpiling of topsoil as feasible given the site constraints. Stockpiling shall be done in such locations and in such a manner as minimizes re-handling of excess stripped material. Areas outside the area of disturbance shall NOT be stripped or otherwise disturbed.

### 1.03 REQUIREMENTS

- A. All Work of this Section shall comply with all applicable codes, rules, regulations, laws, and ordinances of the Town of Newmarket, Rockingham County, New Hampshire Department of Environmental Services (NHDES), the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency (EPA) and all other authorities having jurisdiction within the project areas.
- B. Clearing and Grubbing shall only commence after respective sedimentation and erosion control measures are in place to the satisfaction of the Owner or Resident Engineer in accordance with Section 01560 of these Specifications. The Contractor remains solely responsible for the suitability and adequacy of any of the sedimentation and control materials, methods and procedures. It is recognized that a certain amount of site clearing may be necessary in order to access portions of the site to install sediment and erosion controls. Such clearing shall be acceptable provided steps are taken to limit disturbance of soils and generation of sediment.
- C. The Contractor shall not burn trees, brush, stumps, and other ignitable materials.
- D. Any clearing beyond the boundary limits shall not be permitted without expressed permission from the Owner or Resident Engineer.
- E. The Contractor shall make all arrangements necessary for the disposal of cleared lumber, surficial debris, and other material collected during Site clearing. Debris materials may be temporarily stockpiled at an approved on-site location prior to being lawfully disposed of off-site.
- F. Timber cleared from the site may be salvaged by the Contractor for any other lawful off-site uses, with expressed permission from the Owner or Resident Engineer.

### 1.04 RELATED WORK

The following is a list of related work items that shall be performed or furnished under other Sections of these Specifications as indicated.

- A. Vibration and Movement Limits and Monitoring – Section 01436
- B. Temporary Erosion and Sediment Controls – Section 01560
- C. Site Restoration – Section 01740
- D. Earthwork – Section 02200

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

E. Loaming, Seeding, and Revegetation – Section 02930

### **1.05 SUBMITTALS**

At least ten days prior to the work of this Section, submit to the Owner for review and comment a plan showing the boundaries of all areas to be cleared and grubbed, and showing the locations of proposed stockpiles. Indicate in the submittal the sediment and erosion control measures which will be implemented on and around the stockpiles. Indicate means and methods of clearing and grubbing and of accessing areas to be cleared and grubbed. Indicate stockpile areas and means of placement which will minimize re-handling. Indicate sequencing, if any. Indicate off-site disposal locations, along with any required permits which the Contractor or disposal facility is required to obtain.

## **PART 2 - PRODUCTS**

This Section Not Used

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. The Contractor shall confirm with the Owner or Resident Engineer those areas to be cleared, grubbed, and stripped and the location for the debris stockpiles for materials which will be disposed of off-site.
- B. The Contractor shall locate, identify and protect sensitive areas (especially wetland areas, protected trees, and any utilities) from damage during work.
- C. The Contractor shall coordinate with the Owner or Resident Engineer to identify trees which will be cleared from the site. These trees shall be prominently marked.
- D. The Contractor shall protect sensitive areas (especially wetland areas, protected trees, ) and the existing dam features to remain from damage or displacement.

### **3.02 CLEARING AND GRUBBING**

- A. The Contractor shall clear, cut, or otherwise remove all trees and vegetation from the indicated areas. Trees and vegetation outside the indicated areas shall be protected.
- B. Contractor shall remove all areas from surficial debris, vegetation, roots, and obstructions which will affect excavation and repair operations on the Site. This shall include grubbing of all stumps and major subsurface root systems where roots exceed a quarter of an inch in diameter.
- C. The Contractor shall place all surficial debris into on-site stockpiles for off-site disposal at an approved disposal location. Transportation and disposal will be performed at the Contractors convenience after approval of the material for disposal and location of disposal.

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

- D. No burning shall be allowed. The Contractor may chip cleared trees or brush to create wood chip mulch. This material can be used on site where approved by the Owner or Resident Engineer. The Owner may have use for some portion of the chip mulch material and shall be allowed to remove quantities not used on-site by the Contractor, upon request by the Owner. The remaining material not utilized on-site shall be removed and lawfully disposed of off-site at the Contractor's sole expense.
- E. The Contractor shall screen and/or otherwise treat stripped topsoil which is intended for use as loam. Topsoil to be reused as loam shall meet all requirements and testing for loam set forth in Section 02930 prior to re-use on-site. Excess soil materials from the clearing and stripping processes shall be lawfully disposed of off-site. This work shall be considered incidental and the cost shall be included in the price bid for this item.
- F. No additional payment will be made for moving of stockpiles or re-handling of material. The stockpiles shall be sited, placed, and graded in such a way as to minimize re-handling necessary.

### **3.03 STRIPPING OF TOPSOIL**

- A. The Contractor shall strip all organic topsoil from all areas of proposed excavation and access/stockpile construction locations on the Site. The minimum depth of topsoil stripping shall be six inches (6").
- B. The Contractor shall place all stripped organic topsoil into on-site stockpiles for storage until reused in on-site loaming operations. The Contractor shall site the topsoil stockpiles based on the need to store the material until the final stages of the earthwork at the site. All stockpiles shall be protected against rain and shall have appropriate sediment and erosion controls placed around them. No topsoil shall be stockpiled in any location which drains directly into a river, channel, or wetland (other than the borrow area).

## **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 02170  
TEMPORARY COFFERDAMS**

**PART 1 - GENERAL**

1.01 GENERAL

- A. In order to facilitate work along the right abutment (Phase 1), the slide gates of the control outlet structure will be opened to allow for temporarily lowering of the impoundment to between approximately El. 16 and El. 18. This elevation range correlates to approximately 5 to 7 feet below the impoundment water elevation of El. 23.3 as measured during the survey conducted in 2018 by Doucet Survey Inc.. *Note: water levels vary depending on inflows.* The impoundment drawdown shall be in compliance with New Hampshire Fish and Game Department's (NHFG) drawdown letter dated February 22, 2019. After temporary impoundment lowering is completed, it is envisioned that remaining water in the impoundment will be prevented from entering the work area via the installation of sand-filled "Super Sacks" which (when filled) measure approximately 3-feet-square by 3-feet high and an impervious polyethylene liner. "Super Sacks" will be stacked such that total height of the cofferdam will be on the order of a minimum of 6-feet as measured from the top of the installed crushed stone subgrade placed on the irregular impoundment bottom (refer to **Drawing C-1 through C-3** for additional information on anticipated temporary cofferdam set-up). Additional standard sand bags can be placed atop the "Super Sacks" to provide necessary freeboard behind the cofferdam as the phased sequential water control progresses and the temporary cofferdam is put into place encompassing the existing outlet structure.
- B. It is envisioned that the left abutment Phase 2 work (which may be completed concurrently with the right abutment Phase 1 work discussed above) would begin by a sequenced installation of a temporary cofferdam constructed of sand-filled "Super Sacks", or approved equivalent, which will be stacked and lined with polyethylene as necessary such that the top elevation of the temporary cofferdam will be a minimum of approximately El. 23. The existing gate structure may be used to lower the impoundment by allowing for flow through Bay No. 3 of the existing low-level outlet (refer to **Drawing C-2** for additional information on the phased approach for temporary cofferdam set-up). A working concrete mud mat shall be placed to El. 16.5 within the enclosed portion of the Phase 2 temporary "Super Sack" cofferdam.
- C. It is envisioned that Phase 3 of the sequenced installation of the temporary "Super Sack" cofferdam, or approved equivalent, would allow for placement of the remainder of the mud mat to El. 16.5 upstream of Bay No. 3. The existing gate structure may be used to lower the impoundment by allowing for flow through Bay No. 1 and No. 2 of the existing low-level outlet.
- D. For Phase 4 work it is envisioned that water in the impoundment will be prevented from entering the work area via the installation of temporary "Super Sack" cofferdam (or approved equivalent) encompassing the entire upstream portion of the existing gate structure and founded on the mud mat placed during previous phases (Phase 2 and Phase 3). The temporary cofferdam may be installed in-the-wet and shall have a minimum top elevation of El. 26.5 to allow for depth of flow over the spillway of 3.5+.

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

- E. The Contractor shall be prepared to pump, siphon or otherwise provide means to remove water within the temporary cofferdam to ensure work associated with the existing outlet structure is performed “in-the-dry.” The Contractor shall be responsible for requesting in advance that the Town’s authorized staff be present to operate the existing slide gates during water control operations. The Contractor shall also provide means (suitable to the Owner and Resident Engineer) to handle water from upstream of the temporary cofferdam as may be required in order to maintain the water surface to a final drawdown elevation which allows for the minimum freeboard required. No separate payment will be made for said additional measures. This work shall be performed and paid under the Water Control Item described in the Measurement and Payment section.

### 1.01 SCOPE

- A. The section includes the installation, maintenance, and removal of temporary cofferdams needed to prevent water intrusion into the work area and allow work to proceed in the dry. The work under this section includes the furnishing of all labor, equipment, supplies, materials and utilities required for the design, operation, maintenance, supervision and removal of the temporary cofferdams.
- B. The temporary cofferdams are anticipated to be required to facilitate work at the right upstream abutment and the existing outlet structure to the left of the spillway to the extent shown on the Contract Drawings. Phased sequencing of temporary cofferdam installation and removal will be required as described in this Section and as shown on the Contract Drawings.
- C. The temporary cofferdams shall be placed so as not to interfere with the other components of the Work. All work shall be performed in accordance with the Contract Documents and to the satisfaction of the Owner and their Resident Engineer.
- E. The temporary cofferdams shall remain in-service until all work along the right abutment and the existing outlet structure has been completed and accepted by the Owner. The temporary turbidity curtains shall remain in place after the temporary cofferdam.
- F. Temporary cofferdam systems which would require dumping of earth into the River are specifically excluded.
- G. The Contractor may submit alternative temporary cofferdam configurations, and/or systems for review and approval by the Owner and Resident Engineer so long as the system satisfies the performance requirements for temporary cofferdams and design intents stipulated herein and within the Contract Drawings and Specifications. Alternative systems must be designed by a NH registered professional engineer.
- H. The Work of this Section shall be performed in concert with temporary water control efforts as specified in Section 01565. Initial and ongoing dewatering within the cofferdams, as well as seepage control measures shall be provided under the Work of temporary water control but shall be specifically designed and implemented to work with the temporary cofferdam systems to keep the work area dry and stable. Water control systems shall be sized to accommodate the anticipated leakage through and seepage under/through the cofferdam. The Contractor shall have sole responsibility for water control within the work area.

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

### 1.02 RELATED WORK

- A. The following is a list of related work items that shall be performed or furnished under other sections of these specifications as indicated:
1. Regulatory Requirements – See Section 01060
  2. Sedimentation and Erosion Control - See Section 01560.
  3. Temporary Water Control – See Section 01565
  4. Hydraulic and Hydrologic Data – See Section 01566
  5. Subsurface Data - See Section 01567.

### 1.03 SUBMITTALS

- A. Not less than two (2) weeks prior to the scheduled installation of the temporary cofferdams, the Contractor shall submit his proposed method of installing, maintaining and removing the temporary cofferdams, and emergency procedures, to the Owner for review. The submittal shall include as a minimum the following items:
1. The Contractor's proposed design, layout, sequence of installation, sealing, maintenance, supervision and removal of the temporary cofferdams. Maintenance and supervision requirements during non-working hours (i.e., nights, holidays and weekends) should be addressed. The work plan should also provide a detailed description of the sequence of the installation and removal of the upstream and downstream cofferdams. The work plan should also describe the phased approach required for the spillway construction.
  2. All materials to be used for the work of this section.
  3. The designer's, installer's and supervisor's qualifications. These individuals shall each have documented experience on at least five installations of similar temporary cofferdams under similar conditions in ponds, lakes, or reservoirs. Design drawings showing the layout in plan and section view of the temporary cofferdam installations. The Contractor's cofferdam submittal and Flood Contingency Plan (see below) shall be stamped by a qualified Professional Engineer registered in the state of New Hampshire. If the Contractor proposes alternative (non-proprietary) cofferdam configurations or materials, the submittal package shall include design calculations.
  4. Proposed method of initial lowering of water inside temporary cofferdams and subsequent raising of water levels at the completion of the work, along with siltation control measures for any water that is discharged into the river.
  5. The Contractor's proposed Flood Contingency Plan for prevention or control of potential flooding of the work area during storm events. The Flood Contingency Plan should address, but not be limited to: maximum River level under which the temporary cofferdams may be used, emergency signaling procedures, health and safety plan, emergency breaching and controlled flooding procedures, leakage/seepage/sand boil control measures, and placement of temporary "Super Sack" and sandbag barrier within embankment excavations for emergency situations. The temporary cofferdam, "Super Sack" and sand bag barrier shall be

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

coordinated with the Flood Contingency Plan and the Water Control Plan as described in Specification Section 01565.

### PART 2 - PRODUCTS

#### 2.01 TEMPORARY COFFERDAM

- A. The temporary cofferdam for use in the river upstream of and fully encompassing the work area around the existing outlet structure shall be constructed of “Super Sacks”, as described herein, and membrane system for the temporary retention of water, or similar approved cofferdam system submitted to the Owner and Engineer for approval.
- B. The temporary cofferdam shall encircle the work area completely and abut the dam embankments and/or abutments.
- C. All temporary cofferdam components shall be clean of contaminants and any other materials that could adversely impact water quality.
- E. Liner shall be impervious, inert, flexible fabric membrane. The bed sealing apron shall be weighted to provide negative buoyancy.
- F. System shall be sized and designed in accordance with the foundation bearing capacities, based on anticipated water depth (hydraulic loading). System shall be able to accommodate river levels coincident with the top of the system.
- G. Loose soil material will NOT be an acceptable material for the construction of cofferdams or diversion barriers or to fill voids between “Super Sacks”.

#### 2.03 SUPER SACK AND SAND BAG BARRIER

- A. “Super Sacks” and sand bags shall be a polypropylene, polyethylene, or polyamide woven material, with a minimum unit weight of four ounces per square yard, a Mullen burst strength exceeding 300 psi in conformance with ASTM D3786, and a minimum ultraviolet stability of 70% at 1000 hours in conformance with the requirements of ASTM designation D4355. Burlap sand bags shall not be allowed.
- B. Individual “Super Sacks” shall generally be approximately 3 feet by 3 feet by 3 feet.
- C. Individual sand bags (filled) shall have a minimum length of 18 inches, minimum width of 12 inches and minimum thickness of 3 inches.
- D. “Super Sacks” and sandbags shall be free of rips or tears which would lead to a loss of sand into the Pond, River, or wetlands, and bag openings shall be tied to prevent the same.
- E. The polyethylene liner shall be impervious, inert, flexible fabric membrane. The bed sealing apron shall be weighted to provide negative buoyancy. Liner shall be installed as shown on Contract Drawings.
- F. All materials used in the construction of the sand bag barrier, shall be clean and free of substances or materials which might lead to contamination of the River, wetlands, or other

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

water courses. Material meeting the material properties for On-site or Off-site Common Fill as set out in Section 02200 shall be suitable material for sand bag or “Super Sack” fill material.

- G. Gaps between bags shall not be filled with loose soil material for the construction of the sand bag barrier.

### PART 3 - EXECUTION

#### 3.01 GENERAL

- A. The Contractor shall be responsible for maintaining a safe, clean and accessible work site at all times. The Contractor shall have full responsibility for the complete and proper diversion of water from the work site at all stages of the project. The Contractor shall, at no additional cost to the Owner, repair any damage to any equipment, material or work caused by seepage, flood, overtopping, or other failure of the temporary cofferdam system.
- B. The Contractor shall take all reasonable and prudent precautions during construction to provide and maintain the temporary cofferdams and other related equipment. The temporary cofferdams shall be maintained and supervised by the Contractor's personnel qualified to do such work.
- C. During Phase 1 of the work, a temporary cofferdam shall be installed along the right upstream abutment extending up to but not including the fish ladder to allow for construction activities, as shown on **Drawing C-1**. The Contractor shall not remove the Phase 1 water control measure until completion and acceptance of the work by the Owner.
- D. Phase 2 of the work shall include installation of a temporary cofferdam (which may be conducted concurrently with right abutment Phase 1 work above) upstream of a portion of the existing outlet structure, to the extents shown on **Drawing C-2**, for placement of a concrete mud mat apron up to El. 16.5. The Contractor shall not remove the Phase 2 water control measure until completion and acceptance of the work by the Owner.
- E. During Phase 3 of the work, a temporary cofferdam will be installed along the upstream side of the existing gate structure for installation of the remainder of the concrete mud mat apron up to El. 16.5, to the extent shown on **Drawing C-2**. The Contractor shall not remove the Phase 3 water control measure until completion and acceptance of the work by the Owner.
- F. During Phase 4 of the work, a temporary “Super Sack” cofferdam system, or similar approved system, shall be installed subsequent to Owner approval of the placed and cured concrete mud mat apron installed during previous phases.
- G. The Phase 4 water control measures shall remain in place during the demolition and rehabilitation of the outlet structure and installation of the crest gate system. Once the outlet structure work has been completed and approved by the Owner, the temporary cofferdams shall be removed, and the adjacent areas shall be restored.

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

- H. The contractor will need to install water control measures (i.e., supplemental sand bags) on the stone masonry pier to raise the water control in the vicinity of the pier to the same elevation as the cofferdam.
- I. All OSHA requirements, and all applicable local environmental requirements shall be satisfied.
- J. In the case of overtopping of the cofferdam by waves, settlement or high waters, means shall be provided for controlled flooding of the work area.
- K. All pumping and water discharge shall be in accordance with Sections 01060 and 01565.
- L. Temporary cofferdam components which settle, tilt or move laterally shall be righted, reset or enlarged as necessary at no additional expense to the Owner.
- M. The Contractor shall take all such precautions necessary to protect the site and the Works of this Contract, either completed or incomplete, from flood waters and flows which would either damage the Work or the site or cause delay of the Work.

### 3.02 DESIGN REQUIREMENTS

- A. The temporary cofferdam shall be designed for all expected site-specific conditions, including, but not limited to wind, waves, variations in river level, bottom conditions and site bathymetry/topography. The top of the cofferdam should extend to at least the minimum specified elevation.
- B. The Phase 1 temporary “Super Sack” cofferdam(s) shall be designed/sized such that their top elevation is at a minimum of El. 23 where the Drawings depict the cofferdam is to be placed. It is hereby noted that the bottom of the existing River and impoundment in the area of the Phase 1 work at the right abutment is non-uniform and the Contractor may establish a working platform of crushed stone up to El. 17. The Contractor shall consider existing conditions and design/arrange the cofferdam to account for said conditions. Refer to the Contract Drawings for additional information on temporary cofferdam materials and set-up.
- C. The Phase 4 temporary cofferdam, consisting of a “Super Sacks” or similar system, shall be designed/sized such that its crest elevation is at or above El. 26.5. The total height of the cofferdam is expected to be approximately 9.5 feet as measured from the top of the concrete mud mat placed upstream of the existing outlet structure. Refer to the Contract Drawings for additional information on temporary cofferdam materials and set-up. The Contractor shall make their own evaluation of site conditions, particularly the River bottom and contours along the length of the cofferdam and verify the size/height of the cofferdam required to meet the intent of these specifications. Other temporary cofferdam structures may be presented by the Contractor for review and approval of the Owner and Resident Engineer.
- D. In the event of the River water level rising higher than the limits of the cofferdam during the performance of the Work, the Contractor shall undertake measures to protect existing structures and new work, in conformance with Section 01565.

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

- E. In the event of anticipated flooding, the Contractor shall remove all equipment, erosion-susceptible material items or materials subject to damage from water, and items or materials that could adversely impact water quality from areas liable to be inundated or otherwise impacted by flooding. The Contractor shall secure the site and make all efforts to protect completed and incomplete work, in accordance with Section 01565.
- F. In the event the cofferdams are expected to be in place when ice will be present, the Contractor shall propose and operate an active system (with appropriate backup) to prevent ice formation against the cofferdams (e.g. bubbleers, etc.).

### **3.03 REMOVAL**

- A. The Owner shall be informed at least 48 hours prior to removal or relocation of any portion of the temporary cofferdam systems. The work inside the temporary cofferdams must be observed and accepted by the Owner and Resident Engineer prior to removal.
- B. The temporary cofferdam structures shall remain in place for a period of at least two (2) days after re-flooding of the dewatered area to match existing impoundment water surface elevation(s) to allow for containment and settlement of any miscellaneous suspended particles. Faster removal may be done with approval from the Engineer. Prior to dismantling of the temporary cofferdam, the gate shall be raised to the up (closed position) to prevent migration of sediments downstream during removal of coffer dam.
- C. All parts of the temporary cofferdams shall be removed from the site at the end of the work.

### **3.04 WATER MANAGEMENT**

- A. The Contractor shall be responsible for the management of water within the areas encircled by the cofferdams and shall be responsible for all necessary bypass flows. Management of surface water and groundwater (seepage, etc) shall be accomplished and paid for under separate Sections of the Contract.

### **3.05 EMERGENCY CONDITIONS**

- A. The Contractor shall be responsible for protection of work in the event of an actual or potential emergency situation, including but not limited to an actual or potential failure of the temporary cofferdam and shall submit an emergency plan for approval as a part of the Contractor's Flood Contingency Plan, outlined in Section 01565 – Temporary Water Control. The contingency plan may include the Contractor placing "Super Sacks" within the temporary cofferdam to help protect the work during an emergency or potential failure of the temporary cofferdam. The Contractor must maintain the required materials onsite to construct the approved emergency measures throughout the entire time the upstream temporary cofferdam is in place. This work shall be considered incidental to the temporary water control work item and will not be paid for as part of the temporary cofferdam.

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### **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 02200  
EARTHWORK**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The work of this section applies to all operations involving earthwork and/or soil material. This specification generally governs the execution of excavation, fill placement, and all other earthwork tasks. This specification also generally governs acceptable soil material properties. The provisions of this specification shall apply to all such work and materials unless specifically superseded in another specification.
- B. When earthwork is included as a fundamental or incidental part of the work of a pay item, the Contractor shall provide all equipment, materials, labor, and incidentals and do all work necessary to complete the earthwork shown on the drawings.
- C. Earthwork tasks governed by this Section include, but are not limited to, the following:
  - 1. Excavation of soil, temporary on-site stockpiling, lawful off-site disposal of unsuitable and excess materials (at locations approved by the Owner).
  - 2. Handling and placement of embankment fill and wall backfill materials, in lifts, appropriate grading and compacting to specified densities at specified moistures, of fill materials.
  - 3. Supplying of all required on and off-site fills and related backfill materials.
  - 4. Grading and compaction of sub-grades.
  - 5. Compaction testing by an approved independent laboratory/testing agency.
  - 6. Supplying of appropriate fill material.
  - 7. Intermediate and temporary grading of slopes and excavations.
  - 8. Final grading as per design plans and sections.
  - 9. Executing all incidental excavation, filling, and grading for the placement of material for structures and general site preparation. This work includes, but is not limited to, utility trenching and backfilling, subsurface vault installation, backfilling of underground and retaining structures, site drainage, etc.
  - 10. Testing of fill, whether reused from on-site excavations or imported from off-site sources, for grain size distribution and moisture-density relationship.
  - 11. Design and Construction of excavation support systems other than for the Subsurface Vault, if applicable.
  - 12. Testing of Off-Site Fill for chemical contamination (as necessary).
- D. The Contractor shall coordinate with the Owner, Resident Engineer, and Engineer in regard to field quality control for all earthwork.
- E. Stripping of topsoil shall be performed under Section 02110. Excavation quantities shall be calculated from the ground surface after topsoil material has been stripped.

**1.02 SCOPE OF WORK**

The general scope of work shall be to perform all earthwork, including excavation, trenching, filling, compaction, and grading, required for the Macallen Dam Rehabilitation Project. Any earthwork not

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specifically covered under this or other sections of the Contract Documents shall be considered incidental and shall be accomplished at no additional cost to the Owner. Earthwork includes, but is not limited to the following items:

- A. Common Excavation after Stripping: Excavation of earthfill material (including boulders less than 2.0 cubic yards in volume) where required to achieve the work of the Project both by machine and hand after topsoil has been stripped. The work shall also include the provision of all necessary excavation support and other required items to provide for safe access into the excavation and provide for the location and protection, as needed, of existing utilities and structures in, under, and near the excavation. The work of this item shall also include handling and temporary stockpiling of material. No additional payment will be made for any re-handling of the excavated material once it has been removed from its original position until such time as it becomes Common Borrow or is designated as Spoil for Off-Site Disposal.  
  
Excavations shall be made in those areas indicated on the Contract Drawings or as directed by the Resident Engineer.
- B. Placement of Previously Excavated On-Site Common Fill: Handling, placement, compaction, and grading of on-site common soil material which has been previously excavated by the Contractor at the project site under the work of this Contract. The on-site soil material, if judged suitable by the Resident Engineer, shall be used for backfilling the gatehouse vault, right abutment embankment, or as directed by the Resident Engineer.
- C. Furnishing and Placement of Embankment Fill from Off-Site Sources: Provision of materials, transport, handling, placement, compaction, and grading of off-site embankment fill meeting the material specifications. Fill materials from off-site sources meeting the gradation and compaction specifications associated with their respective uses in the work (i.e. Common, Crushed Gravel or Structural) shall be used, as directed by the Engineer, as excavation backfill and backfill to meet final grades when on-site material is found to be inappropriate or insufficient. Furnishing and Placement of Fill materials for backfill of the Contractor Designed Retaining Walls (Both the MSE Wall and the Precast Concrete Gravity Wall) shall fall under pay item for Section 02832.
- D. Legal Off-Site Disposal of Common or Organic Spoil: Handling, dewatering, transportation, and lawful off-site disposal of excess soil material, common, organic, sediment, or otherwise, excavated from the right embankment or upstream of the existing gate structure and which is judged not needed or not appropriate for use at the project site.
- E. Boulder Removal: Boulder removal shall hereby be considered as removal and disposal of boulders greater than 2.0 cubic yards in volume which cannot be readily excavated and removed by the use of modern small-sized earth excavating equipment (Caterpillar Model 307C tracked excavator or equivalent). Boulder Removal does not include loose, weathered, or fragmented bedrock.
- F. Furnishing and Placement of Crushed Stone Aggregate from Off-Site Sources: Provision of materials, transport, handling, placement, compaction, and grading of Crushed Gravel meeting the material specifications. Crushed Gravel from off-site sources shall be used

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for the surface treatment of the site access roadway as shown on the Contract Drawings or as directed by the Resident Engineer.

- G. Test Pits: Test pits shall be performed within the project limits for the purpose of identifying soil and bedrock conditions when directed by the Owner or Resident Engineer. At a minimum a test pit(s) will be required in the area of the subsurface concrete vault to determine the status of the adjacent training wall and ramifications (if any) on installation of the vault. Test pits shall include all excavation of earthfill material from within the project site both by machine and hand for examination and logging of the excavation by the Owner, its Resident Engineer, and/or Engineer. The work of this item shall include proper refill and compaction.

### **1.03 RELATED WORK**

- A. The following is a list of related work items that shall be performed or furnished under other Sections of these Specifications as indicated:
1. Field Engineering - 01050
  2. Temporary Erosion and Sediment Control - Section 01560
  3. Temporary Water Control – Section 01565
  4. Site Restoration – Section 01740
  5. Saw Cutting, Dismantling, Demolition and Removal of Existing Structures – Section 02065
  6. Clearing, Grubbing, and Stripping – Section 02110
  7. Temporary Cofferdam – Section 02170
  8. Stone and Riprap – Section 02270
  9. Bituminous Concrete Paving – Section 02525
  10. Contractor Designed Retaining Wall – Section 02832
  11. Loaming, Seeding, and Revegetation – Section 02930

### **1.04 FIELD MEASUREMENTS**

- A. Verify survey benchmarks and intended elevations for the work prior to commencement of work in conformance with Section 01050.
- B. Verify final grades for conformance with Contract Drawings.
- C. Make measurements for determination of pay quantities in cooperation with the Resident Engineer as per Section 01950 – Measurement and Payment.

### **1.05 REFERENCE STANDARDS**

- A. ASTM C 33 - Standard Specification for Concrete Aggregates
- B. ASTM D422 - 63(2007) Standard Test Method for Particle-Size Analysis of Soils
- C. ASTM D698 – Standard Proctor Density Test for soil material
- D. ASTM D1556 - 07 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

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- E. ASTM D6938 - 08a Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- F. OSHA Regulations, 29 CFR Part 1926 - Excavations, current revisions.
- G. New Hampshire Department of Transportation (NHDOT) Standard Specifications for Road and Bridge Construction, 2016 Edition.

### 1.06 SUBMITTALS

Submit to the Owner and Engineer for review and comment the following:

- A. Within two weeks of the Notice to Proceed but no later than ten (10) days prior to the start of work at the site, the Contractor shall submit the name, contact information, qualifications, and certifications of its proposed Independent Materials Testing Laboratory. The Owner and/or the Resident Engineer shall be the sole judge of the appropriateness of the proposed Laboratory.
- B. Submit for review, at least ten (10) days prior to use, representative samples of all fill materials to be used, along with laboratory test results for grain size distribution (sieve) and moisture-density (**Standard Proctor**) test results. Testing shall be performed by the Contractor's Independent Materials Testing Laboratory. Test results shall be submitted for all fill to be used, whether imported from off-site or re-used from on-site excavations.
  - a. The Contractor may elect to perform gradation testing in advance of Proctor tests. If this is done, the Contractor shall allow sufficient time for review of separate gradation and Proctor test results prior to use on-site.
  - b. If, in the opinion of the Owner and/or the Resident Engineer, the nature of on- or off-site fill changes during the course of the Work, the Contractor shall resubmit a representative sample and the results of new gradation and Proctor testing prior to further material usage in the Work. These additional tests shall be at no additional cost to the Owner
- C. Submit for review the Earthwork Work Plan, at least ten (10) days prior to the commencement of work, containing at minimum the proposed construction schedule, sequence of construction, coordination with temporary site access and traffic controls, methods of construction including equipment to be used, excavation support methods and details, and proposed locations of haul roads and staging areas within work limits.
- D. If support structures are used by the Contractor to support the sides of excavations or existing structures, the Contractor shall submit to the Owner, at least ten (10) days prior to the commencement of the Work, all plans, sections, details, and calculations describing the Contractor's proposed temporary earth support system. The design of the bracing and support system shall be certified by a Professional Engineer licensed in the State of New Hampshire.
- E. At least ten (10) days prior to use, the Contractor shall submit the identity and location of each source of imported off-site fill material. It is hereby noted that the Contractor shall be prepared if requested by the Owner and/or Construction Engineer to submit results of environmental testing performed on a representative sample of each proposed material. If

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requested testing shall be required for each 500 CY of each type of material from each source of material. Environmental testing shall include, but is not necessarily limited to, the following: Total Petroleum Hydrocarbons (TPH) by ASTM D3328/EPA Method 8100, Volatile Organic Compounds (VOCs) by EPA Method Polynuclear Aromatic Hydrocarbons (PAH) by EPA Method 8270, and metals (RCRA 8) by EPA Methods 6010/7471A. Such testing shall be considered incidental to the earthwork items and performed at no additional cost to the Owner.

Note that the Resident Engineer is amenable to granting partial or full relief regarding environmental testing requirements specified hereinabove if proposed materials are from virgin sources. Furthermore, with respect to non-virgin sources (and virgin if applicable), the Resident Engineer shall request such testing only if evidence of potential environmental contaminates is observed.

- F. Within two weeks of the Notice to Proceed but no later than five (5) days prior to the start of work at the site, the Contractor shall submit the name, contact information, qualifications, and certifications of its proposed Independent Materials Testing Laboratory, including the names and credentials of proposed field testing technicians. The Owner and/or the Resident Engineer shall be the sole judge of the appropriateness of the proposed Laboratory and personnel.
- G. Submit for review and acceptance, in accordance with Section 01300 and at least ten (10) days prior to start of the exploratory test pit(s) and support of excavation installation for the subsurface vault structure, a plan of work for the installation process which includes, at minimum, the following:
  - a. Submit overall plan layout of the system, materials, material properties, member sizes, locations, locations of various types of lateral supports. Indicate existing and proposed utilities, structures or other obstructions, location and type of instrumentation and monitoring points within the area of influence of the excavation. Work plan shall be in accordance with the Contract Drawings.
  - b. Provide the overall sequence of excavation, installation of excavation support and bracing, indicating levels to which the work will be carried out before bracing is installed. Submit descriptive data and operating procedures for all equipment to be used, which shall include, at a minimum, machinery required to install soldier piles, excavate soil and rock, remove obstructions (if required), and dewatering. The Contractor shall submit the means and methods for each stage of the work and the methods of installation.
  - c. Submit the Contractor's and/or subcontractor's, the Contractor Engineer's, and field supervisory personnel's qualifications, including examples of five (5) similar projects they have worked on as a person in responsible charge. The qualifications submittals shall clearly demonstrate a minimum of ten (10) years' experience with similar types of excavation support.
- H. The Contractor shall submit information on the facility to which excess or unsuitable soil will be taken for disposal. The disposal location and license documentation for the facility shall be provided to the Owner along with an necessary testing or paperwork that may be required by local, state, or federal agencies.

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- I. Despite review and comment by the Owner or the Resident Engineer, the Contractor shall remain solely responsible for the adequacy and safety of materials and methods used in construction

### 1.07 PROJECT CONDITIONS

- A. The Contractor shall be responsible for any damage to existing roadways, buildings, utilities, and other structures caused by construction activities and shall repair any damage to the satisfaction of the Owner and at no cost to the Owner. As may be necessary, routes used as haul roads and stockpile areas shall be returned to their original condition or better as shown on the drawings and specified hereinafter, before final acceptance of the project.
- B. The Contractor's attention is called to the fact that the project is a dam site. A higher standard of earthwork construction practices and quality is required for work on and around a dam. Typical construction practices may require modification or adjustment to meet dam construction standards. In addition, additional care is required since the consequences of construction mishaps could extend beyond the project site were a dam failure to result.
- C. The Contractor's attention is called to the fact that the anticipated earthwork is in areas adjacent to existing active residential and commercial structures which must be maintained and remained undamaged during the Work. The Contractor shall provide all such Work as is required to protect existing structures during excavations and placement and compaction of fill. Special methods may be required in some locations, specifically within the area of the existing subsurface propane tanks as shown in the Contract Drawings. Refer to Section 01346 for requirements pertaining to pre-construction surveys and monitoring during critical construction activities.

### 1.08 COORDINATION

- A. Contractor shall be responsible for obtaining representative samples of soil materials proposed to be used and transporting them to the site. Materials shall be delivered to the Owner and/or Resident Engineer sufficiently in advance of the time planned for incorporating them into the work in accordance with these Specifications. Use of proposed materials by the Contractor prior to Contractor's testing and review by the Engineer shall not be allowed.

### 1.09 PERMITS AND CODES

- A. All work shall conform to the Drawings and Specifications and shall comply with applicable codes and regulations.
- B. Comply with all rules, regulations, laws and ordinances of the State of New Hampshire, Town of Newmarket and of all other federal, state, and local authorities having jurisdiction. All labor, materials, equipment and services necessary to make the work comply with such requirements shall be provided without additional cost.
- C. Excavation safety and support in accordance and compliance with all applicable OSHA and other regulations shall be the sole responsibility of the Contractor.

- D. The Contractor shall be responsible for clearing the site with DIGSAFE and with all relevant entities which may maintain utility structures in and around the site.**

**1.10 PROTECTION OF EXISTING PROPERTY**

- A. The work shall be executed in such manner as to prevent any damage to Owner facilities at the site and adjacent property and any other property and existing improvements, such as but not limited to the downstream masonry wall of the dam, service utility lines, overhead wires, other structures, monuments, bench marks, and other public or private property. Protect existing improvements from damage caused by settlement, lateral movements, undermining, washout and other hazards created by earthwork operations.
- B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at his own expense, make good such damage or injury to the satisfaction of, and without cost to, the Owner. Existing features damaged during the project work shall be repaired or replaced to their original condition at the commencement of operations. The Contractor shall replace, at their own cost, existing bench marks, monuments and other reference points which are disturbed or destroyed.
- C. Buried structures, utility lines, etc., including those which project less than eighteen inches (18") above grade, which are subject to damage from construction equipment shall be clearly marked by the Contractor to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment and shall be maintained at all times until completion of project. The Contractor shall coordinate with the Owner in locating all buried utilities, but the Contractor shall ultimately be responsible for the final location, marking, and protection of all existing underground facilities. Locations of underground utilities shown on the Contract Drawings are approximate and may not be complete.

**1.11 DRAINAGE**

- A. The Contractor shall provide, at his own expense, adequate drainage facilities to complete all work items in an acceptable manner, in accordance with the requirements of Section 01560. Drainage shall be done in a manner so that runoff will not adversely affect construction product, construction procedures, nor cause excessive disturbance of underlying natural ground or exacerbate erosion and sedimentation.
- B. The Contractor is advised that groundwater levels within the work area are likely high and that surface water and groundwater control will be required. Lateral and/or upward seepage through existing and proposed slope faces and subgrades is to be expected. The Contractor shall provide, at his own expense, adequate drainage and/or dewatering methods and facilities such that groundwater seepage will not adversely affect the construction product, procedures, nor cause excessive disturbance of underlying natural ground. These methods shall include but not necessarily be limited to the minimum dewatering requirements given in Specification Section 01565.
- C. The Contractor shall grade and ditch the staging areas and access roads, as necessary, to direct and control surface runoff in working areas, subject to approval of the Engineer.
- D. Water from excavations shall be disposed of in such a manner as will not cause injury to public health, nor to Lamprey River water quality, nor to public or private property, nor to existing work, nor to the work completed or in progress, nor to the surface of roads, walks

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and streets, nor cause any undue interference with the use of the same by the public, except in the designated work areas.

### **1.12 FROST PROTECTION AND SNOW REMOVAL**

- A. The Contractor shall, at his own expense, keep the operations under this Contract clear and free of accumulations of snow within the limit of work and on access roads as required to carry out the work.
- B. The Contractor shall protect excavations and the subgrade beneath existing and new structures and pipes from frost penetration when freezing temperatures are expected.
- C. The Contractor shall NOT place fill over frozen soils and shall NOT place frozen fill. The frozen soils shall be removed to the satisfaction of the Resident Engineer prior to fill placement. No payment shall be made for removal of frozen soil nor for replacement with suitable fill.

### **1.13 LAYOUT AND GRADES**

- A. Lay out all lines and grade work at the site in accordance with drawings and specifications. Establish and maintain permanent bench marks. Maintain all established bounds and bench marks and replace as directed any which are destroyed or disturbed.
- B. The word "subgrade" as used herein means the required surface of existing ground, final prepared ground after excavation, or compacted fill.

### **1.14 OBSERVATION BY RESIDENT ENGINEER**

- A. The Owner will employ a Resident Engineer (periodically assisted by the Engineer) to perform full or part-time on-site observation and testing during the earthwork operations. The services of the Resident Engineer may include, but not be limited to, the following:
  - 1. Observation during excavation and dewatering.
  - 2. Observation during subgrade preparation, backfilling and compaction operations.
  - 3. Laboratory testing and analysis of fill materials specified or proposed for use, as required for verification of Contractor submitted analyses.
  - 4. Preparation of test pit logs or documentation of excavation. The Resident Engineer may ask the Contractor to excavate test pits to facilitate the observation and document of sub-surface conditions.
  - 5. Visual or other examination of excavated material to judge suitability for reuse as on-site backfill material.
  - 6. Observation of subgrades for all fills and structures.
  - 6. Observation and documentation of performance of compaction methodology and effort. During the course of construction, the Resident Engineer or the Engineer



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(Owner's Consultant) will advise the Owner and Contractor in writing, if at any time the work does not, in the opinion of the Resident Engineer or Engineer, conform to the Contract Documents.

- B. The presence of the Resident Engineer, other representatives of the Owner, or the Engineer does not include supervision or direction of the actual work by the Contractor, his/her employees, or agents. Neither the presence of the Resident Engineer, other representatives of the Owner, or Engineer nor any observations and testing performed by him/her, or any notice or failure to give notice, shall excuse the Contractor from defects discovered in his/her work.

## PART 2 - PRODUCTS

### 2.01 FILL MATERIALS

All off-site material brought to the site shall be non-soluble and free of contaminants. The Contractor shall identify the source of the material and provide results of environmental testing performed on a representative sample of the material from each source. Testing shall be required for each 500 CY of each type of material from each source of material. Environmental testing shall include the following: Total Petroleum Hydrocarbons (TPH) by ASTM D3328/EPA Method 8100, Polynuclear Aromatic Hydrocarbons (PAH) by EPA Method 8270, and metals (RCRA 8) by EPA Methods 6010/7471A. Such testing shall be considered incidental to the earthwork items and performed at no additional cost to the Owner.

Recycled aggregate product (RAP) containing asphalt shall NOT be used as fill material, nor shall any fill contain concrete or former building materials.

#### A. On-Site Common Fill Material

On-site Common Fill material shall consist of material previously excavated by the Contractor from the project site. Excavated material will be examined by the Resident Engineer to judge its suitability for re-use on the project site as backfill material. Excavated material shall be judged suitable if it generally meets the standards for Common Fill, being a friable soil, non-soluble, free of rubbish, ice, snow, tree stumps, roots and organic matter, with no less than 15 percent (15%) and no more than thirty percent (30%) passing the No. 200 sieve. There shall be no stones greater than 3 inches in size. There shall also be no observable indications of contamination.

The Resident Engineer shall be the sole judge of the suitability of excavated material for use as on-site backfill. Some or none of the excavated material may be judged to be suitable. Peat or other organics are NOT acceptable for common fill. Excavated boulders or bedrock are NOT acceptable for common fill. The Contractor may, at his own expense, choose to modify the excavated material (by screening, crushing, mixing, etc.) to attempt to make the material more suitable for re-use. Some additional handling of suitable material (drying, mixing, and culling of oversized stones) may be necessary and shall be done at no additional cost to the Owner.

Material judged to be unsuitable or extra material shall be separated from the rest. Material unsuitable for use in the embankment may be used elsewhere on site in less critical areas, at the judgment of the Resident Engineer or may be legally removed from the site by the Contractor as directed by the Resident Engineer.

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### B. Off-Site Common Fill Material

The Owner shall approve all Off-site Common Fill material. Off-site material imported for use as Common Fill for the filling of sand bags or “Super Sacks” shall have the same characteristics as stated above under On-Site Common Fill Material, except as follows: The material shall be well graded as per the Unified Soil Classification System and shall not be gap graded. Atterberg limits must plot above the “A” of the standard plasticity chart and the liquid limit shall not exceed 50.

### C. Structural Fill (Low Permeability Fill)

Structural Fill (Low Permeability Fill) for use as embankment backfill to meet new grades on the right side of the dam below the dam foundation, behind and below wingwall and training wall foundations, as well as below and behind control building foundations, below the slab and at other locations deemed suitable by the Engineer shall be a well graded inorganic material, free of rubbish, ice, snow, tree stumps, roots, organic material, or other deleterious materials. There shall be no stones greater than three inches in diameter. Material shall be placed within -1% to +3% of its optimum moisture content. It shall conform to the following gradation requirements:

Sieve Size	Percent Finer by Weight Structural Fill
3 inches	100
No. 4	60-100
No. 40	40-70
No. 200	20-40

Soil characteristics shall also conform to the following requirements:

Soil Characteristic	Minimum Value	Maximum Value
Plasticity Index (PI)	5	20
Uniformity Coefficient ( $C_u$ )	12	---
Coefficient of Curvature ( $C_c$ )	1	3

### C. Crushed Stone

Crushed Stone material shall be as specified in Section 02270 – Stone and Riprap. Crushed Stone shall be used as Riprap bedding material.

### D. Crushed Gravel (NHDOT 304.4)

Crushed Gravel for use to construct the temporary stabilized construction entrance and for drainage layers behind retaining walls shall generally conform to 304.4 of the NHDOT - Standard Specifications for Road and Bridge Construction (latest edition). The composite material shall be free from clay, loam, or other plastic material, and shall conform to the following gradation requirements:

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Sieve Size	Percent Finer by Weight Crushed Gravel
2-inch	100
1 1/2-inch	85-100
3/4-inch	45-75
No. 4	10-45
No. 200	0-5

### E. Loam

Loam shall be as specified in Section 02930 - Loaming and Seeding.

### F. Pervious Crushed Stone Paving

Aggregate binder shall be a natural, non-toxic, non-staining, odorless, environmentally safe powder consisting of 95% Psyllium, and 70% Mucilloid content. The powder shall be of a size that not more than 10% is retained on a US standard #40 mesh sieve. The powder binder shall be “Stabilizer” as manufactured by Stabilizer, Inc., or an approved equal. Color shall be selected by the Owner from the manufacturer’s standard colors. Gradation requirements are as follows:

Sieve Size	Percent Finer by Weight Dense Graded Crushed Stone
1/2 -inch	100
3/8-inch	80-100
No. 4	55-80
No. 8	48-63
No. 16	36-49
No. 30	24-38
No. 50	14-27
No. 100	6-18
No. 200	5-12

Swell Volume: The paving material shall have 35% to 40% swell volume. The Contractor shall provide proof of compliance of their performance value through the use of independent testing. The test, ASTM International D4546 “One dimensional Swell of Settlement Potential of Cohesive Soil” shall be performed by SW Cole Engineering in Somersworth, NH or approved equal. The Contractor shall provide a half-pound sample for testing the first 1,000 square feet and for every 5,000 square feet thereafter.

Contractor shall provide proof of paving material’s compliance to ASTM-F1647-95 Method B.

### G. Other Soil Materials

Other soil materials proposed for use at the site shall meet the NHDOT Standard Specifications. The Resident Engineer shall have sole authority to authorize the use of alternative soil materials. No additional payment shall be made for substituted materials.

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### **2.02 NON-WOVEN FILTER FABRIC/GEOTEXTILES**

Geotextile Fabric shall be used to prevent soil intrusion into drains, crushed stone or aggregate layers, and/or assist in stabilizing soil subgrades to be laid on approved soil subgrades prior to placement of fill materials. Contractor shall use Mirafi 140N or equivalent filter fabric system between crushed stone or aggregate and soils or where indicated on the Contract Drawings. Geotextile fabric used beneath placed riprap or crushed stone working mats or bedding layer shall be as specified in Section 02270 – Stone and RipRap.

### **2.03 CONTROLLED LOW-STRENGTH MATERIAL (CLSM)/FLOWABLE FILL**

Controlled Low-Strength Fill (CLSM) or Flowable Fill Material shall be a cement concrete backfill material that flows like a liquid, supports like a solid when cured, and levels without tamping or vibrating to reach 100 percent compaction, and shall generally conform to the requirements of Concrete Class F – Flowable Fill as described in the NHDOT - Standard Specifications for Road and Bridge Construction (latest edition). CLSM/Flowable Fill shall be “excavatable” material and shall be proportioned to yield a 28-day minimum compressive strength between 60 and 150 psi. The material shall be produced and installed in accordance with ACI 229R and ACI 116R and shall generally consist of a two-sack cement/sand mixture type II Portland cement. The mix formulation shall be approved by the Engineer prior to placement.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION AND PREPARATION**

Grades, both existing and finished, are indicated on the Drawings. The Owner is not responsible for existing grades shown on the Drawings. The Contractor shall check all areas wherein grades are shown to satisfy themselves as to actual conditions. The Contractor shall be responsible for establishing all control points and marks necessary for the work. Precautions shall be taken to preserve the materials outside the lines of the limit of work in the most undisturbed condition possible. The Contractor shall:

- A. Identify and check all required lines, levels, contours, and datum.
- B. Notify the Owner, Resident Engineer, and Engineer in writing of unanticipated subsurface conditions and discontinue affected work in area until notified to resume.
- C. Protect plant life, grassed areas and other features remaining as a portion of final landscaping.
- D. Verify fill materials to be reused are acceptable.
- E. Notify appropriate utility company to remove or relocate utilities, if necessary.
- F. Maintain and protect existing utilities remaining which pass through work area.

### **3.02 TEST PITS**

- A. Excavation of Test Pits, if needed, shall be performed by the Contractor as directed by the Owner or Resident Engineer to evaluate subsurface conditions within the project area and paid under this Section of the Work.

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Excavation of Test Pits will be required, as shown on the Contract Drawings, in the area of the subsurface concrete vault prior to installation of the support of excavation system.

Contractor shall assist the Resident Engineer and/or Engineer to all extent practicable in his duties to log all test pit excavations, at no additional cost. Test Pits specific to the Subsurface Concrete Vault Support of Excavation will be paid under that Section of the Work, as described in Section 01950.

- B. Test pits may be up to 6 feet deep, 4 feet wide at the bottom and with a length sufficient to provide stability for the excavation. The actual size of each test pit will be determined on an individual case basis by the Resident Engineer and/or Engineer.
- C. Any test pits excavated shall be properly backfilled in controlled compacted lifts in accordance with this Section. Backfilled surfaces shall be stabilized in accordance with approved erosion and sedimentation control plans.

### **3.03 PROTECTION OF ADJACENT FACILITIES AND PROPERTIES**

- A. Protect all adjacent facilities which may be damaged by excavation work. All construction induced damage shall be repaired by the Contractor at no additional expense to the Owner. Refer to Section 01436 for additional requirements.
- B. The work area shall be graded, shaped, and otherwise drained in such a manner as to minimize soil erosion, siltation of drainage channels, damage to existing vegetation and property outside the limits of the work area and shall be in accordance with Section 01560.

### **3.04 DISTURBANCE OF EXCAVATED AND FILLED AREAS DURING CONSTRUCTION**

- A. The Contractor shall take the necessary steps to avoid disturbance of subgrade during excavation and filling operations. Methods of excavation and filling operations shall be revised as necessary to avoid disturbance of the subgrade, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials, dewatering and other acceptable control measures. The Contractor shall cooperate with the Owner or Engineer to modify procedures and protect bearing soils.
- B. No payment shall be made for temporary excavations and/or fills to execute construction, beyond those required for the final lines and grades shown on the Contract Drawings. The Contractor shall remove/restore temporary grading at his/her own expense.

### **3.05 EXCAVATION**

- A. Perform all work of any nature and description required to accomplish the work as shown on the Drawings as specified. The work shall include, although not be limited to, earth excavation; on-site stockpiling of materials; and removal of unsuitable materials to designated locations.
- B. Excavations, unless otherwise required by the Resident Engineer, shall be carried only to the elevations and limits shown on the Drawings. If unauthorized excavation is carried out below required subgrade and/or beyond minimum lateral limits shown on Drawings, it shall be backfilled as specified by the Resident Engineer, at the Contractor's expense.

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Excavations shall be kept in good condition at all times, and all voids which may endanger existing structures shall be filled to satisfaction of the Resident Engineer.

- C. The Contractor shall lawfully and satisfactorily dispose of, at his own expense, surplus excavated materials. As necessary, the Contractor will be required to adequately reduce the water content of the spoil material prior to reuse as borrow or offsite disposal. The dewatering technique may include creation of temporary containment areas within the work area or other method approved by the Owner and shall be in accordance with Section 01560. The Owner shall designate surplus excavated materials as materials from the excavations that are unacceptable for use as fill or that are in excess of the fill materials required. These materials, if any, which cannot be placed at once in permanent positions, may be deposited in storage piles at designated locations designated by the Resident Engineer. Re-excavation and re-handling from such storage piles shall be included in unit prices. Separate stockpiles shall be established for material to be reused and material to be disposed of off-site. Stockpiles shall be labeled with temporary signage.
- D. Excavated material which meets the criteria put forth in the specifications shall be reused at the site after Contractor-performed gradation and moisture-density testing. The Contractor is encouraged to reuse excavated material provided it meets the requirements of the intended re-use.
- E. All excavations shall be performed in accordance with OSHA requirements.
- F. The Resident Engineer shall assess the limits of excavation during and after the completion of the work. The Resident Engineer may, at their discretion, reduce or extend the limits and/or depth of excavations, as judged necessary. It is the intent of this work to remove and replace all material which may have been subject to internal erosion and loss of structure.
- G. All appropriate care shall be taken to avoid damage to existing structures, such as, but not limited to, the abutment stone masonry wall, the existing subsurface propane tanks, and utilities during excavation. Hand excavation around these and other structures may be necessary and will be performed as required at no additional cost to the Owner.
- H. The Contractor shall, at all times during the construction provide and maintain proper equipment and facilities to remove all water entering excavations and shall keep such excavations dry so as to obtain a satisfactory dry and undisturbed subgrade foundation condition until the fills or structures to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels.
- I. Boulders greater than 1.0 cubic yards in volume may be reduced in size by mechanical means to simplify removal.
- J. Subgrade Preparation
  - 1. Following excavation, proof compact the exposed subgrade. Proof-compacting shall be performed with a minimum of four (4) completed coverages of the full area with a vibratory drum roller with a minimum of a 2,000 pound static drum weight and providing at least 5,000 lbs. of dynamic force. Proof compacting in confined areas may be accomplished with hand operated vibratory equipment approved by the Resident Engineer. Proof compacting shall be conducted in the presence of the

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Resident Engineer. Subgrade soils which become soft, loose, "quick", or otherwise unsatisfactory for support of the embankment or structure as a result of inadequate excavation, dewatering, proof compacting, or other construction methods shall be removed and replaced with compacted fill or other material satisfactory to the Construction Engineer at the Contractor's expense.

2. If the bottom of any excavation is taken out below the limits shown on the Drawings, specified, or directed by the Construction Engineer, it shall be refilled/compacted at no additional cost to the Owner with either concrete or Low Permeability Fill as determined by the Owner or Construction Engineer.
3. If the Contractor does not care for water properly, through failure to postpone final excavation immediately above the subgrade until shortly before placing of the new work thereon, or other failure or neglect to conduct the excavation work properly so that the surface of the subgrade is in proper condition when he/she is ready for construction, the Contractor shall remove the unsuitable material and replace it with concrete, Low Permeability Fill, or other approved material at no additional cost to the Owner so that the condition of the subgrade meets with the approval of the Construction Engineer before any work is placed thereon.
4. At the conclusion of proof-rolling, and just prior to placement of approved fills, the Contractor shall carefully scarify the top 3-inches of the subgrade so as promote interlocking of the subsequent fill material.
5. All subgrades shall be approved by the Engineer prior to the placement of any fill materials, concrete, geotextile, or any other items.

### 3.07 EXCAVATION SUPPORT AND PROTECTION

The excavation support system specific to the subsurface vault for the new gate structure shall conform to the requirements of the Contract Drawings. All other excavation support and protection shall conform to the requirements herein.

- A. As necessary, provide shoring, sheeting, and/or bracing of excavations in accordance with approved submittal as required to assure complete safety against collapse of earth at side of excavations. The installation, performance and subsequent removal of any excavation support system shall not result in damage or compromise the performance or integrity of the dam.
- B. Comply with local safety regulations and/or, in the absence thereof, with the provisions of the Occupational Safety and Health Act (OSHA) for trenching and excavation.
- C. Remove sheeting and shoring, etc., as backfilling operations progress, taking all necessary precautions to prevent collapse of excavation sides. No excavation support elements shall be permanently left in place within the dam without approval from the Owner or Resident Engineer.
- D. The Contractor shall be fully responsible for furnishing, installing, maintaining, reinforcing and removal of all sheeting and bracing and shall be fully responsible for all damages, losses and claims involving the use or non-use of sheeting and bracing despite any orders given or any orders failed to be given by the Resident Engineer. The Contractor shall hold harmless the Owner and its Engineer from all damages, losses and claims involving the use or non-use of sheeting, shoring and bracing.

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- E. The Contractor shall furnish, put in place, and maintain sheeting and bracing to support the vertical side of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures from disturbance, undermining or other damage.
- F. If the Resident Engineer is of the opinion that at any point, sufficient or proper supports have not been provided, he/she may order additional supports put in at the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.
- G. The Contractor is responsible for understanding the subsurface and soil conditions in areas where excavation support is required. The Contractor shall examine available subsurface data and make additional explorations as needed and as approved by the Resident Engineer.
- H. **No excavation shall be made which will negatively affect the stability of existing structures or in-place cofferdams.**

### 3.08 FILL PLACEMENT AND COMPACTION

- A. Particular care shall be taken in compacting material adjacent to existing structures including, but not limited to, underground utilities and the embankment masonry walls. Compaction of subgrades and fill material within one-foot of existing structures may require the use of hand tampers, as required by the Resident Engineer or as judged necessary by the Contractor.
- B. Fill shall not be placed over wet, frozen or spongy subgrades. In the event these conditions occur, the Contractor shall excavate and remove the unsuitable material prior to placing more fill.
- C. The Contractor shall dewater to maintain groundwater levels a minimum of one foot (1') below bottom of excavations and/or subgrades. All fill is to be placed "in-the-dry."
- D. The Contractor shall bench all existing slopes prior to placing horizontal fill layers on existing slopes of greater than 6H to 1V.
- E. Place and compact materials in continuous horizontal layers not exceeding eight-inch (8") loose lift thickness. Do not place frozen material.
- F. The general standard for compaction for all granular soil materials in non-embankment areas shall be a firm and stable material which, if tested, would achieve a minimum ninety-five percent (95%) of the maximum dry density as determined by ASTM Test D1557 (Modified Proctor Test), with a water content between plus or minus two percent ( $\pm 2\%$ ) of optimum moisture content. If wet fill cannot be adequately compacted, remove and replace with drier fill at no additional cost to the Owner.
- G. The general standard for compaction for Structural Fill soil materials for the raising of the right embankment shall be a firm and stable material and when tested achieves a minimum ninety-eight percent (98%) of the maximum dry density as determined by ASTM Test D-



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698 (Standard Proctor Test), with a water content between -1% to +3% of optimum moisture content. If wet fill cannot be adequately compacted, remove and replace with drier fill.

- H. Fill that is too wet for proper compaction, as determined by testing or the Resident Engineer's judgment, shall be disc'd, harrowed, or otherwise dried to a proper moisture content for compaction to the required density, specified herein. If the fill material cannot be dried within forty-eight (48) hours of placement, it shall be removed and replaced with drier fill at no additional cost to the Owner.
- I. Fill that is too dry for proper compaction, as determined by testing or the Resident Engineer's judgment, shall receive water uniformly applied over the surface of the loose layer. Sufficient water shall be added to allow compaction to the required density.
- J. Compaction of fill material shall be done to meet the above stated density criteria, but at minimum six (6) passes of an approved a vibratory drum roller with a minimum of a 2,000 pound static drum weight and providing at least 5,000 lbs. of dynamic force. Make additional passes as necessary to achieve a degree of compaction of at least 98% for the raised embankment area; 95% elsewhere.
- K. When compacting behind or adjacent to structures, place and compact fill in loose layers not more than eight inches (8") thick. Compact with a powered tamping compactor to the satisfaction of the Resident Engineer.
- L. Fill which becomes disturbed after compaction as a result of the Contractor's operations shall be removed and replaced or re-compacted to the specified degree of compaction at no additional cost to the Owner.
- L. Placement and compaction of soil material on the embankments shall be in a direction parallel to the top of the embankment, when possible.
- M. In cases where prior excavation has not been made, the Contractor shall strip all organic topsoil from along the length and breadth of all areas which are to have fill material placed on top. This work shall be paid for under other Sections of the Contract.
- N. Rough and fine grade the surface of embankment and fill as shown on the Contract Drawings. All surfaces shall be appropriately graded to drain and provided with a firm and stable surface which is resistant to erosion.

### 3.09 FIELD QUALITY CONTROL

- A. All field quality control of earthwork shall be provided by the Contractor's approved Independent Testing Laboratory at no additional cost to the Owner. All field and laboratory quality control work shall be considered incidental to the Work of this Section.
- B. The Resident Engineer shall observe the placement of all fill material. The Resident Engineer shall be provided with the results of tests by the Contractor's Independent Testing Lab or make such observations as are judged necessary to render an opinion as to whether the materials used and compaction effort provided are appropriate to meet the intent of the specifications.

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- C. The Resident Engineer shall judge achievement of the compaction standards by either visual observation of compaction effort and success or through the Contractor's Independent Testing Lab's use of in-place density tests including, but not be limited to, in-place compaction (density and moisture) testing performed in accordance with ASTM D1556 (sand cone) or ASTM D6938 (nuclear density meter). The frequency of testing shall be at the Resident Engineer's sole discretion with a minimum of one test for each lift of material placed in a discrete area, at a minimum frequency of one (1) test for every 4,000 square feet of fill and/or one (1) test for every area of less than 4,000 square feet placed in one (1) day.
- D. If compaction is judged by the Resident Engineer to be inadequate, the Contractor shall provide additional compaction or otherwise correct the problem at no additional cost to the Owner.
- E. The Contractor shall be responsible for providing to the Resident Engineer and Owner the results of independent analysis of proposed on-site and off-site fill materials performed in accordance with ASTM D6913 and ASTM D1557. All the results shall be provided at least five (5) days prior to Delivery or placement of material. Test results to be provided are as follows:
  - 1. Particle size (sieve) analysis for each off-site material.
  - 2. Maximum dry densities and optimum moisture contents, as per the Modified Proctor Test Methodology, for each off-site material.
  - 3. New Proctor curves shall be developed whenever the properties of a certain material are judged by the Engineer to have substantially changed.
- F. The Contractor shall be responsible for coordinating fill placement with the Resident Engineer. No fill shall be placed if the Resident Engineer is not available to observe the Work. Fill placed in the absence of the Resident Engineer may be required to be excavated and replaced at no additional cost to the Owner.
- G. The Contractor shall provide the Owner and the Resident Engineer free and safe access to work at all times, including providing for observation of bottom of excavation and of bearing surfaces.

### 3.10 SPOIL DISPOSAL

- A. It is the responsibility of the Contractor to lawfully dispose of excess or unsuitable soil at an approved off-site location. The Town may provide an alternate location to dispose of excess soils. The Contractor shall coordinate directly with the Town Facilities Manager to determine if off-site locations may be allowed for use by the Contractor. Any necessary testing or paperwork that may be required by local, state, or federal agencies should be provided to the Owner and Engineer at no additional cost.
- B. Spoil material may consist of common excavated material, common excavated material with organics and roots, peat, topsoil, sediment, cobbles, boulders, rock, wet material, or other material which is unsuitable or has been excavated in excess of that quantity needed for fill at the site.

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- C. The Contractor shall be responsible as part of the work of spoil disposal for controlling the water content of the spoil (i.e. dewatering) such that it is suitable for transport. The Contractor shall not create sanitary problems during the transport of spoil material and shall be responsible for cleaning areas where liquids or solids have leaked.
- D. The Contractor shall transport the spoil to an approved spoil disposal area. The Contractor shall use “tight trucks” to minimize leakage of water or spoil.
- E. The Contractor shall be responsible to ensure that free liquid is properly transported. “Wet soils” shall not be loaded for transport. The Contractor shall dewater “wet soils,” and properly dispose of free liquids in accordance with local, state, and federal regulations. The Contractor shall dispose of any free liquids that may result during transportation at no additional cost to the Owner and without adverse impacts to nearby water bodies.

### **3.11 EARTHWORK UNDER OTHER SECTIONS**

- A. Unless specifically contradicted, all earthwork executed under other Sections of the Contract shall be governed by the Methods specifications detailed in this Section.

### **3.12 STOCKPLING**

- A. Stockpile materials on site in such a manner so as to maintain the segregation of different types of material.
- B. The Contractor shall provide, at no additional cost, temporary signage which identifies the type of soil or rock material in each stockpile.
- C. Stockpiles should be protected from erosion in accordance with Section 01560.

## **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 02270  
STONE AND RIPRAP**

**PART 1 - GENERAL**

**1.01    DESCRIPTION**

- A.     The Contractor shall furnish all equipment, materials and labor and do all work necessary to place stone materials, including Crushed Stone and Riprap.
- B.     Crushed Stone material and Riprap shall be sized as indicated on the Contract Drawings or as indicated in the Specification. The Contractor shall be responsible for all furnishing, processing, transportation, and placement necessary to achieve stone with quality and gradations meeting the specifications.
- C.     Placement, intermediate grading and final grading of areas of Riprap placement shall be included in the Work of this Section at no additional cost to the Owner. Such work may involve handling and placement of individual stones to achieve a stable slope to the lines and grades shown on the Contract Drawings.
- D.     Stone, rock, and Riprap material placed by the Contractor shall not exceed the limits shown on the Plans.
- E.     Adherence to the lines, grades, and slopes shown on the Contract Drawings is critical so as to meet permit requirements and minimize encroachment of stone in front of the fish ladder opening and into resource areas.
- F.     Stone, rock, and Riprap placed as incidental under this or other Sections shall conform to the requirements of this Section, except as specified elsewhere.

**1.02    SCOPE**

- A.     Work involving stone and Riprap shall include, but not be limited to the following:
  - 1.     Furnishing and placing Crushed Stone for use as a bedding material for Riprap placed at the upstream portions of the dam and elsewhere on site.
  - 2.     Furnishing and stockpiling of Riprap from off-site sources for use on the right upstream embankment of the Macallen Dam and immediate surroundings, and elsewhere on site.
  - 3.     Placing and grading of Riprap from stockpiles at the site.
  - 4.     Furnishing and placing of Chinking Stone for treatment of Riprap surfaces.

**1.03    RELATED WORK**

- A.     The following is a list of related work items that shall be performed or furnished under other Sections of these Specifications as indicated:
  - 1.     Temporary Erosion and Sedimentation Controls – See Section 01560
  - 2.     Temporary Water Control – See Section 01565

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3. Temporary Cofferdams – See Section 02170
4. Earthwork – See Section 02200

### 1.04 SUBMITTALS

- A. Two (2) weeks prior to the delivery of any stone material to the site, the Contractor shall submit the name and location of the proposed quarry(s) to be used to supply the stone products. The Contractor shall provide the Owner with information regarding the type and physical characteristics of the stone, as required below. The Contractor shall also provide copies of any certifications or approvals of the quarries products from other agencies.
- B. Two (2) weeks prior to the delivery of any Crushed Stone material, stone, rock, or Riprap to the site, the Contractor shall submit a description of the material, the source of the material, a gradation analysis, density/specific gravity test results, and samples of the materials as required by the Engineer. The Contractor shall provide certification of stone source, type, and properties from the quarry.

### 1.05 PERMITS AND CODES

- A. All work shall conform to the Drawings and Specifications and shall comply with applicable codes and regulations.
- B. The Contractor shall comply with all rules, regulations, laws and ordinances of the State of New Hampshire, Town of Newmarket and of all other local authorities having jurisdiction at the site. All labor, materials, equipment and services necessary to make the work comply with such requirements shall be provided without additional cost.

## PART 2 - PRODUCTS

### 2.01 STONE RIPRAP ( NHDOT “Class III”)

- A. Stone Riprap shall consist of hard, durable, **non-soluble** and sound angular stone which is resistant to weathering. Rounded stones, boulders, elongated, thin or flat pieces whose breadth or thickness is less than one-third its length will not be allowed. The parent rock for rockfill and stone Riprap stones shall be igneous or metamorphic rock. **Sedimentary rock types such as shale, sandstone, or similar soft stone and soluble limestone and dolomite shall not be allowed.** The stone shall be free of cracks, overburden, spoil, silt, clay, loam, organics and other deleterious matter.
- B. Riprap stone shall conform to the suitability requirements of the U.S. Army Corps of Engineers Engineering Manual (EM) 1110-2-2302, and shall conform to the following standards:

Unit Weight	Dry unit weight 165 pcf or greater
Absorption	Less than 1 percent
Sulfate Soundness <sup>1</sup>	Less than 5 percent loss
Abrasion <sup>2</sup>	Less than 20 percent loss for 500 revolutions
Freezing-Thawing <sup>3</sup>	Less than 10 percent loss for 12 cycles
Drop Test <sup>4</sup>	No breakage or cracking
Wetting and Drying <sup>5</sup>	Less than 5 percent breakdown after 10 cycles
Solubility <sup>6</sup>	None (no loss of mass)

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- 1) Sulfate Soundness: Stone(s) shall exhibit a less than five percent (5%) loss per the U.S. Army Corps of Engineers standardized method CRD-C 127 for Magnesium Sulfate.
- 2) Abrasion: Stone(s) shall exhibit a loss of less than 20 percent (20%) for 500 revolutions based on the Los Angeles abrasion test per U.S. Army Corps of Engineers standardized method CRD-C 145.
- 3) Freezing-Thawing: Stone(s) shall exhibit a loss of less than 10 percent for 12 cycles based on the U.S. Army Corps of Engineers standardized method CRD-C 144.
- 4) Drop Test: The Contractor shall perform a Drop Test on representative samples of the stones to evaluate suitability. The test stone(s) shall be dropped from a bucket or cherry picker, or by other means from a height half the average diameter of the stone or a minimum of 2 feet onto a rigid surface or second stone of comparable size. The stone shall be examined before testing as well as afterward. Stone(s) shall exhibit no breakage or cracking based on the Drop Test. Failure criteria are development of new cracks, opening of existing cracks, and loss of small pieces from the surface of the stone. The Drop Test shall be repeated as directed by the Owner and/or the Resident Engineer.
- 5) Wetting and Drying: Submerge stone in water for 18 hours, oven dry at 140°F, and cool to complete one cycle.
- 6) Solubility: Apply 3 M hydrochloric acid (HCl) to the stone to determine if the stone is a carbonate rock (i.e. soluble). The stone is considered soluble if a positive reaction (effervescence) is observed. HCl testing shall be performed in accordance with the United States Department of Agriculture – Natural Resources Conservation Service standardize method “Assessing Carbonates in the Field with a Dilute Hydrochloric Acid (HCL) Solution”, Note 5.

It is probable that the Resident Engineer will be able to determine suitability of rock proposed by the Contractor for use as rip rap by visual observation alone and would not require that any of the tests above be undertaken. **However, if, in the opinion of the Owner or the Resident Engineer, testing of the proposed stone source is warranted, the Contractor shall be prepared to provide the results of one or more of the above tests and demonstrate conformance with the specifications at no additional cost to the Owner.**

- C. Gradations of stone Riprap shall be as specified or, if not stated, then based upon the thickness of the stone Riprap layer as shown on the plans. Stone Riprap layer thickness shall be defined as the typical (or average) layer thickness as measured perpendicular to the ground surface or slope. In all cases, no more than 5 percent by weight shall pass a 2-inch sieve. Diameter refers to the equivalent-volume spherical stone diameter as defined by the US Army Corps of Engineers in EM 1110-2-1601. No stone dimension shall be greater than three (3) times the length of another.

Stone Riprap shall meet the requirements of “Class III”, as defined in Section 583 – Riprap of the State of New Hampshire Department of Transportation – Standard Specifications for Road and Bridge Construction (latest edition). For “Class III,” the nominal median particle

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diameter shall be 1 foot. The volume distribution requires that 15 percent of the stone in the mass shall be no larger than 0.4 cubic-feet, 15 percent of the stone in the mass shall be no smaller than 2.5 cubic-feet, and the remaining 70 percent of the stone in the mass shall have a volume between 0.4 cubic-feet and 2.5 cubic-feet with no stone being larger than 6.5 cubic-feet.

- D. Riprap material shall be well graded as a material without gaps in the gradation curve. The uniformity ratio ( $D_{85}/D_{15}$ ) should be between 1.5 and 2.5, as defined in the Federal Highway Administration (FHWA) – Hydraulic Engineering Circular No. 23.
- E. All Riprap stone furnished and placed at the site shall be of the same parent rock from the same quarry and shall be visually similar to the existing Riprap.
- F. The Contractor shall provide certification of stone source, type, and properties from the quarry.
- G. In companion with Paragraph 2.01.B, control of gradation will be by visual inspection. The Contractor shall provide, prior to Riprap placement, a representative sample of Riprap stone for inspection. Any difference of opinion between the Resident Engineer and the Contractor shall be resolved by dumping and checking the gradation of two random truckloads of stone. Mechanical equipment, a sorting site, and labor needed to assist in checking gradation shall be provided by the Contractor at no additional cost, if needed. **Further checking at the quarry site to establish the weight distribution of the Riprap material being supplied may be required by the Resident Engineer. The Contractor shall provide such checking at no additional cost.**
- H. All Riprap shall be underlain by Crushed Stone material bedding layer and geomembrane as shown on the Contract Drawings.
- I. If requested by the Owner, the Contractor shall facilitate and participate in a field visit to the quarry(s) which is the proposed source of the stone material.

### 2.02 CRUSHED STONE MATERIAL (NHDOT Item 304.5)

- A. Crushed Stone material for use as bedding material for Riprap shall consist of aggregate that is inert material from hard, non-soluble, durable stone and coarse sand, free from loam, clay, surface coatings, sod, and deleterious or organic materials. Crushed Stone material shall generally consist of material similar to ¾-inch Crushed Stone and shall have a gradation meeting the following requirements:

Sieve Size	Percent Finer by Weight
3 ½ -inch	100
3-inch	80-100
1 ½-inch	60-90
¾-inch	40-70
No. 4	15-40
No. 200	0-5

**This material shall be used for bedding under all Riprap at the Macallen Dam.**

- B. The thickness of the Crushed Stone material layer below Riprap shall be as indicated on the Contract Drawings, but in no case shall the layer thickness be less than 6 inches.

**2.02 GEOTEXTILE FABRIC**

- A. Geotextile Fabric may be used to prevent intrusion of the Crushed Stone bedding material and/or Riprap into the soil subgrade and/or assist in stabilizing soil subgrades. Contractor may use Mirafi FW700 or equivalent filter fabric system between the soil subgrade and Crushed Stone bedding material or Riprap, where necessary or as directed by the Resident Engineer. Geotextile fabric used to prevent soil intrusion into drains, Crushed Stone behind retaining walls, or aggregate layers shall be specified in Section 02200.

**PART 3 - EXECUTION**

**3.01 EXAMINATION AND PREPARATION**

- A. Grades, both existing and finished, are indicated on the Contract Drawings. The Contractor shall check all areas wherein grades are shown to satisfy him/her as to actual conditions. The Contractor shall be responsible for establishing all control points and marks necessary for the work. Precautions shall be taken to preserve the materials outside the lines of the limit of work in the most undisturbed condition possible. The Contractor shall:
  - 1. Identify and check all required lines, levels, contours, and datum.
  - 2. Notify the Resident Engineer in writing of unanticipated subsurface conditions and discontinue affected work in area until notified to resume.
  - 3. Verify materials to be reused are acceptable to the Resident Engineer.

**3.02 GENERAL RIPRAP PLACEMENT**

- A. The prepared subgrade in Riprap placement areas shall be cleared of all stones greater than 6 inches in diameter, along with any other items that may damage the geotextile (if used). The prepared surface shall be observed and approved by the Resident Engineer prior to installation of the geotextile or placement of the Crushed Stone bedding layer.
- B. The geotextile (if used) shall be placed on the prepared subgrade by unrolling directly from the rolls in a direction approximately parallel to the slope. Folds and wrinkles in the geotextile should be avoided. Adjacent rolls or sections of geotextile shall be overlapped a minimum of 3 feet, with the geotextile covering ground of higher elevation overlapping that which covers ground of lower elevation. The geotextile shall be fixed in place so that slippage does not occur as work continues. If neither a Crushed Stone bedding layer nor a geotextile is shown below the Riprap layer, the Contractor shall place geotextile fabric as if it had been shown on the plans.
- C. Storage and handling of geotextile filter fabric (if used) shall be as per the manufacturer's recommendations for protection from sunlight, ultraviolet rays, heat, dirt debris, etc. which could affect its properties. Uncovered geotextile shall not be left exposed to sunlight, either on the roll or in place. Torn, punctured or otherwise damaged fabric shall not be used. Mishandled or damaged material shall be removed from the site and replaced at no



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additional cost to the Owner.

- D. Crushed Stone bedding material shall be placed immediately after the placement of the geotextile filter fabric (if used). The Crushed Stone bedding layer shall be placed on the prepared subgrade and compacted in layers not exceeding 6 inches. Compaction shall be judged to be firm and stable to the satisfaction of the Resident Engineer. The Contractor shall grade and shape the final surface to conform to the plans and provide a uniform and acceptable surface for placement of the Riprap.
- E. After Crushed Stone layer and/or geotextile placement, the Riprap shall be placed on the slope in uniform fashion to the required thickness. Riprap may be dumped from an excavator or loader bucket, but from no greater than two feet above the ground. Riprap shall be dumped directly onto its final location without rolling down the slope. Care shall be taken during placement so as not to damage or disturb the Crushed Stone bedding layer or underlying geomembrane. Do not dump Riprap directly from truck onto slope or other Riprap placement area.
- F. Riprap shall be placed in such a manner as to produce a reasonably well graded distribution of the various stone sizes, with no localized areas of uniform size material. **Each of the largest stones is to touch adjacent large stones.** The smaller size stones shall fill the spaces between the larger stones so as to obtain a minimum practical percent of void space. Dumping from trucks and spreading shall not be allowed. Post-placement manipulation of the Riprap shall be performed such that individual stones are in contact with one another, without gaps or spaces between.
- G. Riprap shall be compacted and shaped by tamping and manipulation with the bucket of an excavator, or other means acceptable to the Resident Engineer.
- H. It may be necessary to handle and place individual Riprap stones to place the material such that it achieves a stable slope conforming to the lines, grades, and slopes shown on the Contract Drawings. The Contractor shall be responsible for all efforts necessary to place the Riprap in such a manner which produces a stable slope conforming to the lines, grades, and slopes shown on the Contract Drawings. The Contractor shall not place material beyond the limits shown.
- I. “Chink” the final Riprap surface, manually if necessary, to eliminate any significant gaps in the Riprap surface. “Chinking” shall involve the placement and setting of smaller stones in gaps between larger stones so as to provide a more uniform coverage across the Riprap surface. No additional payment shall be made for chinking materials or effort.
- J. Riprap placed directly on concrete or bedrock shall not require a Crushed Stone bedding layer nor a geotextile layer, however, adjacent filter fabric (if used) should be lapped in such a manner so as to prevent loss of sub-grade or movement of soil along concrete or bedrock surfaces.
- K. Tolerances for placement of stone Riprap shall be within plus or minus six inches ( $\pm 6''$ ) of the dimensions shown on the plans.

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### **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 02444  
CHAIN LINK FENCE AND GATES**

**PART 1 - GENERAL**

**1.01     DESCRIPTION**

**A.     Work Included:**

1.     Furnish all materials and install chain link fence of the types, sizes and in the location(s) shown on the Drawings and specified herein.

**B.     Related Work Specified Elsewhere:**

1.     Section 02200 - Earthwork

**1.02     QUALITY ASSURANCE**

**A.     Acceptable Manufacturers:**

1.     USS Cyclone.
2.     National Fence Mfg. Co., Inc.
3.     Anchor Fence, Inc.
4.     Allied Tube & Conduit
5.     Or approved equivalent.

**1.03     SUBMITTALS**

- A.     Submit satisfactory guarantees by the fence manufacturer covering any faults and defects in all parts of the fence arising from defective workmanship or materials for a period of one year from the date of installation.
- B.     Clearly indicate plan layout, grid, spacing of components, accessories, fitments, and anchorage.
- C.     Submit manufacturer's installation instructions and procedures.
- D.     Submit details of fence and gate installation.

**PART 2 - PRODUCTS**

**2.01     FENCE MATERIALS**

**A.     Posts**

1.     End, Corner, and Gate Posts: 4-inch minimum O.D. galvanized steel pipe.

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2. All posts shall be of sufficient length to provide a 36-inch minimum setting in concrete footings, as shown on the plans.
  3. All other Posts: 3-inch pull posts.
- B. Top/Bottom Rails
1. 1-3/4 inch O.D. galvanized steel pipe.
  2. Securely fasten top and bottom rails to the corner posts with heavy galvanized steel brace bands and rail end connections.
- C. Horizontal Braces
1. Provide horizontal braces (brace rails) at all, pull and corner posts.
  2. Securely fasten braces to the corner, line and terminal posts by rail ends and brace bands.
  3. Braces shall be 1-3/4 inch O.D. galvanized steel pipe.
- D. Fencing
1. 9-gauge, 0.148 inch diameter galvanized steel wire, of medium high carbon quality, minimum tensile strength of 80,000 pounds per square inch, interwoven into 2 inch diamond mesh.
  2. Top selvage to be twisted and barbed (optional). Bottom selvage to be knuckled unless otherwise specified.
- E. Diagonal Braces:
1. Provide diagonal braces (truss rods) from the brace ends on the line posts back to the bottom of pull, corner or terminal posts and fastened by brace bands.
  2. Diagonal braces shall be 3/8 inch diameter galvanized steel rods.
  3. Diagonal braces shall be provided with heavy galvanized iron turnbuckles to adjust the tension.
- F. Fabric Connections - Securely fasten fabric to:
1. All terminal posts by 1/4 inch x 1/4 inch galvanized tension bars with 11 gauge galvanized pressed steel bands spaced approximately 14 inches apart.
  2. All line posts with 6-gauge galvanized wire clips spaced approximately 14 inches apart.
  3. All top rails with 9-gauge galvanized tie wires spaced approximately 24 inches apart.
  4. The bottom edge of the fabric shall be fastened to a bottom tension wire with wire ties spaced approximately 24 inches apart.

2.02     GATE MATERIALS

A.    Gate Frames:

1.       Fabricate from 4-inch O.D. steel pipe weighing 2.72 pounds per linear foot.
2.       All welded construction with malleable iron or pressed steel corner fittings. All welds shall be ground smooth to the surface plane of the base metals. Welding shall be performed prior to galvanizing.
3.       Frames shall be rigid enough to be free of twist or sag.
4.       Gate leaves shall have truss rods or intermediate braces.

B.    Truss Rods:

1.       Install 3/8-inch diameter truss rod on each gate.

C.    Hinges:

1.       Hinges shall be structurally capable of supporting the gate leaf and allow the gate to open and close without binding. The hinges shall be so designed to permit the gate to swing a full 100 degrees.
2.       Bottom Hinges: Wraparound adjustable type designed to carry the weight of the gate.
3.       Upper Hinges: Wraparound adjustable type.

D.    Locking Devices:

1.       Positive type latching device with provision for padlocking.

E.    Gate Keeper:

1.       Install on centerline of double gates.
2.       Gate keeper shall be adjusted with gate keeper rod to prevent opening of gate levers when padlocked.
3.       Fabricate from a 1-3/4-inch-wide by 1-3/4-inch-deep galvanized channelway approximately 7 inches long.
4.       Anchor into a 12 inch by 12 inch by 3 feet deep concrete foundation with a 1-1/2 inch O.D. galvanized steel pipe, 18 inches long, welded to the channel way.
5.       Slope top edges of channelway from center toward each end.
6.       Form concrete foundation to meet tops of channelway sides to prevent its removal.
7.       Obtain approval from the Engineer prior to installation of the gate keeper.

F.    Outer Gate Catches:

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1. Material: Galvanized malleable iron or steel.
2. Designed to anchor securely into 12 inch diameter by 3.5 feet deep concrete footing.
3. Obtain approval from the Engineer prior to installation of outer gate catches.

### 2.03 WARNING SIGNS

- A. When applicable, provide warning signs.
- B. The number of signs, the location, size and wording shall be as shown on the Drawings or as directed by the Engineer.
- C. Material:
  1. 16 gauge metal with a baked enamel finish.

### 2.04 VEHICULAR ACCESS GATE

- A. Posts
  1. End Post: 4-inch minimum O.D. galvanized steel pipe.
  2. Rotating Post: 3-inch O.D. galvanized steel pipe set in the concrete footing with a 4-inch O.D. galvanized steel pipe placed on top with a free moving hinge.
  3. All posts shall be of sufficient length to provide a 36-inch minimum setting in concrete footings, as shown on the plans.
- B. Top/Diagonal Rails
  1. 3-inch O.D. galvanized steel pipe.
  2. All welded construction for top and diagonal rails to the Rotating post shall be welded with malleable iron or pressed steel corner fittings. All welds shall be ground smooth to the surface plane of the base metals. Welding shall be performed prior to galvanizing.
- C. Locking Plate
  1. Locking mechanism shall consist of a 15 inch by 4 inch by 3/8 inch steel plate welded to a 4-inch End Post pipe, with a 5 inch I.D. by 4 1/2 inch long steel pipe welded to the steel plate, and a 4 inch by 2 inch by 3/8 inch steel plate welded to the 4 inch End Post with a 1/2 inch diameter hole for a lock.

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### 2.05 CAST IN PLACE CONCRETE FENCE FOUNDATION

Concrete proportioning shall conform to ACI 318, Chapter 5 except as modified in the table below:

**Table 1 - Concrete Class Data**

Class	Strength (f'c)	Coarse Aggregate	% Air ± (1.5%)	Cem.Fac (LB/CY)	Max W/C Ratio	Min.-Max. Slump	
B	4000 PSI	No. 67 (3/4")	6	611	0.45	3	5

- A. No additional mix water shall be added to the concrete on site which will increase the water-cement ratio of the mix. If additional water is to be added on site, it shall be held back from the specified quantity in the mix design during batching and shall be added on-site for the sole purpose of providing the initial slump as specified prior to adding the high range water reducer. The amount of water held back from the mix shall be clearly indicated on the concrete mix delivery slip. The Resident Engineer shall be notified prior to adding the water on site. The addition of a greater quantity of water than that indicated shall be cause for non-compliance and potential rejection of the concrete truck.
- B. Concrete testing shall be performed in accordance with Section 03740 – Concrete Surface Repairs.

### 2.06 NON-SHRINK GROUT

Non-shrink grout shall be as specified in Section 03300 – Reinforced Cast-In-Place Concrete.

## **PART 3 - EXECUTION**

### 3.01 PREPARATION

- A. Galvanizing:
  - 1. Hot dip galvanize all fence and gate materials.
  - 2. Minimum zinc coating shall be 2.0 ounces per square foot of surface per ASTM A123.
  - 3. Galvanize all gate frames after fabrication.

### 3.02 INSTALLATION

- A. Post Spacing:
  - 1. Equidistant in the fence line.
  - 2. Maximum spacing 10 feet on centers.

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### **B. Post Setting:**

1. Set all posts plumb with tops aligned.
2. Set all posts not less than 36 inches deep in concrete footings. Bottom of footings shall be at least 3.5 feet below finish grade. Slope top of footing to shed water.

### **C. Bracing:** Brace gate, corner, end and pull posts to the next nearest post with a horizontal brace (compression member) and a diagonal truss rod and truss tightener (tension member).

### **D. Rails:**

1. Install rails before installing chain link fabric.
2. Pass top rail through intermediate post caps.
3. Provide expansion couplings spaced as recommended by manufacturer.

### **E. Gates:**

1. All gates shall open a full 180 degrees.
2. All gates shall open outward unless noted otherwise.

### **F. Alignment and Grade:**

1. Install fencing to the alignment shown on the Drawings or as directed by the Engineer.
2. Changes in alignment of 30 degrees or more shall be considered as corners.
3. Install fencing to follow the general contour of the finished grades, unless otherwise shown on the Drawings or as directed by the Engineer.
4. Install bottom edge of fence fabric approximately 2 inches above finished grade.

## **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\*\*\*END OF SECTION\*\*\***



**SECTION 02525  
BITUMINOUS CONCRETE PAVING**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The work of this Section includes the furnishing of all labor, tools, equipment and materials and performance of all operations in connection with the construction, restoration, and/or repairs of asphalt-paved areas at Macallen Dam, as well as at 4 Bay Road (Lamprey Falls LLC), 6 Bay Road (Bryant Rock LLC), and 53 Main Street (Durham Book Exchange) if determined necessary by the Owner and/or the Resident Engineer. Work and materials covered under this Section include, but are not limited to the following:
  - 1. Furnishing, placing, and compacting of Sand-Gravel Base Course material.
  - 2. Furnishing, placing, and compacting of Bituminous Concrete Binder Course
  - 3. Furnishing, placing, and compacting of Bituminous Concrete Surface Top Course
  - 4. All other incidental work for the construction or repair of asphalt pavement associated with the Work.
- B. The Contractor shall provide, at his own expense, and Independent Testing Agency, to perform field quality control for paving operations.

**1.02 SCOPE OF WORK**

- A. Furnishing and Placement of Sand-Gravel Base Course: This work shall encompass all providing, placing, and compacting the Sand-Gravel Base Course for areas indicated by the Owner and Resident Engineer which need to be repaired. This work of this item shall also include all necessary grading and shaping.
- B. Furnishing and Placement of Bituminous Pavement Materials: This work shall encompass all providing, placing, and compacting the asphalt pavement (base, binder, surface course, and tack coat) for areas indicated by the Owner and Resident Engineer which need to be repaired. Furnishing and placing bituminous tack coat in conjunction with the re-surfacing work shall be included under this pay item and no separate payment shall be made for tack coat. This work of this item shall also include all necessary grading and shaping.
- C. No payment shall be made for repair of asphalt pavement inadvertently damaged by construction activities.

**1.03 RELATED WORK**

- A. Section 01300 – Submittals
- B. Section 01560 – Temporary Erosion and Sediment Controls
- C. Section 01570 – Temporary Access and Traffic Control

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### D. Section 02200 – Earthwork

#### 1.04 REFERENCE STANDARDS

- A. References herein to any technical society, organization, group or body are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable:
1. MS-2: Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types—The Asphalt Institute (AI).
  2. MS-3: Asphalt Plan Manual—The Asphalt Institute (AI)
  3. Hot Mix Asphalt Paving Handbook - US Army Corps of Engineers, UN 13 (CE MP-ET)
  4. MS-19: Basic Asphalt Emulsion Manual - The Asphaltic Institute (AI)
  5. ASTM D946 Specification for Penetration - Graded Asphalt Cement for use in Pavement Construction

#### 1.05 SUBMITTALS

Submit to the Resident Engineer for review and comment the following:

- A. Plant Information: The supplier's current NHDOT Job mix Formula sheet at least eight (8) days prior to intended use.
- B. Schedule and Methods: At least eight (8) days prior to the commencement of paving work the schedule and sequence for completing work, and methods of construction including equipment to be used.
- C. Layout: At least eight (8) days prior to the commencement of paving work a description of the areas to be paved.
- D. Test Results: At least five (5) days prior to placement, test results on bituminous concrete pavement from the Plant. Submit material source, laboratory analytical results, gradation test results and moisture-density (Proctor) test results for base course in accordance with Section 02200. Bituminous pavement material testing shall be conducted as required under Division 400 – Pavements, in the NHDOT Standard Specifications for Road and Bridge Construction latest revision. New test results shall be submitted when the material source changes or, if in the opinion of the Resident Engineer, when the nature, characteristics or properties of the material change.
- E. Quality Control Test Results: Within ten (10) days after paving, submit quality control test results outlined in Article 3.05 of this Section.

#### 1.06 JOB CONDITIONS

- A. Weather Limitations
1. Apply tack coat where indicated on the Drawings or as directed by the Resident Engineer and when ambient temperature is above forty degrees Fahrenheit (40°F), and when

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temperature has been above 35 degrees Fahrenheit (35°F) for twelve (12) hours immediately prior to application. Do not apply when base is wet, contains excess moisture, or during rain.

2. Construct asphaltic concrete paving when atmospheric temperature is above forty degrees Fahrenheit (40°F) and when base is dry.

### **1.07 SUBMITTALS**

- A. Design Mix: Before any asphaltic concrete liner or pavement is constructed, submit actual design mix to the Engineer for review and/or approval.
- B. Material Certificates: Submit materials certificate to on-site independent testing laboratory which is signed by material producer and Engineer, certifying that materials comply with, or exceed, the requirements herein.

### **1.08 COORDINATION**

- A. The Site Contractor shall coordinate with all other trades, especially underground utility contractors, in order to prevent covering up unfinished or uninspected work and loss of time or labor by improper scheduling. Any rework shall be done at no cost to Owner.

## **PART 2 – PRODUCTS**

### **2.01 BITUMINOUS PAVEMENT MATERIALS**

- A. All bituminous materials and the plants that supply the materials shall conform to the requirements as specified under Division 400 – Pavements, in the NHDOT Standard Specifications for Road and Bridge Construction latest revision.
- B. Hot-Mix Asphalt shall conform to the requirements as specified under Division 403 – Hot Bituminous Pavement, in the NHDOT Standard Specifications for Road and Bridge Construction latest revision.

### **2.02 SAND-GRAVEL BASE COURSE**

- A. Sand-Gravel Base Course materials shall conform to the requirements as specified under Division 300 – Aggregate Base Course, in the NHDOT Standard Specifications for Road and Bridge Construction latest revision.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. The Contractor shall insure that the existing pavement has been saw cut along a smooth line and to a neat, even vertical joint. Broken or raveled edges will not be permitted. Only then may existing pavement and unsuitable subgrade be excavated. Lawfully dispose of asphalt pavement.
- D. Bituminous Concrete Pavement shall be composed of mineral aggregates, mineral filler and

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bituminous material, plant mixed and hot-laid. The pavement shall be constructed in conformity with the lines and grades shown.

- E. If additional cutting and removal of pavement damaged by the Contractor's operations is required, such work shall be performed at no additional cost to the Owner.

### 3.02 SUBGRADE PREPARATION

- A. Proof rolling shall be performed in accordance with Section 02200.
- B. The subgrade shall be fine graded as needed to meet required grades and cross-slope (crown).

### 3.03 SAND-GRAVEL BASE COURSE PLACEMENT AND COMPACTION

- A. Place material in loose-lift thickness such that the final layer thickness will be achieved after compaction. Fine grade as needed to maintain required grades and cross-slope (crown).
- B. The standard for compaction for all materials shall be a firm and stable material which, if tested, would achieve a minimum ninety-five percent (95%) of the maximum dry density as determined by ASTM Test D-698 (Standard Proctor Test), with a water content between plus or minus two percent ( $\pm 2\%$ ) of optimum moisture content. If wet fill cannot be adequately compacted, remove and replace with drier fill. If material is too dry, apply sufficient water uniformly to the loose lift. Excavate and replace isolated pockets of unsuitable material at no additional cost to the Owner.
- C. Compaction shall be done to meet the above stated density criteria. **However, minimum of six (6) passes of an approved compactor shall be required.** Make additional passes as necessary to achieve a degree of compaction of at least 98%. Approved compactors shall be with a vibratory drum roller with a minimum of a 2,000 pound static drum weight and providing at least 5,000 lbs. of dynamic force (i.e. a roller commonly used to compact driveways or small parking areas).

### 3.04 BITUMINOUS CONCRETE

- A. Place binder and surface (Top) course thickness bituminous concrete in layers using a mechanical spreader or other means as acceptable to the Resident Engineer. Each layer thickness shall be at minimum as thick as the existing adjacent pavement layer
- B. Uniformly compact each layer by rolling with a self-propelled tandem roller as per Paragraph 3.03.C above. The roller may be kept moist to prevent adhesion, but excessive water must not be used. For places inaccessible to this roller, the same compaction shall be obtained with a hot hand tamper or vibratory plate.
- C. Where pavement placed joins an existing pavement, the existing pavement shall be saw cut along a smooth line and to a neat, even vertical joint. Broken or raveled edges will not be permitted. Where excavations are made in existing pavement (that is otherwise not to be disturbed by construction), where noted on the Drawings, and where directed by the Resident Engineer, existing pavement shall be saw cut as described above. Contact surfaces of existing pavement shall be painted with a thin uniform coat of RS-1 Tack Coat, just before the mixture is placed against them. Pavement shall be swept prior to the application of the tack coat.

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- D. After the top course has been completed, no vehicular traffic shall be permitted for an appropriate period as judged by the Resident Engineer (minimum 12 hours).
- E. If directed by the Resident Engineer, apply a tack coat between the binder course and the top course to promote adhesion and bonding. Contact surfaces of existing pavement and adjacent structures shall be painted with a thin uniform coat of RS-1 Tack Coat, just before the mixture is placed against them.
- E. Particular care shall be paid to have all manhole covers, instrument road boxes, valve covers, etc. set flush with the finished surfaces of the paving, prior to application of the wearing surface. No depressions or mounds to accommodate these appurtenances will be permitted.
- F. The edges of the asphalt mixture adjacent to rigid curb lines, around manholes, drainage grates, or other solid fixtures, or where no shoulder is constructed, shall be hand tamped before being rolled. Contact surfaces of curbing, gutters, manholes, etc. shall be painted with thin uniform coat of RS-1 Tack Coat, just before the mixture is placed against them.
- G. Shape pavement to provide cross drainage as shown on plans. The Resident Engineer shall perform random spot-checks with a contractor-supplied ten-foot straightedge placed parallel to the centerline of the road to verify surface tolerances. The final surface course shall not vary more than 1/4 inch from a ten-foot straightedge and 3/8 inch for all other courses.
- H. Seal all joints with an approved bituminous joint sealer.
- I. Repair/repave to the satisfaction of the Resident Engineer all other paved areas inside the work limits are disturbed and/or damaged as a result of work being performed in connection with this Contract, at no additional expense to the Owner.

### **3.05 QUALITY CONTROL**

- A. All quality control of paving operations shall be provided by the Contractor. Quality Control for all paving operations, including plant inspection, asphalt compaction, subgrade preparation and subbase course placement, shall be provided by an Independent Testing Agency to be engaged at the Contractor's own expense. Plant inspections shall include sieve analyses, extraction tests and Marshall tests for each mix delivered to the Site. If the Independent Testing Agency for the paving operation is different than that used in for general earthwork, the name and qualifications of the Agency shall be submitted for review.
- B. The density of paved areas after compaction shall be 95 percent of the density obtained by using ASTM D1188 or D2726. A calibrated, nuclear asphalt testing device shall be used for determining the field density of compacted pavement.
- C. All bituminous concrete pavements shall be placed and compacted in the presence of the Resident Engineer. The Resident Engineer shall observe placement and compaction methods and shall indicate to the Contractor if additional effort is necessary. The Resident Engineer must be given 48 hours' notice prior to pavement repair operations. The Owner must approve the new pavement.

## **PART 4 – MEASUREMENT AND PAYMENT**

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No measurement shall be made of any work performed under this section. No separate payment shall be made for any work performed under this section. The cost of any work done or facilities provided under this section shall be included under other pay items within the Contract.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 02832**  
**CONTRACTOR-DESIGNED RETAINING WALLS**

**PART 1 - GENERAL**

**1.01    DESCRIPTION**

- A.     This Section describes contractor design, furnishing and installation of the precast concrete gravity block wall required at Macallen Dam for the wall running along the alley way of 53 Main Street (Durham Book Exchange), and of the Mechanically Stabilized Earth (MSE) site retaining wall for the raising of the right upstream abutment training wall, as shown in the Contract Drawings.
- B.     Provide all labor, materials, tools, equipment and appurtenant materials, and perform all work necessary to design, install and backfill the retaining walls at the locations shown on the Contract Drawings and in accordance with the provisions specified in this Section. Work also includes preparation of wall system foundation subgrade for the approved wall type, furnishing and installing retaining wall foundation leveling pad, and/or other required foundation elements, placing/compacting backfill and drainage material to the lines and grades designated in the approved proprietary wall system design drawings.
- C.     The precast gravity block retaining wall along the alley way of 53 Main Street (Durham Book Exchange) will consist of pre-cast interlocking, large concrete blocks (such as Redi-Rock block retaining walls or equivalent). The blocks shall be stacked on a prepared soil or reinforced concrete leveling pad and backfilled with free-draining material to form a gravity retaining wall system.
- D.     The site retaining wall for raising of the right upstream abutment wall shall be a Mechanically Stabilized Earth (MSE) wall system up to about 8 feet tall in total height. MSE walls are defined herein as proprietary precast concrete/masonry segmental panel or block units which interlock to form the wall face. Layers of geosynthetics/geogrid attached to the wall face are used to stabilize and reinforce compacted soil behind said wall face. The backfill area for the MSE wall will be considered the portion of earth material placed within the zone of reinforcement for the MSE wall system.
- E.     The soil mass behind the reinforced cast-in-place concrete wall, for raising of the right upstream abutment wall and adjacent to the fish ladder, shall be a Reinforced Ground Supporting Wall from the base of the cast-in-place wall approximately 4 feet tall in total height and to the elevation grades shown on the Contract Drawings (approximately El. 32.2). Layers of woven geofabric (such as Mirafi HP series or equivalent) wrap around the soil to reinforce and stabilize the soil mass behind the concrete wall. The backfill area for the Reinforced Ground Supporting Wall will be considered the portion of earth material placed within the zone of reinforcement for the wall system.
- F.     Small block retaining walls with geogrid (i.e. Versa Lok or similar) will not be allowed.
- G.     Included in the work shall be the preparation of wall system foundation subgrade for approved wall, furnishing and installing respective proprietary wall foundation leveling pad, spread footing, foundation slab, and/or other required foundation elements, as well as

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installing required select backfill and drainage material to the lines and grades designated in the approved proprietary wall system design drawings.

- H. The Contractor shall be responsible for the layout of all required lines, and grades not presently established at the site related to the Contractor-designed retaining walls.
- I. The Contractor shall be responsible for protecting the existing abutment walls. Excavations to construct the new precast concrete block walls or MSE wall system shall consider unbalanced loading on the existing abutment wall. Any bracing, shoring or sloping required to install the walls shall be including in the Contractor's price.

### 1.02 QUALITY ASSURANCE

- A. Codes and Standards: Comply with all codes, rules, regulations, laws and ordinances of the State of New Hampshire, the Town of Newmarket, and all other governing authorities having jurisdiction. All labor, materials, equipment and services necessary to make the work comply with such requirements shall be provided at no additional cost to the Owner.

### 1.03 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements, which affect the work in this section. Other specification sections which directly relate to the work of this section include, but are not limited to, the following:

- 1. Section 02300 - Earthwork

### 1.06 REFERENCE STANDARDS

- A. Definitions and reference standards which govern the performance of the work in this Section include, but are not limited to the following:
  - 1. OSHA Regulations, 29 CFR Part 1926 - Including, but not limited to, Trenching and Excavations, current revisions.
  - 2. ACI Standard Building Code Requirements for Reinforced Concrete (ACI-318).
  - 3. Each manufacturer's respective Selected Proprietary Wall System's specific precast concrete (or other proprietary specific material types) module, bin, segmental block, reference standards and specifications.
  - 4. Each manufacturer's respective Selected Proprietary Wall System's specific soil reinforcement reference standards and specifications.

### 1.07 SUBSURFACE DATA

- A. Logs of borings and test pits performed at the site are included with Section 01567 – Subsurface Conditions. Review exploration logs and other pertinent data for the site. After obtaining Owner's permission, take whatever additional subsurface explorations deemed necessary at no expense to the Owner.
- B. Aforementioned data are for general information and are accurate only at the particular location and time the subsurface explorations were made. It is the Contractor's



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responsibility to make interpretations and draw conclusions on the character of materials encountered and their impact on the design and construction of the retaining walls (permanent and temporary) based on his/her expert knowledge of the area and of previous related experience. The Contractor, subject to the approval of the Owner and at no additional cost to the Owner, may take whatever additional borings and explorations he/she deems necessary to provide additional design/construction support.

- C. If a potential conflict exists between the subsurface exploration logs and these technical specifications, the Contractor shall, immediately upon its discovery, request clarification from the Engineer.
- D. By submitting a Bid, the Contractor affirms that they have carefully examined the site and all conditions affecting the Work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions as indicated in the Contract Documents, or obvious from observation at the site.

### 1.08 SUBMITTALS

Submit to the Owner's Geotechnical Engineer for review and comment at least 14 days prior to delivery of retaining wall materials to the site and to the start of retaining wall construction (including excavation) the following:

#### A. Experience

- 1. Provide at least three (3) examples of similar walls successfully constructed by the Contractor. Examples shall be of similar height and length and constructed in similar soil conditions. Provide Owner's name and telephone number for each example.
- 2. Provide documentation that Contractor's Engineer has at least five (5) years' experience designing selected wall types under similar conditions. Provide references for at least three (3) projects completed over the last five (5) years.

#### B. Permanent Retaining Wall Systems

- 1. A complete set of design calculations and shop drawings which shall include, but not be limited to the following items for each retaining wall (both the Precast Gravity Wall and the Mechanically Stabilized Earth Wall):
  - a. Legible, complete and organized design computations indicating soil parameters, design criteria, pressure diagrams, allowable stresses, stability computations and other details necessary to clearly demonstrate the rational basis for design.
  - b. Drawings showing all material specifications and details for the structural elements and sequences of assembly including backfilling materials and procedures.
  - c. Each retaining wall shall be shown in plan, elevation, and section with appropriate elevations and scaling.

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- d. The elevation and location of any structure or utilities (existing or proposed) affecting or affected by any retaining wall shall be shown in plan and section.
- e. Detailed construction procedures and sequencing for the installation of the retaining wall system shall be provided.
- f. Details of drainage provided behind wall and connection/routing of drainage to discharge endpoints, as appropriate.
- g. Drawings and computations shall bear the stamp and signature of a Professional Engineer who is licensed in the State of New Hampshire and who is experienced in the design of retaining walls of the type proposed. Provide global stability calculations.
- h. Where fencing or guardrails are required at the top of wall, provide details of fence/rail installation such that it does not negatively impact wall. Wall stability calculations shall include any horizontal or vertical loadings from the fence/railing.
- i. If temporary earth support is required to construct permanent wall, submit temporary earth support design calculations and drawings in accordance with Section 02200 – Earthwork.

### C. Samples

The Contractor shall submit the following for the proposed permanent retaining wall system:

- 1. Samples in the form of actual specimens and manufacturer's product literature of all products used in the work of this Section.
- 2. Latest edition of manufacturer's standards and specifications for proposed materials, method of installation and list of material proposed for use.

Despite review and comment by the Engineer, the Contractor shall remain solely responsible for the adequacy and safety of materials and methods used in construction.

### 1.09 DELIVERY, STORAGE AND HANDLING OF MATERIALS

- A. The Contractor shall check the materials of the retaining wall system materials upon delivery to assure that proper material has been received.
- B. The Contractor shall prevent excessive mud, wet cement, epoxy, and like materials which may affix themselves, from coming in contact with the materials.
- C. The Contractor shall protect the materials from damage at all times. Damaged material shall not be incorporated into the retaining wall structure.
- D. Geogrid/geosynthetic materials shall at all times be stored flat or as recommended by the manufacturer.

## PART 2 - PRODUCTS

### 2.01 PRECAST GRAVITY WALL CONCRETE BLOCKS

- A. Precast concrete blocks shall conform to the latest applicable recommendations of the ACI Standard Building Code Requirements for Reinforced Concrete (ACI-318) and the proprietary manufacturer's standards and specifications.
- B. Materials
  - 1. Wall units shall be made with concrete in accordance with ASTM C94. The entrained air content shall be not less than 4.5 percent nor more than 7.5 percent at the time concrete is deposited in the forms. Coarse aggregate shall consist of AASHTO-M80 per AASHTO-M43 (No. 67) or ASTM D-448. An abrasion loss of 50 percent in the Los Angeles test will be permitted. The addition of calcium chloride or admixtures containing calcium chloride will not be permitted. Minimum twenty-eight-day compressive strength of the concrete mix shall be 3,000 pounds per square inch. The slump shall be between 3.5 and 6.5 inches at time of element fabrication.
  - 2. Reinforcing steel (if required) shall conform to the requirements of ASTM-615.
  - 3. Filter fabric wrapped around specified drainage zone media (if applicable) shall be Mirafi 140N, non-woven or approved equivalent.
- C. Fabrication
  - 1. The precast concrete elements shall be manufactured in a concrete products plant with approved facilities. Before proceeding with production, a model of each approved precast concrete element shall be provided by the fabricator for the Engineer's approval to establish a guide and standard for the type of finish to be furnished on the exposed face. Each model shall be kept at the fabricator's plant to be used for comparison purpose during production. Formed surfaces other than the exposed face (and wall top) shall not require a special finish.
  - 2. Forms for the elements shall be constructed of steel with dimensional tolerances that will assure the production of uniform units.
  - 3. The concrete mix as designed shall be proportioned and mixed in a batch mixer to produce a homogenous concrete conforming to the requirements. The transporting, placement, and compaction of concrete shall be by methods that will prevent segregation of the concrete materials and the displacement of the reinforcement steel from its proper position in the form. Concrete shall be carefully placed in the forms and vibrated sufficiently to produce a surface free from imperfections such as honeycomb, segregation, or cracking.
  - 4. All reinforcing steel (if required) for precast elements and other components shall be fabricated and placed in accordance with details of the approved Shop Drawings. No welding of reinforcing steel will be allowed unless approved by the owner's engineer.

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5. Precast elements shall be cured by a method or combination of methods that will give satisfactory results in accordance with accepted proprietary practices and standards. If steam curing is used, it shall be done under a suitable enclosure to contain the live steam to minimize moisture and heat losses. The initial application of the steam shall be from two to four hours after the final placement of the concrete to allow the initial set of the concrete to take place. If retarders are used, the waiting period before application of the steam shall be increased from four to six hours. Application of the steam shall not be directly on the concrete.
6. Exposed concrete surfaces shall be acceptable to the Owner.
7. Before shipment, surfaces of all precast elements shall be examined. If the exposed face of an element is below the standard of the approved model, it shall be properly repaired to conform to the balance of the work with respect to appearance, strength, and durability or shall be replaced.
8. Handling devices, as required, shall be provided in each precast element for the purpose of handling and placing. Care shall be taken during storage, transporting, hoisting and handling of all elements to prevent cracking or damage. Elements damaged by improper storing, transporting, or handling shall be replaced or repaired to the satisfaction of the Owner.
9. The quality of materials, the process of manufacture, and the finished elements shall be subject to inspection by the Owner prior to shipment. Precast elements may be subject to rejection on account of failure to conform to the Specification requirements. Individual units may be rejected because of any of the following:
  - a. Variations in the exposed face that substantially deviated from the approved model as to texture in accordance with precast concrete industry standards.
  - b. Honeycombed or open texture not properly repaired.
  - c. Defects which would affect the structural integrity of the element.

### **2.02 MECHANICALLY STABILIZED EARTH WALL PANELS**

- A. MSE wall panels shall be concrete faced and the system shall be Tensar ARES, or approved equivalent. The facing panels shall have a 28-day minimum compressive strength of 5,500 psi. Portland cement shall conform to Type I/II. Only one brand of cement shall be used for the units required for any one structure. Type III cement shall not be used without the written permission of the Owner or Engineer.
- B. Reinforcing steel and lifting devices shall be set in place to the dimensions and tolerances shown on the plans prior to casting. Geogrid connection tabs shall be installed at the required locations subsequent to placement and consolidation of the concrete. Tabs shall be floated in while the concrete is fully plastic.
- C. Contractor shall follow all manufacturer recommendations and specifications for the proprietary wall system chosen and approved to include but not limited to testing, inspection, casting, curing, finishing, material properties, and shipping and handling.
- D. MSE wall panels shall be compatible with the MSE Wall Geogrids chosen by the Contractor.

**2.03    MECHANICALLY STABILIZED EARTH WALL GEOGRIDS**

- A.     The geogrids shall consist of Tensar UX series structural geogrids, or approved equivalent, which are formed by uniaxially drawing a continuous sheet of select high density polyethylene material and shall have aperture geometry and rib and junction cross-sections sufficient to permit significant mechanical interlock with the material being reinforced. The geogrid shall have high flexural rigidity and high tensile modulus in relation to the material being reinforced.
- B.     The geogrids shall have high resistance to deformation under sustained long-term design load while in service and shall also be resistant to ultraviolet degradation, to damage under normal construction practices and to all forms of biological and /or chemical degradation normally encountered in the material being reinforced.
- C.     The contractor shall check the geogrid upon delivery to ensure that the proper material has been received and is free from defects that may impair its strength and durability. The geogrids shall be stored in conditions above -20 degrees F (-29 degrees C) and not greater than 140 degrees F (60 degrees C). The contractor shall prevent excessive mud, wet cement, epoxy, and like materials from coming into contact with and affixing to the geogrid material. Geogrid rolls may be laid flat or stood on end for storage and as designed and determined by the design contractor of the Mechanically Stabilized Earth Wall System.
- D.     Geogrids shall be compatible with the Mechanically Stabilized Earth Wall Panel system chosen.

**2.04    EARTH MATERIALS**

- A.     Earth materials shall satisfy the requirements of the proprietary retaining wall system design. At a minimum, permeable backfill consisting of Crushed Gravel wrapped non-woven filter fabric shall be provided for a 1-foot-wide zone behind both the precast concrete gravity retaining wall and the MSE wall to aid in drainage of both the walls.
- B.     All backfill, with the exception of the 1-foot-wide drainage zone, behind the Precast Gravity Wall system and Reinforced Ground Supporting Wall should be Structural Fill which is non-plastic with a maximum of 8 percent passing the 200 sieve and should be compacted to at least 95 percent of maximum dry density as defined by the Modified Proctor density test, ASTM D-1557 or higher if required by the proprietary retaining wall system design.
- C.     Backfill, with the exception of the 1-foot-wide drainage zone, behind the MSE wall may be Crushed Gravel or Structural Fill which is non-plastic with a maximum of 8 percent passing the 200 sieve and should be compacted to at least 95 percent of maximum dry density as defined by the Modified Proctor density test, ASTM D-1557 or higher if required by the proprietary retaining wall system design
- D.     Crushed Gravel Material shall be as specified in Section 02200 – Earthwork.
- E.     Geotextile consisting of Non-Woven Filter Fabric shall be as specified in Section 02200 – Earthwork.
- F.     Geotextile for the Reinforced Ground Supporting Wall shall be Mirafi HP series or

equivalent.

## **PART 3 - EXECUTION**

### **3.01 RESPONSIBILITIES**

- A. The Contractor is responsible for the production of design and erection drawings and plans for the Contractor-designed retaining walls. Such drawings and sketches shall bear the seal of a Professional Engineer who is experienced in this type of work and is licensed in the State of New Hampshire. All risks of error or omission shall be assumed by the Contractor. The Owner and/or Engineer shall not be held responsible for the performance and integrity of the retaining walls as designed or constructed.
- B. The design and construction criteria indicated herein are minimum criteria. The Contractor's design shall include all measures necessary to insure the stability of the retaining wall and to protect persons and property.

### **3.02 PURPOSE**

- A. The purpose of the retaining walls is to provide permanent lateral support of differential elevations as indicated on the Contract Drawings. The Contractor's design effort shall be performed in accordance with this goal.

### **3.03 DESIGN CRITERIA**

- A. The approved proprietary wall systems and foundations shall be designed to function as a unit with the backfill behind and/or within the structural elements of each of the walls and shall form, when erected, a permanent retaining wall system capable of resisting applied forces without undergoing deformations or settlements which will unduly affect the performance or appearance of the walls or result in loss of ground or damage to existing structures/facilities.

The approved proprietary wall systems shall be designed to resist all of the various (where applicable) lateral earth pressures including, but not limited to, conditions of the proposed ground surface levels and elevation differences (including sloping backfill), loads from compaction equipment, and seismic earthquake pressures per New Hampshire State Building Code requirements. Additionally, the wall shall be designed such that it is stable throughout the 100-year design flood event during which the water elevation on both sides of the wall (front and back) is as high as 31.2 feet.

- B. The loads from compaction equipment include using a vibratory plate compactor weighing less than 300 pounds within 5 feet of back of the walls.
- C. The walls shall be designed to support post-construction surcharge loading of 300 pounds per square foot at the ground surface at the top of slope, or construction loadings as required by the Contractor's operations, whichever is greater. Stability computations shall be made neglecting passive earth pressure in front of the retaining walls. The minimum factor of safety against overturning shall be 2.0 and the minimum factor of safety against sliding shall be 1.5. The design shall also include an evaluation of global stability.
- G. Allowable stress criteria and design and analysis procedures shall be in conformance with

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latest edition of the ACI Specification. The wall material shall, as a minimum, be designed to support lateral pressures computed from earth pressure, surcharge loads, compaction equipment and seismic earthquake pressures determined by using the design criteria shown on the Contract Drawings and as specified herein.

- H. The approved MSE wall system shall be designed to bear on a reinforced concrete leveling pad cast onto the existing portion of the right abutment wall, as shown in the Contract Drawings.
- F. The approved Precast Concrete Gravity Retaining Wall system and Reinforced Ground Supporting Wall shall be designed to bear on undisturbed, natural inorganic soils, or compacted Structural Fill place over undisturbed, natural soils. Design net allowable bearing pressure shall not exceed 2 tons per square foot (tsf) for natural, undisturbed soils and for Structural Fill, place over undisturbed soils.
- G. The maximum design friction angle between the soil and the back of the retaining wall shall be 17 degrees.
- H. The wall system(s) shall be designed for the following soil parameters:
  - 1. Backfill: Soil required for use as backfill shall be considered to have the following design properties:
    - a. The design moist unit weight of the backfill shall not be less than 125 pounds per cubic foot.
    - b. The design angle of internal friction of the backfill shall not be more than 32 degrees. This 32 degree angle assumes 95 percent degree of compaction per ASTM D1557.
    - c. The cohesive strength of the backfill shall be assumed to be zero.
- I. Off-site soils will likely be required as backfill within the geogrid reinforcing zone of the MSE wall system.

### 3.04 MINIMUM CONSTRUCTION CRITERIA

- A. Where the proprietary precast concrete gravity retaining wall and reinforced ground supporting wall is placed on a prepared soil leveling pad, the wall foundation subgrade shall be observed by the Resident Engineer, who shall determine requirements, if any, for additional excavation to remove remaining unsuitable materials. In the case that unsuitable bearing materials as determined by the Resident Engineer are encountered at the design subgrade elevation, the Engineer may direct the removal of the unsuitable material and refill/compact with Structural Fill meeting the applicable requirements of Section 02200 - Earthwork. The Contractor shall take every precaution during final excavation to prevent disturbance of the excavated retaining wall subgrade. Disturbed materials shall be excavated and replaced with approved compacted Structural Fill. Costs of removal and replacement/compaction of disturbed material shall be borne by the Contractor.

Prior to beginning wall foundation construction, proof-roll soil subgrade with a minimum of 4 passes of a vibratory plate compactor having a centrifugal force of not less than 3,500 lbs., and in conformance with requirements of Section 02200.

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- B. The proprietary wall system(s) (precast concrete gravity retaining wall, MSE wall and reinforced ground supporting wall) shall be erected by personnel experienced with the system and in accordance with the manufacturer's recommended drawings, construction specifications, installation instructions, procedures and sequences.
- C. All approved earth materials used for backfilling the retaining wall systems shall be placed and compacted in accordance with the requirements of the proprietary wall system design plans and specifications and shall be undertaken in conjunction with wall construction in accordance with the manufacturers recommended installation procedures and sequences. As a minimum, backfill shall be placed in lift thicknesses compatible with the compaction equipment in use and suitable to the Resident Engineer. The minimum acceptable degree of compaction shall be 95 percent of the respective soil's maximum dry density as determined by ASTM Test 1557.
- D. The precast concrete gravity retaining wall and reinforced ground supporting wall shall be constructed on a prepared leveling pad consisting of a minimum of 6 inches of compacted crushed stone or as specified by the proprietary retaining wall system design. If the retaining wall subgrade consists of bedrock, the leveling pad shall be at least 12 inches thick.
- E. The approved proprietary MSE wall facing elements shall be constructed and placed on a reinforced concrete leveling pad. The reinforced concrete leveling pad shall be placed atop the existing upstream abutment wall at the dimensions and elevations as shown in the Contract Drawings.
- F. Free-draining Crushed Stone material wrapped in non-woven filter fabric shall be provided within at least 1 foot of the back of the wall systems wrapped in non-woven filter fabric.
- G. Contractor shall install each approved proprietary wall system in accordance with the respective manufacturer's recommendation.

## **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\*\* END OF SECTION \*\***

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**SECTION 02930  
LOAMING, SEEDING, AND REVEGETATION**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The work under this Section includes the furnishings of all labor, equipment, supplies and materials for loaming (on-site topsoil or imported loam), seeding, revegetating, and related items, as indicated on the drawings and/or as specified herein as follows:
  - 1. Topsoil (on site) or Loam (from off-site sources)
  - 2. Seeding
  - 3. Fertilizing (using low phosphate, slow release fertilizer only)
  - 4. Erosion Protection
  - 5. Maintenance
- B. The work of this Section covers loaming and seeding operations, as well as prior preparation and subsequent conditioning (fertilizer and erosion protection) and maintenance, at all locations where fill is placed, excavations made, or existing vegetation is disturbed.
- C. The performance of this work shall be judged by the establishment of appropriate ground cover, as specified, in the indicated areas. The Contractor shall be responsible for the watering and other proper care of the seeded areas until final acceptance by the Owner.
- D. Loaming operations shall utilize reclaimed topsoil previously stripped from on-site locations unless specifically directed by the Engineer. On-site topsoil will not be used only in the event that it is found to be unsuitable due to its composition, the inclusion of invasive plant material or seeds, or the presence of undesirable substances.
- E. In the event that on-site topsoil is found to be un-usable or the quantities are found to be inadequate, the Contractor shall supply acceptable weed-free loam (i.e. suitable topsoil from off-site sources). The Contractor shall be responsible for the determination of the quantities of off-site loam required. Any topsoil created by mixing of different on-site soils shall be considered as on-site topsoil and paid for accordingly.
- F. In general, the work shall consist of all loaming, seeding, and revegetation necessary to prepare all areas on the site for revegetation, placing loam (on-site topsoil and/or off-site loam), seeding with approved seed mix, conditioning and fertilizing the soil as required, protecting areas without permanent turf reinforcement from erosion through the use of mulch or biodegradable blankets, and maintaining the seeded areas (watering, etc.) until the grass and vegetation is well established.
- G. The Contractor shall be responsible for all maintenance and repair of loam and seeded areas until final acceptance. The Contractor shall loam, seed, and revegetate all areas where construction shall take place as shown on the Contract Plans, as well as any other areas necessary for the work of the Contract (with approval from the Owner). The Contractor

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shall perform ALL necessary loaming, seeding, and revegetation at all locations on the site.

- H. It is specifically noted that seeding and revegetation operations may be affected by cold weather. It is possible that project scheduling may require dormant seeding, re-seeding, and resumption of work during more favorable weather conditions. Seeding of frozen soil will NOT be allowed. It shall be the Contractor's responsibility to develop a plan to ensure adequate establishment and maintenance of vegetation which considers the schedule and potential cold weather conditions.

### 1.02 RELATED WORK

- A. The following is a list of related work items that shall be performed or furnished under other Sections of these Specifications as indicated:
1. Temporary Erosion and Sedimentation Control – See Section 01560
  2. Clearing, Grubbing and Stripping – See Section 02110
  3. Earthwork – See Section 02200

### 1.03 PROTECTION OF WATERWAYS

Because the project is located adjacent to the Lamprey River, and environmentally sensitive wetland resources, it is critical that no fertilizers or other chemicals be allowed to reach open water or stream areas.

**In accordance with the New Hampshire Shoreland Water Quality Protection Act (NH RSA 483-B:9(d), no fertilizer shall be applied to vegetation or soils located within 25 feet of the reference line of any public water. Beyond 25 feet, slow or controlled release fertilizer, as defined by rules adopted by the department (NHDES), may be used. See Paragraph 2.04.A below for additional information on acceptable fertilizer.**

DO NOT over-fertilize and take care that runoff containing fertilizer does not enter the pond or downstream channel. NO herbicides, pesticides, or similar chemicals will be allowed at the site. Fertilizers must be approved prior to application and shall not contain herbicides or pesticides.

### 1.04 SUBMITTALS

The Contractor shall submit to the Owner for review and approval, the following information a minimum of eight (8) days in advance of starting any loaming, seeding, and revegetation operations:

- A. Composition, test data as specified herein, Manufacturer's information, and/or source of following material:
1. Soil Chemistry Test Results (On-site and Off-site sources)
  2. Off-site Loam (topsoil) material information
  3. Seed (including certification of weed content)
  4. Limestone
  5. Fertilizer

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6. Compost
7. Mulch and/or Erosion Protection Blanket material.

### PART 2 – PRODUCTS

#### 2.01 TOPSOIL AND LOAM

- A. Suitable on-site topsoil shall be used first for all areas to be revegetated. On-site topsoil shall be taken from stockpiles of previously stripped topsoil or directly relocated. Suitable material shall generally consist of loose, friable, sandy loam, or loam topsoil, free of admixture of subsoil, refuse, stumps, rocks, brush, weeds and other materials which will prevent the formation of a suitable seed bed. No stones in excess of one and one-quarter inch (1-1/4") in diameter will be tolerated. The Contractor shall rake or otherwise sort topsoil to remove deleterious material.

Muck, peat, or other organic soils resulting from excavation shall not be considered topsoil. Topsoil found to contain unacceptable invasive species shall likewise not be reused.

- B. Off-site loam, to be furnished from sources outside of the project limits, shall consist of loose, friable, sandy loam, or loam topsoil, free of admixture of subsoil, refuse, stumps, rocks, brush, weeds and other materials which will prevent the formation of suitable seed bed. No stones in excess of one and one-quarter inch (1-1/4") in diameter will be tolerated. The soils shall conform to the following gradation:

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
1-inch	90-100%
No. 4	70-95%
No. 40	30-85%
No. 100	25-50%
No. 200	20-40%

(No more than 15 percent of loam shall be clay)

The Contractor shall notify the Owner of the location of the source supply for the loam at least ten days prior to delivery of the loam to the project site. Any imported materials which do not meet the above requirements shall be rejected and removed from the site.

The pH of the material shall be between 5.5 and 7.6. The loam shall contain at least 4%, but not more than 20%, organic material as determined by the loss during ignition of oven-dried samples. Test samples shall be dried to a constant weight at a temperature of 221°F ± 5°F. Loam shall not have greater than 500 ppm salt.

- C. All topsoil and/or loam shall, at the Contractor's expense, be subjected to a Standard Soil Test with Organic Matter which shall include reporting of the following parameters: pH, Buffer pH, Extractable Nutrients, Extractable Heavy Metals (e.g. Lead), Cation Exchange Capacity, Percent Base Saturation, Percent Organic Matter, and Total Soil Nitrogen. The laboratory test results shall provide recommendations for nutrient and pH adjustments.

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A minimum of one test shall be performed on each distinct on-site topsoil or off-site loam source. A standard soil test shall be performed for every 500 CY of topsoil or loam used at the site. Soil testing shall be performed at the UMass Soil and Plant Nutrient Testing Laboratory or other approved accredited testing laboratory.

### 2.02 COMPOST

A. Compost shall be mature and well cured (4-6 months curing after completion of thermophilic compost process) and moderately screened. It shall have a moisture content that results in no visible free water or dust produced when handling the material.

B. Compost shall meet the following criteria:

	Minimum	Maximum
Percent passing 2"	100%	--
Percent passing 1"	90%	100%
Percent passing ¾"	70%	100%
Percent passing ¼"	4%	75%

C. Compost pH shall be between 6.0 and 8.5. Manufactured inert material (plastic, metal, etc.) shall be less than 0.5 percent on a dry weight or volume basis, whichever provides the least amount of foreign material. Minimum organic matter shall be 40 percent dry weight basis as determined by Loss-On-Ignition Matter Method. Soluble salt contents shall be less than 6.0 mmhos/cm. The compost shall be composed of a minimum of 65 percent by volume recycled plant waste. A maximum of 35 percent by volume of other approved organic waste and/or biosolids may be substituted for recycled plant waste. The supplier shall provide written verification of feedstock sources.

D. Compost shall be certified free of herbicides and other harmful chemicals. Composts generated from the decompositions of biosolids shall not be used.

### 2.03 SEED

A. Seed shall be the commercial product of a reputable grower approved by the Owner and shall be certified to be not more than one (1) year old. Seed mixes provided by New England Wetlands Plants, Inc. (NEWPI) or other approved grower/vendor and optimized for the on-site conditions shall be applied where shown on the Contract Drawings. The seed mix proposed for use shall be the New England Erosion Control/Restoration Mix for Dry Sites or equivalent. Plant species typically provided as follows:

Canada Wild Rye (*Elymus Canadensis*), Red Fescue (*Festuca Rubra*), Annual Rye-grass (naturalized)(*Lolium multiflorum*), Little Bluestem (*Schizachyrium scoparium*), Indian Grass (*Sorghastrum nutans*) Upland Bentgrass (*Agrostis perennans*), Switch Grass (*Panicum Perenne*), Perennial Ryegrass (naturalized)(*Lolium perenne*).

B. Other seed mixes may be utilized subject to prior approval by the Owner.

C. The seed shall be furnished and delivered premixed in the proportions specified above. All seed shall comply with applicable State and Federal seed laws. A grower's certificate of compliance with the specifications shall be submitted by the grower with the shipment of

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the seed. The certificate shall include the guaranteed percentage of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed shall be sown until the Contractor has submitted the certificate to the Owner.

### **2.04 FERTILIZER**

- A. Fertilizer shall be furnished in containers plainly marked with chemical analysis of the product and showing one of the following compositions by weight. In accordance with NH RSA 438, it shall be a low phosphate, slow release nitrogen guaranteed as indicated on the label to contain:
  - a. Not more than 2% Phosphorus; and
  - b. A Nitrogen component which is at least 50% slow release Nitrogen components.
- B. No fertilizer except limestone shall be applied within 25 feet of any surface water body.

### **2.05 LIMESTONE**

- A. Limestone shall be ground limestone having a minimum total neutralizing value of 88% calcium carbonate equivalence. A minimum of 90% shall pass the No. 20 sieve and a minimum of 60% shall pass the No. 100 sieve.
- B. Packaged agricultural limestone packed in the manufacturer's standard containers shall weigh not over 100 lbs each, with the name of the material, net weight of contents and the manufacturer's name and guaranteed analysis appearing on each container.
- C. Bulk delivery of limestone shall be accompanied by a certificate providing the names, weight and analysis as specified herein for packaged material.

### **2.06 EROSION CONTROL BLANKET MATERIAL**

- A. Erosion control blankets shall be appropriate for use on slopes where mulch is not stable, or where erosion has been observed after loaming and seeding. The erosion protection blankets shall be for temporary application and shall be biodegradable and non-toxic. Materials such as jute, coir fiber, and mattresses with straw matrices are judged acceptable, provided no other unsuitable material is included. All erosion control products should be new and previously unused and free of weed and other undesirable seeds. The purpose of these materials is to provide temporary erosion control during the period of establishment of the underlying grass. The blankets shall allow for the growth of grass seeded under the blankets.
- B. Erosion control blankets anchors shall be compatible with the blanket material and shall be of wooden or other biodegradable material.

### **2.07 MULCH**

- A. Straw mulch used in this project shall Straw for mulching shall be stalks of oats, wheat, rye or other similar crops which are free from noxious and invasive species. Straw shall show no signs of excessive moisture and be visually free of mold or mildew. Hay mulch

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shall not be allowed.

- B. Hydraulically applied wood fiber mulch (Hydro-mulch) shall be manufactured so that the materials will remain uniformly suspended in water under agitation and will blend with seeds, fertilizer and other additives to form homogeneous slurry. It shall have the characteristics which, upon hydraulic application, shall form a blotter-like ground coating with moisture absorption and percolation properties and the ability to cover and hold seeds in contact with the soil. Hydro-mulch shall contain no growth or germination inhibiting factors.

### **PART 3 – EXECUTION**

#### **3.01 PREPARATION**

- A. The Contractor shall clean all equipment involved in turf establishment to remove plants, seeds and propagules prior to commencement of work. Any work to clean equipment shall be at no additional cost to the Owner.
- B. The Contractor shall rough grade areas to be loamed and seeded in accordance with Section 02200 and the lines and grades shown on the Contract Drawings.

#### **3.02 TOPSOIL OR LOAM**

- A. Topsoil (or Loam) shall be spread on the designated areas so as to form a cover of topsoil to a minimum depth of 3 inches on the left abutment and 6 inches on the right abutment unless otherwise shown on the drawings or directed by the Engineer. Areas designated for covering with topsoil shall be scarified or otherwise roughened, just prior to the application of topsoil. After the spreading of topsoil all stiff clods, hard lumps, large stones, trash, wood, brush, stumps, roots, or other objectionable material shall be gathered and removed from top soiled area. Compaction may be accomplished by the use of a lawn roller commonly used for this work.
- B. Promptly fertilize, seed, mulch, or otherwise cover, and stabilize through tracking with suitable equipment any topsoil placed on grades steeper than 5 percent.

#### **3.03 FERTILIZING AND LIMING**

- A. Fertilizing and liming shall be done when the soil is in a moist condition and at least twenty-four (24) hours before the sowing of seed. The fertilizer and lime shall be applied to the soil at the rates dictated by the laboratory analysis. Spreading may be accomplished by means of a mechanical spreader or other approved method capable of maintaining a uniform rate of application and shall be thoroughly harrowed, raked or otherwise mixed with the soil to a depth of not less than 1 inch.
- B. The fertilizer and lime shall not be applied together. If the limestone and fertilizer are applied dry, the limestone shall precede the fertilizer and shall be worked thoroughly into the soil before the fertilizer is spread. Fertilizer shall be raked to a depth of at least two inches (2") and the area brought to a smooth surface
- C. Extreme care shall be taken by the Contractor so as not to introduce fertilizer into adjacent

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waterbodies or wetland areas. Over-fertilization will not be allowed.

### 3.04 SEEDING

- A. Grass seed of the required mixture and quality shall be spread by a mechanical seeder or other method which sow the seed uniformly at the required rate over the entire area to be seeded. The mechanical seeder shall be capable of being operated to avoid the growth of grass in rows and shall be so operated.
- B. The Contractor shall apply the seed mix at a rate of 1 pound of New England Erosion Control/Restoration Mix for Dry Sites per 1,250 square feet of seed area or one and a half times the manufacturer's recommended application rate, whichever is greater.
- C. After seeding, all areas shall be lightly raked by hand to mix the seed and topsoil. Seeded areas shall be rolled with a lawn roller not to exceed one hundred and twenty pounds (120 lbs.) in weight.
- D. The recommended seeding periods are from April 1 to June 1, and from August 15 to October 1. Dormant seeding after October 1 shall be allowed, however, seed application rate shall be doubled. Regardless of the time of seeding, the Contractor shall be responsible for a full establishment and growth of vegetation.

### 3.05 MULCHING

- A. Protection of seeded areas shall be either through the application of mulch or the installation of temporary erosion control blankets.
- B. Areas which have been seeded shall be mulched immediately following seeding. Areas which cannot be seeded within the specified seeding periods shall be mulched to provide temporary protection to the soil surface. Mulch shall be spread with a mulch blower or by hand. Mulch shall be immediately anchored with a mulch-anchoring tool (operated perpendicular to the contour) or by tracking with a tracked vehicle (operated parallel to the contour). Applying mulch simultaneous to seeding in a hydroseeding operation is acceptable.
- C. The Contractor shall perform the initial watering and shall spread straw or wood fiber (hydro) mulch uniformly in a continuous blanket to hide the soil from view.
- D. Straw mulch shall be applied to seeded areas at a rate of 10 pounds per 100 square feet. The rate shall be doubled for unseeded areas.

### 3.06 TEMPORARY EROSION CONTROL BLANKET INSTALLATION

- A. Protection of seeded areas shall be either through the installation of temporary biodegradable erosion control blankets or the application of mulch. Temporary erosion control blankets may be necessary if mulch is found to be ineffective in controlling erosion prior to the establishment of vegetation.
- B. Erosion control blankets are anticipated to be necessary for areas of revegetation where slopes exceed 4H:1V.

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- C. Temporary erosion control blankets shall be installed as per the manufacturer's instructions and recommendations. In general, such blankets are installed down (perpendicular to) slopes and are anchored in a trench at the top of the slope.
- D. All temporary erosion control blankets must be anchored to the ground by the use of stakes, or stables as per the manufacturer's instructions and recommendations. In general, stakes should be placed in staggered rows on 2 to 3-foot centers. Stakes should be long enough to achieve adequate anchorage.

### **3.07 MAINTENANCE AND REPAIR**

- A. The Contractor shall be responsible for the watering and other proper care of the seeded areas until final acceptance. If seeded areas have not established by the end of the initial growing season, the maintenance period shall extend through the following growing season.
- B. The Contractor shall be responsible for repair of all damage to and erosion of the loamed and seeded areas until final acceptance by the Owner. Repair responsibilities shall include, but not be limited to, repair of eroded areas, reseeded, replacement of erosion control measures, re-grading, etc. The intent is to facilitate the establishment of an adequate ground cover over all disturbed areas on the site. If seeded areas have not established by the end of the initial growing season (September 1), the period during which the Contractor is responsible for repairs shall extend through the following season (June 1 or later).

### **3.08 ACCEPTANCE**

- A. Seeded areas shall show no gaps or dead spots at acceptance. The grass growth shall be widespread and robust with vigorous, healthy root growth.
- B. The Contractor is responsible for ensuring that a satisfactory firm stand of grass is obtained and shall do all necessary re-loaming, re-fertilizing and re-seeding, and make all necessary repairs, regardless of cause of damage, to this effect until final acceptance of the project.
- C. If seeded areas have not established and been accepted by the end of the initial growing season (September 1), the Owner will defer evaluation for acceptance until the following season (June 1 or later).

## **PART 4 – MEASUREMENT AND PAYMENT**

No measurement shall be made of any work performed under this section. No separate payment shall be made for any work performed under this section. The cost of any work done or facilities provided under this section shall be included under other pay items within the Contract.

**\* \* END OF SECTION \* \* \***



**SECTION 03300  
REINFORCED CAST-IN-PLACE CONCRETE**

**PART 1 - GENERAL**

**1.01    DESCRIPTION**

- A.     The work of this section includes furnishing and placing normal-weight cement concrete composed of specified proportions of cement, aggregates, and water mixed to form a homogeneous composition and consolidated in the work as indicated without segregation, under the Resident Engineer's inspection and approval. The Contractor's proposed concrete mix design shall demonstrate the required compressive strengths and densities and be submitted to the Owner and Engineer.
- B.     The work of this section includes the furnishing and placement of reinforcing steel within the concrete structures shown on the Drawings to be so reinforced. All other work incidental to the construction of the reinforced concrete structures, including waterstops, penetrations, dowels, anchors, etc., is also included in this section.
- C.     The work of this section includes all formwork, bracing, and temporary construction required to build cast-in-place concrete structures as shown on the Contract Drawings.

**1.02    SCOPE OF WORK**

- A.     Reinforced concrete structures to be constructed under the Work of this Section shall include, but not be limited to, a new concrete slab foundation for new crest gate system, a concrete cap on existing masonry pier adjacent to spillway, new concrete abutment along the left training wall, a concrete facing for a portion of the left upstream retaining wall, new concrete slab cap downstream of the new gate structure, new retaining wall along the right abutment wall, and new concrete facing for portions of the right abutment. The work will also include miscellaneous concrete placement such as the patching required along the right abutment training wall. Cast-in-place concrete shall also be required at any other locations shown on the Contract Drawings. Concrete shall be an air-entrained 4,000 psi mix unless otherwise noted. Reinforcing steel shall be uncoated Grade 60 bars unless otherwise noted. Detailed materials specifications are provided below.

**1.03    SPECIAL CONDITIONS**

- A.     The Contractor shall sequence construction, temporary cofferdam and any needed by-pass pipe configuration so work at the dam may proceed in the dry. Refer to Section 01565 – Temporary Water Control and the Contract Drawings for additional information and requirements.
- B.     Cofferdams, as described in Section 02170 – Temporary Cofferdams, must be installed for completion of this Work.
- C.     The existing gate structure at the location of the proposed Work will be demolished as part of Section 02065 – Saw Cutting, Dismantling, Demolition, Removal of Existing Structures.

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### 1.04 QUALITY CONTROL

- A. The Contractor shall be required to engage, at his own expense, an independent testing agency to perform all quality control tests as per Section 03305 of the Specifications.

### 1.05 REFERENCES

- A. ACI 211.1-91 - Standard Practice for Selecting Proportions for Normal Heavyweight, and Mass Concrete
- B. ACI 301-05 - Standard Specifications for Structural Concrete
- C. ACI 302.1R-04 - Guide for Concrete Floor and Slab Construction
- D. ACI 304.2R-96 - Placing Concrete by Pumping Methods
- E. ACI 305R-99 - Hot Weather Concreting
- F. ACI 306.1-90 - Standard Specification for Cold Weather Concreting
- G. ACI 308R-01 - Guide to Curing Concrete
- H. ACI 308.1-98 - Standard Specification for Curing Concrete
- I. ACI 309R-05 - Guide for Consolidation of Concrete
- J. ACI 318-08 - Building Code Requirements for Structural Concrete and Commentary
- K. ACI 347-04 - Guide to Formwork for Concrete
- L. ACI 350-06 - Code Requirements for Environmental Engineering Concrete Structures
- M. ASTM A82M-07 - Specification for Steel Wire, Plain, for Concrete Reinforcement
- N. ASTM A185M-07 - Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
- O. ASTM A615/A615M-07 - Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement
- P. ASTM A675/A675M-03e1 - Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties
- Q. ASTM C33-07 - Specification for Concrete Aggregates
- R. ASTM C94/C94M-07 - Specification for Ready Mixed Concrete
- S. ASTM C150-07 - Specification for Portland Cement
- T. ASTM C260-06 - Specification for Air Entraining Admixtures for Concrete

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- U. ASTM C309-98a - Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- V. ASTM C494/C494M-99a - Specification for Chemical Admixtures for Concrete
- W. ASTM C595-08 - Specification for Blended Hydraulic Cements
- X. ASTM C618-05 - Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- Y. ASTM C881/C881M-02 - Specification for Epoxy-Resin-Base Bonding Systems for Concrete
- Z. ASTM C989-06 - Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
- AA. ASTM C1240-05 - Specification for Silica Fume Used in Cementitious Mixtures
- BB. ASTM C1602-04 - Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
- CC. Concrete Reinforcing Steel Institute - Manual of Standard Practice
- DD. Concrete Reinforcing Steel Institute - Placing Reinforcing Bars

### **1.06 RELATED SECTIONS**

- A. The following is a list of related work items that shall be performed or furnished under other sections of these specifications as indicated:
  - 1. Sedimentation and Erosion Control - See Section 01560.
  - 2. Temporary Water Control – See Section 01565
  - 3. Demolition – See Section 02060.
  - 4. Temporary Cofferdams – See Section 02170
  - 5. Earthwork - See Section 02200.
  - 6. Concrete Testing – See Section 03305.
  - 7. Concrete Finishing, Curing, and Repairs – See Section 03346.
  - 8. Pneumatic Gate System – See Section 11288.

### **1.07 SUBMITTALS**

The Contractor shall submit, both to the Resident Engineer and Engineer, the following information:

- A. Reinforcing Steel
  - 1. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of

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reinforcing steel, bending and cutting schedules, and supporting and spacing devices.

2. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
3. Submit certified copies of mill test report of reinforcement materials analysis.
4. Field inspection report from Contractor's Independent Testing Service. The field inspection report shall be submitted within 5 days of inspection.

### B. Concrete

1. Name, address, qualifications of Contractor's Independent Testing Service and all other required items as outlined in Section 03305 of the Specifications.
2. Concrete mix design, material test results, and results of strength tests from the trial concrete mixes by the Concrete supplier
3. Manufacturer's cement mill test reports for each shipment of cement, regardless of quantity, prior to incorporation into the work.
4. Product data for proprietary materials and items, including forming accessories, admixtures, curing compounds, non-shrink non-metallic grout and others requested by the Owner.
5. Field Test Results from Contractor's Independent Testing Service.
6. Independent Laboratory Test Results as per Section 03305 of the Specifications.

### C. General Procedures

1. Two (2) weeks prior to the start of any work involving concrete, the Contractor shall submit a schedule of labor, equipment and methods of concrete placement, curing and protection for approval. As part of this submittal include means and methods of delivering concrete to placement areas.
2. Two (2) weeks prior to the start of any work involving concrete, the Contractor shall submit the name and qualifications of the independent testing company engaged to perform field and laboratory testing of the concrete and reinforcing steel.
3. Two (2) weeks prior to the start of any work involving concrete, the Contractor shall submit the proposed concrete mix design to the Resident Engineer and Engineer for approval.
4. Two (2) weeks prior to the start of any work involving concrete, the Contractor shall submit the proposed reinforcing bar shop drawings to the Resident Engineer and Engineer for approval.

## 1.08 QUALITY ASSURANCE

### A. Reinforcing Steel

1. Do not fabricate reinforcement until shop drawings have been approved by the Owner.

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2. Perform Work in accordance with CRSI - Manual of Standard Practice, ACI 301, ACI SP-66 and ACI 318. Where contradictions exist, the more stringent code shall govern.
  3. Maintain one copy of each document on site.
  4. Replace all reinforcement with bends and kinks not shown on the approved fabrication shop drawings. Remove from job site all such reinforcement and replace with new fabricated steel. Field bending of reinforcement is prohibited without prior written approval of the Owner and Engineer.
  5. Reinforcing steel must be inspected by the Resident Engineer and the Contractor's Independent Testing Service for conformance with Contract Documents and approved shop drawings.
- B. Concrete
1. Perform Work in accordance with ACI 301.
  2. Maintain one copy of document on site.
  3. Acquire cement and aggregate from one source for Work.
  4. Materials and installed work may require testing and retesting at any time during progress of work. Retesting of rejected materials for installed work shall be done at the Contractor's expense.
  5. Do not use admixtures which will cause accelerated setting of the cement in concrete. Use of calcium chloride will not be permitted.
  6. Employ an independent accredited testing laboratory, acceptable to the Owner in accordance with Section 03305.
  7. Acceptance of completed concrete work requires conformance with dimensional tolerances, appearance, and strength as specified and indicated.

## PART 2 - PRODUCTS

### 2.01 CONCRETE

- A. Ready-mixed, air-entrained, low-permeability concrete secured from a batch or mixing plant concrete in accordance with ASTM C94. Minimum 28-day compressive strength of concrete shall be as specified on the Drawings or 4,000 psi, whichever is greater. Minimum 7-day compressive strength shall be 3,000 psi.
- B. Cement concrete mix design shall be submitted for review.
- C. The normal-weight cement concrete shall be proportioned per ACI 211.1. The low-permeability cement concrete shall conform to the following requirements of ACI 350R as part of the mix design:

Minimum 28-day compressive strength	4,000 psi
Maximum water/cement ratio	0.45
Maximum aggregate size	¾ inch
Maximum air content	6.0 percent (±1.5 percent)

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The following table of minimum cement contents for various minimum 28-day compressive strengths (6"x12" Cylinders) are based on air entrained and water reduced mixtures. The use of approved additives other than air entraining and water reducing admixtures shall not affect the minimum cement content.

The Contractor shall submit to the Owner, for approval, his/her proposed concrete supplier, source, and type of materials, with current ASTM C-33 aggregate test data, and concrete mix designs by an approved laboratory complete with trial mix data. Trial mixtures will be designed and tested at the maximum slump and air content for each designated class of concrete.

Minimum cement contents may be supplemented by the addition of Slag (GGBFS) or Fly Ash in percentages by weight as stipulated below.

Trial mix 28-day strengths shall be 1,200 psi over required  $F'_c$  for mixes 4,000 psi and above.

Minimum 28-Day Compressive Strength	Minimum Cement Pounds per C.Y. Maximum Size Coarse Aggregate			In place Slump (inches)
	1 1/2"	3/4"	3/8"	
<u>PSI</u>				
2000	376	423	470	2-4
2500	423	470	517	2-4
3000	470	517	564	2-4
3500	517	564	611	2-4
4000	564	611	658	2-4
4500	611	658	705	2-4
5000	658	705	752	2-4
Percent Air Content	5.0	6.0	7.5 (all air content $\pm 1.5$ percent)	

- D. Cement shall be Type II or Type I/II normal Portland cement and admixtures. The cement shall conform to the requirements of ASTM C150 for Portland cement, and shall be either Type II or Type I/II for general use or Type III when high early strength is required. High early strength may also be obtained by use of a non-chloride set accelerating admixture as approved by the Owner and Engineer. The use of type III Portland cement will not be allowed in concrete exposed to seawater, sewerage, or soils containing chlorides. However, only one type of cement shall be used in a single placement. Cement shall be fresh, sieved, and free of lumps.

Cement shall not exhibit a flash set or cause an abnormal initial rise of temperature upon engaging with water, and it shall maintain its full plasticity and fluidity during the period required for placing the concrete.

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Cement having a uniform color shall be used in all exposed concrete.

In the event that the proposed cement is not low alkali, the producer shall submit evidence that the proposed aggregate is not reactive as per ASTM C1260 or AASHTO T303.

- E. Fly ash – Class F may be substituted for cement up to a maximum of 30% by weight of the design cement content. Fly ash – Class F or equivalent cementitious produce shall conform to the requirements of AASHTO M 295 or ASTM C618 – Type F. Fly ash may be used to mitigate Alkali-Silica Reactivity (ASR), however fly ash shall replace no more than 30% by weight of the design cement content and any additional fly ash will be considered fine aggregate. Slag (GGBFS) meeting ASTM C989, Latest Edition, Grade 100 or 120, may be used to replace no more than 40% by weight of the design cement content. Either fly ash or slag may be used, not both.
- F. Cement grout and admixtures for use to fill minor depressions below concrete structures (dental concrete) shall be proposed by the Contractor and will be subject to the Owner and Engineer’s review and comment prior to approval for use in the work.
- G. Water shall not exhibit any deleterious effects to the required properties of the concrete. Water shall be clean, clear and free from deleterious amounts of oil, acid, alkali, salts and organic matter and conform to ASTM C94, as well as the following requirements:
1. Acidity 0.1 Normal NaOH 2 c.c. max.\*
  2. Alkalinity 0.1 Normal HCl 10 c.c. max.\*  
\*(to neutralize 200 c.c. sample)
  3. Total Solids:
    - a. Organic 0.01% max.
    - b. Inorganic 0.10% max.
    - c. Sulphate 0.05% max.

Testing of the water by the Contractor shall be in accordance with AASHTO T26 and the test results shall be submitted to the Owner and Engineer for approval.

H. Aggregates:

1. Fine Aggregate: Fine aggregate shall consist of natural sand, manufactured sand, or a combination thereof, conforming to the requirements of ASTM C33, Specifications for “Concrete Aggregates”, latest edition and the following requirements:

SIEVE NO.	PERCENT PASSING
4	95 to 100
8	80 to 100
16	50 to 85
30	24 to 60
50	5 to 30
100	0 to 10

The fineness modulus of the fine aggregate shall be 2.80 plus or minus 0.20 and the percent passing the #200 sieve shall not exceed 2 percent by dry sieving and 3 percent

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by wet sieving.

2. Coarse Aggregate: Coarse Aggregate shall consist of washed gravel, crushed gravel, crushed stone, or a combination thereof conforming to ASTM C33, Specifications for “Concrete Aggregates” latest edition and the following:

PERCENT PASSING				
SIEVE	NO. 67 (3/4")	NO. 57 (1")	NO. 8 (3/8")	NO. 467 (1 ½ ")
1-½ inch	--	100	--	100
1 inch	100	95-100	--	--
¾ inch	90-100	--	--	35-70
½ inch	--	25-60	100	--
3/8 inch	20-55	--	85-100	10-30
No. 4	0-10	0-10	10-30	0-5
No. 8	0-5	0-5	0-10	--
No. 16	--	--	0-5	--
No. 50	--	--	--	--

Aggregates for lightweight concrete shall conform to ASTM C330, Specifications for “Lightweight Aggregates for Structural Concrete.”

Select aggregate which is not considered susceptible to Alkali-Silica Reactivity (ASR), in accordance with ASTM C295.

- I. Admixtures: Air entraining and water reducing admixtures will be used in all concrete as specified. They shall be used in strict accordance with the manufacturer's recommendations and added at the batch plant. Admixtures shall be ready-to-use liquid material, and contain no calcium chloride. Set retarding admixtures will be used at the discretion of the Owner and Engineer when concrete temperatures exceed 80 degrees. The use of high range water reducing admixtures will be allowed only with prior approval of the Owner and Engineer when circumstances dictate its necessity to facilitate placement.

Air Entraining Admixtures: Shall conform to ASTM C260 Specifications for “Air Entraining Admixtures for Concrete.” Testing for air entrainment shall be as per ASTM C231.

Water Reducing, Retarding, Set Accelerating and High Range Admixtures: Shall conform to ASTM C494 Specifications for “Chemical Admixtures for Concrete.”

Curing Compounds shall conform to ASTM C309

The use of mid and high range water reducing admixtures will be allowed only with prior approval of the Owner and Engineer when circumstances dictate its necessity to facilitate placement.

### 2.02 ACCESSORIES

- A. Bonding Agent: Two component modified epoxy resin.



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- B. Epoxy Adhesive: Two component epoxy equivalent to HILTI HY150 or equal. Fast setting adhesive shall NOT be used without express permission.
- C. Cloth, Burlap, Jute or Kenaf. CCC-C-476C
- D. Non-Shrink, Non-Metallic Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 5000 psi in 48 hours, with zero percent volume change for plastic state in accordance with ASTM C827, such as Five Star Grout by Five Star Products, Upcon 262 by Emhart Chemical Group or approved equivalent.
- E. Surface Finishing / Patching Cement: Premixed fast setting non-shrink patching cement with integral bonding agent, such as ConproSet or approved equivalent.
- F. Fill-Side Waterproofing: Two coats of a cement based waterproofing product applied by brush or spray and in accordance with the manufacturer's recommendations. Submit product for approval.
- G. Joint Filler and Slab Perimeters: J-Joint polyethylene foam with tear off strip for sealant or equivalent; joint filler to be slab thickness in depth less 0.5 inch for sealant.
- H. Expansion Joint Filler: Self expanding cork by W.R. Meadows or W.R. Grace or equivalent, size as indicated on the Drawings.

### 2.03 STEEL CONCRETE REINFORCEMENT

- A. Uncoated Reinforcing Steel Bars: ASTM A615, 60 ksi yield Grade 60 deformed billet steel, unless otherwise indicated.
- B. Tie Wire: Mild steel or annealed iron, minimum 16 gauge.
- C. Splice Devices: Sleeve or coupler type, sized to develop minimum 125 percent of bar yield strength.
- D. Supports: Provide supports, such as chairs, bolsters, spacers, blocks, hangers, or other devices to support and position reinforcement, of adequate strength and accepted design to prevent displacement of reinforcement. Supports of any type coming in contact with form work shall be plastic or stainless steel.
- E. General. After bar list and shop drawings have been accepted, fabricate each unit of reinforcement to conform to the type, shape, and size indicated on the accepted bar list and shop drawings.
- F. Cutting and Bending. Perform cutting and bending of reinforcing bars before shipment to the site in manner consistent with ASTM and specification CRSI Manual of Practice. Field bending of reinforcing steel is not allowed.
- G. Dowels: Dowels through construction joints shall be considered a part of the work of this section. These shall be cast monolithically into the concrete and not drilled in after the concrete has been placed. These dowels shall be deformed bars, sized as shown, conforming

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to ASTM A615, Grade 60 unless otherwise indicated. Dowel shall be No. 6 bars unless otherwise indicated on Contract Drawings.

### **2.04     DOWEL BAR SPLICERS**

- A.     Thread bars in shop only.
- B.     Provide plastic plugs in female end at form.
- C.     Develop 125% of yield strength of specified bar size across joint.
- D.     Acceptable Manufacturers: Richmond DB-SAE Splicer System, Lenton Form Saver or Dayton Superior dowel bar replacement system or equivalent.
- E.     Submit product data with strength tests.

### **2.05     MECHANICAL BAR SPLICERS**

- A.     Develop 125% of yield strength of bar across mechanical splice.
- B.     Use metal filled sleeve type: Richmond DB-SAE Splicer Systems, Dayton Superior D-250 Bar Lock Coupler or equivalent.

### **2.06     CONCRETE CLASS**

- A.     Reinforced concrete sections greater than 10" thick: Class A
- B.     Reinforced concrete sections equal to or less than 10" thick: Class B
- C.     Sand/Cement Slurry: Class A without Coarse Aggregate

### **2.07     FORM MATERIALS AND ACCESSORIES**

- A.     Plywood Forms:
  - 1.     Material: Material shall not be reactive with concrete and shall provide a finish equivalent in smoothness and appearance to plywood conforming to PS-1, Exterior Type Grade B-B. Each panel shall be labeled with grade trademark of APA/EWA.
  - 2.     Provide forms which will not deflect beyond finish specified tolerances or indicated on the drawings.
- B.     Prefabricated Forms
  - 1.     Preformed Steel Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
  - 2.     Form Liners: Smooth, durable, grainless and non-staining hardboard, unless otherwise shown on Drawings.
  - 3.     Framing, Studding and Bracing: Stud or No. 3 structural light framing grade.

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### C. Accessories

1. Form Ties: Provide ties fitted with devices that will form cone shape holes in the concrete surface not less than 3/8-inch interior diameter or more than 1 ¼ inch exterior surface diameter and at least 1 ½ inches deep such that the portion of the concrete tie remaining in the concrete will be at least 1 ½ inches back from the concrete surface.
2. Spreaders: Standard, non-corrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face. Wire ties, wood spreaders or through bolts are not permitted.
3. Form Anchors and Hangers: Do not use anchors and hangers exposed concrete leaving exposed metal at concrete surface. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member. Penetration of structural steel members is not permitted.
4. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture.
5. Corners: ¾ inch x ¾ inch triangular fillet type, milled clear straight-grain pine, surfaced each side, or extruded vinyl type, with or without nail flange to form all exposed concrete wall edges.
6. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

### 2.05 WATERSTOPS

- A. Waterstops shall contain a continuous fastening system for mechanically attaching each edge of the waterstop to reinforcing steel or formwork as necessary to prevent displacement during concrete placement and consolidation operations. The fastening systems shall include a series of one inch (1") continuous galvanized wire loops, 12 per foot both sides and shall have a minimum pull-out strength of 148 pounds per square inch (psi) per wire loop.
- B. Water-stops shall be ribbed PVC with dumbbell and centerbulb type placed through all construction joints. Approved products include those meeting applicable NHDOT specifications for Item 541, NH#2).
- C. For flat slab construction joints, a polyurethane-based, non-sag elastomeric sealant surface sealer shall be provided above a backer bar.
- D. For waterstops where new concrete is to adjoin existing (i.e. recently poured) concrete, masonry, or other material, waterstops shall consist of bentonite-free preformed swellable waterstops such as Hydrotite CJ product (or approved equal).
- E. Other types of waterstops shall be as noted on the drawings.
- F. Waterstops shall be placed as per the Contract Drawings or in any location where concrete joints create the potential for water movement through the joint.

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### **2.08 PVC DRAINAGE OR VENT PIPES**

- A. Where called for, PVC drainage pipe for use in the weepholes or other seepage collection systems or air vent pipes shall be Type I, Schedule 80 pipe conforming to ASTM D1785-99. Joints shall be made as per ASTM D 2855. The ends shall be covered with a galvanized metal fabric. DO NOT INSTALL WEEPHOLES UNLESS SPECIFICALLY CALLED FOR BY CONTRACT PLANS.

### **2.09 BACKFILL**

- A. Backfill material shall be as per the drawings and conform with the material specifications in Section 02200 – Earthwork.

## **PART 3 - EXECUTION**

### **3.01 METHODS OF PREPARATION AND DELIVERY**

See ASTM C94 - Standard Specification for Ready-Mixed Concrete

### **3.02 CONSTRUCTION METHODS**

- A. General
  - 1. Reinforced concrete shall be constructed to the dimensions and design indicated on the Drawing Details, to the lines and grade shown and as directed by the Resident Engineer, with reinforcement as required, and where necessary, at the direction of the Resident Engineer.
  - 2. The work under this section includes setting all reinforcement and inserts furnished under this specification section to be embedded in cement concrete including all water-stops, anchors, and dowels. The concrete after setting and finishing shall be true to required dimensions and shall be of high quality and exhibit an approved finish and workmanship.
  - 3. The Contractor shall present mix designs for the specified class of concrete. Each of the laboratory design mixes shall be varied as directed by the Owner until a mix has been produced that meets the requirements of these Specifications and which receives the written approval of the Owner. The approved mix design shall not be varied for the remainder of the job unless such change is directed by the Owner.
  - 4. No concrete shall be formed or placed until all sediment control, water control, masonry and rock surface preparation, and anchor bar installation work has been completed. These tasks are covered under other sections of the Specifications.
  - 5. The Contractor shall provide and maintain all necessary equipment for the control of surface, groundwater and seepage within the limits of new concrete areas in order to permit assembly of reinforcement (and related appurtenances), and placement of concrete to be conducted in the dry.

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### B. Forms

1. Approved centralizers, spacers and forms shall be provided by the Contractor. No extra compensation for false work will be allowed, such work being considered a part of the form work. False work shall be set to give the structural sizes indicated on the Plans or as specified, plus allowance for shrinkage or settlement. Forms, except as hereinafter specified, shall be made of planed lumber or form plywood and shall conform to the design of the work.
2. Inserts, anchors and support systems shall be installed by the Contractor, including reinforcing steel, water-stops, and dowels and such similar items that are required to be incorporated into the concrete construction. It is the responsibility of the Contractor to ensure that all inserts are accurately installed and securely held in place immediately prior to placing the concrete, and to ensure that these devices are inspected and approved by the Resident Engineer at least 24 hours before placing concrete. Concrete placed without such approval of the Resident Engineer may be rejected and removed at no additional cost to the Owner.
3. All forms shall be cleaned and repaired as required and oiled prior to each placement. Defective forms with unplugged holes or other defects shall not be used.
4. The sheathing shall be joined tightly to prevent leakage from the mix and it shall be of sufficient strength to hold the concrete without bulging between supports. Forms shall be properly braced and tied so as to maintain correct dimensions. Bolts, rods or approved form ties shall be used for internal ties. Wire ties will not be permitted except when directed or where concrete is not exposed to view.
5. Prior to placing concrete in the forms all foreign matter, lumber and wire ends shall be removed.
6. The forms shall be true to the lines, satisfactorily supported and firmly secured. They shall remain in place as long as directed and shall be replaced by new forms if they lose their proper dimensions or shape.
7. All forms shall be treated with non-staining mineral oil or other approved release agent before placing the concrete. The release agent shall be applied before the reinforcing steel is placed. Any material which will adhere to or discolor the concrete shall not be used.
8. Use steel, plywood or lined board forms as forms for “Smooth Finish” Concrete. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish. Install form lining with close-fitting square joints between separate sheets without springing into place. Use full size sheets of form lines and plywood wherever possible. Tape joints to prevent protrusions in concrete. Use care in forming and stripping wood forms to protect corners and edges. Level and continue horizontal joints. Keep wood forms wet until stripped.
9. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust

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and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

### C. Handling and Placing Concrete

1. Within ten (10) days from Notice to Proceed, the Contractor shall submit a schedule of labor, equipment and methods of concrete placement, curing and protection for approval. As part of this submittal, include means and methods of delivering concrete to placement areas. Failure to submit aforementioned schedule or demonstrate operation of equipment at the Resident Engineer's request may be just cause for cancellation of the schedule placement.
2. Aluminum shall not be used in any equipment where it would be in permanent or abrasive contact with fresh concrete.
3. Whenever possible, place concrete during normal working hours. When concrete placement schedules require concrete placement at times other than normal working hours, notify the Owner and its Resident Engineer of special conditions at least 48 hours in advance of placement. Notify Resident Engineer minimum 48 hours prior to commencement of concrete placement operations. Include within this notification, the quantity of concrete, method and placement location, frequency of trucks, ordered slump and time of initial delivery.
4. Provide a delivery batch ticket to the Resident Engineer, written in ink or computer printed, with each batch delivered to the discharge location, and as specified in ASTM C94 and in addition, state the following:
  1. Load number, truck number and driver's name
  2. Volume of Concrete (Cubic Yards)
  3. Mix designation number
  4. Actual batch weights of cement, fine and coarse aggregate, admixtures, and water
  5. Time batched
  6. Signature of ready-mix representative
5. Failure to provide this information at delivery will be considered cause for rejection of the load.
6. Additional information which may be required at the discretion of the Resident Engineer is as follows:
  1. Compression strength of concrete
  2. Reading of revolution counter at first addition of water
  3. Type, brand and amount of cement
  4. Type, brand and amount of admixture
  5. Information necessary to calculate total mixing water

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### 6. Maximum size of aggregate

#### D. Transportation

1. Order concrete from batching plant so that trucks arrive at discharge locations when the concrete is required. Avoid excessive mixing of concrete or delays in placing successive layers of concrete in forms. The concrete supplier shall deliver concrete to discharge locations in watertight agitator or mixer trucks without altering the specified properties of water-cement ratio, slump, air-entrainment, temperature and homogeneity. Deliver concrete in order that the contractor can accept delivery within 90 minutes after batching or earlier during hot weather concreting as specified. Do not add retempering water, nor exceed the specified water-cement ratio. The Contractor or Resident Engineer shall reject concrete not conforming to specification, unsuitable for placement, exceeding time limitation restraints, and not having a complete delivery batch ticket.
2. The concrete shall be transported from the mixer and placed in the forms by a method which will permit handling concrete of the slump required without segregation. Buggies and wheelbarrows used for this purpose shall be equipped with pneumatic tires. Chutes shall be metal or metal lined, inclined so as to have a slope of between 2 and 3 horizontally to 1 vertically. Long chutes shall be provided with reversed flow or re-mixing hoppers in order to correct for segregation.
3. Transportation of concrete by pumping is considered a suitable means for delivering concrete. The equipment shall be suitable in kind and adequate in capacity for the work. The equipment and operation shall conform to the requirements of the latest American Concrete Institute (ACI) Specifications for Masonry, Placing Concrete by Pumping. The operation shall be such that a continuous stream of concrete without air pockets is produced. When pumping is completed, the concrete remaining in the pump-line shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients.
4. At the conclusion of placement, the entire equipment shall be thoroughly cleaned and all waste and debris shall be legally disposed of off-site in accordance with Federal, State and Local laws, regulations and ordinances. The number and lengths of flexible lines used for pumping concrete shall be kept to the minimum required for proper distribution. Transition sections for reducing the diameter of the lines shall be of slick-line material and shall be as long as possible.

#### E. Placing Concrete

1. Place concrete in accordance with ACI 301. Deposit concrete at its final position in formwork, to preserve slump, air content, and homogeneity in accordance with ACI 304, and as specified herein. Clean out forms of all soil and debris prior to placement. Wet forms and existing concrete but remove standing water. Concrete shall be properly distributed in the forms by shoveling. The forms shall be filled in horizontal layers 1½ to 2 feet thick maximum, with each layer extending completely across the forms. Do not allow concrete to fall freely in forms to cause segregation. Do not move concrete horizontally more than four feet from the point of discharge. Space points of deposit not more than eight feet apart. Care shall be taken to avoid splashing the forms and reinforcing above the level of the mix. Do not interrupt successive

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placement; do not permit cold joints to occur. Do not deposit partially hardened concrete in forms. Retempering of partially hardened concrete is prohibited. Remove all partially hardened concrete from site at no additional compensation

### F. Consolidation

1. Consolidate concrete in accordance with ACI 309. Each layer shall be thoroughly consolidated by vibration. The face of the forms shall be carefully spaded to bring a dense mortar to the face, and produce a good finish.
2. All concrete, unless otherwise directed, shall be compacted by means of approved mechanical vibrators operated within the mass of the concrete. The Contractor shall provide approved methods of vibration to fully consolidate the mix. Vibrators shall be of internal type, of standard make and approved capacity, and shall be capable of transmitting vibrations to the concrete at frequencies of not less than 4500 impulses per minute.
3. Vibration of forms or reinforcing shall not be permitted except where internal vibration is not practical and then only with approval of the Resident Engineer for each specific application.
4. The vibrator shall be applied directly to the mass at the point and time of deposit and move throughout the mass continuously from point to point in the mix using care to avoid hitting the forms, over-vibration, causing segregation, over-finished surface and excess water gain.
5. Vibrators of sufficient number and size shall be provided to obtain proper placing in accordance with the rate of deposit. At least one spare of each type vibrator required shall be on hand at all times.
6. Extreme care shall be taken to prevent penetrating or disturbing previously placed concrete which has become partially set.

### G. Joints

#### 1. Construction Joints

Concrete in structures shall be placed in such a manner that all construction joints shall be exactly horizontal or vertical, as the case may be, except as otherwise specified, and that they shall be straight and as inconspicuous as possible.

When construction joints are indicated, all concrete between consecutive joints shall be placed in a continuous operation.

In order to allow for shrinkage, concrete shall not be placed against the second side of the construction joints for at least 12 hours after that on the first side has been placed.

Approval from the Owner and Engineer in writing must be secured before the placing of any construction joints not indicated in the plans.



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Unless otherwise indicated, interlocking or keying at construction joints shall be provided by use of keyways and/or dowels in a manner approved by the Owner and Engineer.

Concrete shall be placed in the order of the sequence of construction. All longitudinal and transverse construction joints shall be formed as described herein and as indicated.

### 2. Bonding to Concrete Already Set

In all locations where new concrete is going to be placed on or adjacent to existing masonry, existing concrete, and/or newly placed mass concrete, the surface of the said masonry or concrete shall be thoroughly cleaned of all dust, particles and otherwise deleterious material via high-pressure air or water jetting. A bonding agent shall be applied, per manufacturer recommendations, prior to placement of new concrete. Roughening or preparing of the existing concrete surface shall be conducted per the bonding agent manufacturers recommendation.

No reinforced concrete may be placed until preparation of all contact surfaces has been approved by the Resident Engineer.

## H. Protection

Suitable precautions shall be taken to thoroughly protect the concrete from any damage by weather conditions or otherwise during and after placing.

1. Warm and Dry Weather. During warm or dry weather, and as directed all curing concrete shall be water-cured throughout the curing period.
2. Rainy Weather. During rainy weather all curing concrete shall be properly covered, as may be necessary to prevent damage. Sufficient approved material for covering shall be available at the site of the work for immediate use as may be needed.
3. Cold Weather. During cold weather all curing concrete shall be fully protected, by methods approved by the Owner and Engineer, until properly set and hardened to prevent damage. Cold weather concrete shall be protected at the required minimum temperature according to ACI 306, as outlined in Section 3.02 (J), specifically regarding the minimum number of days that temperature protection must be maintained.

## I. Finishing

All concrete shall be finished in accordance with Section 03346 of the Specifications.

## J. Curing

All concrete shall be cured in accordance with Section 03346 of the Specifications.

## K. Removal of Forms

1. If necessary, the forms for any portion of the structure shall not be removed until the

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concrete is strong enough, as determined by the Resident Engineer, to avoid possible injury from such removal. Forms shall not be removed or disturbed without the prior approval of the Resident Engineer. Form supports shall be removed in such a manner as to permit the concrete to take the stresses due to its own weight uniformly and gradually.

2. The minimum compressive strength for the type of concrete prior to removing forms or loading the structure shall be not less than seventy-five (75) percent of the design strength as demonstrated by a concrete cylinder test. In no event shall forms be removed from concrete less than 3 days following placement.
3. Any defective work discovered after the forms have been removed shall be immediately removed and replaced. If the surface of the concrete is bulged, uneven or shown excessive voids or form joint marks which cannot be repaired satisfactorily, the entire section shall be removed and replaced. All repairs and renewals due to defective work shall be done at the expense of the Contractor.

### L. Loading of Concrete Structures

All concrete structures (footings, slabs, tank walls, elevated slabs, roofs, foundations, etc.) shall not be loaded until the concrete has obtained sufficient strength to resist the loads imposed. Further, concrete structures or segments thereof shall not be loaded until the concrete obtains the following design strength.

Loading	Required Strength
Concrete loads from above	75%
Earth filled, backfilling	100%
Equipment Loads	100%

### M. Concrete Construction during Cold Weather

All concrete construction during cold weather shall be performed in accordance with Section 03346 of the Specifications.

### N. Concrete Construction during Hot and Dry Weather

All concrete construction during hot and dry weather shall be performed in accordance with Section 03346 of the Specifications.

### O. Waterproofing

1. An approved waterproofing compound shall be applied where indicated. The waterproofing compound shall be applied as per the manufacturer's specifications. When, indicated, all joints shall also be treated with the waterproofing compound as per the manufacturer's instructions.
2. Waterproofing shall be applied to all vertical concrete surfaces in direct contact with backfill unless otherwise specified.

**3.03 PLACING, SUPPORTING AND SPLICING REINFORCING STEEL**

- A. Reinforcing steel shall be clean and free of dirt, scale, paint, oil, grease and other foreign matter when placed in the work. Metal reinforcement coated with firmly bonded rust, mill scale, or a combination of both shall be considered satisfactory provided the minimum dimensions and weight of a hand wire-brushed test specimen are not less than the applicable specification requirement. Rust or mill scale which is difficult to remove by vigorous scrubbing with a wire brush shall be considered firmly bonded to the steel.
- B. Arrange and place reinforcement as shown on the diagrams, placement plans, and in accordance with the required tolerances. Concrete shall not be placed in any member until the reinforcement steel has been inspected and approved by the Resident Engineer.
- C. Support and secure reinforcement together as required in accordance with the following requirements:
  - 1. Prevent displacement, by construction loads or by the placing of concrete reinforcement and concrete, beyond the required tolerance.
  - 2. Tie or clip bars together securely; weld only where permitted by the Resident Engineer.
  - 3. Maximum spacing of bar supports: six feet.
- D. Minimum concrete protective covering shall be as shown on the Drawings unless otherwise noted or directed by the Owner or Engineer.
- E. Support reinforcing bars imposition by means of accepted spacers, chairs or hangers.
- F. Maintain the specified tolerances between reinforcement and the forms by means of stays, blocks, ties, hangers, or other accepted supports.
- G. Furnish reinforcing bars in full lengths to the extent practicable. Splices and laps will be permitted only where shown on the accepted shop drawings or as otherwise permitted by the Owner or Engineer. No splices will be permitted at points where the section does not provide a minimum distance of 2 inches between splices and the nearest adjacent bar or the surface of concrete. The bars shall be rigidly clamped or wired at all splices. Sheets of metal mesh shall overlap each other sufficiently to maintain uniform strength and shall be securely fastened at the ends of the edges. Splices made with mechanical connectors shall be as detailed on the Drawings or as permitted and shall develop at least 125% of the specified yield strength of the reinforcing bar being spliced. The minimum concrete cover over the reinforcing steel as shown on the Drawings shall be maintained at the mechanical splice.

**3.04 FIELD QUALITY CONTROL AND TESTING**

- A. Field quality control and testing for concrete shall be performed in accordance with Section 03305 of the Specifications.
- B. The Contractor shall engage a qualified Independent Testing Service, as defined in Section 03305 of the Specifications, to inspect the reinforcing steel for conformance with Contract

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Documents, approved shop drawings and applicable codes. Reinforcing steel shall be inspected and approved prior to placement of concrete.

- C. Perform reinforcing steel quality control inspection with personnel certified as an ACI Concrete Special Inspector according to the American Concrete Institute (ACI).

### 3.05 WATERSTOPS

#### **Approved waterstops shall be provided at all vertical and horizontal joints.**

Install dumbbell or centerbulb waterstops as specified herein and as depicted on the Drawings at locations where new concrete expansion or construction joints are to meet new expansion or construction joints. Waterstops shall be cut and spliced in accordance with manufacturer's recommendations using tools specifically designed for that purpose.

Apply bentonite-free pre-formed swellable water stop at all locations where new concrete is placed against existing (i.e. recently poured) concrete, masonry, or other structures. Additionally, Contractor shall be prepared to place bentonite-free pre-formed swellable water stop at locations deemed necessary by the Construction Engineer based on conditions observed in the field during actual construction at no additional cost.

### 3.06 FAILURE TO MEET STRENGTH REQUIREMENTS

- A. The strength of the concrete in place will be considered substandard if any one of the following results occur: Note: A test is defined as the average of two cylinders
  - 1. The arithmetic average of 28-day cylinder tests for any three (3) consecutive test results are less than the specified strength ( $f'_c$ ).
  - 2. More than 10 percent of the 28-day cylinder tests have strengths less than the specified strength ( $f'_c$ ).
  - 3. A compressive strength test result falls below the specified strength ( $f'_c$ ) by more than 500 psi.
- B. Concrete which fails to meet the strength requirements as outlined above will be reviewed by the Resident Engineer. The Resident Engineer will determine whether the substandard concrete will be accepted, rejected or additional tests performed.
- C. When Substandard concrete occurs as defined in the above paragraphs A.1 and A.2, the Resident Engineer will require corrective measures to be taken immediately in order to increase the average of subsequent strength tests.
- D. When substandard concrete occurs as defined in the above paragraph A.3, the Resident Engineer may require cores drilled in the area of question in accordance with Specification 03305. If the core tests are inconclusive or impractical to obtain, load tests may be required and their results evaluated in accordance with ACI 318 Chapter 20. If the average of the three cores is less than 85% of the specified 28-day strength or if one core is less than 75% of the specified 28-day strength, then that portion of the structure shall be strengthened by a method proposed by the Contractor and no exceptions taken by the Resident Engineer or replaced by the Contractor at no additional cost to the Owner.

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### **3.07 DEFECTIVE CONCRETE**

- A. Defective concrete is defined as concrete in place which does not conform to strength, shapes, alignments, appearances and/or elevation as shown on the drawings and/or presents faulty surface areas.
- B. Reinforcing steel size, quantity, strength, position, or arrangement at variance with the Drawings will be considered defective.
- C. Concrete which differs from the required dimensions or locations in such a manner as to reduce the strength will be considered defective.
- D. Concrete surfaces not finished or not cured in accordance with Section 03346 shall be classified as defective concrete.
- E. Formed surfaces larger or smaller than dimensional tolerances specified in this Division may be rejected. If the Resident Engineer permits the Contractor to correct the error, such correction shall be as directed and in such a manner as to maintain the strength, function and appearance of the structure.
- F. Concrete members cast in the wrong location may be rejected and shall be removed at no additional cost to the Owner if the strength, appearance or function of the structure is adversely affected.
- G. Inaccurately formed surfaces exposed to view may be rejected and shall be repaired or removed and replaced at no additional cost to the Owner.
- H. Concrete exposed to view with defects which adversely affect the appearance of the specified finish shall be repaired. Excessive honeycomb or embedded debris in concrete is not acceptable. If, in the opinion of the Resident Engineer, the defects cannot be repaired, the concrete may be accepted or rejected in accordance with the decision of the Engineer.

### **3.08 DRILLING AND ADHERING DOWELS**

- A. Use rotary drills and cores (non-percussive) and drill holes into concrete to the depth indicated. Hole size shall be one inch larger in diameter than the dowel diameter unless otherwise indicated on the Contract Drawings.
- B. Scour the dowel hole by thoroughly roughening the sides with a coarse, wire flue brush or use the appropriate drill bits to provide a roughened surface appropriate for the epoxy system utilized.
- C. Clean hole of dust and debris with a power vacuum.
- D. Fill hole with high strength epoxy or non-shrink grout as indicated; insert dowel with twisting motion; add grout or epoxy as needed.
- E. Maintain dowel stationary until grout or epoxy cures.

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- F. If existing reinforcing steel is encountered while drilling, offset the drill hole by a maximum of 2-inches. The new relocated hole shall be in the same line as the line of drilled holes. All offset holes shall be a minimum of 4 inches from a free concrete edge. Maintain the original spacing locations of the remaining dowels as indicated on the Contract Drawings.

### **PART 4 - MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 03305  
CONCRETE TESTING**

**PART 1 - GENERAL**

1.01     DESCRIPTION

- A.     This Section describes requirements for quality control testing for cement concrete used in the construction of cast-in-place concrete structures at the site. Testing shall be done both on site and in the laboratory on samples collected from the site.
- B.     The Contractor shall engage a qualified, certified, and approved Independent Materials Testing Laboratory to perform all quality control testing for cement concrete placed under the work of this contract. The Independent Testing Service shall conduct all on-site and laboratory testing.
- C.     The Contractor shall be responsible for any and all corrective measures necessary based on testing results obtained and provided by the Independent Testing Service.

1.02     SCOPE OF WORK

- A.     The Scope of Work under this Section shall include all work, labor, materials, equipment, and other effort and expenses necessary to engage a qualified, certified, and approved Independent Materials Testing Service to perform all quality control testing for cement concrete placed under the work of this contract. The work shall include all necessary field work, laboratory testing, and reporting by the Independent Testing Service.

1.03     SECTION INCLUDES

- A.     Concrete Testing

1.04     RELATED SECTIONS

- A.     Section 01300 – Submittals
- B.     Section 03300 - Cast-In-Place Concrete
- C.     Section 03346 - Concrete Finishing, Curing and Repairs

1.05     REFERENCES

- A.     ASTM C31/C31M-06 - Standard Practice for Making and Curing Concrete Test Specimens in the Field
- B.     ASTM C39/C39M-05e1 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- C.     ASTM C42/C42M-04 - Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

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- D. ASTM C172-07a - Practice for Sampling Freshly Mixed Concrete
- E. ASTM C231-04 - Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- F. ASTM E329-07a - Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
- G. ASTM C1602/C1602M-06 - Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
- H. ACI 301-05 - Standard Specifications for Structural Concrete
- I. ACI 350.1-01/350.1R-01 - Tightness Testing of Environmental Engineering Concrete Structures

### **1.07 SUBMITTALS**

- A. The Contractor shall be responsible for the submittals for review and acceptance by the Resident Engineer at no additional cost to the Owner. Submittals shall include Independent Testing Service's qualifications, all testing reports, etc.
- B. Qualifications, experience, and certifications of each proposed Independent Testing Service.
- C. Certificates of calibration for testing equipment (if requested).
- D. Independent Testing Service will submit one copy each of all test reports to each of the following: Resident Engineer, Engineer, Owner, Contractor and concrete supplier.
- E. Independent Testing Service will submit reports within 5 days of testing or inspection.
- F. Independent Testing Service will telephone the Resident Engineer within 24 hours if tests indicate deficiencies.

### **1.06 QUALITY ASSURANCE**

- A. The responsibility of the Resident Engineer includes the inspection of the test results provided by the Independent Testing Service for compliance with project specifications. Tests shall be conducted by the Contractor's Independent Testing Service as required below.
- B. The Contractor shall be required to engage, at his own expense, a qualified Independent Testing Service to perform all required quality control tests. The Independent Testing Service is subject to approval by the Owner and Engineer.
- C. The Independent Testing Service shall have the following general qualifications:
  - 1. Minimum of five years as a firm with the type of testing specified herein.



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2. Ability to provide timely field testing services to minimize the impact of the testing requirements on construction progress.
3. Certification to perform the specified services in the State of New Hampshire.
- D. Testing services proposed by the Contractor shall be subject to review by the Owner and Engineer. Any testing firm not acceptable to the Owner or Engineer will be rejected.
- E. All testing agencies and laboratories must meet the requirements of ASTM E329.
- F. Independent Testing Service shall have been in business for a minimum of the last 5 years providing applicable testing services.
- G. Testing equipment shall be calibrated at maximum 12-month intervals by devices of accuracy traceable to National Bureau of Standards. Submit copy of certificate of calibration made by accredited calibration agency.
- H. Testing shall be in accordance with applicable codes and regulations referenced in individual Specification Sections, and with selected standards of the American Society for Testing and Materials.
- I. Key personnel for the Independent Testing Service must be qualified and experienced in concrete quality assurance.
- J. Perform concrete field quality control testing with personnel certified as an ACI Concrete Field Testing Technician, Grade 1 according to the American Concrete Institute (ACI).
- K. Perform reinforcing steel quality control inspection with personnel certified as an ACI Concrete Special Inspector, according to the American Concrete Institute (ACI).

## **PART 2 - PRODUCTS**

This Section Not Used

## **PART 3 - EXECUTION**

### **3.01 CAST-IN-PLACE CONCRETE**

- A. The Contractor shall notify the Independent Testing Service of proposed upcoming concrete placements as follows.
  1. The Contractor shall notify the Independent Testing Service of proposed concrete placements on a weekly basis.
  2. The Contractor shall notify the Independent Testing Service of specific placements a minimum of 24 hours in advance.
- B. Obtain one composite sample for each day's pour of each concrete mix exceeding 5 CY, but less than 25 CY, plus one set for each additional 50 CY or fraction thereof. Measurements shall be taken not less than once per day. Each composite sample shall consist of six (6) standard test cylinder samples (6" x 12").

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- C. Perform compressive strength tests per ASTM C39; Test 2 cylinders at 7 days; 2 cylinders at 28 days. Hold one cylinder for later testing. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated. One average for lab cured specimens and a separate average for field cured specimens. Two remaining cylinders shall be retained until notified by the Owner of approval for disposal.
- D. Perform one slump test at the point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change. If applicable, perform slump and air entrainment tests before addition of High Range Water Reducer (when the high range water reducer is added on site) and slump and air entrainment tests after addition of High Range Water Reducer (all concrete).
- E. Perform one air content test for each composite sample, but not less than one test for each day's pour of each concrete mix. Air content test shall be per ASTM C231, pressure method, for normal-weight concrete, and per ASTM C173, volumetric method, for structural lightweight concrete.
- F. Sample concrete for testing of air and slump at the discharge end of the truck. When concrete is pumped, concrete taken for test cylinders shall be at the discharge end of the pump hose. **All concrete sampled for testing shall be taken from the beginning of the concrete truck discharge. No concrete shall be placed until the testing is complete. All concrete sampled for casting of cylinders shall be taken from the middle third of the concrete truck discharge.**
- G. Perform Concrete Temperature testing per ASTM C1064; one test hourly when air temperature is 40° F and below and when 80° F and above, and one test for each composite sample.
- H. Perform Unit Weight testing per ASTM C567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
- I. Perform strength, slump and air entrainment tests at other times when directed by the Resident Engineer.
- J. Additional testing and sampling required as a result of deficient results or improper curing shall be paid for by the Contractor.
- K. Contractor shall provide and maintain an insulated, heated concrete cylinder curing box, 4 foot square minimum, with a min.-max. thermometer and maintain the temperature between 60°F and 80°F. Contractor to coordinate the location and specific details of the curing box with the Resident Engineer and Independent Testing Service and Resident Engineer.
- L. Contractor shall provide access to the site at all times for the Independent Testing Service Personnel.

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- M. Test results shall be reported in writing to the Owner, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

### 3.02 ADDITIONAL TESTS

- A. Independent Testing Service shall provide additional testing of in-place concrete as directed by Resident Engineer due to non-compliance or considered substandard. Additional tests may consist of non-destructive testing, cores drilled from the area in question or load tests. Costs of additional testing will be paid by the Contractor.
- B. When the concrete strength is substandard as defined in Specification 03300 Section 3.06 paragraph A, concrete core specimens shall be obtained and tested from the affected area.
  - 1. Three (3) cores shall be taken for each sample in which the strength requirements were not met. The drilled cores shall be obtained and tested in conformance with ASTM C 42 “Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete”.
- C. Field cured cylinders may be cast and tested by the Independent Testing Service at the request of the Contractor. The costs of these tests shall be borne by the Contractor. If the field cured cylinders are cast and tested prior to 28-days to determine the in-place concrete strength in order to facilitate an accelerated schedule for subsequent concrete placements, or backfilling the following criteria must be met:
  - 1. The Contractor shall notify the Resident Engineer and Independent Testing Service 48 hours in advance of the concrete placement. The Resident Engineer will determine at that point if the results of the field cured cylinders may be used to determine the in-place concrete strength. The Contractor shall notify the Resident Engineer as to when the field cured cylinders will be tested and for what purpose.
  - 2. A minimum of 2 cylinders shall be cast for each separate test the Contractor requests. A test consisting of at least two cylinders will be required to be considered valid.
  - 3. The field cured cylinders shall be left in the field and located such that they are exposed to the identical environmental conditions as the concrete structure. The cylinders shall remain at this location a minimum of 14 days prior to testing.
  - 4. The Resident Engineer shall determine if the strengths indicated by the field cured cylinder tests are adequate for their intended purpose.
- D. The Resident Engineer or Contractor shall reject concrete delivered without a complete concrete delivery batch ticket as specified. Copies of the signed batch ticket will be furnished by the concrete supplier to the Contractor and the Resident Engineer. The Resident Engineer and Contractor shall inspect the concrete transit truck’s barrel revolution counter and gauge for measuring water added to the concrete. The Resident Engineer or Contractor shall reject concrete which exceeds the maximum barrel revolution of 300 or which has had water added during transit. The Resident Engineer or Contractor shall reject concrete exceeding specified time limitations. Concrete not conforming to these

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Specifications shall be rejected by the Contractor or the Resident Engineer before discharging into the forms.

### **E. Load Testing**

Should the compression test of the cores taken from the structure fail to be in compliance with these Specifications, the Contractor will be directed by the Owner to conduct a load test of the structure in conformance with ACI 318 under the direction of the Contractor's laboratory testing firm. Should the load test fail, the structure shall be removed from the site and replaced. All tests associated with the load testing and removal and replacement of the structure will be by the Contractor, at no cost to the Owner.

## **3.03 REINFORCING STEEL INSPECTION**

- A. Contractor shall notify the Independent Testing Service and Resident Engineer when the reinforcing steel is complete and ready for inspection, at least 48 hours prior to the proposed concrete placement. Do not cover reinforcing steel with concrete until the installation of the reinforcement, including the size, spacing and position of the reinforcement has been inspected by the Independent Testing Service and by the Resident Engineer. Upon certification of correct installation of the reinforcing steel by the Independent Testing Service and approval by the Resident Engineer, the Contractor may proceed with placement of concrete. Keep forms open until the Independent Testing Service and the Resident Engineer has completed inspection.

## **PART 4 - MEASUREMENT AND PAYMENT**

No measurement shall be made of any work performed under this section. No separate payment shall be made for any work performed under this section. The cost of any work done or facilities provided under this section is incidental to the work shall be included under other pay items within the Contract.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 03346  
CONCRETE FINISHING, CURING, AND REPAIRS**

**PART 1 - GENERAL**

1.01     DESCRIPTION

- A.     This Section describes requirements for finishing, curing, and repairing cast-in-place cement concrete at the site.
- B.     The intent of the work of this Section is to provide concrete which is durable, neat, and visually appropriate. Concrete shall be cured so as to provide the required final material strength and durability properties of the concrete. Concrete surfaces shall be finished so as to provide durable surfaces which are neat and trim and textured as appropriate for their locations.
- C.     Concrete repairs shall be performed as necessary by the Contractor in all cases where concrete is judged by the Owner to be either materially or visually deficient.

1.02     SCOPE OF WORK

- A.     The Scope of Work under this Section shall include all work, labor, materials, equipment, and other effort and expenses necessary to finish and cure concrete as described below, as required under standard ACI guidance, and as directed by the Owner.
- B.     The Scope of Work under this Section shall include all work, labor, materials, equipment, and other effort and expenses necessary to repair concrete judged to be deficient by the Owner. Repairs shall be implemented as described below, as required under standard ACI guidance, and as directed by the Owner.

1.03     SECTION INCLUDES

- A.     Concrete Curing
- B.     Concrete Finishing
- C.     Concrete Repairs

1.04     RELATED SECTION

- A.     Section 01300 - Submittals
- B.     Section 03300 - Cast-in-Place Concrete
- C.     Section 03305 - Concrete Testing

1.05     REFERENCES

- A.     ACI 301-05 - Standard Specifications for Structural Concrete

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- B. ACI 302.1R-04 - Guide for Concrete Floor and Slab Construction
- C. ACI 305R-99 - Hot Weather Concreting
- D. ACI 306.1-90 - Standard Specification for Cold Weather Concreting
- E. ACI 308R-01 - Guide to Curing Concrete
- F. ACI 350-06 - Code Requirements Environmental Engineering Concrete Structures
- G. ASTM C309-07 - Specification for Liquid Membrane - Forming Compounds for Curing Concrete
- H. ASTM C1602/C1602M-06 - Specification for Mixing Water Used in the Production of Hydraulic Cement Production

### **1.06 SUBMITTALS**

- A. Submit product data and material safety data sheets for curing compounds, floor sealers and hardeners, and repair materials.
- B. Submit procedures prior to concrete placements for cold weather protection, hot weather protection and curing methods.
- C. Submit qualifications of flatwork finisher.

### **1.07 SAMPLES**

- A. For each type of wall finish used on the project, the first 100 square feet of finished area shall be observed by the Resident Engineer for acceptance. Sample areas shall be provided until no exceptions are taken with the wall finish. The accepted sample area shall serve as a guide for the remainder of the project.

### **1.08 ENVIRONMENTAL CONDITIONS**

- A. Environmental Conditions are defined as follows:
  - 1. Cold Weather - When temperature conditions during the concrete placement or during the 7-day curing period following the placement will fall below 40°F.
  - 2. Hot Weather - When temperature conditions during the concrete placement or during the 7-day curing period following the placement will rise above 90°F.

### **1.09 QUALITY ASSURANCE**

- A. All curing, finishing and repair materials shall meet all Federal and State regulations pertaining to Volatile Organic Compounds (VOC) Compliance.
- B. Contractor performing flatwork finishing of concrete slabs shall provide at least one (1) flatwork finisher certified as an ACI Concrete Flatwork finisher.

## **PART 2 - PRODUCTS**

### **2.01     CURING MATERIALS**

- A.     Curing and Sealing Compound; ASTM C309 Type 1 Class B. Application rate 200 square feet per gallon. Super Kurseal 25 by A.H. Harris & Sons, Inc. Emulsion Kurseal 309 by A.H. Harris & Sons, Inc. or equivalent.
- B.     Dissipating Resin Curing Compound: ASTM C1315 type 1; Film must break down in two to four weeks. Application rate 200 square feet per gallon. Kurez-DR by Euclid Chemical Company, KonKure Clear Emulsion by A.H. Harris & Sons, Inc., or equivalent.
- C.     Curing/Hardening Compound: Sodium Silicate Type. Application rate 200 square feet per gallon. Eucosil by Euclid Chemical Company, Super KurHard by A.H. Harris & Sons, Inc., or equivalent.
- D.     Curing, Sealing and Hardening Compound: Ashford Formula by Curecrete. Application Rate 200 square feet per gallon.
- E.     Curing Water: Water shall be potable from a municipal water supply or shall meet the requirements of ASTM C1602, and shall be free of materials that have the potential to stain concrete. Water from the Lamprey River either upstream or downstream of the dam shall not be used. The temperature of the curing water shall not be lower than 20°F cooler than the surface temperature of the concrete at the time the water and concrete come in contact.

### **2.02     FINISHING MATERIALS**

- A.     Slab Sealer: Siloxane based 96% chloride ion screen, Euco-Guard-100 by Euclid Chemical, SikaGard 701W by Sika Corporation or equivalent. Do not apply to surfaces cured with curing compounds, except for that specified in paragraph 2.1.B.
- B.     Bonding Admixture: Latex, non-rewettable type SBR Latex or Flex-con by Euclid Chemical, Daraweld C by W.R. Grace or equivalent.
- C.     Grout Paint: mix 1 part Portland Cement, 1.5 part fine sand, 50:50 mixture of bonding admixture to consistency of thick paint.
- D.     Patching Mortar: 1 part of a mixture of white and grey Portland Cement to 2.5 parts of damp loose sand. Cement type to match substrate.

### **2.03     REPAIR MATERIALS**

- A.     Epoxy Adhesive: Arimatec 110 by Sika Corporation, Corr-Bond by Euclid Chemical Company or equivalent.
- B.     Repair Mortar: polymer improved, cementitious, 2 component, trowel grade mortar equal to Concrete Coat by Euclid Chemical; Sikatop 122 Plus by Sika Corp. or equivalent.

## **PART 3 - EXECUTION**

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### 3.01 FINISHES

- A. Repair all holes and defects and allow to set prior to finishing concrete.
- B. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete.
- C. Finish concrete surfaces as scheduled.

### 3.02 FINISHING SLABS AND FLATWORK

- A. Screed to bring concrete surface to proper contour and elevation.
- B. Highway straightedge, bull float or darby float the concrete surface immediately after screeding.
- C. Allow bleed water to evaporate or remove.
- D. (STF) Steel Troweled Finish: Float the surface with magnesium or cast aluminum float or with a power finishing machine. Steel trowel surface immediately after floating to produce smooth surface. Steel trowel again after concrete has hardened enough so that mortar does not adhere to trowel edge. Ringing sound should be apparent when performing second troweling due to tilted, compacting motion.
- E. (WFF) Wood Float Finish: allow concrete to stiffen; float surface twice or more to a uniform sandy texture.
- F. (LBF) Light Broom Finish: wood float finish as in E above; while plastic draw a soft-bristled broom, over the concrete in long even strokes with downward pressure. Broom transverse to traffic or at right angles to the slope of the slab.
- G. Finish to receive concrete fill: do not bull float; remove water scum, laitance and loose aggregate from surface after concrete has started to harden with stiff bristle brush to partially expose coarse aggregate. Clean surface with brooms, water jets or air jets. Maintain wet for 12 hours immediately before placing fill concrete. As fill concrete is placed and just ahead of placement, broom in grout paint to the damp concrete surface. Do not allow grout paint to set prior to placement of concrete fill.
- H. Flatness and Levelness: All concrete slabs with a steel trowel finish shall be finished to achieve the following "Face Floor Profile Numbers" for composite flatness ( $F_F$ ) and composite levelness ( $F_L$ ) in accordance with Section 8.15 of ACI 302.1:
  - 1. Specified Overall Value:  $F_F$  20/ $F_L$  15.
  - 2. Minimum Local Value:  $F_F$  15/ $F_L$  10.

### 3.03 FINISHING VERTICAL SURFACES

- A. (RFF) Rough Form Finish: Repair structural defects only and patch tie holes as specified in the paragraph titled "STRUCTURAL DEFECTS" in this Section. Fins exceeding 1/4 in. in height to be removed by grinding and/or rubbing.



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- B. (SFF) Smooth Form Finish: The concrete surface shall be of uniform color, texture and free of all irregularities. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to the minimum. Material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used. Remove fins flush by grinding and/or rubbing. Repair surface and structural defects as specified in the paragraphs titled “SURFACE DEFECTS” and “STRUCTURAL DEFECTS” in this Section.

### 3.04 MISCELLANEOUS CONCRETE SURFACE

- A. Curbs: Provide monolithic finish to curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations chamfered.

### 3.05 SLAB SEALER

- A. Cure concrete for 30 days.
- B. Clean surface of oil, grease, dirt, and foreign materials as recommended by the manufacturer.
- C. Apply when slab temperature is between 40°F and 80°F.
- D. Apply in strict conformance to manufacturers' recommendations.
- E. Maximum coverage: 125 square feet per gallon.

### 3.06 CURING

- A. Curing: Curing shall begin immediately following the initial set of concrete or after slab surface finishing has been completed and shall continue after form removal. All concrete shall be cured to attain strength and durability by one of the following methods for a minimum of seven days after placement regardless of the ambient air temperature: See Schedule of Finishes and Curing Requirements in this Section:
  - 1. Moist Cure
    - a. Ponding or continuous sprinkling. Intermittent wetting and drying is not an acceptable curing method.
    - b. Application of absorptive mats of fabric kept continuously wet.
  - 2. Application of concrete curing compounds. If applying slab sealing compounds, use dissipating resin curing compound. Allow dissipating resin curing compound to chemically break-down, and remove residuals and other foreign material, prior to applying slab sealing compound.
- B. Moisture loss from surfaces placed against wooden or metal forms exposed to heating by the sun shall be minimized by keeping the forms wet until they can be safely removed. After form removal, the concrete shall be cured by one of the methods described above, for the balance of time remaining as specified above.

C. Cold Weather:

Cold weather is defined as any time during the concrete placement or curing period the ambient temperature at the work site drops below 40°F or when the temperature may reasonable be expected to drop below 35°F within 24 hours. **Concrete shall not be placed during cold weather, except with written approval by the Owner, which will not be granted until satisfactory provisions have been made to protect the work.** Cold weather concreting shall conform to ACI 306R. Any concrete placed during cold weather shall be placed at the Contractor's risk and any damage or unsatisfactory concrete shall be removed and replaced at the Contractor's expense. When cold weather is reasonably expected or has occurred within 7 days of anticipated concrete placement, the Contractor shall submit detailed procedures for the production, transporting, placing, protecting, curing, and temperature monitoring of concrete during cold weather. All material and equipment required for cold weather placement and curing protection shall be available at the project site before commencing concrete placement. All snow, ice, and frost shall be removed from the surfaces, including reinforcement and subgrade, against which the concrete is to be placed. The temperature of any surface that will come into contact with fresh concrete shall be at least 35°F and shall be maintained at a temperature of 35°F or above during the placement of concrete.

The minimum concrete surface temperature requirements indicated in the Table below shall be continuously maintained for a curing period of at least 7 days. The 7-day minimum curing period of time will be extended when necessary to develop satisfactory strength in the concrete. Any day during which the minimum concrete surface temperature requirement is not continuously maintained shall not count as a day contributing to the curing period.

Cold Weather Concrete Surface Temperature Requirements				
	Minimum Section Size Dimension			
	Under 1 foot	1-3 feet	Over 3 ft. up to 6 ft	Over 6 feet
Minimum temperature of concrete during curing period	14°C (57°F)	12°C (54°F)	10°C (50°F)	10°C (50°F)
Maximum allowable temperature drop in any 24-hour period after end of curing	28°C (50°F)	22°C (40°F)	16°C (30°F)	11°C (20°F)

As much as possible, any enclosure for protection shall be in place before depositing of any concrete and the remainder shall be installed as rapidly as possible in order to reduce heat losses to a minimum. Heating within the enclosure shall be attained by such means of artificial heat as will maintain the temperatures specified continuously and with a reasonable degree of uniformity in all parts of the enclosures. All exposed surfaces of concrete within the enclosure shall be kept sufficiently moist to prevent any drying of the surface concrete with possible resulting damage to the concrete in place. Heating appliances shall not be placed in such a manner as to endanger the enclosure, forms or supports, or expose any area of concrete to drying out or other injury due to excessive temperatures.

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### D. Hot Weather:

Concrete construction during hot weather shall, unless otherwise indicated, conform to ACI 305. During hot dry weather, and as directed, all new concrete shall be kept shaded from the sun, shielded from the wind and kept wet with water, or protected by other approved methods to retain the moisture in the concrete throughout the curing period. During concrete placement operations in hot weather, appropriate measures shall be taken to reduce the hazards of increased rate of cement hydration, flash set, loss of water due to evaporation, high concrete ingredient temperatures, and the increased difficulty of concrete placing and finishing. The following requirements shall be met during concrete placement operations in hot weather:

1. Concrete Temperature: The temperature of the concrete at the point of discharge shall not exceed 26.7°C (80°F). Concrete shall not be placed when the internal temperature of the concrete is 80°F or above.
2. Cooling Materials: The Contractor may reduce the temperature of the concrete by cooling one or more of several ingredients. The aggregates may be cooled by fogging, or other suitable means that will not result in a high variation of moisture content within the stockpile. Chipped or crushed ice may be used in the mix as a portion of the mixing water on a pound for pound basis, provided such measure is determined at the time it is placed in the mix. If used, all ice shall be melted before the batch is discharged from the mixing unit. Ice shall be added with the approval of and/or as directed by the Owner. Water may also be cooled by refrigeration or other means that provide a uniform mixing water temperature.
3. Concrete Placing: Immediately before the concrete is placed, the forms and reinforcement steel shall be cooled by spraying with water. In no case shall there be any standing water in the concrete forms as a result of the spraying procedures. The Contractor shall have sufficient skilled men and adequate equipment to place the concrete without delays which may cause excessive slump loss and evaporation due to over-mixing or exposure before it is placed.

Conform to ACI 305R when concreting during hot weather. Alternatively, when concrete temperatures exceed 80°F, a set retarding admixture conforming to ASTM C494 type B or D may be added to the concrete mix as directed by the Owner.

4. Finishing: To prevent shrinkage cracking resulting from moisture loss, the Contractor may be required to furnish windscreens, to use water fogging, or other approved means of supplying moisture. If the use of windscreens is required, the windscreens shall consist of canvas barriers of suitable height erected on the windward side of the concrete placement. Finishing operations shall follow as closely as practicable behind the placing operation so that curing may begin as soon as possible.

### 3.07 SCHEDULE OF FINISHES AND CURING REQUIREMENTS

- A. Provide finishes on concrete surfaces according to the following schedule:

SCHEDULE OF FINISHES AND CURING REQUIREMENTS		
Location	Finish	Curing Requirements
Training Walls, Retaining Walls, All exterior vertical faces	SFF	Moist Cure
Vertical faces below grade in contact with backfill	RFF	Moist Cure
All horizontal faces and surfaces	STF	Moist Cure

**NOTES:**

1. When two (2) coats of materials are required as indicated above, second coat shall be applied perpendicular to the first coat.

**3.08 SURFACE DEFECTS**

- A. As soon as the forms have been stripped and the concrete surfaces exposed, allow the Resident Engineer to inspect concrete surfaces. Excessive honeycombing is not considered acceptable. If approved by the Resident Engineer, repair all surface defects. Surface defects include all form tie holes, minor honeycombed areas and surface blemishes including air voids and bug holes with a nominal diameter or depth greater than ¼ inch, visible construction joints, fins, burs and other defects. All concrete repair work shall result in a concrete surface of uniform color and texture, and shall be free of all irregularities. Honeycombed and/or rat holes larger than 50 cubic inches are considered a structural defect.
- B. Cut out and remove honeycombed areas and rock pockets down to solid concrete, but in no case to a depth less than 1 inch, by means of hand chisels or pneumatic chipping hammers. Saw cut the edges perpendicular to the surface. No feather-edges shall be allowed.
- C. Remove all loose aggregate paste and debris and scrub clean; thoroughly wet area to be repaired; brush and scrub grout paint into the substrate of the area to be repaired.
- D. Apply a stiff consistency of patching mortar to the area with a trowel; apply prior to the set of grout paint (but after it has cast its water sheen): leave patched surface slightly higher than surrounding surface; do not finish for 1 hour minimum. Cure in same manner as adjacent concrete.
- E. Mix patching mortar using as little water as possible; allow to stand with frequent manipulation of trowel to achieve stiffest consistency; blend white and gray Portland cement to achieve color match with surrounding concrete.
- F. Form Tie Holes: After cleaned and thoroughly dampened, apply grout paint and fill tie holes solid with patching mortar.
- G. Finished Flatwork exceeding specified tolerances:

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1. High areas shall be repaired by grinding after the concrete has cured 14 days.
2. Low areas shall be repaired by cutting out low areas and replaced with concrete. Finish repair area to match adjacent concrete.

### 3.09 STRUCTURAL DEFECTS

- A. Remove and replace or repair all structural defects. Structural defects include honeycombed areas and/or rat holes greater than 50 cubic inches, areas which cracking, spalling or other signs of deterioration are present or develop during the initial curing or thereafter until accepted by the Resident Engineer. The Contractor shall propose a specific repair method, suitable for the situation, and the Resident Engineer will review the method prior to the repair.
- B. Cut out and remove defective concrete, honeycombed areas and rock pockets to sound concrete by means of hand chisels or pneumatic chipping hammers. Saw cut 1 inch minimum the edges perpendicular to the surfaces. If honeycomb exists around reinforcement, chip to provide a clear space at least 1 inch wide all around the reinforcement. Moisten surfaces and allow to dry until damp. Apply bonding agent. Apply a polymer-modified cement with 3/8-inch coarse aggregate. Cure as required by manufacturer.
- C. Random Cracks:
  1. Random shrinkage or structural cracks shall be repaired utilizing a low viscosity, 100% solids, two (2) component epoxy resin system. Remove all dust, debris or disintegrated material from crack or void by use of oil-free compressed air or vacuuming.
  2. Crack or void must be dry at time of application. Cracks saturated with oil or grease must be chipped out to unsaturated concrete. "Vee" out cracks in horizontal surfaces slightly.
  3. Where cracks extend through members and are accessible, seal bottom of crack which is to receive the epoxy. Apply epoxy in strict accordance with manufacturer's recommendations.
  4. Patching of vertical wall or overhead cracks shall be accomplished in the same manner using a similar epoxy material of higher viscosity as recommended by the manufacturer.
  5. Materials shall be as indicated in Part F below.
- D. Excessive Cracking:
  1. Floor slabs containing an excessive amount of cracks as defined herein, and which will remain exposed, shall receive an epoxy mortar topping after sealing of cracks in accordance with the above paragraph.
  2. Excessive cracking shall be defined as areas containing cracks averaging 1/64<sup>th</sup>-inch wide or greater, and in excess of 15 linear feet of cracks per 100 square feet of slab. In the event that excessive cracking occurs in isolated areas of a given floor, topping will only be required in the area of the cracks bounded by construction, expansion, or control joints.

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3. Materials shall be as indicated in Part F below.

E. Spalls:

1. All weakened, damaged or disintegrated concrete shall be removed to sound concrete. For defective areas involving only the surface and/or the finish of the concrete, refer to the paragraph titles “SURFACE DEFECTS” in this Section.
2. For spalled areas involving depths generally in excess of three (3) inches, utilize 3/8-inch peastone in the repair material.
4. Materials shall be as indicated in Part F below.

F. Repair Materials:

1. Repair materials shall be as indicated in the table below:

REPAIR MATERIALS			
Company	Random Cracks	Excessive Cracking	Spalls
Sika	Sidadur 35 Hi-Mod LV	SikaTop 121 Plus	SikaTop 121 Plus
L&M	Epoflex SL	Durathin Patch	Duracrete
Euco	Euco 8000	Concrete Coat	Eucocrete

NOTES:

1. All repair materials shall be installed in accordance with the manufacturer's recommendations.
2. All cracks that are wet (either damp or leaking) at the time of repair shall be repaired with a material that is specifically intended for wet repair as recommended by the manufacturer.
3. All spall repair material shall be bonded to the concrete with an epoxy adhesive material.
4. All repair materials in contact with potable water shall be NSF Standard 61 approved.

### 3.10 PROTECTION

- A. Protect concrete from high and low temperatures for seven days.
- B. Protect against vibration until concrete has attained 33% of its 28-day strength. Do not blast ledge within 100 feet of freshly placed concrete until concrete has attained 33% of its 28-day strength.
- C. Protect against premature loads until the 28-day strength has been attained.

**PART 4 - MEASUREMENT AND PAYMENT**

No measurement shall be made of any work performed under this section. No separate payment shall be made for any work performed under this section. The cost of any work done or facilities provided under this section is incidental to the work shall be included under other pay items within the Contract.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 03605  
PRECAST CONCRETE VAULT**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment, and incidentals required to procure and install the precast concrete vault, hatch cover, frame and lock, an interior lighting system, sump and pump, heater and vent fan, all necessary electrical panels and meters, and all associated appurtenances as shown in Contract Drawings and as specified herein.

**1.02 RELATED WORK**

The following is a list of related work items that shall be performed or furnished under other Sections of these Specifications as indicated.

- A. Earthwork – Section 02200
- B. Pneumatic Gate and Appurtenances – Section 11000
- C. General Electrical – Section 16000

**1.02 SUBMITALLS**

- A. Submit to the Engineer, in accordance with Section 01300, shop drawings, product data, materials and details of construction, reinforcing and joints. Submittals shall include at least the following:
  - 1. Shop drawings shall be fully dimensioned and show reinforcing details, joint details, loads, pertinent design calculations, and lifting and erection inserts. Shop drawings shall also include the precast manufacturer's handling, assembly, and installation directions and recommendations.
  - 2. All precast structures shall be designed by a registered Professional Engineer in the State of New Hampshire and each drawing for design shall be stamped and signed by the Professional Engineer.
  - 3. Concrete design mix.
  - 4. Pipe connections and penetrations to vaults.
  - 5. Vault hatch frame and cover with notarized certificate indicating compliance with the specified ASTM standard and Class designation.
  - 6. Method of repair for minor damage to precast concrete sections.
- B. Submit to the Engineer copies of cylinder break reports by an approved commercial test laboratory, made from each casting for this Project to verify the concrete has attained minimum strength specified.

**1.04 REFERENCE STANDARDS**

- A. ASTM A185 – Standard Specification for Steel Welded Fabric, Plain, for Reinforcement



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- B. ASTM A615 – Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement
- C. ASTM A185 – Standard Specification for Steel Welded Fabric, Plain, for Reinforcement
- D. ASTM C33 – Standard Specification for Concrete Aggregates
- E. ASTM C857 – Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
- F. ASTM C858 – Standard Specification for Underground Precast Concrete Utility Structures
- G. ASTM C877 – Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
- H. ASTM C891 – Practice for Installation of Underground Precast Concrete Utility Structures
- I. ASTM C990 – Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
- J. ASTM C1244 – Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
- K. ASTM C1677 – Standard Specification for Joints for Concrete Box, Using Rubber Gaskets

### **1.05 QUALITY ASSURANCE**

- A. All material shall be new and unused.
- B. Manufacturer and Contractor shall have a minimum of 5 years of experience providing, installing, and finishing precast structures of similar size and complexity.
- C. The materials' quality, manufacturing process, and finished sections are subject to inspection and acceptance by the Owner, the Resident Engineer, and the Engineer. Inspection may be made at place of manufacture, at work site following delivery, or both.
- D. Materials will be examined for compliance with ASTM standards, this Section, and approved manufacturer's drawings. Additional inspection criteria shall include appearance, dimensions, blisters, cracks and soundness.
- E. Repair minor damage to precast concrete sections by approved method, if repair is authorized by Owner and/or the Resident Engineer. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.

### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Precast concrete vault shall not be transported until concrete has cured to a minimum of 80 percent of design strength.

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- B. Store precast concrete vault off ground on wood blocks, pallets, or other appropriate means away from brush, and in an area accessible for inspection.
- C. Unload and handle precast concrete vault with crane, backhoe, or equipment of adequate capacity, equipped with appropriate slings and lifting devices to protect material from being damaged.

## **PART 2 – PRODUCTS**

### **2.01 GENERAL**

- A. Reference to a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. Like items of materials/equipment shall be the end products of one manufacturer in order to provide standardization for appearance, operation, maintenance, spare parts and manufacturer's service.
- C. Provide lifting lugs or holes in each precast section for proper handling.
- D. Reinforced concrete materials shall generally follow Section 03300. Cement shall conform to ASTM C150, Type II or Type I/II cement or equal.
- E. Mark date of manufacture, name and trademark of manufacturer on the inside of each precast section.

### **2.01 PRECAST CONCRETE VAULT SECTIONS**

- A. Precast concrete vault sections shall conform to ASTM C858 – Specification for Underground Precast Concrete Utility Structures.
- B. Precast concrete vault sections shall have a one pour monolithic reinforced concrete base section and shall have a keyway type joint between other precast sections.
- C. Joint between precast concrete section shall be sealed as recommended by manufacturer and shall be watertight upon completion of joint and shall conform to requirements of ASTM C990 for flexible joint sealants or ASTM C1677 for profile rubber gaskets.
- D. Provide and install water-tight joint treatment conforming to the requirements of ASTM C877.
- E. Provide integrally cast knock-out panels in precast concrete manhole sections at locations and sizes to be coordinated with Pneumatic Gate Drawings and Specifications. Knock-out panels shall have no steel reinforcing.
- F. An OSHA-approved ladder shall be provided for the precast concrete vault section. Holes for ladder rungs shall be made during casting of the concrete section. Drilling of holes for manhole rungs may be used to accommodate field conditions when approved by the Engineer.
- G. Provide a sump assembly along the floor to drain water with the size and location to be coordinated with the Pneumatic Gate manufacturer. The vault floor shall be sloped to drain toward the sump. A minimum 1.5-inch sump pump shall be provided to drain sump. Provide

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drainage through integrally cast sleeve or knock-out panel and location shall be coordinated with manufacturer and Pneumatic Gate manufacturer.

- G. Provide an Interior Lighting System which shall consist of two (2) industrial-grade light fixtures attached to the inside wall within the vault with a light switch accessible from the hatch. Interior Lighting System shall be coordinated with other utilities within the vault and with the gate manufacturer.
- H. If required by the gate manufacturer, provide a heating system for the vault. Heating system shall be coordinated with the gate manufacturer.
- I. Acceptable manufacturers:
  - 1. Oldcastle Infrastructure; 41 Almeida Road, Rehoboth, MA 02769; Tel: (508) 336-7600; Website: <https://oldcastleinfrastructure.com/>
  - 2. Shea Concrete Products; 160 Old Turnpike Road, Nottingham, NH 03290; Tel: (603) 942-5668; Website: <https://sheaconcrete.com/>
  - 3. Or approved equivalent.

### 2.01 VAULT FRAME AND COVER

- A. Vault frame and covers shall be waterproof, of good quality, strong, tough, free from defects of any kind which render them unfit for the service for which they are intended. Connection of frame and cover to concrete vault shall be as per manufacturer's recommendations.
- B. Vault frame and cover shall be waterproof and constructed with a lockable double leaf steel channel frame and shall be Bilco Type JD or approved equivalent.
- C. A lock shall be provided for the vault cover.

### 2.01 PIPE CONNECTION TO VAULT

- A. Pipe connections shall be permanent and watertight. Connect pipes or conduits to vault in the following ways:
  - 1. Flexible sleeve – Integrally cast sleeve in precast concrete vault section or install sleeve in a formed or cored opening. Fasten pipe in sleeve with a stainless-steel clamp(s). Coat stainless steel clamp(s) with bituminous or asphaltic damp proofing material to protect from corrosion. Flexible sleeve shall be Kor-N-Seal connector; PRX Press-Seal Gasket or approved equivalent.
  - 2. Compression gasket – Integrally cast compression gasket in precast concrete vault section. Insert pipe into compression gasket. Compression gasket shall be A-Lok or approved equivalent.
  - 3. Modular sealing sleeve – Install modular, elastomer sealing system. Insert pipe through wall penetrating sleeve. Modular sealing sleeve shall be Link Seal or approved equivalent.
  - 3. At the discretion of the Resident Engineer, the following procedure may be allowed:

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Grout in place – Precast concrete vault section shall have a formed, tapered circular opening larger than the pipe outside diameter. Grout shall be non-shrink and waterproof equal to Hallemite, Waterplug, or Embeco. Plastic pipe shall have a waterstop gasket secured to pipe with a stainless-steel clamp prior to grouting.

### **2.01 WATERPROOFING**

- A. Two coats of bituminous waterproofing material shall be applied to the below-grade exterior surfaces of the precast concrete vault by brush or spray and in accordance with the manufacturer's recommendations. Waterproofing shall be Hydrocide 648 by Sonneborn Building Products; Dehydratine 4 by A.C. Horn Inc.; RIW Marine Liquefy by Toch Brothers or an approved equivalent.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Precast concrete vault structures shall be constructed to the dimensions shown on the Contract Drawings, specified herein, and coordinated with the Pneumatic Gate Drawings and Specifications.
- B. The Work for the precast concrete vault structure contained herein shall be coordinated with the support of excavation protocols provided in Section 02200 – Earthwork. The precast concrete vault base section will be placed in accordance the Drawing **S-10** and **S-11**, details and notes thereon.
- C. Precast concrete vault structure shall be free from visible leakage. The structure shall be tested for leaks and inspected, and all leaks shall be repaired in a manner subject to the Engineer's approval.
- D. Allow joints to set for 14 hours before backfilling unless the Engineer specifically approves a shorter period.
- E. Plug holes in the concrete sections required for handling with a non-shrinking grout or non-shrinking grout in combination with concrete plugs. Finish flush on the inside.
- F. Penetrations should be pre-formed into vault. Cut or core holes in precast concrete vault sections to accommodate pipes and conduits prior to setting the section in place to prevent jarring which may loosen the mortar joints.
- G. Construct precast concrete vault pipe connections, including pipe stubs, as specified herein. Close or seal pipe stubs for future connections with a gasketed watertight plug.
- H. Paint outer surface of precast concrete vault with two coats of bituminous waterproofing in accordance with the manufacturer's instructions.
- I. The precast concrete vault shall be tested to ensure water tightness prior to backfilling and testing shall be in accordance with ASTM C1244

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- J. Backfill carefully and evenly around the precast concrete vault structure and in accordance with Section 02200 and the Contract Drawings.

### **3.02 INSTALLATION OF INTERIOR LIGHTING SYSTEM**

- A. Coordinate final location of interior light system within the subsurface gate operations vault with the Pneumatic Gate manufacturer and the Owner prior to installation.
- B. Interior Lighting System shall be affixed to the interior wall of the subsurface gate operations vault and a switch shall be provided and installed which shall be easily accessible to the entrance hatch.
- C. Provide electrical supply to fixtures under separate Sections of the Work. Supply to subsurface vault must be via underground conduit. Final connection may be via direct burial cable.
- D. Ensure proper grounding of the fixture.

## **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 04510  
REPOINTING MASONRY JOINTS**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. All materials, equipment, and labor necessary to inspect the left upstream granite masonry wall of the Macallen Dam as indicated by the Owner or Resident Engineer and clean, re-point and repair the granite masonry joints with cement mortar, as specified herein and as shown on the Contract Drawings.
- B. The Contractor is advised of the historical nature of the dam. All masonry joint re-pointing and restoration shall be done with such materials and in such a manner as to create a neat, clean, uniform, and visually attractive appearance for the masonry without damaging the stone masonry. Skilled masons shall be employed for all finishing work.
- C. Install weepholes in repointed masonry joints where directed by the Owner or Resident Engineer, in accordance with the Contract Drawings and this Section.
- D. The Contractor shall keep and submit records documenting the repointing details and location of repointed masonry joints, including the locations of weepholes.
- E. The work of this Section shall specifically include all necessary provisions for safe access to the work areas, including scaffolding, ropes, and other such methods.
- F. Provide measures to protect the Site from dust and debris from the repointing operations. Clean mortar, dust, and debris from the downstream and staging areas after repointing is completed. Mortar removed from masonry joints shall be legally disposed of off-site.

**1.02 RELATED SECTIONS**

- A. Section 01565 – Temporary Water Control
- B. Section 01740 – Site Restoration
- C. Section 02170 – Temporary Cofferdam

**1.03 REFERENCES**

- A. ACI 530 - Building Code Requirements for Masonry Structures.
- B. ACI 530.1 - Specifications For Masonry Structures.
- C. ASTM C5 - Quicklime for Structural Purposes.
- D. ASTM C91 - Masonry Cement.
- E. ASTM C94 - Ready-Mixed Concrete.

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- F. ASTM C144 - Aggregate for Masonry Mortar.
- G. ASTM C150 - Portland Cement.
- H. ASTM C199 - Test Method for Pier Test for Refractory Mortar.
- I. ASTM C207 - Hydrated Lime for Masonry Purposes.
- J. ASTM C270 - Mortar for Unit Masonry.
- K. ASTM C387 - Packaged, Dry, Combined Materials, for Mortar and Concrete.
- L. ASTM C595 - Blended Hydraulic Cement.
- M. ASTM C780 - Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- N. ASTM C1142 - Ready-Mixed Mortar for Unit Masonry.
- O. IMIAC (International Masonry Industry All-Weather Council) - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
- P. IMIAC (International Masonry Industry All-Weather Council) - Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

### **1.03 QUALITY ASSURANCE**

- A. The Masons performing the repointing shall have a minimum of five (5) years of experience in repointing masonry and shall have performed at least five (5) projects repointing masonry structures within the last five years.
- B. Obtain mortar mix materials from a single manufacturer for each different product required.
- C. Comply with manufacturers' recommended procedures.
- D. Mock-Up: Before starting work, prepare and repoint a sample area of not less than 10 feet high and 10 feet long using the procedures, proposed colors and texture, finish and workmanship for approval by the Owner and Resident Engineer.

### **1.04 SUBMITTALS**

- A. Provide Company brochures and other information to demonstrate that the masons performing the repointing operations have the required experience within 30 days following Notice to Proceed.
- B. Not less than ten (10) working days prior to the scheduled start of work, the Contractor shall submit a proposed Work Plan for inspecting, cleaning, and re-pointing and containing and disposal of waste to the Engineer for review. The submittal shall also include the following items:
  - 1. Product Data: Manufacturer's catalog cuts and specifications for all materials used including masonry cement, backer material, weephole pipes, prepackaged dry mortar, admixtures, and cleaning solutions. Include documentation from the

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manufacturer demonstrating that the materials used will not adversely affect the reservoir water quality.

2. Grain size distribution for mortar aggregate if prepackaged mortar mix is not used.
  3. Details of mortar mix including all components and proportions.
  4. Samples: Submit two samples of mortar, illustrating mortar color and color range.
  5. Methods and procedures for removing old mortar from joints, preparing joints for repointing mortar, and installing repointing mortar.
  6. A list and technical description of the specific equipment to be used.
- C. Reports: Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C270 and test and evaluation reports to ASTM C780.
- D. Within two weeks of completing the work, submit to the Owner and/or Resident Engineer a complete record documenting the repointing operations. Include a summary of the work performed, and a drawing showing the approximate work limits, including the locations of any weepholes installed and dates of completion.

### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

### **1.06 PROJECT CONDITIONS**

- A. Do not proceed with installation of any mortar products when ambient and substrate temperature conditions are outside the limits permitted by mortar/grout manufacturer of below 40 degrees Fahrenheit (4.4 degrees Celsius) for a minimum of 48 hours.
- B. Do not proceed with installation of mortar or joint grout until contaminants capable of interfering with their adhesion are removed from joint substrate.

### **1.07 SCHEDULE**

- A. Coordinate all work at the site with the Owner. Notify the Owner and Resident Engineer at least seventy-two (72) hours prior to starting work.

## **PART 2 PRODUCTS**



2.01 PORTLAND CEMENT MORTAR PRODUCTS:

Mortar for use in re-pointing of joints shall be a Portland cement-based material.

A. General Re-Pointing Portland Cement Mortar

Standard Portland Cement Mortar shall be Type N in general conformance with ASTM C270, Specification for Mortar for Unit Masonry. The mortar mix shall be submitted to and approved of by the Engineer. Minimum 28-day compressive strength shall be 750 psi as per ASTM C-109 Modified. Materials shall be as follows:

1. Portland cement: ASTM C150 Type I/II or Type II, grey or white as required to match original mortar. Fly ash, slag and pozzolans are not permitted as substitutes for Portland cement.
2. Hydrated Lime: ASTM C207 Type S, incorporated as a finely divided powder in uniform particle size, free of lumps, flakes or other inconsistencies.
3. Mortar Aggregate: ASTM C144 Natural sand blend, rounded to sub-angular in shape, washed, screened and dried, with zero- or near zero-270 crystalline silica content. Aggregate to be selected to match the color and texture of the original mortar aggregates as closely as possible while remaining in compliance with ASTM C144 grading and soundness requirements.
4. Mortar Colors: Inorganic mineral oxides meeting the requirements of ASTM C797, at levels not to exceed 10% on cement weight, except for carbon black, which may not exceed 2% on cement weight.
5. Admixtures: NO admixtures shall be used without the express written consent of the Engineer and the mortar manufacturer. Calcium chloride is not permitted in any mortar. Admixtures containing more than 0.1% chloride ions are NOT permitted.

B. General Repair Mortar Products

Products in the SikaRepair line of repair mortars, as manufactured by Sika Corporation, Lyndhurst, New Jersey, are considered to conform to the requirements of the specification. An equivalent product may be used pending approval by the Owner and Engineer.

C. Instant-Setting Portland Cement Water-Stop:

SikaSet Plug, as manufactured by Sika Corporation, Lyndhurst, New Jersey, is considered to conform to the requirements of the specification and have performed satisfactorily for rapid concrete repairs for a minimum of ten years. This type of mortar shall be used where water is present.

1. Properties of the mixed instant-setting Portland cement water-stop:
  - a. Time of Set (ASTM C-403): 15 - 90 seconds.
  - b. Color: concrete gray.
2. Properties of cured instant-setting Portland cement water-stop:
  - a. Compressive Strength (ASTM C-109)

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- i. 1 day: 3600 psi min.
    - ii. 7 day: 5800 psi min.
  - b. Tensile Strength (ASTM C-496)
    - i. 7 day: 500 psi min.
    - ii. 28 day: 600 psi min.
  - c. Sulfate-Resistance Test (ASTM C-88) no deterioration.
    - i. The material shall not produce a vapor barrier.

### **2.02 WATER**

The water used in the re-pointing/repair work shall be potable, fresh, clean, and free from deleterious materials. Water from the Lamprey River is not considered suitable for use and therefore shall not be used in the repointing work.

### **2.03 MISCELLANEOUS MATERIALS**

- A. Provide backer material for modified repointed masonry joints, which prevents three-sided adhesion, and controls sealant depth.
- B. Provide material for weepholes, consisting of 3/8" I.D. stainless steel pipe, cut to three inches (3") long.

### **2.04 CLEANING SOLUTIONS**

- A. Cleaning solutions shall be safe for the environment.

## **PART 3 EXECUTION**

### **3.01 GENERAL**

- A. Repair any damage to the downstream masonry wall caused by the Contractor's operation at no additional cost to the Owner.
- B. Removal and re-setting of stone masonry blocks is prohibited, unless approved by the Owner.
- C. The Contractor shall be responsible for maintaining a safe, clean and accessible work site at all times.
- D. All OSHA requirements, and all applicable local environmental requirements, and Otis Conservation Commission Order of Conditions shall be satisfied.

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### **3.02 JOINT PREPARATION**

- A. Clean all vegetation, soil deposits, and loose/unsound grout substrate by mechanical means from all exposed surfaces of stone masonry. Remove mortar using hand or power tools compatible with the stone masonry units. Select equipment and methods that will not damage or change the appearance of the stone masonry units. Sand blasting or high pressure water blast shall not be allowed.
- B. Remove dust, loose particles and debris remaining from cleaning operations by vacuuming or blowing out joints with oil-free compressed air. To allow for mortar adhesion. No chemicals which could pollute the wetland resources areas shall be used in cleaning.
- C. Barriers shall be constructed as necessary to collect debris and water for disposal and to minimize the effects of infiltration into the waterways, and procedures shall be taken to minimize contamination of these waterways due to cleaning procedures. After cleaning, all masonry should be inspected for previously obscured deficiencies.

### **3.03 MORTAR MIXING**

- A. Measure mortar materials to achieve consistent mix proportions, yields, workability, and color from batch to batch.
- B. Measure sand by volume or equivalent weight; do not measure by shovel.
- C. Mix and prehydrate materials in accordance with the appendix to ASTM C270 for tuck pointing mortar.
- D. Retemper mortar as needed.
- E. Discard unused mortar 2-1/2 hours after initial mixing.

### **3.04 STANDARD MASONRY JOINT REPOINTING**

- A. Do not repoint mortar joints unless the ambient air temperature is between 40 and 90 deg F and will remain so for at least 48 hours after completion of the work. Protect freshly placed mortar from freezing or rapid surface drying.
- B. Clean out joints immediately before installing mortar to comply with recommendations of mortar manufacturers. Dampen joints to be pointed. Allow masonry units to absorb surface water, and remove standing water from the joints.

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- C. Tightly pack mortar into joints in layers as required to control shrinkage. The joint shall be a minimum of ¾-inch thick, placed in maximum ¼-inch thick layers. Allow each layer to become “thumbprint hard” before applying the next layer.
- D. After the final layer becomes “thumbprint hard,” tool the joints to match the original joints.

### **3.05 MODIFIED MASONRY JOINT REPOINTING**

- A. Install modified repointed masonry joints where existing mortar is unsound or non-existent for a depth of two inches from the face of the masonry block, or as directed by the Resident Engineer.
- B. Install appropriate backer material to prevent three sided adhesion and to control sealant depth.
- C. Gun, inject, or pour sealant into joint, tool as required to properly fill joint.

### **3.06 WEEPHOLES IN MASONRY JOINT REPOINTING**

- A. Where directed by the Owner and Resident Engineer, weepholes shall be installed in joints where seepage through the masonry wall is actively occurring.
- B. Removal of any loose material from within the joint prior to the insertion of the pipe is critical. The Contractor shall, to the satisfaction of the Owner and Resident Engineer, thoroughly clean out the masonry joint prior to the insertion of the pipe.
- C. Weepholes shall be constructed using 3/8-inch inside diameter x 3 inch long stainless steel pipes shall be installed within masonry joints where seepage is occurring. The pipe shall be set in the joint with modified joint with portland cement mortar and instant setting Portland cement water stop mortar joint as shown on the Drawings.
- D. The stainless steel weephole pipes shall extend ½-inch beyond the face of the masonry.

### **3.07 SITE RESTORATION**

- A. Clean exposed stone surfaces on completion. Remove mortar droppings, dust, and other foreign substances from masonry surfaces.
- B. Remove equipment, materials, and debris from downstream area. Restore area in accordance with Section 01740.

**PART 4 - MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 05730  
ORNAMENTAL ALUMINUM HANDRAILS AND RAILINGS**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. This section specifies the requirements for furnishing and installing an architectural fence (ornamental aluminum railing) system. The work under this section includes the furnishing of all labor, equipment, supplies, materials and utilities required for the removal and disposal of the existing fence along the left abutment training wall and existing outlet structure, preparation and cleaning of the existing or repaired concrete, masonry, or granite surfaces, and installation of new ornamental aluminum railing as shown on the Contract Drawings. All work shall be performed in accordance with the plans and specifications and to the satisfaction of the Engineer.
- B. The intent of the Work of this Section is to replace the architectural fence system in-kind which matches the existing ornamental railing system along the left abutment training wall and existing gate structure after installation of the new gate structure and rehabilitation to the left abutment wall are completed. The replacement fence shall be submitted for review and approval to the owner, and shall generally match the height, style, color, etc., of the existing system to be replaced.
- C. The extents of ornamental aluminum railings along the crest of the left abutment wall to be replaced-in-kind shall be, at a minimum, from the existing structure at 4 Bay Road to the southernmost extent of the downstream apron of the gate structure. The railing shall be connected to the new underlying concrete by means of anchored base flanges.
- D. The ornamental aluminum railings shall perform to all applicable OSHA standards.

**1.01 REFERENCES**

- A. AA DAF-45 - Designation System for Aluminum Finishes; The Aluminum Association.
- B. ANSI A1264.1 - Safety Requirements for Workplace Floor and Wall Openings, Stairs, and Railing Systems.
- C. ANSI/ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- D. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- E. ASTM B 211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
- F. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- G. ASTM B 247 - Standard Specification for Aluminum and Aluminum Die Forgings, Hand Forgings, and Rolled Ring Forgings.

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- H. ASTM B 429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
- I. ASTM E 935 - Standard Test Methods for Permanent Metal Railing Systems and Rails for Buildings.
- J. 29 CFR 1910.23 - Guarding floor and wall openings; Occupational Safety and Health Administration.
- K. BOCA National Building Code; Building Officials and Code Administrators International, Inc.
- L. ICBO Uniform Building Code; International Conference of Building Officials.
- M. SBCCI Standard Building Code; Southern Building Code Congress International, Inc.

### **1.02 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Engineer, fabricate, and install handrails, guardrails, and railing systems to withstand the structural loading required by applicable codes.
- B. Comply with requirements of building authorities having jurisdiction in the Project location.
- C. Thermal and Corrosion Control:
  - 1. Allow for thermal action resulting from the maximum range (change) in ambient temperature in the design, fabrication, and installation of rail systems, to prevent opening of joints, buckling, and other detrimental effects, including overstressing of connections and components.
  - 2. Prevent galvanic action and other forms of corrosion by isolating dissimilar metals or materials, preventing direct contact with each other.

### **1.03 SUBMITTALS**

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's specifications and installation instructions for all components of each product type specified.
- C. Shop Drawings: Prepared specifically for this project.
  - 1. Show complete layout; plan views, elevations, connections, details for fabrication and attachment to other elements, and other installation details. Indicate materials, methods, finishes and types of joinery, fasteners, anchorages and accessory items.

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### **1.04 QUALITY ASSURANCE**

- A. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- B. Manufacturer/Installer qualifications demonstrating documented experience successfully executing projects with similar scope within the last 3 years.
- C. Manufacturer/Installer Qualifications: Provide handrails, guardrails, and railing systems from one source, produced by a manufacturer and craftsmen having resources to provide consistent quality in appearance and physical properties, without delaying the work.
- D. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic cleaning and maintenance of all components.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver handrails, guardrails, railing systems, and related components in protective packaging. Inspect materials to ensure that specified products have been received.
- B. Store components to avoid damage from moisture, abrasion, and other construction activities.

### **1.6 SEQUENCING**

- A. Ensure that products of this Section are supplied to affected trades in time to prevent interruption of construction progress.

### **1.7 PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Field Measurements: Take measurements of actual dimensions where necessary for fit without gaps. Indicate measurements on shop drawings.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturers:
  - 1. Ultra Aluminum Manufacturing; 2124 Grand Commerce Drive, Howell, MI 48855; Tel: (800) 656-4420, Fax: (800) 643-7429, Website: <http://www.ultrafence.com/>
  - 2. Master Halco; 3010 Lyndon B Johnson Freeway, Suite 800, Dallas, TX 75234; Tel: (888) 643-3623, Website: <https://www.masterhalco.com/>
  - 3. Ameristar Fence Products; 1555 N. Mingo Road, Tulsa, OK 74116; Tel: (888) 333-3422, Website: <https://www.ameristarfence.com/>
- B. Alternate systems or manufacturers may be submitted for approval.



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- C. Provide all handrails, guardrails, and railing systems from a single manufacturer.

### 2.02 MATERIALS

- A. General: Provide material free from surface blemishes where exposed to view in the finished installation.
- B. Aluminum material for fence framework (i.e., tubular pickets, rails and posts) shall conform to the requirements of ASTM B221. The aluminum extrusions for posts and rails shall be Alloy and Temper Designation 6005-T52. The aluminum extrusions for pickets shall be Alloy and Temper Designation 6063-T52.
- C. Pickets shall be 3/4" square x .045" thick. Horizontal rails shall be 1-1/4" x 1-7/16" U- channel with .060" thick top & internal web wall, and .090" thick side walls and shall be punched to allow picket to pass through the top of the rail. The horizontal rail shall be constructed with an internal web insert providing a raceway for the pickets to be retained with a 1/8" retaining rod. The number of rails shall vary with the style, height and strength as determined by manufacturer.
- D. Accessories: Aluminum castings shall be used for all post caps, scrolls, finials, and other miscellaneous hardware. Hinges and latches shall be fabricated from aluminum, stainless steel or composite materials.

### 2.03 FABRICATION

- A. Fabricate handrails and railing systems to comply with manufacturer's printed requirements, project design requirements, details, dimensions, finish and member sizes, including post spacing and anchorage, but not less than the structural requirements to support loading.
  - 1. Clearly mark component units for site assembly and installation.
  - 2. Use connections that maintain structural capacity of joined members.
  - 3. All pipe cuts shall be square and accurate for minimum joint-gap. Cuts shall be clean and free of chamfer, from deburring, nicks and burrs.
- B. Pickets, rails and posts shall be pre-cut to specified lengths. Horizontal rails shall be pre-punched to accept pickets. Grommets shall be inserted into the pre-punched holes in the rails and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal upper raceway of the horizontal rails. Retaining rods shall be inserted into each horizontal rail so that they pass through the pre-drilled holes in each picket, thus completing the panel assembly.
- C. If railing is angled horizontally, machine to proper angle into the post.
- D. Fabricate railing system to meet step railing requirements; riser and tread dimensions of the steps.
- E. Provide components required for anchorage of framing. Fabricate anchors and related components of material and finish as required, or as specifically noted.

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### **2.04 FINISHES**

- A. Contractor shall provide a powder coat finish. Alternate finishes may be proposed for approval by the Owner. Samples of the finish should be provided.
- B. Color to match existing. May require powder coat finish.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine system components, substrate, and conditions where railing systems are to be installed.
- B. Do not begin installation until substrates have been properly prepared.
- C. Notify Engineer and Owner in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surrounding construction to receive railing system installations to comply with manufacturer's requirements.
- C. Review and coordinate setting drawings, shop drawings, templates, and instructions for assembly and installation of railing system and related items to be embedded in concrete and masonry.
- D. Ensure that adjacent surfaces, structures, and finishes are protected from damage by construction activities of this Section.
- E. Use wood blocks and padding to prevent damage to railing members and fittings during erection.

### **3.03 INSTALLATION**

- A. Install railing system and related components in strict accordance with manufacturer's printed installation instructions and project shop drawings.
- B. Separate aluminum which might contact concrete, masonry, or other metals (to include steel anchoring and fasteners), by means of asphaltic or bituminous paint or other approved coating or method to prevent electrolytic action.
- C. Preassemble railing system, including posts, in easy to lift sections whenever possible.
  - 1. Align rails so that variations from level for horizontal members do not exceed 1/4 inch in 12 feet.

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

- D. Adjust, level, and securely install railing system components.
  - 1. Avoid springing assembled components of system into place.
- E. Keep perimeter lines straight, plumb, and level.
- F. Install anchored base flanges onto the top of the existing of rehabilitated wall by means of approved stainless-steel anchor bolt system made by Hilti or approved equal.
- G. Provide for thermal expansion and contraction by use of expansion joints/gaps in top rails, 40 foot (6.096 m) maximum intervals.
  - 1. Strictly adhere to manufacturer's instructions for locations of expansion joints and fastening of expansion sleeves.
  - 2. Attach top rail to posts located at maximum 5 foot (1.524 m) on center spacings.
  - 3. Install bottom rails in unspliced lengths between posts.
  - 4. Install posts of continuous sections from mounting base to top rail.
- H. Provide for water to drain from the railing system hollow sections by drilling weep holes at bottom locations or other approved methods.

### **3.04 ERECTION TOLERANCES**

- A. Install railing system plumb and level, securely fastened, with vertical members plumb.
  - 1. Maximum variation from plumb: ¼ inch (6.0 mm).
  - 2. Maximum misalignment from true positions: ¼ inch (6.0 mm).
  - 3. Maximum misalignment between adjacent separated members: 1/8 inch (3.0 mm).

### **3.05 CLEANING**

- A. Immediately upon completion of installation, remove all dust or foreign matter from components; clean all railing system surfaces using clean water and mild soap or detergent and in accordance with AAMA 609 and AAMA 610-02.
- B. Do not use abrasive agent or harsh chemicals.

### **3.06 PROTECTION**

- A. Provide adequate protection for all surfaces of completed installations to prevent damage during remainder of construction activities.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

## **PART 4 - MEASUREMENT AND PAYMENT**

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 11288  
PNEUMATIC GATE SYSTEM**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This section includes the design, manufacture, delivery, and installation of a pneumatic gate system including steel gate panels, reinforced rubber air bladders, anchor bolts, abutment plates, heaters, seals, clamp casting and associated embeds, air supply pipe, electrical control panel, mechanical control panel, compressed air equipment, and other associated equipment, supplies, and tools. A technical advisor from the pneumatic gate supplier shall be at the project location during gate installation and startup tests. The work shall be as specified herein. Reference standards including their date of adoption or revision shall be as follows and will be referred to hereinafter by their abbreviation. Equivalent internationally recognized codes are acceptable. All accessories required for satisfactory installation and operation of the equipment shall be furnished and installed whether or not explicitly mentioned in these Specifications or shown on the Plans.
- B. Final details, drawings and technical specifications for the pneumatic gate and required appurtenances shall be coordinated by the Contractor with the manufacturer during the procurement process. The cost of said activities shall be included in the Contractor's bid price.

**1.02 RELATED WORK**

The following is a list of related work items that shall be performed or furnished under other Sections of these Specifications as indicated.

- A. Saw Cutting, Dismantling, Demolition, and Removal of Existing Structures – Section 03300
- B. Temporary Cofferdam – Section 02170
- C. Reinforced Cast-in-Place Concrete – Section 03300
- D. Precast Concrete Vault – Section 03605
- E. General Electric – Section 16000

**1.03 REFERENCE STANDARDS**

- A. ASTM A29/A29M – Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot Wrought and Cold Finished
- B. ASTM A36/A36M – Standard Specification for Structural Steel
- C. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated Welded and Seamless
- D. ASTM A123 – Standard Specification for Zinc (Hot-Dip-Galvanized) Coatings on Iron and Steel Products

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

- E. ASTM A193 – Standard Specification for Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service
- F. ASTM A312 – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
- G. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- H. ASTM A403 – Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
- I. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
- J. ASTM C501 – Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser
- K. ASTM D751 – Standard Method of Testing Coated Fabrics
- L. ASTM D1149 – Standard Test Method for Rubber Deterioration Surface Ozone Cracking in a Chamber (Flat Specimens)
- M. ASTM D2000 – Standard Classification System for Rubber Products in Automotive Applications

### 1.04 SUBMITALS

- A. Submit structural calculations prepared and/or reviewed, and stamped, by a registered Professional Structural Engineer for the design of the pneumatic gate system. Indicate profiles, sizes, spacing, and locations of structural members, connections, attachments, openings, fasteners, gate reactions and anchorage locations, anchor bolt size and embedment lengths.
- B. Submit complete shop drawings and descriptive literature showing details of the pneumatic gate design, fabrication, and erection. Include complete dimensioned details, sizes, thicknesses, gauges, material, welding requirements for all joints, finishes, all connection details, abutment plate details, anchorage details to concrete spillway and abutment, actuator support pedestal, operating stem, air vent piping, heater, local/remote control panel, heaters, gate position indicator, and all other necessary appurtenances to provide complete operating pneumatic gate system. Submit shop drawing information on performance charts, parts list, and factory performance report. Shop drawings for mechanical gate and operating systems shall be stamped by a registered Professional Mechanical Engineer.
- C. Submit anchor bolt setting plan.
- D. Submit complete installation and erection drawings, details, and procedures.
- E. Submit Manufacturer's Warranty in accordance with Paragraph 1.07 of this Specification.

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

- F. Submit electrical details, wiring diagrams, schematic control diagrams, field instruments, control panel, construction details and dimensional drawings. Project specific wiring interconnection diagrams showing all field termination points to remote equipment. All electrical details shall also be in accordance with Section 16100. Shop drawings for electrical systems shall be stamped by a registered Professional Electrical Engineer or Licensed Electrician.
- G. Submit spare parts list.
- H. Submit names and qualifications of professional engineers who will be engaged in the design of gate and gate systems.
- I. Submit the following supporting information:
  - 1. Operation and Maintenance Manuals: Three sets of operation, maintenance, and parts manuals shall be submitted to the Engineer before final acceptance. The manuals shall include all information, diagrams, and drawings plus instructions to be used in operating and maintaining the dams and equipment. All components shall be catalogued and described so that replacement parts can be purchased in the future.
  - 2. Installation Manual: Three sets of installation manuals shall be submitted to Engineer describing in detail installation procedures, testing, and commissioning procedure of rubber dam and control equipment.

### 1.05 PERFORMANCE CRITERIA

- A. The pneumatic gates shall consist of a steel gate panel attached to the reinforced concrete invert by means of an elastomeric hinge and an air bladder mounted between the hinged gate and the concrete. The hinge shall be anchored using stainless steel anchor bolts. The elastomeric hinge shall allow the pneumatic crest gate to operate through a range from fully raised to fully lowered. Rubber wiper type abutment seals shall be provided to allow a water tight seal across the full range of gate motion. Pneumatic air control lines (supplied by the Installation Contractor) to and from the gates shall be manufactured from stainless steel. The pneumatic crest gate system shall be designed to operate in both a fully raised and a partially raised position for extended periods of overtopping without experiencing significant oscillation, adverse flow conditions, or wear. The gates are generally designed for a minimum of 12-inches of overtopping in the fully closed position at a minimum El. 22.8, however overtopping tolerances for final design shall be coordinated with the Owner and Gate Manufacturer.
- B. System Operation:
  - 1. The pneumatic gate shall be operated at a normal internal design pressure less than or equal to 35 psi. Air shall be supplied by an air compressor; however, voltage and phase power should be coordinated with the manufacturer during procurement. Under normal circumstances, the gate will be used to maintain a constant upstream water elevation. A submersible depth transmitter installed at the existing low flow diversion wet well will monitor water elevation. Location of the depth transmitter will be coordinated in the field between the Contractor, Owner, Engineer, and Resident Engineer. If the upstream water elevation rises above the operator set-

point, the electrical control panel will deflate the gate.

2. The control system shall be designed to provide the maximum protection against upstream flooding. Two (2) independent auto deflation systems shall be provided:  
1) A fail-safe mechanical valve system that senses the upstream water elevation using a bubbler (BBS) and 2) an electrical system that utilizes a pilot operated solenoid valve that is automatically (or manually) controlled by the electrical control panel. Elevation for placement of the auto deflation systems shall be coordinated in the field between the Contractor, Owner, Engineer, and Resident Engineer.
  3. The BBS automatic deflation elevation will be initially set at an elevation corresponding to the maximum overtopping condition. If high water actuates the BBS, the BBS will interrupt air flow from the air compressor to the inflate solenoid valve and will deflate the pneumatic gate. After upstream water elevation recedes to the BBS set-point, the BBS will restore air flow to the inflate solenoid valve and will allow the Electrical Control System to raise the gate.
- C. The piping system shall be designed to minimize the possibility of blockage of the air inflate/deflate lines. The system shall also provide a condensate purge valve for removal of condensation from the piping system. The system shall be designed to require the minimum number of penetrations of the rubber fabric.
- D. The anchoring system shall be designed for maximum reliability, air tightness, and ease of installation. The design of the clamping system shall permit easy unclamping and reclamping of the gate without damage to the air bladder body.
- E. The rubber fabric shall be designed with a minimum factor of safety of 8.0 when comparing fabric strength to normal operating pressure hoop stress.
- F. The anchor bolts shall be designed with a minimum factor of safety of 3 based on normal working load and the anchor bolt steel yield strength and a minimum factor of safety of 5 based on normal working load and the anchor bolt steel tensile strength.
- G. Gate panels shall be designed in accordance with The United States Corps of Engineers “Design of Hydraulic Steel Structures” (EM-1110-2-2105, 1993). Other steel members will maintain a minimum safety factor of 2.5 based on normal working load and the material yield strength and a minimum factor of safety of 5 based on normal working load and the material tensile strength.
- H. The pneumatic gate for this application shall be manufactured to provide a minimum damming height of 6.2 feet above the invert, however overtopping tolerances for final design shall be coordinated with the Owner and Gate Manufacturer which may increase damming height. The gate shall span 23 feet between abutment plates.

#### 1.06 TECHNICAL ADVISOR

- A. The Contractor shall retain the services of an experienced installation/operation advisor from the pneumatic gate manufacturer. The technical advisor shall provide guidance in the installation and testing of the pneumatic gate and its appurtenant inflation/deflation equipment during periods recommended by the manufacturer. All costs involved in



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acquiring the services of the technical advisor shall be the responsibility of the Contractor. The technical advisor shall be on site for a minimum of 2 days of installation and 1 day for testing of the pneumatic gate and appurtenant equipment.

### **1.07 WARRANTY**

- A. The Contractor shall obtain a Certificate of Warranty from the manufacturer and deliver the Certificate to the Owner and Engineer. The Warranty Certificate shall be made out in favor of the Owner and shall contain all the provisions enumerated in the following paragraphs:
1. Within two years from the date of initial operation, but not more than two years and six months from the date of shipment by Manufacturer of any item of the product (s), Purchaser discovers that such item was not as warranted and promptly notified Manufacturer in writing thereof, Manufacturer shall remedy such non-conformance by, at Manufacturer's option, adjustment or repair or replacement of the item or any affected part of the product (s). Purchaser shall assume all responsibility and expense for removal, reinstallation, and freight in connection with the foregoing remedies. The same obligations and conditions shall extend to replacement parts furnished by Manufacturer thereunder. Manufacturer shall have the right of disposal of parts replaced by it. The Manufacturer shall not be liable for any repairs, replacements, or adjustments to the Product (s) or any costs of labor performed by the Purchaser or others without the Manufacturer's prior written approval.
  2. The purchaser shall not operate the Product (s) which is considered to be defective, without first notifying the Manufacturer in writing of its intention to do so. Any such use of the Product (s) will be at the Purchaser's sole risk and liability unless Manufacturer gives Purchaser approval to operate the Product (s). Such approval will not be unreasonably withheld.
  3. The effects of corrosion, erosion and normal wear and tear are specifically excluded from the Manufacturer's warranty.
  4. Manufacturer's liability to Purchaser relating to the product (s) whether in contract or in tort arising out of warranties, representations, instructions, installations, or defects from any cause, shall be limited exclusively to correcting the product (s) and under the conditions as aforesaid.
  5. Any separately listed item of the product (s) which is not manufactured by the Manufacturer shall be covered only by the express warranty of the manufacturer thereof.

## **PART 2 – PRODUCTS**

### **2.01 GENERAL**

- A. Materials shall be new, free from defects and imperfections and shall conform to the specifications herein.

2.01 PNEUMATIC GATE MATERIALS

- A. Air Bladder: The air bladder body shall be a minimum of 2-ply polyester reinforced rubber. Ozone and ultraviolet protection shall be provided by using Exxon Exxpro TM or equivalent in the outer protective cover. Minimum nominal air bladder wall thickness shall be 9-mm. The fabricated dam body shall be tested to conform to the following:
6. Tensile breaking strength of the unidirectional polyester reinforcing fabric shall be a minimum of 2320 pounds per linear inch when tested in accordance with ASTM 0751.
  7. The air bladder shall use unidirectional reinforcing fabric in the inflatable envelope. The use of square woven reinforcing fabric is not allowed.
  8. The adhesion between the polyester reinforcing fabric and the rubber shall be tested in accordance with ASTM 0751. The adhesion shall be a minimum of 50 pounds per inch before aging and a minimum of 36 pounds per inch after aging in 158 degrees Fahrenheit for 96 hours. This requirement also applies to the adhesion of the outer Exxon Exxpro TM cover.
  9. The ozone test shall show no abnormality in appearance when subjected to an ozone test conducted at 100 mPa, 104 degrees F, 96-hours and 20 percent elongation, in accordance with ASTM D1149.
  10. An abrasion test using an H18 stone with a 2.2-pound load for 1000 repetitions as modified from ASTM C501 shall show less than 0.03 cubic inches of abrasion.
  11. A means to relieve fabric stress shall be incorporated into the air bladder wherever the reinforcing fabric changes direction (along the downstream and lateral edge deflated fold lines). Stress relief size will be determined by manufacturer.
  12. The rubber fabric shall be fully vulcanized using a high pressure/heat vulcanization method. Secondary vulcanization cycles or use of post vulcanization bonding agents to seal or otherwise join materials is not permitted.
- B. Steel Gate Panel and other Ferrous Parts: A steel gate panel with reinforcing ribs shall overhand the air bladder through the full range of gate motion. The allowable stress value within the gate panel shall be determined from AISC Allowable Stress Design (1989).
1. The steel gate panels and restraining strap clamps will be manufactured from ASTM A572 grade 50 steel plate or engineering equal.
  2. Steel hinge retainers, web retainers, and other non-structural components to be manufactured from A36 steel or engineering equal.
  3. All threaded fasteners including anchor bolts and welded gate studs shall be from AISI 304/304L stainless steel or approved equal unless otherwise specified.

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4. The steel gate panels will be sand blasted in accordance with SSPC-SP 10 and coated with CeramKote 54 epoxy paint or equivalent in accordance with manufacturer's recommendation.
  5. Peripheral steel parts to be sand blasted and hot dip galvanized in accordance with ASTM A123 and ASTM A153.
- C. Abutment Plate: The pneumatic gate system abutment plates will be manufactured from UHMW polyethylene. The abutment plates will be designed to compensate for differences in thermal expansion between the concrete and the UHMW polyethylene.
- D. Anchor Bolts: The main anchor bolts, restraining strap anchor bolts, abutment plate anchor bolts, and all welded gate studs shall be from AISI 304/304L stainless steel or engineering equal unless otherwise specified.
- E. Air Supply Equipment: The air supply equipment will be sourced from Ingersoll Rand or approved equivalent supplier. The air compressor system shall nominally comprise an air compressor, desiccant type air dryer, and dry receiver tank. The system will be designed so that the air dryer does not constantly purge the receiver tank during periods of low air demand. The compressor and dryer voltage and phase power should be coordinated with the manufacturer during procurement.
- F. Pressure Sensor: The pneumatic gate system shall be supplied with an ASCO, KPSI, or approved equivalent supplier, air bladder pressure sensor. This sensor shall be supplied by the gate supplier. The exact model number and catalog sheet shall be submitted with shop drawings.
- G. Water Level Sensor: The pneumatic gate system shall be supplied with a Druck, KPSI, approved equivalent supplier, submersible depth transmitter for measuring upstream water elevation. The sensor shall be supplied by the gate supplier. The exact model number and catalog sheet shall be submitted with shop drawings. The location of the water level sensor shall be upstream of the 6-inch PVC irrigation intake pipe, as described in Section 01740 and shown on the Contract Drawings, and final location shall be determined in the field and mutually agreed upon between the Contractor, Owner, and Resident Engineer.
- H. Inflate and Deflate Valves: Separate inflate and deflate pilot operated solenoid valves will be provided by the gate supplier for inflating and deflating the pneumatic gate. The details of this equipment shall be submitted with shop drawings.

### 2.01 CONTROL SYSTEM

- I. The pneumatic gate consists of an air bladders and gate panel that spans across a water way. The pneumatic gate is held in place by anchor bolts that are embedded in the concrete foundation. The gate is inflated to design height when air is supplied through a pilot operated inflate valve by the air compressor. For gate deflation, air is allowed to exhaust from the gate either automatically by a failsafe bubbler back-up system that senses upstream water elevation, or by a pilot operated exhaust valve which is controlled at the control panel. Inflation or deflation of the gate may be done either manually (push button) or automatically by the electrical control cabinet or manually (manual by-pass valves) through the mechanical cabinet. Modes of operation are as follow:

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

1. Manual Touchscreen: Inflation/deflation of the pneumatic gate is accomplished by interfacing with the programmable logic controller (PLC) through the touchscreen located on the front of the electrical cabinet.
2. Manual Mechanical: Inflation/deflation of the pneumatic gate is accomplished by physical operation of % turn manual ball valves located in the mechanical cabinet.
3. Automatic Mode: In automatic mode, inflation/deflation of the pneumatic gate is controlled by a PLC in the electrical cabinet. The main purpose of the PLC is to measure upstream water elevation using supplied water level transducer, and to inflate or deflate the gate as required in order to maintain a constant upstream water elevation within +/-2-inch.

### J. Electrical Control Panel Description:

The primary purpose of the Electrical Control Panel is to control the operation of the inflate and deflate solenoid valves in order to maintain a constant upstream water elevation. The control panel shall be wall mounted, NEMA 4, metal cabinet suitable for installation on an interior building wall. Incoming power 110 VAC power shall enter the top of the cabinet. 24VDC control wiring shall enter from the bottom of the panel. All equipment shall be maintained from the front side of the cabinet. A four-way switch for placing the electrical cabinet into MANUAL MODE/AUTOMATIC MODE/REMOTE MODE/OFF and a 5.7" color touchscreen interface (HMI) shall be located on the front of the cabinet:

1. Front Panel Controls:
  - A. Mode Selection – via four position switch (manual touchscreen, manual mechanical, automatic, remote)
  - B. Mode Indicator Lights
  - C. Power Indicator Light
  - D. Emergency Stop
  - E. Touch Panel Human Machine Interface
2. Touch Panel Human Machine Interface: A touch panel human machine interface shall be used for accessing the PLC and changing system variables and set points. The following screens shall be provided:
  - A. Upstream water elevation: The upstream water elevation shall be shown in feet and inches as referenced from an engineer approved datum elevation.
  - B. Upstream water elevation setpoint: A system variable to be input by an operator.
  - C. Raise/Lower/Stop: Used to manually raise and lower the gate.
  - D. Screen Alarms: Specific pages showing alarm conditions shall

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

include:

1. PLC Failure
  2. Water level sensor signal failure
  3. Inflate (auto by PLC)
  4. Deflate (auto by PLC)
  5. Inflate (manual via touchscreen)
  6. Deflate (manual via touchscreen)
  7. Air bladder pressure low
  8. Air bladder pressure high
  9. Air compressor run
  10. Pilot pressure low
3. Electrical Power: The incoming electrical power to the Electrical Control Panel shall be 120VAC. A 24VDC power supply in the Electrical Control Panel will supply 24VDC to the PLC and to the other electrical control equipment.
  4. General Construction: Design and construction shall be of the highest quality and using good engineering practice and reliable components. All wiring shall be neatly tied and color coded. Terminal strips for control wiring, telemetry interconnection, and incoming power shall be suitably located in properly labeled.
  5. PLC Processor: The PLC Processor shall consist of a Square D M340 PLC, or Owner approved equal.
  6. Uninterruptible Power Supply: A Phoenix Uninterruptible Power Supply (UPS) will be mounted inside the Electrical Control Cabinet. The UPS will be sized to provide a minimum 120-minute backup power source for the PLC.
  7. Pond Water Level Sensor: The water level sensor shall be a small bore depth sensor and transmitter which shall display pond water levels on the HMI on the Electrical Control Panel.
  8. Pressure Transducer: The pressure transducer for measuring internal air bladder pressure shall cover the range from 0 to 35 psi gage air pressure. Electrical output shall be 4 to 20 mA.

### K. Mechanical Control Panel Description:

The primary purpose of the Mechanical Control Panel is to house the inflate and deflate solenoid valves, system set-pressure regulator, manual by-pass valves, and pressure gages required for gate operation. The control panel shall be a floor pad mounted, NEMA 4, metal cabinet. 24 VDC control wiring shall enter the side of the cabinet as shown in the shop drawings.

## PART 3 - EXECUTION

### 3.01 INSPECTION

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

- A. Examine the foundations and the conditions under which work is to be performed and check anchor bolt setting for line and grade. Verify foundation and anchor bolt layout matches the gate manufacturer's template.
- B. Inaccuracies in alignment or levelness of foundation or anchor bolts shall be brought to the attention of the Engineer in writing immediately.
- C. Field modifications to the gate to fit the foundation shall not be permitted.

### **3.02 MANUFACTURING AND INSTALLATION**

- A. The pneumatic gate supplier shall supply material of high and consistent quality.
- B. The gate manufacturer shall prepare a written, detailed procedure for the erection and installation of the gate and gate equipment. The installation procedure shall include the sequence of steps necessary for installation, precautions to be taken, description of adjustments to be made and tolerances to be maintained.
- C. Install pneumatic crest gate system in strict accordance with manufacturer's erection drawings.
- D. Install pneumatic crest gate true to line, plumb, without warping or racking.
- E. Material Testing: Material testing shall be recorded and test certificates submitted to the owner.
- F. Tolerances: The thickness of the pneumatic air bladders shall be uniform plus minus 15%. No discontinuities of reinforcing fabric will be allowed in the body of the air bladders.
- G. Manufacturing: The rubber fabric shall be fully vulcanized using a high pressure/heat vulcanization method. Holes shall be pre-drilled in the hinge flaps at the factory to facilitate ease of installation.
- H. Tests: Upon completion of the work and adjustment of all equipment, all systems shall be tested under the guidance of the technical advisor to demonstrate that all equipment furnished and installed and connected under the provisions of these specifications function satisfactorily in the manner required, as described below.
- I. The removal of the temporary cofferdam, as described in Section 02170, shall not take place until near the end of the work after construction of the gate has been completed and the gate has been tested and accepted by the Engineer and the Owner.

### **3.03 PNEUMATIC CREST GATE STARTUP**

- A. Pneumatic crest gate startup "dry operation" shall be defined as the initial placing into operation of the gate and control systems prior to final grouting of the fixed parts of the gate by representatives of the Contractor, any subcontractors directly responsible for the equipment provided, and the equipment manufacturer.

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

- B. Pneumatic crest gate startup shall be performed by a duly authorized representative of the manufacturer who is fully trained in the installation, startup and operation of the equipment.
- C. The pneumatic crest gate startup shall be performed prior to crest gate certification testing and Operator Training.
- D. The crest gate shall be operated through all modes of operation, testing, all monitoring and control functions and all necessary adjustments made and as part of the startup, the Contractor shall:
  - 1. Verify that the equipment is installed properly and in accordance with manufacturer's requirements and instructions, and as such, it is appropriate to apply power to the units in question.
  - 2. Verify that all manual, automatic and safety control features of the equipment functions properly.
  - 3. Verify that the equipment can operate without excessive noise, vibration, overheating, overloading, jamming, etc., during normal operating conditions.
  - 4. Check amperage draws on all power feeds with equipment running under normal operating conditions.
- E. Any defects disclosed during testing shall be promptly corrected without additional cost to the Owner and the tests repeated until the gate has satisfactorily passed the tests. No separate payment shall be made for testing and adjusting the gate.
- F. The manufacturer representative and Contractor shall complete the crest gate startup certification form included at the end of this Section. Startup will not be considered complete until this form has been provided to the Engineer

### **3.04 PNEUMATIC CREST GATE CERTIFICATION TESTING**

- A. Pneumatic crest gate certification testing "wet operation" shall be defined as the formal and scheduled demonstration of operations of the gate and control systems with the water level at El. 23.3. This formal demonstration shall be performed in the presence of Engineer by representatives of the Contractor, any subcontractors directly responsible for the equipment provided and the equipment manufacturer.
- B. Pneumatic crest gate certification testing shall be performed after the pneumatic crest gate startup testing is completed and it has been verified that equipment functions in accordance with the requirements of the Contract Documents in all aspects. It is required that a duly authorized representative of the manufacturer, who is fully trained in the installation, startup and operation of the equipment be in attendance for the pneumatic crest gate certification testing.
- C. Contractor shall provide Owner and Engineer with at least 72 hours' notice of his desire to perform certified equipment testing.
- D. The pneumatic crest gates shall be operated through all modes of operation under the "wet operation" all monitoring and control functions and all necessary adjustments made.

## Macallen Dam – Abutments and Outlet Structure Rehabilitation

Testing shall be performed in the presence of the Engineer and as part of the certification testing, the Contractor shall:

1. Verify that the equipment is installed properly and in accordance with manufacturer's requirements and instructions, and as such, it is appropriate to apply power to the units in question.
  2. Verify that all manual, automatic and safety control features of the equipment functions properly.
  3. Verify that the equipment can operate without excessive noise, vibration, overheating, overloading, jamming, etc., during normal operating conditions.
  4. Check amperage draws on all power feeds with equipment running under normal operating conditions.
  5. Leakage Criteria: At a minimum water level of El. 23.3, the gate shall exhibit no air leakage and water leakage shall be less than 1-liter/minute/meter of seal length. Overtopping tolerances and final damming height shall be coordinated with the Owner and Gate Manufacturer which may raise the water level for the leakage criteria.
- E. Any defects disclosed during testing shall be promptly corrected without additional cost to the Owner and the tests repeated until the gate has satisfactorily passed the tests. No separate payment shall be made for testing and adjusting the gate.
- F. The manufacturer's representative and Contractor shall fill out the pneumatic crest gate certification form included at the end of this specification. Pneumatic crest gate certification will not be considered complete until this form has been provided to the Engineer.

### 3.04 OPERATOR TRAINING

- A. Operating training shall generally be defined as the formal and scheduled instruction of the Owner designated representatives in the proper operations of provided equipment, and in the techniques, methods, schedules, etc., associated with maintenance. This formal training shall be performed in the presence of the Engineer by representatives of the Contractor, any subcontractors directly responsible for the equipment provided, and the technical advisor of the equipment manufacturer.
- B. Operator training shall be performed by a duly authorized representative of the manufacturer who is fully trained in the installation, startup and operation of the equipment.
- C. Contractor shall provide Owner and Engineer with at least 72 hours' notice of his desire to perform operator training.
- D. Provide minimum of one day (8-hour days, not including travel time) of combined training and operational assistance for the Owner in the proper operations of provided equipment and in the techniques, methods, schedules, etc., associated with maintenance.



## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

- E. The manufacturer's representative and Contractor shall fill out the operator training certification form included at the end of this specification. Pneumatic crest gate certification will not be considered complete until this form has been provided to the Engineer.

### **PART 4 – MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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EQUIPMENT START-UP CERTIFICATION

"Dry Operation"

Owner: \_\_\_\_\_ Date: \_\_\_\_\_  
\_\_\_\_\_

Project: \_\_\_\_\_  
\_\_\_\_\_

Contractor: \_\_\_\_\_  
\_\_\_\_\_

Equipment Manufacturer: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Equipment: \_\_\_\_\_

As an authorized representative of the equipment manufacturer, the undersigned certifies that the equipment listed above conforms to the requirements of the contract documents. The undersigned authorized representative of the manufacturer further certifies that the equipment has been installed in accordance with the manufacturer's written instructions, that it is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.

\_\_\_\_\_  
(Authorized Representative of the Manufacturer) (Date)

\_\_\_\_\_  
(Contractor) (Date)

\_\_\_\_\_  
(Resident Engineer) (Date)

EQUIPMENT CERTIFICATION

"Wet Operation"

Owner: \_\_\_\_\_ Date: \_\_\_\_\_  
\_\_\_\_\_

Project: \_\_\_\_\_  
\_\_\_\_\_

Contractor: \_\_\_\_\_  
\_\_\_\_\_

Equipment Manufacturer: \_\_\_\_\_  
\_\_\_\_\_

Equipment: \_\_\_\_\_  
\_\_\_\_\_

This certifies that the entire equipment/system conforms to the requirements of the Contract Documents.

\_\_\_\_\_  
(Authorized Representative of the Manufacturer) (Date)

\_\_\_\_\_  
(Contractor) (Date)

\_\_\_\_\_  
(Resident Engineer) (Date)

OPERATOR TRAINING CERTIFICATION

Owner: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_

Project: \_\_\_\_\_

\_\_\_\_\_

Contractor: \_\_\_\_\_

\_\_\_\_\_

Equipment Manufacturer: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Equipment: \_\_\_\_\_

1. I have trained the Owner's personnel in the proper operation and maintenance of the above equipment.

\_\_\_\_\_  
(Authorized Representative of the Manufacturer)

\_\_\_\_\_  
(Date)

2. The personnel listed below attended the training session.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
(Contractor)

\_\_\_\_\_  
(Date)

3. Witnessed by: \_\_\_\_\_

\_\_\_\_\_  
(Resident Engineer)

\_\_\_\_\_  
(Date)

**SECTION 14321  
PORTABLE DAVIT CRANE AND CABLE WINCH**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Work Included: Furnish, install, and test a portable crane and cable winch system along the right abutment retaining wall for use at the fish ladder of the Macallen Dam as shown on the Drawings and specified herein.

1.02 SCOPE

- A. The Contractor shall provide a davit crane for raising the grates on the fish ladder along the right abutment. The davit crane shall be man portable and shall include a manual ratchet winch, steel cable, and a hook.

1.02 RELATED WORK

- A. Section 01300 – Submittals
- B. Section 03300 – Reinforced Cast-In-Place Concrete

1.03 QUALITY ASSURANCE

- A. The specifications direct attention to certain required features of the equipment, but do not purport to cover all the details entering into its design and construction. Nevertheless, the Contractors shall furnish the equipment complete in all details and ready for operation.
- B. Acceptable Manufacturers:
  - 1. Thern Inc., Winona, MN.
  - 2. Or equivalent.

1.04 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300.
- B. Submit detailed layout Drawings showing all dimensions and support locations and details demonstrating coordination with the stoplogs and lifter systems.
- C. Submit the Manufacturer's cut sheet on the davit crane.
- D. Davit crane attachment detail and design.

**PART 2 - MATERIALS**

**2.01 PRODUCTS**

- A. A portable davit crane system for placing and/or removing the grates of the fish ladder shall be provided. No permanent frame or hoist is proposed.
- B. Crane and cable winch assembly shall have a minimum capacity of at least 2000 pounds at the minimum reach and 1000 pounds at the maximum reach with ¼" cable.
- C. Mast and boom:
  - 1. Adjustable boom shall telescope to four different lengths and shall have a reach range from 27 inches to 82 inches. Boom shall be secured in position by removable locking pins.
  - 2. Boom shall be pivot mounted to mast top with a hand operated ratchet style screw jack attached to the boom and mast to adjust the vertical height of the boom. Boom height shall be adjustable under load.
  - 3. Boom shall have an integral cable sheave with cable guard to prevent the cable from jumping off the sheave.
  - 4. Crane shall have swivel boom with full 360° rotational range with a boom handle to assist with rotation.
  - 5. Crane shall break down for easy storage and transport. The davit crane shall be portable such that it can be carried in a pickup truck and can be moved and installed by a single person
  - 6. Material and Finish: Carbon steel with galvanized finish.
- D. Mounting base:
  - 1. Design: Raised Pedestal Base
  - 2. Material and Finish: Carbon steel with galvanized finish.
  - 3. Bolts shall be 316 stainless steel and shall be provided by the Contractor.
  - 4. Provide anchor bolt diameter, length, depth of penetration, method of installation and instructions to Contractor in shop drawings and full installation instructions in the installation, operation and maintenance manuals.
- E. Winch:
  - 1. Design: Worm Gear Hand Winch
  - 2. Finish: Corrosion resistant, electrostatic powder coated.
  - 3. Winch shall be top mounted to boom.
  - 4. Winch shall have disc brake handle to give control of the load for lifting and lowering operations.

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5. Winch Safe Working Load Rating: Minimum 2000 lbs.
- F. Winch Cable:
  1. Maximum lift distance below floor mounting level shall be 15 feet.
  2. Winch shall be provided with a minimum of 60 feet of ¼" stainless steel cable.
  3. Cable Ends:
    - a. Load End: A ¾ ton latching eye hook with stainless steel thimble compressed to the cable.
    - b. Winch End: A swaged ball for quick connection or disconnection of cable from winch drum.
  4. Cable Safe Working Load Rating: Minimum 2000 lbs.
- G. Provide surface preparation and shop coatings in accordance with specification Section 09905.
- H. Accessories:
  1. Crane shall be provided with a plastic base cover that fits in the mast hole to prevent water from collecting inside the base when the crane is removed.
  2. Crane shall be provided with an electric 400 rpm drill-motor, 120 VAC with 1-⅛" hex socket to power drive the hand winch. The winch shall also have the capability of being operated manually.
  3. Crane shall have a stainless-steel cable spool for storage of the wire rope when detached from the crane.
  4. Cranes shall be provided with a wire rope keeper to hold the free end of the wire rope when detached from the crane.
- I. Portable crane and cable winch assembly shall be Thern 5PT20, Commander Series 2000 or equivalent.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. The Contractor shall verify all dimensions and clearances in the field prior to erection and shall be responsible for the proper fitting and operation of the equipment and coordination with the stoplogs and lifting system.
- B. Contractor to provide and install 316 stainless steel bolts.
- C. Install in accordance with manufacturer's instructions.

### **3.02 FIELD QUALITY CONTROL**

- A. The cable winch shall be tested at rated load by the Contractor and shall be adjusted to

## **Macallen Dam – Abutments and Outlet Structure Rehabilitation**

operate in a manner satisfactory to the Department and Resident Engineer.

### **3.03    CLEANING**

- A.        Thoroughly clean crane and cable winch to remove mill scale, dirt, rust, grease and other foreign matter and touch up factory finish as required.

## **PART 4 - MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\* \* \* END OF SECTION \* \* \***

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**SECTION 16100**  
**ELECTRICAL WORK - GENERAL PROVISIONS**

**PART 1 GENERAL**

1.01     DESCRIPTION

- A.     Furnish all labor, materials, equipment and incidentals required to design and make ready for use the complete electrical systems as shown on the Contract Drawings and as specified hereinafter to fulfil the intent of the Project and to service all systems and devices procured and installed under the Contract, specifically the equipment and appurtenances associated with the pneumatic gate structure and subsurface gate operations vault.
- B.     It shall be the responsibility of the Contractor to design the electrical supply, metering, protection, distribution, and other systems necessary to operate the electrical loads installed under other Sections of this Contract. All such work shall be designed by a Professional Electrical Engineer or Licensed Electrician engaged by the Contractor. All aspects of the system shall be designed in accordance with all applicable local, state, and Federal codes and subject to approval by the Owner and Engineer.
- C.     The Contractor shall be responsible for all local permits for electrical work and for scheduling and passing local electrical code inspections.
- D.     The loads to be supplied under the Work of this Section shall specifically include, but not be limited to, the following:

- 1.    Precast Concrete Vault (Section 03605)
- 2.    Pneumatic Gate System (Section 11288)
- 3.    Lighting (Section 16550)

Restoration of electrical systems, fixtures, and appliances which are temporarily disturbed by the Contractor's work, shall be completed under the performance standards of this Section and other Sections as applicable (and all applicable local, state, and Federal codes), but shall be paid for under other Sections of the Work.

- E.     Temporary electrical systems used by the Contractor during construction shall be provided under other Sections of the Work.
- F.     The Work of this Section covers all general electrical work necessary for the installation, commissioning, and proper functioning of all electrical systems which are part of the Work of this Contract. The Work of this Section shall include, but not be limited to, the following:
  - 1.    Examination and inspection of existing electrical systems
  - 2.    Disconnection of existing systems which must be de-energized during construction for safety reasons.
  - 3.    Decommissioning of electrical systems to be removed under the Work of this Contract

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4. Design, certification, and permitting of electrical systems at the site which are to be repaired, replaced, modified, or installed as part of the Work of this Contract.
  5. Provision and installation of all miscellaneous electrical equipment, including, but not limited to:
    - i. Transformers
    - ii. Breakers and Switches
    - iii. Outlets
    - iv. Grounding
    - v. Surge protectors and lightning protection
    - vi. Misc. lighting
    - vii. Wiring and Cables
    - viii. Raceways
    - ix. Conduits, including reinforced concrete / flowable fill encasement
    - x. Meters, including 3 phase, 480 Volt Cold Sequence Meter in Gatehouse building
    - xi. NEMA boxes
    - xii. Control boxes
    - xiii. Handholes and Pull Boxes
    - xiv. Bushings
  6. All coordination with the electrical utility.
  7. All coordination with the pneumatic gate and instrumentation suppliers and installers.
  8. All connections to equipment and devices furnished under Division 16 and other Sections of these specifications except as otherwise specified.
  9. Testing and commissioning of all electrical systems.
  10. All documentation and “as built” drawings.
- E. Included in the Work of this Section is the installation of an underground electrical conduit bank to connect the new gate and light to the controls and existing power supply terminals. The Work of this Item includes:
1. All conduits
  2. All pull / junction boxes
  3. All excavatable flowable fill backfill for the trench
  4. All other incidentals not covered under other pay items
- Excavation for the trench and replacement of paving and/or landscaping above the trench are paid for under separate Items.
- F. It is the intent of these specifications that the electrical system shall be suitable in every way for the service required. All material and all work, which may be reasonably implied as being

incidental to the work of this Section shall be furnished at no extra cost to the Owner.

1.02 INTENT

- A. The Work included for the Items under this Section is intended cover all labor, materials and equipment required for installation and successful commissioning. The systems shall be complete and finished in all respects, tested and ready for operation. Work shall include calibration of equipment with factory settings. All materials, equipment and apparatus shall be new and of first-class quality.
- B. Any apparatus, appliance, material or work not shown on drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation as determined by good trade practice even if not particularly specified, shall be furnished, delivered and installed under their respective Divisions without any additional expense to the Owner.
- C. Minor details not usually shown or specified but necessary for proper installation and operation shall be included in the work as though they were hereinafter shown or specified.
- D. Work under each Section shall include giving written notice to the Owner and Engineer of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of work omitted. In the absence of such written notice, it is mutually agreed that work under each Section has included the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.
- E. Location of all existing systems and equipment shown on floor plans is based on the best available information. The Contractor shall verify all dimensions and locations of existing systems and equipment in the field and adjust as necessary.
- F. Certain items of existing equipment may be indicated for removal or relocation. Items noted for removal shall be disconnected and turned over to the Owner or disposed of by the Contractor if the Owner so requests. If instructed to dispose of items, the Contractor shall remove the items from the premises and dispose of them in a safe, legal and responsible manner and location. Items noted for relocation are intended for reuse in another location as designated on the Contract Drawings. It shall be the responsibility of the Contractor to remove the material from its present location, store the material in a safe place and reinstall the material in its new location. Questions regarding the suitability of the material or equipment shall be brought to the attention of the Owner and Engineer in writing.
- G. Wherever a particular piece of equipment, device or material is specifically indicated on the Contract Drawings by model number, type, series or other means, that specification shall take precedence over equipment or materials specified herein. For example: If a particular switch is specified on the Contract Drawings, its specification takes precedence over switch specified herein.

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### 1.03 SCOPE

- A. The Scope of the Work of this Item shall include, but not be limited to, design, provision and installation of the following:
  - 1. Interconnection with existing utility supply as needed to bring electrical service to the new underground vault and related project components requiring such.
  - 2. All metering, protection, and transformer capacity necessary for electrical service for systems in the underground vault.
  - 3. Installation and connection of all electrical systems and equipment necessary for the function of the new pneumatically operated crest gate.
  - 4. Installation and connection of all data sensors and systems necessary for the function of the new pneumatically operated crest gate.
  - 5. Provision, installation, and connection of all general electrical systems and equipment specified for the underground vault. However, measurement and payment for electrical equipment within the underground vault will be covered under a separate Section.
  - 6. All aboveground and below ground cabling and conduit, including excavation and backfill, necessary for all electrical and data systems.

### 1.04 RELATED WORK

Precast Concrete Vault - Section 03605

Pneumatic Gate System – 11288

Lighting – Section 16500

### 1.05 CODES, INSPECTIONS AND FEES

- A. Reference Standard Compliance
  - 1. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), and Underwriters Laboratories Inc. (UL), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.
  - 2. Independent Testing Organization Certificate: In lieu of the label or listing, indicated above submit a certificate from an independent testing organization, competent to perform testing, and approved by the engineer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.
- B. The Following Codes and Standards listed below apply to all electrical work. Wherever

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Codes and/or Standards are mentioned in these Specifications, the latest applicable edition or revision shall be followed:

New Hampshire State Building Code  
The International Building Code  
The International Mechanical Code  
The International Plumbing Code  
The BOCA National Code Supplement  
The National Electrical Code (NEC) as amended by the New Hampshire Electrical Code.  
NFPA 101 Life Safety Code  
Model Energy Code  
ASHRAE 90.1 and International Energy Conservation Code.

- C. The following Standards shall be used where referenced by the following abbreviations:

AIA	American Institute of Architects
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
EPA	Environmental Protection Agency
FM	Factory Mutual
FSSC	Federal Specification
IEEE	Institute of Electrical and Electronics Engineers
NBS	National Bureau of Standards
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSC	National Safety Council
OSHA	Occupational Safety and Health Administration
UL	Underwriters' Laboratories

- D. All materials furnished, and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction and the requirements of all Governmental departments having jurisdiction.
- E. The Electrical Sub-Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and Drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether shown on Drawings and/or specified or not.
- F. Obtain all necessary permits and pay all fees for permits and inspections.
- G. Coordinate with local building departments to schedule and pass all required inspections.
- H. The Contractor shall coordinate with the local electrical utility and shall be responsible for paying all fees associate with utility company work necessary to complete the Scope of this Section.

### 1.06 INTERPRETATION OF DRAWINGS

- A. The Drawings are not intended to show exact locations of conduit runs.

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- B. Each circuit shall be run in a separate conduit unless otherwise shown on the Drawings or recommended by the Pneumatic Gate manufacturer.
- C. Unless otherwise approved by the Owner, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.
- D. Where circuits are shown as homeruns, all necessary fittings and boxes shall be provided for a complete raceway installation.
- E. Any work installed contrary to or without review by the Owner shall be subject to change as directed by the Owner, and no extra compensation will be allowed for making these changes.
- F. The locations of equipment shown on the drawings are approximate only and exact locations should be coordinated with the Pneumatic Gate manufacturer. Exact locations shall be as determined by the Owner during construction after coordination with the Pneumatic Gate manufacturer. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an acceptable manner.
- G. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems shown, to include equipment and appurtenances for operation of the Pneumatic Gate system. Additional circuits shall be installed wherever needed to conform to the specific requirements of the equipment.
- H. All connections to equipment shall be made as required and in accordance with the approved shop and setting drawings.

### 1.07 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING

- A. The Contractor's professional electrical engineer or licensed electrician shall prepare all necessary plans, diagrams, and schematics which show the proposed equipment, equipment layout, and circuits necessary for providing power, metering, protection, and control to all electrical loads at the site. This shall include, but not be limited to, one-line circuit diagrams, cabinet outlines and schematics, and other necessary plans. These plans shall be submitted to the Owner and Engineer for approval a minimum of two (2) weeks prior to the start of electrical work and shall be coordinated with the Pneumatic Gate manufacturer prior to submittal.
- B. The Contractor's professional electrical engineer or licensed electrician shall select and submit the manufacturer's name, product designation or catalog number, descriptive literature and data shall be submitted for all material and equipment to be installed under the Work of this Section. This information shall be coordinated with the Pneumatic Gate manufacture to ensure compatibility of equipment. This information shall be submitted to the Owner and Engineer for approval a minimum of two (2) weeks prior to the start of electrical work.
- C. Prior to submittal, all shop drawings and data shall be checked for accuracy and conformance to contract requirements and coordinated with the Pneumatic Gate manufacturer. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to the specifications and drawings. This

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statement shall also list all discrepancies with the specifications and drawings. Shop drawings not so checked and noted shall be returned. Where required by code, the submittals shall be certified by a licensed electrician or stamped by an Electrical Engineer, as appropriate.

- D. The Owner's review shall be only for conformance with the design concept of the project and compliance with the specifications and drawings. The responsibility of, and the necessity of, furnishing materials and workmanship required by the specifications and drawings which may not be indicated on the shop drawings is included under the Work of this Section.
- E. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this work with the work of all other trades is also included under the work of this section.

## PART 2 PRODUCTS

### 2.01 GENERAL MATERIALS

- A. The materials used in all systems shall be new, unused and as hereinafter specified. All materials, where not specified, shall be of the very best of their respective kinds. Samples of materials or manufacturer's specifications shall be submitted for review as required by the Owner.
- B. Materials and equipment shall be compatible with the equipment necessary to operate the Pneumatic Gate system. All materials and equipment associated with the operation of the Pneumatic Gate system shall be coordinated with the Pneumatic Gate manufacturer.
- C. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored outdoors. Electrical equipment shall be stored in dry permanent shelters. If any apparatus has been damaged, such damage shall be repaired at no additional cost. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as directed by the Owner or shall be replaced at no additional cost to the Owner.
- D. The Contractor's attention is directed to the requirements of the various sections of Division 16 for additional product specifications.

### 2.02 WIRING

- A. Conductor Sizes: Standard American wire gauge sizes.
  - 1. Conductors No. 10 and smaller shall be solid copper.
  - 2. Conductors No. 8 and larger shall be stranded copper.
  - 3. Copper shall be soft drawn copper.
- B. Instrumentation wire shall be twisted pair construction, multiple pair series with individual and overall shield and PVC jacket. Minimum of 6 pairs AWG size 18 cable, UL listed. In the event the instrumentation provided will not accommodate AWG size, a smaller than a #18

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AWG cable can be used.

### 2.03 CONDUITS

#### A. Metal Conduit

Above Grade: Provide PVC Coated Steel conduit. Provide PVC coated outlet, pull, and junction boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

#### B. Non-Metallic Conduit (Underground)

1. Shall be heavy wall high impact strength rigid PVC conforming to the requirements of:
  - a. EPC - 80-PVC conduit
  - b. NEMA TC 2
  - c. UL listed in accordance with Chapter 3 of NEC for underground use
2. Fittings for EPC-80-PVC conduit shall meet the requirements of NEMA TC 3.
3. The conduit and fittings shall carry a U.L. label on each 10-foot length of conduit and stamped or molded on every fitting.
4. Conduit, fittings and cement shall be produced by the same manufacturer to assure system integrity.

#### C. Liquidtight, Flexible Metal Conduit, Fittings and Couplings

1. Liquidtight, flexible metal conduit shall be LA-LOR as manufactured by Electri-Flex Company or equal.
2. Fittings used with the flexible metal conduit shall be screw-in type as manufactured by Crouse Hinds Co., Raco or equal.

#### D. Conduit Mounting Equipment

1. All bolts, screws nuts, washers and etc. shall be stainless steel.
2. All wall hangers, clamps and etc. shall be non-metallic. If non-metallic is not available on certain items, PVC coated hardware will be acceptable field applied PVC coatings shall not be acceptable.
3. All threaded rod shall be stainless steel and no smaller in diameter than 3/8 inch.
4. Unistrut shall be 1 5/8 inch in width and be hot dipped galvanized.

#### E. Conduit Seals



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1. Conduit wall sleeve seals shall be Link-Seal as manufactured by Thunderline Corp or equal.
  2. Bolts and nuts shall be stainless steel.
- F. Standard Threaded Rigid Steel Conduit for Interior Runs and Exterior Riser
1. Rigid conduit heavy-wall galvanized.
  2. Threaded type fittings: "Erickson" couplings where threaded cannot be used.
  3. Rigid metal conduit Type RMC per NEC Chapter 3.
  4. Follow NEC Chapter 3 for elbows, couplings and associated fittings
  5. RMC shall meet the requirements of NEC Chapter 3 for bends, reaming and threading, securing and supporting.

### **2.04 UNDERGROUND ELECTRICAL PULL/JUNCTION BOXES**

- A. Pull/junction boxes used as part of the conduit bank shall be precast concrete meeting with watertight cover rated for AASHTO H-20 loading. Penetrations shall be treated to provide watertightness or the conduits passing through the box shall be sealed watertight. Cover shall be securable. Provide boxes at ends, mid-point, and junctions of conduit bank with a minimum of one box every 250 feet.

### **2.05 MANUFACTURER'S NAMEPLATES**

- A. All equipment shall have the manufacturer's name, address, model or type designation, serial number and all applicable ratings clearly marked thereon in a location which can be readily observed after installation. The required information may be die-stamped into the surface of the equipment or may be marked on durable nameplates permanently fastened to the equipment.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Provide and place all sleeves for conduit penetrations through floors, walls, partitions, etc., specifically the precast concrete subsurface gate vault. Locate all necessary slots and inserts for electrical work and place in forms before concrete is poured. Conduit penetrations shall be coordinated with Section 03605 – Precast Concrete Vault.
- B. Provide surge and lightning protection for all circuits.
- C. All systems and equipment shall be properly grounded using appropriate permanent, separate conductors in accordance with the NEC and IEEE recommended practices. Inspect and test all grounding systems prior to commissioning of systems and equipment.
- D. All equipment, materials, and construction must be suitable for damp environments where water may be present.

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### **3.02 RECORD DRAWINGS**

- A. As the work progresses, legibly record (red line) all field changes on a set of project contract drawings. Prior to Substantial Completion of the project, record drawings shall be prepared in accordance with the requirements of Section 01055 – As-Built Drawings.

### **3.03 TESTS AND ADJUSTMENTS**

- A. Test all systems furnished under Division 16 and repair or replace all defective work. Make all necessary adjustments to the systems and equipment and instruct the Owner's personnel in the proper operation of the systems and equipment. The Owner reserves the right to videotape the instruction sessions for future use in training.
- B. The Contractor's attention is directed to requirements of the various sections of Division 16 for additional test specifications.

### **3.04 GENERAL WORK**

- A. All Work under this Section shall be performed in accordance with all local, state, and Federal codes.
- B. All Work under this Section shall be performed or directly supervised by a licensed master electrician.
- C. Coordinate with the electrical utility for the site, as needed.
- D. Coordinate with the Pneumatic Gate manufacturer, as needed.

### **3.05 SHUTDOWNS**

- A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such time as designated by the Owner.
- B. The Engineer and the Owner shall be notified in writing of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.
- C. Work shall be arranged for continuous performance whenever possible. The Contractor shall provide all necessary labor, including overtime if required, to assure that existing operating services will be shut down only during the time actually required to make necessary connections.

### **3.06 CLEANING AND LABELING**

- A. The Contractor shall thoroughly clean all equipment of all foreign substances, oils, dust, dirt, etc., inside and out before final acceptance by the Owner.
- B. All systems, components, wires, and switches shall be clearly, securely, and permanently labeled with all relevant information using a durable and visible labeling system. Labeling shall include nameplates, labels, wire markers, conduit and raceway markers, etc. Color

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coding shall be as per NEC.

- C. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

### 3.07 OPERATING AND MAINTENANCE MANUALS

- A. Prepare operating and maintenance manuals in accordance with the requirements of Division 1 and as follows. The Contractor shall prepare three (3) copies of a complete maintenance and operating instructions manual, bound in booklet form. Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty, 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder.
- B. Manual shall include the following:
  - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
  - 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
  - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
  - 4. Servicing instructions and lubrication charts and schedules.
  - 5. Emergency instructions.
  - 6. Spare parts list.
  - 7. Copies of warranties.
  - 8. Wiring diagrams.
  - 9. Recommended "turn around" cycles.
  - 10. Inspection procedures.
  - 11. Shop Drawings and Product Data.
  - 12. Equipment start-up reports.
- C. Include in the manual, a tabulated equipment schedule for all equipment. Schedule shall include pertinent data such as: make, model number, serial number, voltage, normal operating current, belt size, filter quantities and sizes, bearing number, etc. Schedule shall include maintenance to be done and frequency.
- D. Maintenance and instruction manuals shall be submitted to the Owner at the same time as the

seven (7) day notice is given prior to the instruction period.

3.08     CONDUIT AND RACEWAY INSTALLATION

A.     General

1. All non-metallic conduit and fittings shall be solvent cemented in accordance with the written manufacturer's instructions.
2. Install in accordance with Chapter 3 of the NEC.
3. No conduit smaller than 1/2-inch electrical trade size shall be used, nor shall any have more than three 90-degree bends in any one run. Pull boxes shall be provided as required or directed.
4. No wire shall be pulled until the conduit system is complete in all details; in the case of concealed work, until all rough plastering or masonry has been completed; in the case of exposed work, until the conduit system has been completed in every detail.
5. The ends of all conduits shall be tightly plugged to exclude dust and moisture until wire is pulled. Immediately after pulling any wire, the box and enclosure covers shall be installed.
6. Conduit supports shall be spaced:  
  
Rigid non-metallic in compliance with Chapter 3 of the NEC.  
Rigid metal in compliance with Chapter 3 of the NEC
7. Single conduits shall be supported by one-hole pipe clamps with back plates designed to raise the conduit from the surface. Multiple runs of conduits shall be supported on Unistrut members supported with threaded rod.
8. All conduits on exposed work shall be run at right angles to and parallel with the surrounding wall. No diagonal runs will be allowed. Bends in parallel conduit runs shall be concentric. All conduits shall be run perfectly straight and true.
9. Conduit terminating in pressed steel boxes shall have double locknuts and insulated bushings.
10. Conduit terminating in non-metallic boxes shall have terminal adapters (threaded ended by socket end).
11. Conduit terminating in gasketed enclosures shall be terminated with conduit hubs.
12. Conduits shall be installed using threaded fittings.
  - a. Wherever raw metal is exposed on the conduit (cutting of threads), the exposed metal shall be cleaned and given a coat of ZRC cold galvanizing compound.
13. Liquidtight flexible metal conduit shall be used for all motor terminations and other equipment where vibration is possible.

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14. Signal Conduits
  - a. Signal conduits shall be separated from power conduits by a minimum of four (4) inches where possible runs shall cross each other at right angles.
  - b. Signal circuits shall not be contained in the same raceway of boxes with power, lighting or control circuits.
  - c. Signal circuits within equipment enclosures shall be separated from power, lighting or control circuits by containing the signal circuit in metal raceway.
15. Secure continuous grounding by bonding conductor throughout conduit systems.
16. Conduits shall be placed with minimum horizontal direction of travel. Vertical travel is the preferred direction. Conduit shall travel vertical through the ceiling and travel horizontal along the masonry wall in the ceiling. Plenum conduits shall not be run diagonally across the top of the ceiling.
17. Conduit travel is restricted in areas that will compromise the architecture structure of the building.
18. Provide touch-up compounds for coated raceways. In the event the PVC coated metal is damaged during raceways installation.
19. RMC shall be used for long runs of wire to utilize supports for RMC.
- B. Rod and swab embedded conduit after concreting and masonry work have been completed. If obstructions are encountered which cannot be removed, or if any condition exists which may result in damage to wires and cables pulled through the conduit, install a new conduit run at a location approved by the Engineer at no additional cost to the Owner.
- C. In each conduit or raceway assigned for the future, or space use, a pulling polyester or nylon pull line that can be left in conduit for future use and that will not rot or mildew. Ends of future or space conduits shall be sealed to prevent all undesired entry, water, animals, or materials.
- D. Place conduits in conduit bank trench so as to maintain minimum cover as shown on the plans and minimum separation.
- E. Install junction / pull boxes at both ends, mid-point, and all junctions with a minimum of one every 250 feet.
- F. Backfill conduit bank trench with excavatable flowable fill to bottom of overlying paving material. Flow fill material as per Section 02200 – Earthwork. Cost of flow fill to be included in the unit cost of the Conduit Bank.

**PART 4 MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\*\*\*END OF SECTION\*\*\***

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**SECTION 16550  
LIGHTING**

**PART 1 GENERAL**

1.01 DESCRIPTION

- A. The Work of this Section shall include all work, operations, equipment, materials, personnel, and incidentals for removal and replacement-in-kind of the existing decorative light pole and appurtenant systems adjacent to the work to be conducted along the left abutment of the dam and as shown on the Contract Drawings. The intent of the work is to restore or replace-in-kind the light pole to the pre-construction condition. The existing light pole may be re-used provided the condition is deemed acceptable by the Owner and Resident Engineer.

1.03 RELATED WORK

The following is a list of related work items that shall be performed or furnished under other Sections of these Specifications as indicated.

- A. Pneumatic Gate System– Section 11288
- B. Electrical Work – 16100

1.04 SUBMITTALS:

- A. Ten (10) days prior to ordering materials, submit manufacturer's data and descriptive literature for all overhead outdoor lighting fixtures and components to be installed as part of the Work of this Contract.
- B. Submit information on mast pole and foundation system design for mast pole.

1.05 COORDINATION:

- A. Coordinate the work with other Sections to provide for controls and power supply and connection to the existing light pole.

**PART 2 PRODUCTS**

2.01 DECORATIVE LIGHT POLE (AS NEEDED)

- A. The decorative light pole for use along the left abutment, as shown on the Contract Drawings, and which generally resembles the light poles within the parking lot for 6 Bay Road (Bryant Rock LLC).
- B. The light pole base shall provide access to the poles internal wiring.
- C. The light pole color shall be black, as directed by the Owner.

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- D. Accessories, including but not limited to attachment and grounding hardware and decorative scrollwork shall be provided.
- E. The associated handhold and accompanying conduit, as shown on the Contract Drawings, shall also be removed and replaced-in-kind.
- F. The cost of light pole foundations shall be considered incidental to the price bid for light pole and fixtures.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION OR RE-INSTALLATION OF LIGHT POLE**

- A. Verify location with the Owner prior to installation.
- B. Mount fixtures in true vertical and horizontal alignment. Adjust the location of any lighting fixture as required to avoid interferences with existing conditions and of the work of other trades. All exterior lighting poles shall be grounded as shown on the contract drawings. Adjust as necessary any occupancy sensor for the automatic lighting controls such that all areas in the space being luminated is covered.
- B. Each fixture provided shall be a completely finished unit with all components, mounting and/or hanging devices necessary for the proper installation of the particular fixture.
- C. Provide electrical supply to the light and handhold box under separate Sections of the Work. Supply to the light pole shall be via underground conduit.
- D. All fixture assemblies shall be grounded. Exterior metallic poles shall be grounded by connecting the equipment ground conductor to each grounding bushing and to the pole grounding terminals.

#### **3.02 COORDINATION**

- A. Coordinate with the electric utility as necessary.
- B. Coordinate with the municipal electrical inspector to schedule and pass all required inspections in accordance with the local codes.

### **PART 4 MEASUREMENT AND PAYMENT**

Refer to Section 01950 – Measurement and Payment for the measurement and payment items related to this Section.

**\*\*\*END OF SECTION\*\*\***

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